

The State of Nevada Enhanced Hazard Mitigation Plan

2018



Governor
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Executive Summary

This State Enhanced Hazard Mitigation Plan is the official statement of Nevada's statewide hazard mitigation goals, strategies, and priorities. Hazard mitigation can be defined as any action taken to reduce or eliminate long-term risk to life and property from natural and human-caused disasters.

The standard version of the State Hazard Mitigation Plan was originally submitted by the Nevada Division of Emergency Management and approved by FEMA in 2004; it was updated in 2007, updated and enhanced in the 2010 iteration. Since 2010, the Nevada Hazard Mitigation Planning Committee, Nevada Hazard Planning Subcommittee, Nevada Division of Emergency Management staff, and Nevada Bureau of Mines and Geology staff at the University of Nevada, Reno contributed to the 2013 update and the current 2018 update of the Enhanced State Hazard Mitigation Plan.

The Nevada Division of Emergency Management created the Nevada Hazard Mitigation Planning Committee in 2003 to support the development and implementation of the first State Hazard Mitigation Plan. Initially, members were tasked with directing the planning process and the review and approval of the resulting draft document. Since its formation, the Committee has expanded and currently promotes the development of hazard plans and public awareness of mitigation activities in Nevada's communities throughout the state. Other responsibilities include the review and prioritization of mitigation activities presented by state and local agencies to the Nevada Division of Emergency Management and the Division of Water Resources for funding under the Unified Hazard Mitigation Assistance programs, promoting land use regulations and providing technical assistance and data for the development of the state and local planning efforts. The Committee meets quarterly, with special meetings scheduled as necessary. Prior to November 2009, meetings were held alternately in the City of Reno (north) and the City of Las Vegas (south). However, since the beginning of the 2010 calendar year, the Committee members agreed to hold meetings around the state in an effort to provide current information about hazards, mitigation efforts, and funding opportunities to the communities hosting the meetings and to learn about the concerns of those communities regarding hazards, capabilities, and resiliency.

The Subcommittee was created to allow greater flexibility for stakeholder participation in the planning process. Representatives from state, local, and tribal agencies were invited to participate in the process via email from the Nevada Division of Emergency Management on behalf of the Committee. Invitations were sent in January of 2011 as the 2013 update of the plan began. The Subcommittee invited participation from experts in different fields based on the hazards being addressed. The Subcommittee established a Planning Team to coordinate the data compilation and to implement the proposed updates of the plan document. The process began again in 2014 with the first meeting of the Subcommittee in order to begin the update of the 2018 plan.

The Planning Team consists of four people gathering the information and incorporating it into the draft plan document: the State Hazard Mitigation Officer, a mitigation specialist (when available), a geologist/editor, and a GIS specialist both from the Nevada Bureau of Mines & Geology, University of Nevada, Reno.

Each draft section was distributed via email and posted on the Nevada Hazard Mitigation Planning Committee and Nevada Division of Emergency Management website for review by the Subcommittee members with a request for feedback and distributed to other agencies with

expertise in each of the hazards. Any feedback was incorporated into the appropriate draft section revision by the Planning Team members, which was then reposted on the website and sent again via email to members for their review and comment prior to presenting drafts for the Subcommittee to make recommendations to the Committee. The Subcommittee meetings take place one month before the full Committee meetings to allow the review and contribution by the Committee members of all updates before approval of the drafts is placed for approval on its agendas. Public comment is possible through the Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee websites for any and all portions of the plan posted. The mitigation planning process at the state level is continuous; the compilation and sharing of data, integration, and implementation of the plan begins immediately upon submission to FEMA for review.

All sections of the 2018 Enhanced Plan were reviewed by the Subcommittee and the Planning Team; modifications were made to each section of the plan with current information, new maps, additional hazard data, tabulation of data, and integration of local plans. The Committee reviewed and approved the final drafts of all sections and appendices of the updated plan. The Committee is confident of the integration of local and regional planning efforts into the State plan and the capability of the State to implement its strategies, assess their effectiveness, and modify those strategies as necessary to accomplish the plan's goals.

The most important parts of the plan are contained in Sections Three and Section Four. Section Three contains the five elements of the Risk Assessment process:

- Identifying and screening the hazards faced by the State
- Profiling those hazards
- Identifying the assets at risk
- Assessing the vulnerabilities
- Analyzing potential losses due to the major hazards in the state

Much of the work of the Subcommittee was spent in compiling this information, which has been expanded with more detail and member input since the last iteration.

Section Four describes the State's mitigation goals and resultant selection of mitigation activities to achieve those goals, which constitute the State's Mitigation Strategy. While the overall goals have not changed since the last iteration, some of the strategic actions have been modified, added, or deleted to correspond with those of member agencies.

The Nevada Hazard Mitigation Planning Committee and Nevada Division of Emergency Management acknowledge the numerous local, state, federal and tribal groups, agencies, and their representatives who patiently provided their time, effort, and resources to make this a truly Enhanced Plan. There are too many to list all contributors without omitting someone whose help was invaluable, so please know that your assistance is greatly appreciated.

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List of Acronyms

A3	American Avalanche Association
AIS	Aquatic Invasive Species
AML	Abandoned Mine Lands
ANSI	American National Standards Institute
ARC	Atlantic Richfield Company
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ATC	Applied Technology Council
AWG	Alpine Watershed Group
AZGS	Arizona Geological Survey
BAPC	Bureau of Air Pollution Control
BCA	Bureau of Corrective Actions
BFF	Bureau of Federal Facilities
BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMI	Basic Management Incorporated
BMRR	Bureau of Mining Regulation and Reclamation
BOR	U.S. Bureau of Reclamation
BSDAC	Building and Safety Division Administrative Code
BSDW	Bureau of Safe Drinking Water
BWPC	Bureau of Water Pollution Control
BWQP	Bureau of Water Quality Planning
CBRNE	Chemical, Biological, Radiological, Nuclear, Explosives
CCHD	Clark County Health District
CCSD	Clark County School District
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERT	Community Emergency Response Teams
CFR	Code of Federal Regulations
COAD	Community Organizations Active in Disasters
CRMS	Carson River Mercury Site

CRS	Community Rating System
CTP	Cooperating Technical Partners
CVCD	Carson Valley Conservation District
CWPP	Community Wildfire Protection Plans
CWSD	Carson Water Subconservancy District
DCNR	Nevada Department of Conservation and Natural Resources
DFIRMS	Digital Flood Insurance Rate Maps
DHS	Department of Homeland Security
DOB	Duplication of Benefits
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DPBH	Nevada Division of Public and Behavioral Health
DRI	Desert Research Institute
DRMS	Decision, Risk, and Management Sciences Program
DVCD	Dayton Valley Conservation District
EAA	Emergency Assistance Account
EAP	Environmental Assistance Program
EDA	U.S. Economic Development Administration
EHP	Environmental Planning and Historic Preservation
EHS	Extremely Hazardous Substances
EIP	Environmental Improvement Program
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ERT	Emergency Response Team
ESF	Emergency Support Functions
FAW	Flood Awareness Week
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FMAG	Fire Management Assistance Grant
FSA	Farm Service Agency
FTRS	Flood Threat Recognition System
GAR	Governor's Authorized Representative

GIS	Geographic Information Systems
GOAS	Goals, Objectives, Action
HMA	Hazard Mitigation Assistance
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMTA	Hazardous Materials Transportation Act
HPP	Hospital Preparedness Program
HSEEP	Homeland Security Exercise and Evaluation Program
HSWG	Homeland Security Working Group
HUD	U.S. Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
IDF	Inflow Design Flood
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IFGC	International Fuel Gas Code
IGCC	International Green Construction Code
IMC	International Mechanical Code
IPMC	International Property Maintenance Code
IRC	International Residential Code
ISPSC	International Swimming Pool and Spa Code
ITCN	Intertribal Council of Nevada
ITERC	Intertribal Emergency Response Committee
IWUIC	International Wildland-Urban Interface Code
JFO	Joint Field Office
LAS	Loss Avoidance Study
LEPCs	Local Emergency Planning Committees
LHAs	Local Health Authorities
LHMP	Local Hazard Mitigation Plan
LTAISWG	Lake Tahoe Aquatic Invasive Species Working Group

LTBMU	Lake Tahoe Basin Management Unit
LVWD	Las Vegas Water District
MapMod	Map Modernization
MMI	Modified Mercalli Intensity Scale
MTBE	Methyl tert-butyl ether
NAC	Nevada Administrative Code
NAP	Noninsured Crop Disaster Assistance Program
NBMG	Nevada Bureau of Mines and Geology
NCDC	National Climatic Data Center
NDA	Nevada Department of Agriculture
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDHHS	Nevada Department of Health and Human Services
NDI	Nevada Division of Insurance
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDPS	Nevada Department of Public Safety
NDSP	National Dam Safety Program
NDWR	Nevada Division of Water Resources
NEC	National Electrical Code
NEHRP	National Earthquake Hazard Reduction Program
NEPA	National Environmental Protection Act
NESC	Nevada Earthquake Safety Council
NETAP	National Earthquake Technical Assistance Program
Nevada DEM	Nevada Division of Emergency Management
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHA	Nevada Hospital Association
NHM	Nevada Hazard Mitigation
NHMP	Nevada Hazard Mitigation Plan
NHMPC	Nevada Hazard Mitigation Planning Committee
NIC	Nevada Insurance Council

NLTFPD	North Lake Tahoe Fire Protection District
NLVOEM	City of North Las Vegas Office of Emergency Management
NMA	Nevada Mining Association
NNG	Nevada National Guard
NOA	Naturally Occurring Asbestos
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPL	National Priority List
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRS	Nevada Revised Statutes
NSAA	National Ski Areas Association
NSF	National Science Foundation
NTRT	Nevada Tahoe Resource Team
NWAM	Nevada Wildfire Awareness Month
NWS	National Weather Service
OMB	Office of Management and Budget
OOE	Office of Epidemiology
OSHA	Occupational Safety and Health Administration
OU-1	Operable Units One
OU-2	Operable Units Two
PA	Public Assistance
PCE	Perchloroethylene
PDA	Preliminary Damage Assessment
PDM	Pre-Disaster Mitigation
PNPs	Private Non-Profit
PSC	Philip Services Corporation
RAP	Radiological Assistance Program
RCRA	Resource Conservation and Recovery Act
RFC	Repetitive Flood Claims
RFCD	Clark County Regional Flood Control District

RiskMAP	Risk Mapping, Assessment, and Planning
RL	Repetitive Loss
RSF	Recovery Support Functions
SAC	Sierra Avalanche Center
SAD	Standards for Accessible Design
SARA	Superfund Amendment Reauthorization Act
SARS	Severe Acute Respiratory Syndrome
SCEMP	State Comprehensive Emergency Management Plan
SEOC	State Emergency Operations Center
SERC	State Emergency Response Commission
SFHA	Special Flood Hazard Area
SHD	State Health Division
SHMO	State Hazard Mitigation Officer
SHMP	State Hazard Mitigation Plan
SHPO	State Historic Preservation Officer
SMAC	State Mapping Advisory Committee
SNWA	Southern Nevada Water Authority
SPS	Singatse Peak Services
SPWD	State Public Works Division
SRL	Severe Repetitive Loss
SSFS	Sparks Solvent/Fuel Site
SUAs	State Units on Aging
SURE	Supplemental Revenue Assistance Payments Program
TCE	Trichloroethylene
TCID	Truckee-Carson Irrigation District
TDFPD	Tahoe Douglas Fire Protection District
TFFT	Tahoe Fire and Fuels Team
THIRA	Threat and Hazard Identification and Risk Assessment
TMWA	Truckee Meadows Water Authority
TNC	The Nature Conservancy
TRFMA	Truckee River Flood Management Authority
TRFP	Truckee River Flood Project

TRPA	Tahoe Regional Planning Agency
TSCA	Toxic Substances Control Act
TTX	Tabletop Exercise
UAC	Uniform Administrative Code
UAS	Unmanned Aircraft System
UMC	Uniform Mechanical Code
UNCE	University of Nevada Cooperative Extension
UNLV	University of Nevada, Las Vegas
UNR	University of Nevada, Reno
UPC	Uniform Plumbing Code
URM	Unreinforced Masonry Building
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health and Human Services
USFS	U.S. Forestry Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPSHT	Uniform Swimming Pool, Spa & Hot Tub
VCG	Vista Canyon Group
VOAD	Voluntary Organizations Active in Disasters
WFSC	Desert Research Institute's Wildland Fire Science Center
WHO	World Health Organization
WIPP	Water Isolation Pilot Program
WMD	Weapons of Mass Destruction
WNV	West Nile Virus
WRN	Weather Ready Nation
WUI	Wildland Urban Interface

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This Section provides an overview of the plan contents, a state profile, and a summary of land management in the State of Nevada. *Demographic and economic data have been updated for the 2018 iteration of the Plan. A new table was added to this section, Table 0-4: population projections (2015-2019) for the state of Nevada, because the most recent population estimates for Nevada are from 2014.*

0.1 OVERVIEW OF PLAN CONTENTS

This is the fourth revision of the original Standard State Hazard Mitigation Plan (SHMP) that was written and approved by the Federal Emergency Management Agency (FEMA) in 2004 and last revised in 2013. It presents an assessment of the risks and potential losses posed by these hazards throughout the State. It also provides the methodology for prioritization of these risks. The Nevada Hazard Mitigation Planning Committee (NHMPC) that wrote and revised the plan was composed of representatives from federal, state, tribal, and local entities and the private sector.

This plan is a living document and has been in a state of constant revision since the 2007 Plan, according to the maintenance process presented in Section 6. The NHM Planning Subcommittee met quarterly throughout 2015, 2016 and 2017 until the completion of the major elements of the revised Enhanced Nevada SHMP in June of 2018. The current revision of the SHMP is organized according to the elements presented in the FEMA State Mitigation Plan Review Guide. The plan meets the requirements of the Code of Federal Regulation (44 CFR 201) which precede each section.

This plan provides the basis and guidance for hazard mitigation in the State of Nevada. The goal of the plan is to reduce loss of life and property by fostering disaster-resilient communities.

Section 1 describes the State's process for adoption of the Plan and presents the state's authority to implement the plan.

Section 2 provides an overview of the planning process; identifies the NHMPC members, and documents the participation of interested groups in the planning process. It also documents how the planning team reviewed and analyzed each section of the plan and indicates whether each section was revised.

Section 3 provides the identification of hazards that were considered and profiles each hazard affecting Nevada.

Section 4 provides the State's blueprint for reducing the losses identified in the risk assessment. It describes the State mitigation goals that guide the selection of mitigation activities. It also describes how the previous goals were assessed and whether or not they were revised. It includes a discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities. It includes an evaluation of State laws, regulations, policies, and programs related to hazard mitigation. It evaluates the State's policies related to development in hazard-prone areas and discusses State funding capabilities for hazard mitigation projects. This section includes a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

Section 5 describes how the State supports local jurisdictions and tribal entities in developing plans that will accomplish their mitigation goals, objectives, and actions, through funding and technical assistance.

Section 6 describes the State of Nevada's plan for monitoring, evaluating, and updating the SHMP. It describes implementation measures, and reviews progress on mitigation goals, activities, and project closures.

Section 7 provides a list of sources used as references to gather data.

Section 8 provides the response to the enhanced plan requirements.

0.2 STATE PROFILE

This subsection provides a profile of the State of Nevada including economy, physiography, state facts, demographics, tribal information, geography, population, climate, political divisions and jurisdictions.

0.2.1 Economy

The major industry in Nevada is tourism. Tourism includes the large resorts and casinos found in large numbers in southern Nevada around Las Vegas and, to a lesser extent, in Reno and Lake Tahoe and the smaller communities. Please see Table 0-1 below showing earnings by major industry in Nevada for 2016. The information source is the Nevada Regional Economic Analysis Project. This data was retrieved January 31, 2018. The table below provides a snapshot of overall employment of the population of the state. Figure 0-1 is a shaded relief map of the state showing location of county boundaries, river systems, major rail, and highway networks.

Table 0-1. Nevada Earnings by Major Industry, 2016

Major Industry	2016 Earnings $(1000s)	Percent of Total
Accommodation and Food Service	13,920,335	16.1%
Local Government	8,569,636	9.9%
Health Care and Social Assistance	8,125,324	9.4%
Professional, Scientific, and Technical Services	6,043,297	7.0%
Retail Trade	5,999,678	6.9%
Construction	6,184,511	7.2%
Finance and Insurance	3,054,893	3.5%
Transportation and Warehousing	3,952,574	4.6%
Administrative and Waste Services	4,040,785	4.7%
Manufacturing	3,067,930	3.5%
Wholesale Trade	3,063,581	3.5%
Other Services, except Public Administration	2,990,096	3.5%
Management of Companies and Enterprises	3,570,016	4.1%
State Government	3,051,153	3.5%
Federal Civilian	1,875,344	2.2%
Military	1,222,390	1.4%
Mining	1,563,790	1.8%
Real Estate, Rental and Leasing	921,153	1.1%
Arts, Entertainment and Recreation	2,424,518	2.8%
Information	1,534,583	1.8%
Utilities	620,920	0.7%
Educational Services	550,189	0.6%
Farm Earning	91,873	0.1%
Forestry, Fishing and Related Activities	23,194	0.0%
Total	**86,461,763**	**100.00%**

Source: Nevada Regional Economic Analysis Project 2016 data
http://nevada.reaproject.org/analysis/industry-analysis/by_industry/earnings/

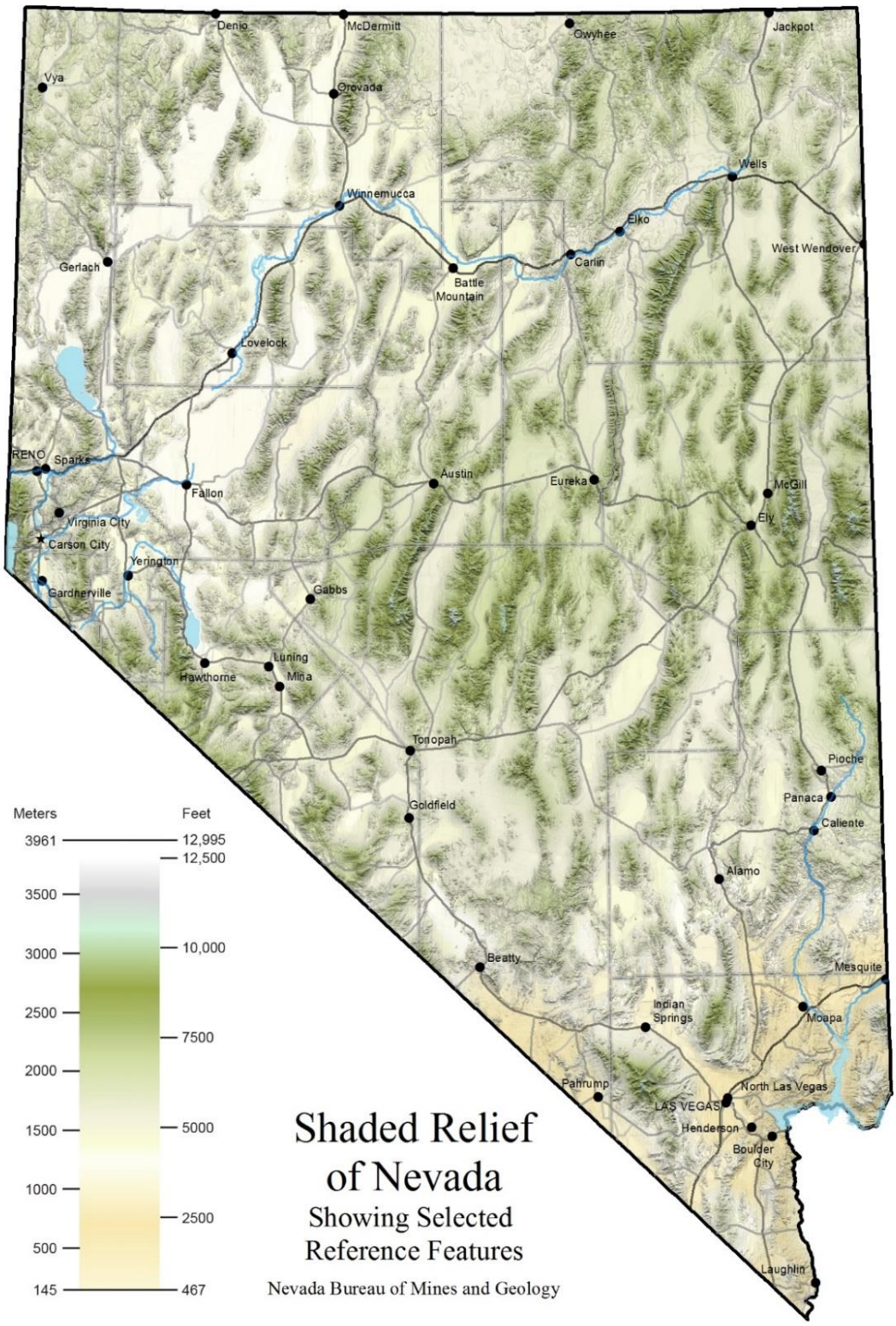


Figure 0-1. Shaded Relief Map of Nevada

0.2.2 Physical Geography

Nevada is bordered by California on the west, Oregon and Idaho on the north, Utah on the east, and Arizona on the southeast. Nevada is located primarily in the Basin and Range physiographic province with more than 30 north-south-trending mountain ranges and intervening valleys. Average elevation in the northern part of Nevada ranges from about 4,000 to 6,000 feet and averages from 2,000 to 3,000 feet in the southern part of the state. The highest elevations are Boundary Peak in the Sierra Nevada, at 13,143 feet, and Wheeler Peak, at 13,063 feet in the eastern part of the state. The southern part of the state lies within the Mojave Desert. The northernmost part of the state lies within the Columbia River Plateau Physiographic region.

Most of Nevada lies within the Great Basin whose waters do not reach the ocean but terminate in sinks or flow into lakes with no outlets. There are some small drainage areas in the north margins of the state that empty into the Columbia River Basin and another limited region in the southeast that drains into the Colorado River.

The state's three main river systems that originate in the Sierra Nevada and flow generally eastward into Nevada are the Truckee, the Carson, and the Walker Rivers. The termini of these rivers are respectively Pyramid Lake, Carson Sink, and Walker Lake. The Humboldt River system in northern Nevada is the only major river system that is entirely contained within the state, ending in Humboldt Sink. In the southern part of the state, the Virgin and Muddy Rivers flow south into the Colorado River system; this includes Lake Mead.

In addition to these natural waterways, there are several major man-made reservoirs in the state, briefly described in Table 0-2 below.

Table 0-2. Major Nevada Reservoirs

Name	River System	Total Storage Capacity (acres)	Total Capacity Units (acre-feet)
Lake Mead	Colorado	29.7M	26.134M
Lake Mohave	Colorado	1.82M	1.818M
Lake Lahontan Reservoir	Carson	317,000	312,000
Pitt-Taylor Reservoir Upper	Humboldt	24,200	24,200
Pitt-Taylor Reservoir Lower	Humboldt	22,200	22,200
Rye Patch Reservoir	Humboldt	171,000	213,000
South Fork Reservoir	Elko	41,000	40,000
Wild Horse Reservoir	Owyhee	73,500	95,235

0.2.3 Climate

Nevada is the driest state in the U.S., with overall average annual precipitation of approximately nine inches. The low precipitation and high average elevation characterize most of the state as high desert.

0.2.4 Temperature

Nevada is characterized by exceptionally large daily ranges of temperature caused by strong surface heating during the day and rapid nighttime cooling. The mean annual temperatures vary from the middle 40s (Fahrenheit) in the northeast to the 50s in the west and central areas, and to the middle 60s in the south. The average range between the highest and the lowest daily temperatures is 30 to 35 degrees with larger variations in summer than the winter. Temperature extremes range from 120° F to 50° F below zero. Summer temperatures above 100° F are common in the south and occasional over the rest of the state. Over the northern and central portions of the State, freezes begin early in the autumn and continue until late in the spring.

0.2.5 Precipitation

Nevada's geographic location on the lee side of the massive mountain barrier of the Sierra Nevada markedly influences the precipitation that falls on the state. Prevailing west winds bring warm moist Pacific air that ascends, cools, condenses, and falls as precipitation before it reaches the eastern slope of the Sierra Nevada. The effects of this mountain barrier are felt throughout the State, resulting in desert conditions over the rest of the state. Nevada averages only about nine inches of precipitation overall. Highest amounts are in the Sierra Nevada averaging over 40 inches. The Ruby Mountains area in central Nevada averages about 18 inches, and the least amount of precipitation, as little as five inches, falls in the lower valleys of Nevada from Death Valley, California to the Idaho border. In the western and south-central mountains of the state, most of the precipitation falls as winter snow, while in the central and northeastern area most precipitation occurs as spring rain. In the southeastern part of the state, most of the precipitation comes from summer thunderstorms.

Although Nevada is characterized by generally low mean annual precipitation, occasional extreme precipitation events do present a risk to Nevada's people, homes, and infrastructure.

0.2.6 Population

Nevada has 17 counties with its population concentrated in centers separated by large sparsely populated spaces, as shown in Figures 0-2 and 0-3. More than 88% of the state's inhabitants reside in the two most populous counties, Clark and Washoe. Population statistics are presented in Table 0-3 and Table 0-4. The sparsity of population and vast distances between population centers seriously impacts preparation, response, and recovery efforts in an emergency event.

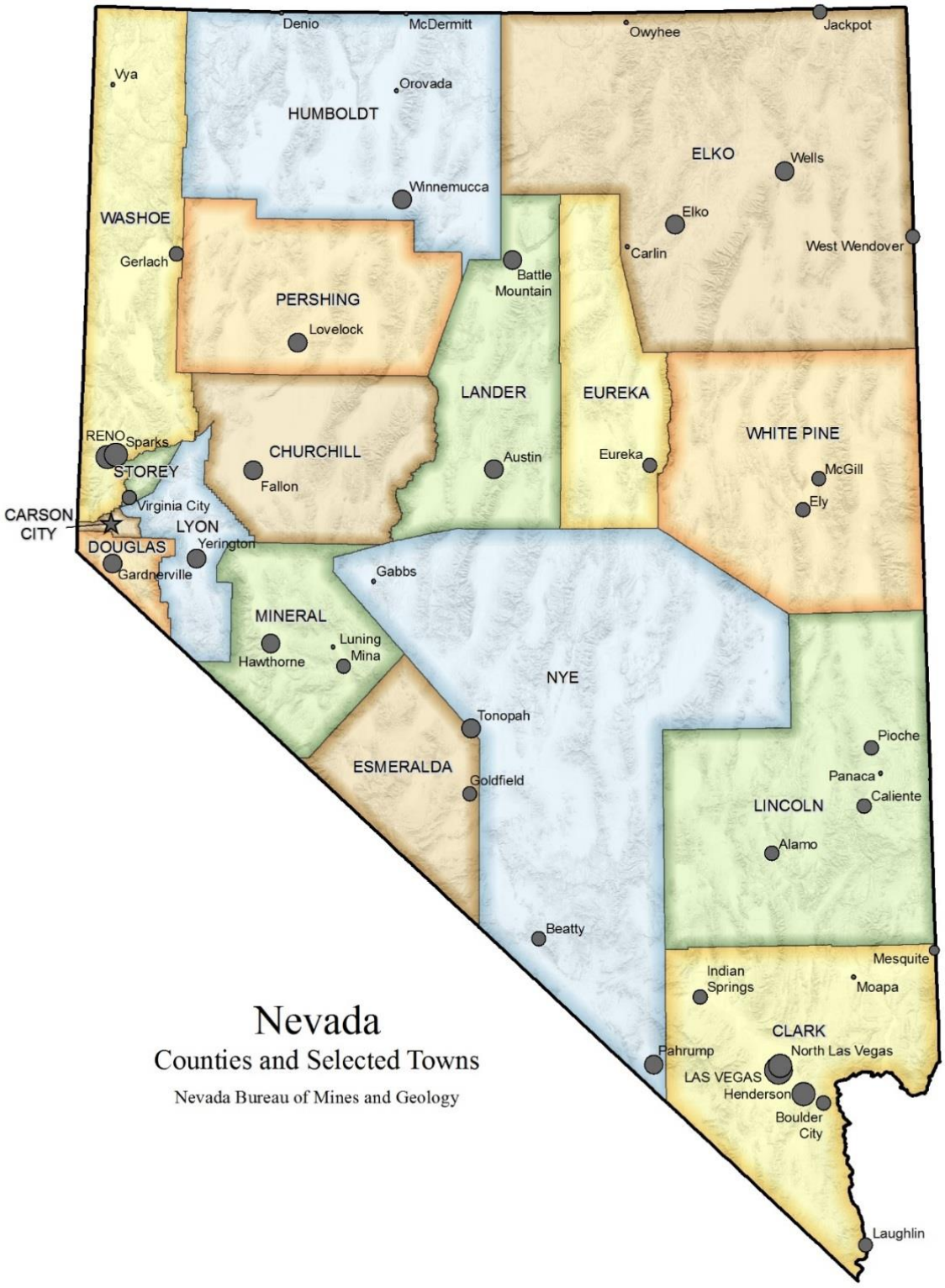


Figure 0-2. County Map of Nevada

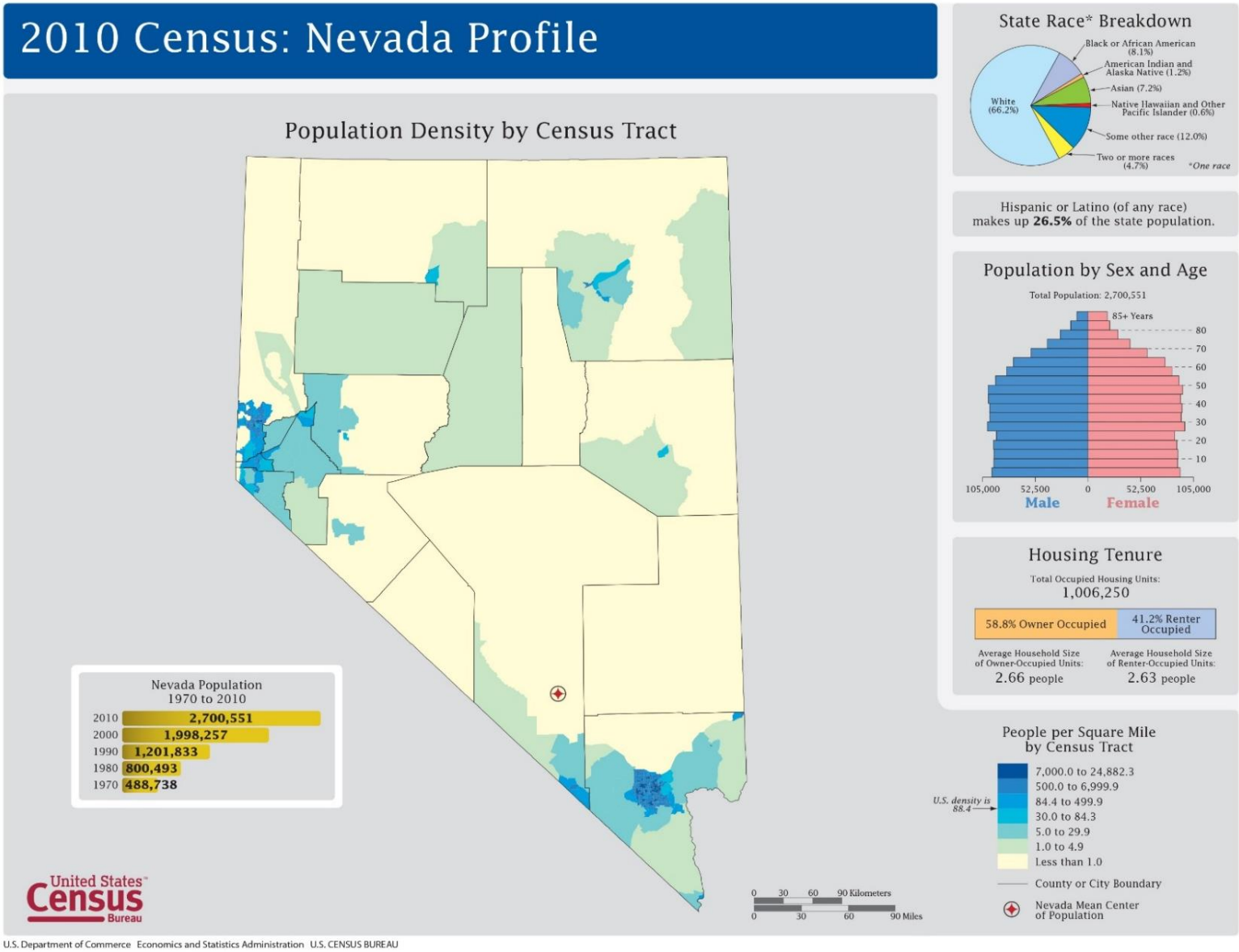


Figure 0-3a. Nevada's Population Density, 2010

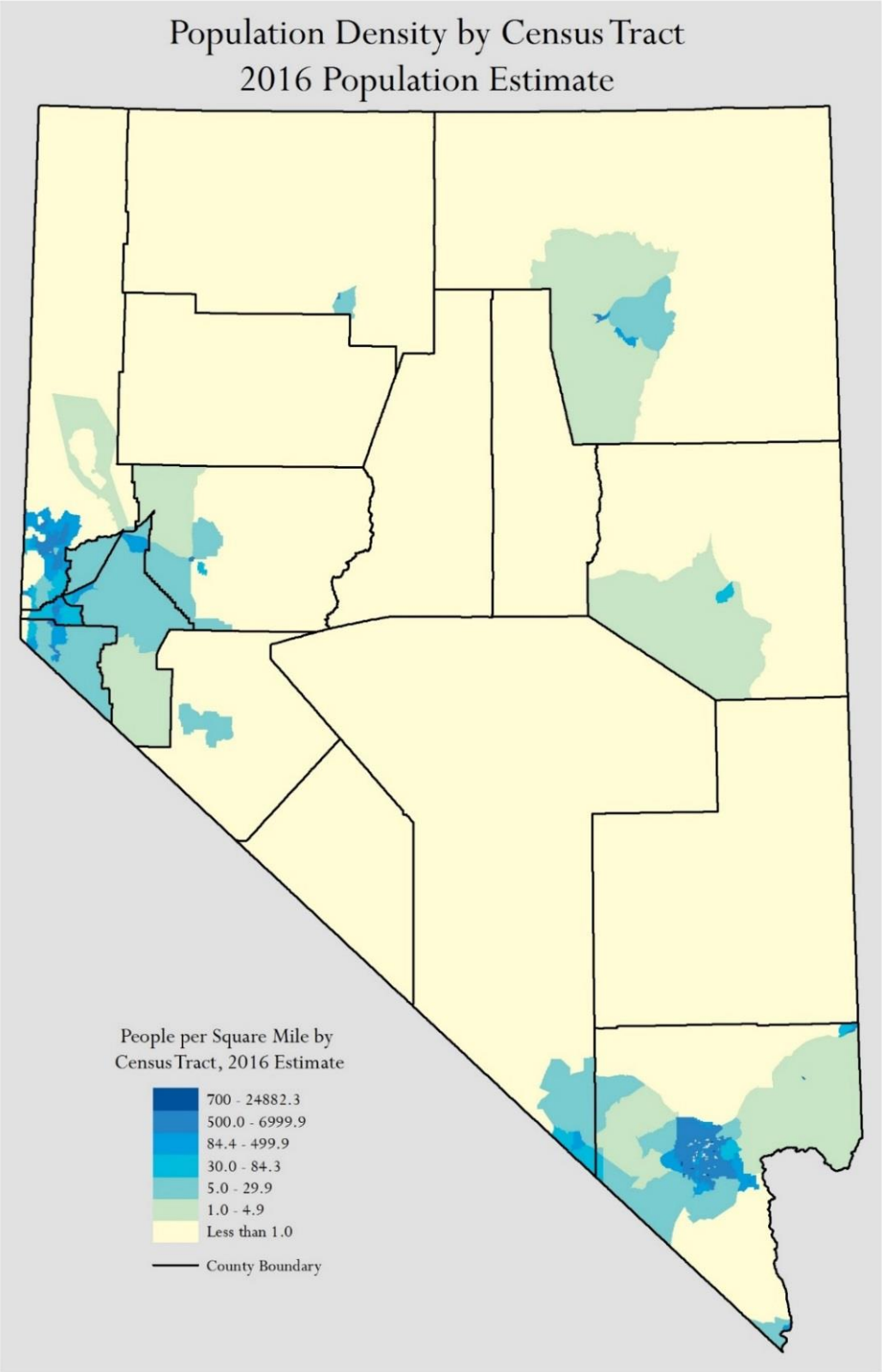


Figure 0-3b. Nevada's Population Density, 2016 Estimate

Table 0-3. Nevada County and City Population Estimates 2014

County	Population	County	Population
Carson City	**53,969**	**Lander County**	**6,560**
		No cities	
Churchill County	**25,103**	*Unincorporated towns*	
Cities		Austin	170
Fallon	8,645	Battle Mountain	3,804
		Kingston	128
Clark County	**2,069,450**		
Cities		**Lincoln County**	**5,004**
Boulder City	15,627	*Cities*	
Henderson	280,928	Caliente	1,056
Las Vegas	610,637	*Unincorporated towns*	
Mesquite	18,262	Alamo	578
North Las Vegas	230,491	Panaca	797
Unincorporated towns		Pioche	784
Bunkerville	1,039		
Enterprise	174,064	**Lyon County**	**53,344**
Indian Springs	1,220	*Cities*	
Laughlin	8,963	Fernley	19,077
Moapa	1,352	Yerington	3,095
Moapa Valley	6,851		
Mt. Charleston	635	**Mineral County**	**4,584**
Paradise	191,047	*No cities*	
Searchlight	344	*Unincorporated towns*	
Spring Valley	191,342	Hawthorne	3,023
Summerlin	27,244	Luning	98
Sunrise Manor	202,710	Mina	160
Whitney	40,567	Walker Lake	329
Winchester	32,413		
		Nye County	**45,456**
Douglas County	**48,553**	*Cities*	
No cities		*Unincorporated towns*	
Unincorporated towns		Amargosa	1,426
Gardnerville	5,760	Beatty	975
Genoa	217	Gabbs	245
Minden	3,072	Manhattan	133
		Pahrump	37,626
Elko County	**53,358**	Round Mountain	846
Cities		Tonopah	2,578
Carlin	2,731		
Elko	20,865	**Pershing County**	**6,714**
Wells	1,411	*Cities*	
West Wendover	4,420	Lovelock	1,952

Table 0-3. Nevada County and City Population Estimates 2014

County	Population	County	Population
Unincorporated towns		Unincorporated towns	
Jackpot	907	Imlay	257
Montello	56		
Mountain City	107	**Storey County**	**3,974**
		No cities	
Esmeralda County	**926**	*Unincorporated towns*	
No cities		Gold Hill	201
Unincorporated towns		Virginia City	832
Goldfield	272		
Silver Peak	128	**Washoe County**	**436,797**
		Cities	
Eureka County	**1,903**	Reno	235,371
No cities		Sparks	92,396
Unincorporated towns			
Crescent Valley	374	**White Pine County**	**10,218**
Eureka (town)	691	*Cities*	
		Ely	4,165
Humboldt County	**17,388**	*Cities*	
Cities		Lund	208
Winnemucca	8,042	McGill	1,200
No towns		Ruth	429
STATE	**2,843,301**		

Source: Nevada State Demographer's Office, http://nvde.org/data-and-publications/estimates/estimates-by-county-city-and-unincorporated-towns/

Table 0-4. Nevada Population Projections 2015 to 2019			
Year	**Total Population**	**Change Previous Year**	**Percentage Change**
2014	2,843,301		
2015	2,871,934	28,633	1.0%
2016	2,900,442	28,508	1.0%
2017	2,930,654	30,212	1.0%
2018	2,961,744	31,089	1.1%
2019	2,992,733	30,990	1.0%

Source: Nevada State Demographer's Office, Projections are based on Nevada State Demographer's 2014 Estimate. http://nvdemography.org/wp-content/uploads/2015/02/March-2015-Five-Year-Projections.pdf
For population change by county (2010-2017) see Section 3.5.5, Table 3-38.

0.3 LAND MANAGEMENT AND JURISDICTION

An effective hazard mitigation plan must involve cooperation among all land management participants. Figure 0-4 is a map showing the overall distribution of federal and tribal lands in Nevada. Federal agencies control more than 86% of the land. These groups include the U. S. Bureau of Land Management (BLM), U.S. Department of Defense (DOD), U.S. Forest Service (USFS), U.S. Bureau of Indian Affairs (BIA), U.S. Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (USFWS), National Parks Service (NPS), and others. Some of the areas controlled by these agencies are shown in Figure 0-4 below.

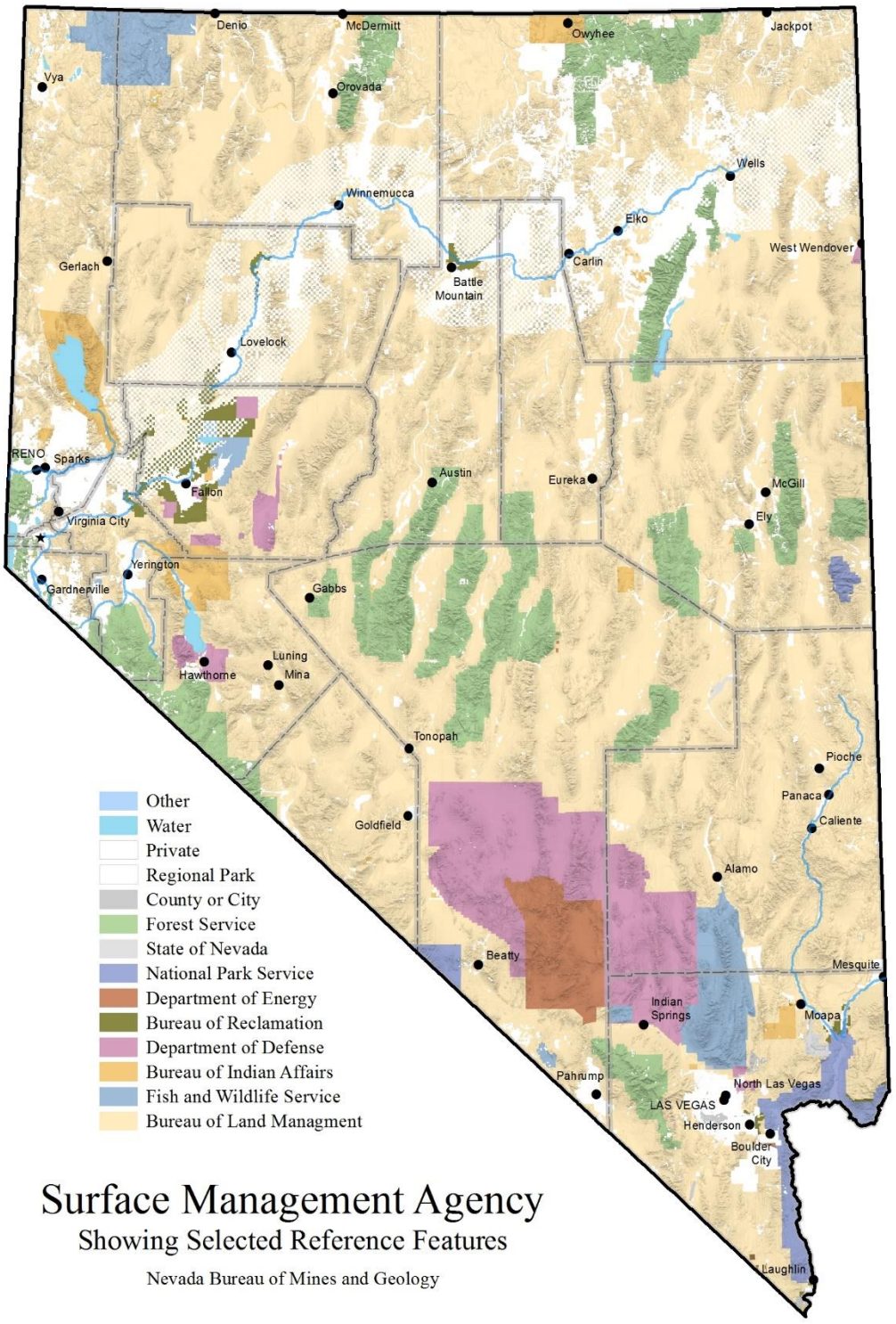


Figure 0-4. Nevada Land Use and Jurisdictions

Figure 0-5 below shows the location of Indian reservations and colonies in Nevada and contact information for each tribal entity.

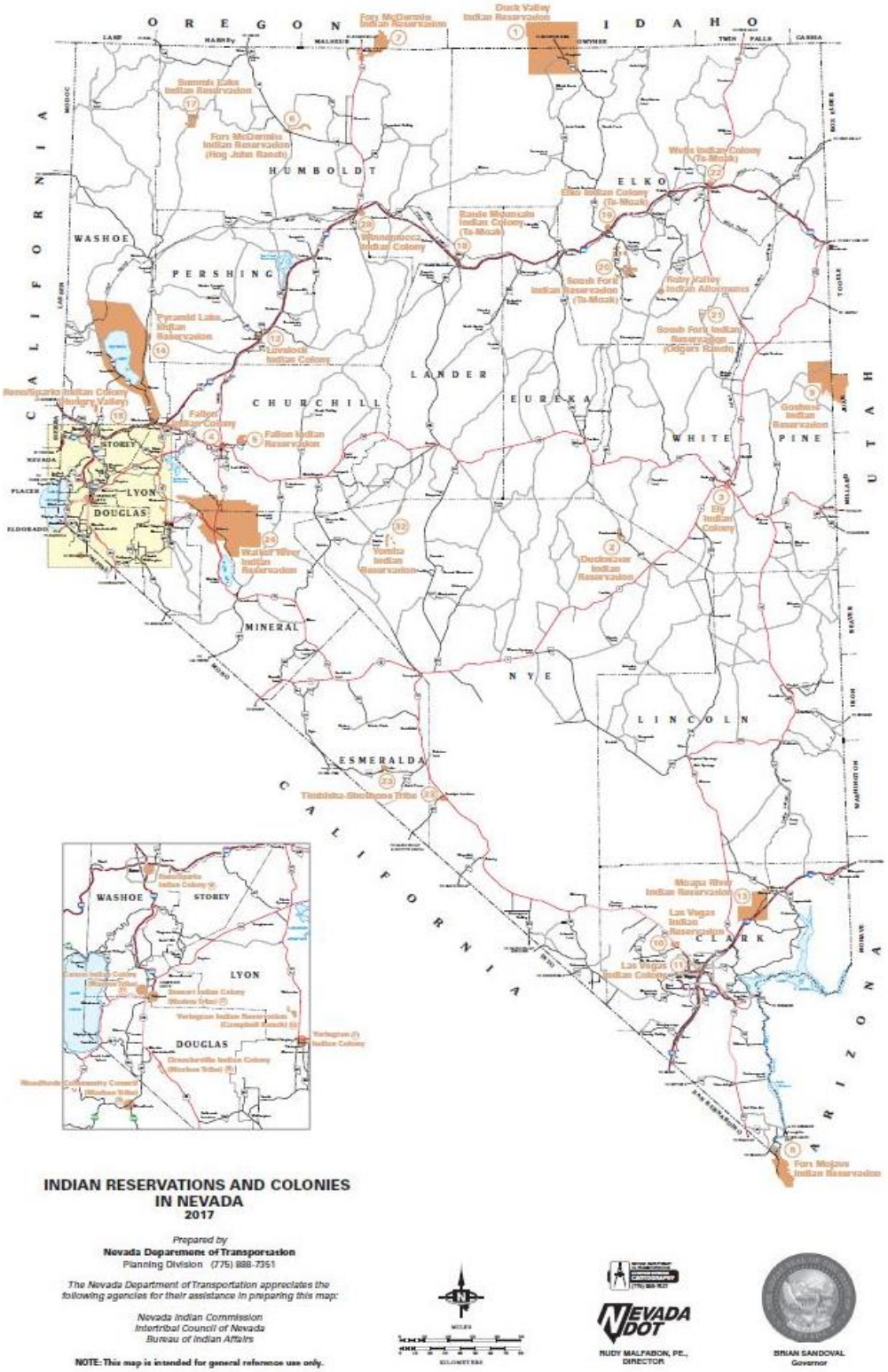


Figure 0-5. Nevada Indian Reservation Map with Contact List

INDIAN RESERVATIONS AND COLONIES IN NEVADA

Duck Valley Sho-Pai Tribe (1)
P.O. Box 219
Owyhee, Nevada 89832
Phone: (208) 759-3100
Fax: (208) 759-3940
www.shopaitribes.org

Duckwater Sho-Pai Tribes (2)
P.O. Box 140068
Duckwater, Nevada 89314
Phone: (775) 863-0227
Fax: (775) 863-0301
www.duckwatertribe.org

Ely Shoshone Tribe (3)
16 Shoshone Circle
Ely, Nevada 89301
Phone: (775) 289-3013
Fax: (775) 289-3156
www.elyshoshonetribe-nsn.org

Fallon Paiute-Shoshone Tribe (4,5)
565 Rio Vista Drive
Fallon, Nevada 89406
Phone: (775) 423-6075
Fax: (775) 423-5202
www.fpst.org

Fort McDermitt Paiute Shoshone Tribes (6,7)
P.O. Box 457
McDermitt, Nevada 89421
Phone: (775) 532-8259
Fax: (775) 532-8487

Fort Mojave Indian Tribe (8)
500 Merriman Street
Needles, California 92363
Phone: (760) 629-4591
Fax: (760) 629-5767
www.fortmojave.com

Goshute Business Council (9)
P.O. Box 6104
Ibapah, Utah 84034
Phone: (435) 234-1138
Fax: (435) 234-1162
www.goshutetribe.com

Las Vegas Paiute Tribe (10,11)
1 Paiute Drive
Las Vegas, Nevada 89030
Phone: (702) 386-3926
Fax: (702) 383-4019
www.lvpaiutetribe.com

Lovelock Paiute Tribe (12)
P.O. Box 878
Lovelock, Nevada 89419
Phone: (775) 273-7861
Fax: (775) 273-5151

Moapa Band of Paiutes (13)
P.O. Box 340
Moapa, Nevada 89025
Phone: (702) 865-2787
Fax: (702) 865-2875
www.moapapaiutes.com

Pyramid Lake Paiute Tribe (14)
P.O. Box 256
Nixon, Nevada 89424
Phone: (775) 574-1000
Fax: (775) 574-1008
www.plpt.nsn.us

Reno-Sparks Indian Colony (15,16)
98 Colony Road
Reno, Nevada 89502
Phone: (775) 329-2936
Fax: (775) 329-8710
www.rsic.org

Summit Lake Paiute Tribe (17)
1708 H Street
Sparks, Nevada 89431
Phone: (775) 827-9670
Fax: (775) 827.9678
www.summitlaketribe.org

Te-Moak Tribe of Western Shoshone
525 Sunset Street
Elko, Nevada 89801
Phone: (775) 738-9251
Fax: (775) 738-2345
www.temoaktribe.com

Battle Mountain Band Council (18)
37 Mountain View Drive #C
Battle Mountain, Nevada 89820
Phone: (775) 635-2004
Fax: (775) 635-8016

Elko Band Council (19)
1745 Silver Eagle Dr
Elko, Nevada 89801
Phone: (775) 738-8889
Fax: (775) 753-5439

South Fork Band Council (20,21)
H.C. 30 Box B-13
Spring Creek, Nevada 89815
Phone: (775) 744-4273
Fax: (775) 744-4523

Wells Band Council (22)
P.O. Box 809
Wells, Nevada 89835
Phone: (775) 345-3089
Fax: (775) 752-2179

Timbisha Shoshone Tribe (23)
1349 Rocking W Dr
Bishop, California 93514
Phone: (760) 872-3614
Fax: (760) 690-4486
www.timbisha.org

Walker River Paiute Tribe (24)
P.O. Box 220
Schurz, Nevada 89427
Phone: (775) 773-2306
Fax: (775) 773-2585
www.wrpt.us

Washoe Tribe of Nevada & California
919 Highway 395 South
Gardnerville, Nevada 89410
Phone: (775) 265-4191
Fax: (775) 265-6240
www.washoetribe.us

Carson Colony Community Council (25)
2900 South Curry Street
Carson City, Nevada 89703
Phone: (775) 883-6459
Fax: (775) 883-6467

Dresslerville Community Council (26)
1585 Watasheamu
Gardnerville, Nevada 89460
Phone: (775) 265-5645
Fax (775) 265-6240

Stewart Community Council (27)
465 Clear Creek
Carson City, Nevada 89701
Phone: (775) 883-7794
Fax: (775) 265-6240

Woodfords Community Council (28)
96A Washoe Boulevard
Markleeville, California 96120
Phone: (530) 694-2170
Fax: (530) 694-1890

Winnemucca Colony Council (29)
P.O. Box 1370
Winnemucca, Nevada 89446
Phone: (775) 623-0888
Fax: (775) 623-0888

Yerington Paiute Tribe (30,31)
171 Campbell Lane
Yerington, Nevada 89447
Phone: (775) 463-3301
Fax: (775) 463-2416

Yomba Shoshone Tribe (32)
H.C. 61 Box 6275
Austin, Nevada 89310
Phone: (775) 964-2463
Fax: (775) 964-2443
www.yombatribe.com

RELATED ORGANIZATIONS

Bureau of Indian Affairs Western Regional Office
400 North 5th Street
Phoenix, Arizona 85004
Phone: (602) 379-6782

Bureau of Indian Affairs Western Nevada Agency
311 E Washington Street
Carson City, NV 89701
Phone: (775) 887-3500
Phone: (775) 887-3531

Bureau of Indian Affairs Eastern Nevada Agency
1555 Shoshone Circle
Elko, NV 89801
Phone: (775) 738-5165

Nevada Indian Commission
5366 Snyder Avenue
Carson City, Nevada 89701
Phone: (775) 687-8333
Fax: (775) 687-8330
www.nic.nv.gov

Nevada Urban Indians, Inc.
745 W Moana Ln
Suite 330
Reno, Nevada 89509
Phone: (775) 788-7600
Fax: (775) 788-7611
www.nevadaurbanindians.org

Inter-Tribal Council of Nevada
680 Greenbrae Drive, Suite 280
Sparks, Nevada 89431
Phone: (775) 355-0600
Fax: (775) 355-0648
www.itcn.org

Las Vegas Indian Center, Inc.
2300 West Bonanza Road
Las Vegas, Nevada 89107
Phone: (702) 647-5842
Fax: (702) 647-4497
www.lasvegasindiancenter.org

California / Nevada Tribal Technical Assistance Program (TTAP)
Nevada Indian Justice Center
5250 Aero Drive
Santa Rosa, California 95403
Phone: (707) 579-5507 or (707) 579-9019

Figure 0-5. (cont.) Nevada Indian Reservation Map with Contact List

Table 0-5. Tribal Demographics in Nevada				
Reservation Names and Map ID Numbers shown on Figure 0-5	**Date Established**	**Resident Tribe(s)**	**Population of the Reservation in NV (2012-2015 ACS Estimates)**	**Enrolled Tribal Members**
Shoshone-Paiute Tribes of the Duck Valley Reservation (1)	1877	Western Shoshone, Paiute	1,450	~2,300
Duckwater Shoshone Tribe of the Duckwater Reservation (2)	June 14, 1942	Western Shoshone	361	
Ely Shoshone Tribe of Nevada (3)	1931	Western Shoshone	218	~500
Paiute-Shoshone Tribe of the Fallon Reservation and Colony (4, 5)	1887	Paiute, Western Shoshone	882	1,457
Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR) (6, 7)	1892	Shoshone, Paiute	482	
Fort Mojave Indian Tribe (AZ, CA, NV) (8)			1,570	
Confederated Tribes of the Goshute Reservation(NV and UT) (9)	1863; 1940 constitution	Goshute, Western Shoshone, Navajo, Ute, Paiute, Northern Cheyenne, Southern Arapahoe, Bannock	122	
Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony (10, 11)	1911	Paiute	117	
Lovelock Paiute Tribe of the Lovelock Indian Colony (12)			85	

Table 0-5. Tribal Demographics in Nevada				
Moapa Band of Paiute Indians of the Moapa River Indian Reservation (13)			~265	~311
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation (14)	1936	Paiute	1,581	~2,253
Reno-Sparks Indian Colony (15, 16)	Early 1900s; more formal Tribal Government in 1935	Paiute, Shoshone, and Washoe	1,080	1,134
Summit Lake Paiute Tribe of Nevada (17)			0	
Te-Moak Tribe of Western Shoshone Indians of Nevada *(see the four constituent bands below)*		Te-Moak Western Shoshone		
Battle Mountain Band (18)	1917	Te-Moak Western Shoshone	254	
Elko Band (19)	1918	Te-Moak Western Shoshone	932	
South Fork Band (20, 21)	1941	Te-Moak Western Shoshone	101	
Wells Band (22)	1863	Te-Moak Tribes of Western Shoshone	106	
Walker River Paiute Tribe of the Walker River Reservation (24)	1874	Paiute	~720	3,540
Washoe Tribe (Nevada and California) *(see individual bands below)*			3,108	
Carson Colony (25)	1934	Washoe	315	
Dresslerville Colony (26)	1934	Washoe	456	
Stewart Community (27)	1934	Washoe	183	
Woodfords Community (28)	1934	Washoe		
Washoe Ranches	1934	Washoe		

Table 0-5. Tribal Demographics in Nevada				
Winnemucca Indian Colony of Nevada (29)			35	
Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch (30, 31)			257	
Yomba Shoshone Tribe of the Yomba Reservation (32)	Dec 22 1939	Western Shoshone	146	

Source: U.S. Census Bureau, My Tribal Area (2012-2016 American Community Survey 5-Year Estimates), and Nevada county HMPs. https://www.census.gov/tribal/?st=32&aianihh=0165

Table 0-6 presents pertinent historical, geographic, and demographic facts about the State of Nevada as well as State Trivia.

Table 0-6. Nevada Facts	
State Facts	
Admitted to United States	October 31, 1864
State name	Nevada, meaning snow-capped
Capital City	Carson City
Largest City	Las Vegas
Number of Counties	17
Number of Tribal Reservations	26
Percentage of federally controlled lands	86%
Physiography	
Total land area	109,781 sq. mi., rank: 7th largest
Latitude and Longitude	Longitude: 114°W to 120°W Latitude: 35°N to 42°N
Highest point	13,140 ft. at Boundary Peak in the White Mountains
Lowest point	470 ft on the Colorado River in Clark County
Mean elevation	5,500 feet above sea level
Demographics	
Total population (2014 estimate)	2,843,301
Population per square mile (2012)	25.1
Population, percent change 2010 to 2017	11.0%

Table 0-6. Nevada Facts	
Owner-occupied housing unit rate, 2012-2016	54.8%
Median household income (in 2016 dollars), 2012-2016	$53,094
High school graduates, percent of persons age 25+, 2012-2016	85.4%
State Trivia	
State nickname	Silver State; Sagebrush State, Battle-Born State
State slogan	Battle Born
State motto	"All for our country"
State animal	Desert Bighorn Sheep *(Ovis canadensis nelsoni)*
State bird	Mountain bluebird *(Sialia currucoides)*
State fish	Lahontan cutthroat trout *(Salmo clarki henshawi)*
State flower	Sagebrush *(Artemisia tridentate)*
State fossil	Ichthyosaur *(Shonisaurus)*
State grass	Indian rice grass *(Oryzopsis hymenoides)*
State reptile	Desert tortoise *(Gopherus agassizii)*
State trees	The Single-leaf pinon *(Pinus monophylla)* **a**nd the Bristlecone Pine *(Pinus aristata)*
State rock	Sandstone
State precious gemstone	Virgin Valley black fire opal
State colors	Silver and blue
State metal	Silver

Source: U.S. Census Bureau, https://www.census.gov/quickfacts/fact/table/NV/PST120217#viewtop

This Section provides an overview of the Disaster Mitigation Act of 2000 (DMA 2000; Public Law 106-390), the adoption of the *Nevada Standard Hazard Mitigation Plan* (NHMP) by the State of Nevada, and assurances to amend the NHMP to reflect changes in federal laws and regulations.

1.1 DISASTER MITIGATION ACT OF 2000

The DMA 2000 was passed by Congress to emphasize the need for mitigation planning to reduce vulnerability to natural and human-caused hazards. The DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act; 42 United States Code [USC] 5121 et seq.) by repealing the act's previous Mitigation Planning Section (409) and replacing it with a new Mitigation Planning Section (322).

To implement the DMA 2000 planning requirements, the Federal Emergency Management Agency (FEMA) published an Interim Final Rule in the *Federal Register* on February 26, 2002 (FEMA 2002a). This rule (44 code of Federal Regulations [CFR] part 201) established the mitigation planning requirements for states, tribes, and local communities. The planning requirements are described in detail in Section 2 and identified in their appropriate sections throughout the plan.

1.2 PLAN ADOPTION PROCEDURES

The requirements for the adoption of the NHMP by the State of Nevada, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR §201.4(c)(6) [32]] ***Intent:*** *Adoption demonstrates commitment to the goals and actions identified in the plan. Ideally, adoption by the highest elected official or designee provides statewide recognition and demonstrates risk reduction as a statewide priority.*	The state must provide documentation of formal adoption by the highest elected official or designee prior to the final review and approval by FEMA. Documentation of formal adoption may be a resolution or other mechanism. ***Highest elected official or designee*** means a senior state official with authority to commit the various state agencies responsible for implementing the mitigation actions identified in the plan. ***Special Consideration:*** After all other plan requirements have been met and FEMA has received the formal adoption documentation, FEMA will provide a letter indicating the plan is approved. See Appendix A: Submission and Review Procedures.

ELEMENT	REQUIREMENTS
S20. Did the state provide assurances? [44 CFR §201.4(c)(7)] ***Intent:*** *To confirm the state's intent to comply with all applicable Federal statutes and regulations.*	a. The plan must include assurances that the state will manage and administer FEMA funding in accordance with applicable Federal statutes and regulations. For information on FEMA mitigation grants programs award administration requirements, refer to the HMA Guidance (Part VI. Award Administration Information). For example, reporting requirements include, but are not limited to, submitting quarterly financial and performance reports on time. b. The plan must include assurances that the state will amend its plan whenever necessary to reflect changes in state or Federal laws and statutes. ***Special Consideration:*** For information regarding consequences of failure to comply with applicable Federal statutes and regulations, see Appendix A: Submission and Review Procedures.

[32] 44 CFR §201.4(c)(6): "A Plan Adoption Process. The plan must be formally adopted by the State prior to submittal to us for final review and approval."

Upon completion, the Nevada Hazard Mitigation Planning Committee (NHMPC) will forward the plan to FEMA for final approval through the Nevada Division of Emergency Management (Nevada DEM). The Governor of the State of Nevada will adopt the plan upon approval by FEMA. The Nevada DEM will immediately forward the adoption documentation to FEMA. The Governor's adoption resolution for the 2013 plan is in Appendix A. A similar document will be prepared and completed to adopt the 2018 plan.

The Nevada HMP meets the requirements of Section 409 of the Stafford Act and Section 322 of the DMA 2000. This includes meeting the requirement that the Nevada HMP is adopted by the State. The State plan was prepared by the NHMPC, with participation from various State and Local agencies, and other organizations listed in Appendix B and Section 2.

1.2.1 State Authority

The Governor of the State of Nevada has broad powers over emergency management within the State of Nevada under Chapter 414 of the Nevada Revised Statutes (NRS). Under these powers, he has the obligation to ensure that an emergency management plan is prepared for the entire State, to ensure its proper implementation and to ensure compliance with all State and Federal laws pertaining to emergency management, which would include mitigation issues. The Nevada DEM is the lead agency for compliance and implementation.

1.2.2 Nevada Revised Statutes

The Nevada Revised Statutes (NRS) are the current codified laws of the State of Nevada and are a compilation of all legislation passed by the Nevada Legislature. In **NRS 220.110, the Nevada Revised Statutes** shall contain the following items:

- The Constitution of the United States.
- The Constitution of the State of Nevada.
- The laws of this state of general application.
- A full and accurate index of the statute laws.
- Such annotations, historical notes, Supreme Court and district court rules, and other information as the Legislative Counsel deems appropriate to include.

[Part 2:304:1951; A 1953, 388]— (NRS A 1963, 1022; 1969, 12)

Table 1-1 below provides a summary of information on specific statutes that promote hazard mitigation on the state level. These statutes can be found at the following link http://www.leg.state.nv.us/NRS/Index.cfm.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation

NRS Statute	Summary
NRS Chapter 205	This chapter is titled "Crimes Against Property," which includes arson.
NRS Chapter 206	Chapter 206 is titled "Malicious Mischief," and includes crimes to public and private property.
NRS Chapter 239C & NRS Section 239C.010	Chapter 239C is Nevada's Homeland Security legislation, which provides plans to respond to terrorism and related emergencies. Also, it promotes statewide preparations for acts of cyber-terrorism, environmental catastrophes, and other related incidents.
NRS Chapter 268 & NRS Section 268.012	This Chapter and section give the cities of the State authority to adopt uniform building, plumbing and electrical codes.
NRS Chapter 278 & NRS Section 278.02521	This Chapter provides direction in land use planning for the protection of environmentally sensitive areas and development where there are sufficient resources and water to accommodate such development and to promote the efficient use of land in urban areas along with conversion of rural lands to other uses as appropriate.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 278.580(16)(a)	This Section mandates that a governing body shall amend its building codes to include seismic provision of the International Building Code and the standards for the investigation of hazards relating to seismic activity including, without limitation, potential surface ruptures and liquefaction.
NRS Section 321.5977	This Chapter provides objectives in administering Public lands under NRS Chapter 321 – State Public Lands.
NRS Sections 321.640 – 321.770	NRS Sections 321.650 through 321.770 contain State land use planning – laws to govern growth and use of lands which could impact emergencies.
NRS Chapter 322	This Chapter provides direction in the Use of State Lands – those lands that belong to the State and the governing of them.
NRS Chapter 323	This Chapter is the State of Nevada's adoption of the "Taylor Grazing Act" which facilitates that law within our State.
NRS Chapter 324	This Chapter is the State of Nevada's adoption of the principles in the "Carey Act" – which regulates the use of water, particularly the capturing of water in dams, for irrigation and the reclamation aspects of such water projects as governed by the Bureau of Land Management.
NRS Chapter 341 & NRS Section 341.087	Chapter 341 pertains to the construction of state facilities. The Legislature has also mandated the state Public Works Board to adopt the seismic provisions of the International Building Code and the standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction.
NRS Section 353.2735	Chapter 353 creates and administers the Disaster Relief Account. The account is used to stabilize the operation of the State Government, including local jurisdictions, from an emergency/disaster.
NRS Sections 410.095 - 410.210	NRS Sections 410.095 through 410.210 contain the regulation and restriction of landfills, garbage dumps and junkyards.
NRS Section 414.040	Under this Chapter, the Chief of the Division of Emergency Management has the authority and power to develop an integrated process for the mitigation of, response to and recovery from emergencies or disasters through the various governmental agencies, business and industry, volunteer organizations and any other interested parties.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 414.060(3)b	The Governor may prepare a comprehensive state emergency management plan and develop a program for emergency management in this state to be integrated into and coordinated with the plans of the Federal Government and of other states for emergency management to the fullest possible extent, and coordinate the preparation of plans and programs for emergency management by the political subdivisions of this state to be integrated into and coordinated with the plan and program of this state to the fullest possible extent.
NRS Section 414.135	The Section describes the Emergency Assistance Account. This account is to provide supplemental emergency assistance to the State of Nevada or to its local governments impacted by an emergency and/or disaster.
NRS Chapter 415	This Chapter contains the Emergency Management Assistance Compact. "The purpose of this Compact is to provide for mutual assistance between the States entering into this Compact in managing any emergency or disaster that is duly declared by the Governor of the affected State(s), whether arising from natural disaster, technological hazard, man-made disaster, civil emergency aspects of resources shortages, community disorders, insurgency, or enemy attack." It also provides for mutual cooperation in emergency exercises, testing, and training.
NRS Chapter 416	This Chapter is about Emergencies Concerning Water or Energy. In **NRS Section 416.010,** "the purpose of this chapter is to meet effectively water and energy emergencies by providing for conservation, efficient utilization, production and allocation of water and energy in ways which will: 1. Carry out as necessary, national water and energy policies under federal water and energy laws; 2. Maintain vital services necessary for the peace, health, safety and welfare of the people of this state; 3. Promote the most efficient use of water and energy; 4. Lessen adverse impacts upon employment in and the economy and environment of this state; 5. Ensure to the extent reasonably possible equitable treatment of all regions of the State and all sectors of the economy, consistent with other necessary considerations; and 6. Promote and protect the interests of this state in the course of decisions to be made and actions to be taken under federal water and energy laws.(Added to NRS by 1977, 548)"

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Chapter 441A	This Section deals with Communicable Diseases (a disease which is caused by a specific infectious agent or its toxic products, and which can be transmitted, either directly or indirectly, from a reservoir of infectious agents to a susceptible host organism), Emergency Quarantine of humans, and Enforcement of quarantines.
NRS Chapter 444A	This Chapter contains programs for recycling and the regulation of disposal of solid waste and other waste.
NRS Chapter 445A	This Chapter contains Water Controls – laws to protect the Lake Tahoe Watershed, to prevent water pollution and to regulate the fluoridation of water supplies.
NRS Chapter 445B	This Chapter deals with Air Pollution – laws for control of and administration of all aspects of prevention of air pollution – the creation of the State Environmental Commission.
NRS Chapter 445C	This Chapter contains environmental requirements, penalties for violations and the administration and enforcement of such requirements.
NRS Chapter 445D	This Chapter contains environmental covenants that attach to real property – governed by the Nevada Department of Natural Resources and Conservation
NRS Chapter 455	This Chapter contains the control and restriction of excavations and high voltage lines.
NRS Section 459	This Chapter contains the Western Interstate Nuclear Compact, of which Nevada is a member State. It provides for the development of nuclear related fields for economic development of the Western States with provisions for the cooperation of party states in the response to and mitigation of a nuclear incident in any of the member states and to recommend changes to laws, regulations, ordinances, administrative procedures and practices to facilitate safe and secure usage of nuclear technologies.
NRS Sections 459.010-370	The Nevada Legislature in NRS 459.001 adopted the Rocky Mountain Low-Level Radioactive Waste Compact making Nevada a participating state in this compact. It provides for the safe management of low-level radioactive waste material generated within the party states through appropriate laws within the compact.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Sections 459.0085- 0098	NRS Sections 459.0085 through 459.0098 contain the creation, duties, and powers of the Committee on High-Level Radioactive Waste. These sections empower the Committee to study and evaluate: Information and polices regarding the location in the State of Nevada of a facility for the disposal of high-level radioactive waste; Any potentially adverse effects from the construction and operation of a facility and the ways of mitigating those effects; and Any other policies relating to the disposal of high-level radioactive waste.
NRS Sections 459.380-930	The remainder of Chapter 459 of the NRS (Sections 459.380 through 459.930) provides for the regulation of, storage of and transportation of hazardous materials within the State. These laws proved for the response to, the mitigation of and recovery from hazardous material releases.
NRS Section 461.170	The Nevada Legislature has adopted by statute, for the purposes of manufactured buildings, the Uniform Housing Code, the Uniform Building Code, the Uniform Plumbing Code, Dangerous Building, the Uniform Building Code Standards and the American National Standards Institute Standard No. A117.1.
NRS Chapter 472	This Chapter gives the State Forester Fire Warden authority over the development of, mitigation of and prevention of fires within the state's forested areas by establishing fire control districts, adopting and enforcing regulations regarding standards for fire retardant roofing and administering monies appropriated and grants awarded for fire prevention, control and the education of fire personnel for these purposes. Establishment and preservation of forest and vegetation cover in forest and watershed.
NRS Chapter 475	This Chapter entitled "Crimes and Responsibilities Concerning Fires" details penalties for neglecting or causing fires on one's own property or the property of another.
NRS Chapter 476	This Chapter entitled "Explosives and Inflammable Materials" details the penalties for misuse of these materials.
NRS Chapter 477	This Chapter of the NRS governs the State Fire Marshal's Office and its duties and powers. These laws provide for the proper regulation of and enforcement of existing laws, which govern the prevention of, mitigation of and recovery from fires within this State. Particularly, the State Fire Marshal makes recommendations for changes to building codes and existing structures to ensure fire safety.
NRS Chapter 486A	This Chapter provides provisions for alternative fuels and clean-burning fuels.
NRS Chapter 506	This Chapter is the Wildlife Violator Compact – a compact among the states to aid wildlife management as a trust by the state for all residents and visitors.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Section 514.040(3)	The Nevada Bureau of Mines and Geology, established by the Legislature and given as one of its duties: ". . . to apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State."
NRS Chapter 519A	This chapter governs the reclamation of land subject to mining operations and exploration projects.
NRS Sections 522.039-522.040	Sections 522.039 and 522.049 regulate oil and gas drilling to prevent waste.
NRS Chapter 527	This Chapter titled "Protection and Preservation of Timbered Lands, Trees and Flora" describes the protection and preservation measures for Nevada's trees and flora. In addition, it describes measures taken for controlled burns.
NRS Chapter 528	This Chapter regulates forest practice and reforestation.
NRS Chapter 534	This Chapter regulates underground water and depletion of aquifers.
NRS Section 535.030	This section covers dam inspections and the State Engineer's powers to protect life and property by lowering the water level in the reservoir, emptying the reservoir, or any other step to essential to safeguarding life and property.
NRS Chapters 540 -540A	Chapters 540 and 540A provide planning and development of water resources and the regional planning and management of water resources.
NRS Chapter 541	This Chapter creates Water Conservancy Districts for wise water management.
NRS Chapter 543 & NRS Section 543.020	This Chapter is dedicated to flood control. The declaration of the policy being adopted states: "It is hereby declared to be the policy of the State of Nevada to cooperate with the United States and its departments and agencies, and with the counties, cities and public districts of the State, in preventing loss of life and property, disruption of commerce, interruption of transportation and communication and waste of water resulting from floods, and in furthering the conservation, development, utilization and disposal of water."
NRS Chapter 548	This Chapter regulates agricultural lands to preserve and conserve the natural resources of this State.
NRS Chapter 555	This Chapter provides the Director of the Department of Agriculture with the powers to control insects, pests and noxious weeds.
NRS Chapter 568	This Chapter regulates the grazing and ranging of lands within the State of Nevada.

Table 1-1. Summary of NRS Statutes Pertaining to Hazard Mitigation	
NRS Chapter 571	This Chapter defines the State Quarantine Officer and provides the Officer power to proclaim and enforce quarantine. This Chapter also adopts the rules and regulations of the federal Secretary of Agriculture relating to control and suppression of disease in animals.
NRS Chapter 701	This Chapter provides for the Office of Energy (under the Governor), which regulates energy resources and energy conservation and encourages renewable energy.
NRS Chapters 703 – 704	Chapters 703 and 704 provide for the regulation of public utilities by the Public Utilities Commission.
NRS Section 708.120	This Section authorizes the Public Utilities Commission to regulate oil pipelines to prevent waste and dangerous operations.

1.2.3 Legislative Process

The Nevada Legislature meets every odd number year for approximately six months. During this period, the NHMPC may support hazard mitigation-related legislation presented by state agencies, private non-profits (PNPs), businesses and or local jurisdictions. The NHMPC can also present new or modifications to existing hazard mitigation-related legislation. Any revisions or additions will be recorded in this Section of the NHMP during its revision period. During the 2013 Legislative session, Senate Bill 44 clarified language for the Disaster Relief Account currently found in Chapter 352 of the Nevada Revised Statutes.

1.2.4 Assurances to Comply with Federal Laws and Regulations

Through the development and enforcement of this plan, the assurances listed in Appendix I are provided as documentation that the state or any subsequent sub-grantee will continue to comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

This Section provides an overview of the planning process; identifies the NHM Planning Subcommittee members; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used in the development of this NHMP. *The overall planning revision process was the same as in the previous update. Since the 2013 update, efforts have continued to track public education and outreach, and efforts in hazard mitigation were made by Nevada Hazard Mitigation Planning Committee and NHM Planning Subcommittee members. The plan continues to document Nevada's participation in the U.S. Army Corps of Engineers' Silver Jackets program.*

2.1 OVERVIEW OF THE PLANNING PROCESS

The requirements for the documentation of the mitigation planning process, as stipulated by the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S1. Does the plan describe the process used to develop the plan?[44CFR §§201.4(b) and[7] (c)(1)] [8] ***Intent:*** *To demonstrate a deliberative approach to plan development.*	The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or timeframe, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the extent possible with other state planning efforts. ***Agencies and stakeholders*** means state, local, and tribal agencies, colleges and universities, private entities, or private non-profit organizations, such as multi-jurisdictional utilities, that perform a critical function. ***Special Consideration:*** The plan must describe the planning process, but supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are encouraged to retain supporting documentation as a permanent record of how decisions were made and who was involved.

ELEMENT	REQUIREMENTS
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)] ***Intent:*** *To actively involve stakeholders with the data and expertise to develop the plan, but also with the responsibility or authority to implement mitigation actions and reduce risk state-wide.*	The plan must describe how other state and Federal agencies and other stakeholders were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and stakeholders responsible for the following sectors: a. Emergency management; b. Economic development; c. Land use and development; d. Housing; e. Health and social services; f. Infrastructure; and g. Natural and cultural resources. Where coordination with agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations. ***Involved in the process*** means engaged as participants and given the chance to provide input to affect the plan's content. ***Special Consideration*:** While coordination with other agencies and stakeholders is foundational to the success of the plan update as well as implementation, FEMA acknowledges the inherent differences in state governance and capabilities. In evaluating coordination, FEMA will credit the state's efforts to engage other agencies and stakeholders.

[7] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

[8] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

2.1.1 How the Updated Plan was Prepared

The NHM Planning Subcommittee followed the method for updating the plan presented in Section 6.1.4 of the 2013 NHMP. What follows is a narrative summary of how this was accomplished:

In May of 2015, the NHM Planning Subcommittee met to discuss the 2018 Hazard Mitigation Plan (HMP) update and modifications to the hazard profiles documented in Section 3. The Subcommittee continually provided direction and expertise throughout the update process. The planning team solicited input from the Subcommittee members and other agencies with the expertise needed to address the required State Mitigation Plan Review Guide elements revisions for each section. Each section of the plan was reviewed, analyzed, and updated before presenting them to the Subcommittee members. The Subcommittee members would provide input as needed. Members from the NHM Planning Subcommittee present updated sections to the NHMPC for final approval. Table 2-4 in Section 2.1.4 lists each planning teamwork session and accomplishments.

Proposed updates to sections were emailed to subcommittee members prior to quarterly NHM Planning Subcommittee meetings, and were presented at the meetings where revisions were discussed and feedback provided in the weeks following. If no changes were made, the new sections were incorporated into the NHMP update.

2.1.2 Who Was Involved in the NHMP Update Process

In order to prepare the 2018 update to NHMP, the NHM Planning Subcommittee reevaluated FEMA's State Mitigation Plan Review Guide comments and the Annual Review Questionnaire to identify any stakeholders whose participation would be invaluable to the planning process or to mitigation actions. Based on this review, the planning team drafted a letter of invitation and a list of potential stakeholders to whom the invitation was sent: some responded and some did not. The resultant NHM Planning Subcommittee participating members and their proxies are listed in Table 2-1. Subcommittee participation and contributions are documented by the attendance rosters and minutes of each meeting. The Subcommittee was expanded in this iteration with representation from several new entities. These include:

Table 2-1. NHM Planning Subcommittee Members and Alternates (as of April 2018)

Nevada Division of Emergency Management **Jim Walker** Emergency Management Programs Manager 2478 Fairview Drive Carson City, NV 89701 Ph: (775) 687-0305 Email: james.walker@dps.state.nv.us	**Nevada Department of Agriculture** **Dr. Keith Forbes, D.V.M.** Veterinary Diagnostician 350 Capitol Hill Reno, NV 89502 Ph: (775) 353-3707 E-mail: keith.forbes@agri.state.nv.us
Nevada Division of Environmental Protection **Harold Dawson** Info: Jeff Collins, Rebecca Bodnar 901 South Stewart Street Carson City, NV 89470-5249 Ph: (775) 687-9480 E-mail: hdawson@ndep.nv.gov jrcollins@ndep.nv.gov, Rebecca.bodnar@ndep.nv.gov	**Churchill County Emergency Management** **Mike Heidemann** Emergency Manager 155 N. Taylor St., Suite 177 Fallon, NV 89406 Ph: (775) 428-1311 E-mail: mheidemann@churchillcounty.org
Nevada Division of Water Resources **Bunny Bishop** State Floodplain Manager 901 South Stewart St., Suite 2002 Carson City, NV 89701 Ph: (775) 684-2834 E-mail: bbishop@water.nv.gov	**Dept. of Admin./ Risk Mgmt. Division** **Vacant** Info: Maureen Martinez Safety Specialist Consultant 201 South Roop St., Suite 201 Carson City, NV 89701 Ph: (775) 687-3190/881-8892 E-mail: memartinez@risk.state.nv.us

Table 2-1. NHM Planning Subcommittee Members and Alternates (as of April 2018)	
City of Las Vegas Office of Emergency Mgmt. **Rick Diebold** 7551 Sauer Ave Las Vegas, NV 89128 Ph: (702) 229-0067	**Nevada Division of Insurance** **Rajat Jain** Chief Insurance Examiner, Property & Casualty Section Nevada Division of Insurance 1818 E. College Pkwy., Suite 103 Carson City, NV 89706 Ph: (775) 687-0774 E-Mail: rjain@doi.nv.us
City of North Las Vegas Office of Emergency Mgmt. **Carlito Rayos** Emergency Manager 4040 Losse Rd North Las Vegas, NV 89030 Ph: (702) 633-2145 E-mail: rayosc@cityofnorthlasvegas.com	**Inter-Tribal Emergency Response Commission** **Dan Hourihan** Director 680 Greenbrae Dr., Ste 228 Sparks, NV 89431 Ph: (775) 355-0600 Ext. 154 Email: dhourihan@itcn.org
Nevada Division of Emergency Management **Bill Elliott** Lead Planner 2478 Fairview Dr. Carson City, NV 89701 Ph: (775) 687-0308 E-mail: welliott@dps.state.nv.us	**Nevada Bureau of Mines and Geology** **Craig dePolo** Research Geologist/NHMPC Chair MS 178/University of Nevada, Reno Reno, NV 89557-0178 Ph: (775) 682-8770 E-mail: cdepolo@unr.edu
Nevada Division of Forestry **Ryan Shane** Info: Scott Rasmussen Community Protection 2478 Fairview Drive Carson City, NV 89701-5250 Ph: (775) 684-2511 E-Mail: rshane@forestry.nv.gov E:Mail: sarasmussen@forestry.nv.gov	**State Public Works Board** **Branden Pearson** Project Coordinator III 515 East Musser St. Carson City, NV 89701 Ph: (775) 684-4114 E-mail: bpearson@admin.nv.us

Table 2-1. NHM Planning Subcommittee Members and Alternates (as of April 2018)	
Nevada State Hospital Association **Chris K. Lake, Ph.D.** *Executive Director, Hospital Preparedness* 5190 Neil Road, Suite 400 Reno, NV 89502 Ph: (775) 827-0184 E-Mail: chris@nvha.net	**Nevada Department of Transportation** **Vacant** Supervisor II – Associate Engineer 1301 Old Hot Springs Rd. Carson City, NV 89706 Ph: (775) 888-7862 E-mail: @dot.state.nv.us
National Weather Service/Reno **Chris Smallcomb** Warning Coordination Meteorologist 2350 Raggio Parkway Reno, NV 89512 Ph: (775) 673-8100 x223 E-mail: chris.smallcomb@noaa.gov	**STAFF:** **Nevada Division of Emergency Management** **Janell Woodward** State Hazard Mitigation Officer 2478 Fairview Dr. Carson City, NV 89701 Ph: (775) 687-0314 E-mail: jwoodward@dps.state.nv.us
Nevada Threat Analysis Center **Selby Marks** 2478 Fairview Drive Carson City, NV 89701 Ph: (775) 687-0452 E-mail: smarks@dps.state.nv.us	**Nevada Division of Emergency Management** **Karen Johnson** Mitigation Specialist 2478 Fairview Dr. Carson City, NV 89701 Ph: (775) 687-0373
State Fire Marshal **Bart Chambers** 107 Jacobsen Way, Stewart Facility Carson City, NV 89711 Ph: (775) 684-7525 E-mail: bchambers@dps.state.nv.us	**Nevada Bureau of Mines and Geology** **Rachel Micander** Analyst - GIS and Cartography MS 178/University of Nevada, Reno Reno, NV 89557-0178 Ph: (775) 682-8772 E-mail: rmicander@unr.edu
State Historical Preservation Office **Vacant** 100 N. Stewart St. Carson City, NV 89701 Ph: Email:	**Nevada Bureau of Mines and Geology** **Sydney Wilson** Cartographer/GIS Specialist MS 178/University of Nevada, Reno Reno, NV 89557-0178 Ph: (775) 682-6346 E-mail: sydneywilson@unr.edu

Table 2-1. NHM Planning Subcommittee Members and Alternates (as of April 2018)	
FEMA Region IX **Alison Kearns** Lead Community Planner 1111 Broadway, Suite 1200 Oakland, CA 94607	**FEMA Region IX** **Juliette Hayes** Deputy Branch Chief 1111 Broadway, Suite 1200 Oakland, CA 94607 Ph: (510) 627-7211 E-Mail: juliette.hayes@fema.dhs.gov

Nevada Revised Statutes on Open Meetings were followed in publicly posting scheduled meetings of the NHM Planning Subcommittee. Participation from the public in the planning process was also solicited via postings in the online quarterly meeting agendas, on the NHMPC and Nevada DEM websites, and on social media mitigation sites (Facebook, Twitter) maintained by Nevada DEM requesting input and feedback on mitigation issues and activities. A public commenting period was held between April 25 and May 25. Public comment was solicited during this period through Nevada DEM and NBMG social media accounts and elsewhere. To date, there has been one public comment in response to these postings; updated information regarding the policies outlined in Appendix N was provided. These policies were updated based on the information received.

Information about the plan update and the planning process was presented by Nevada Earthquake Safety Council (NESC) at meetings that took place during the plan update period. This reached a much larger audience that included hospitals, service providers, casinos, private industry, PNPs, Geographic Information Systems (GIS) specialists, building officials, federal agencies such as BLM, USFS, architectural and engineering firms, homeowners, and local firefighters. Nevada DEM staff ensured that the meeting agendas were distributed to local emergency managers and tribal entities requesting input.

All members of the NHM Planning Committee and Subcommittee participate in a wide variety of other state and public organizations such as the NESC, the Wildland Urban Interface (WUI) Summit, the State Mapping Advisory Committee (SMAC), Nevada Mining Association (NMA), the State Emergency Response Commission (SERC), Homeland Security Working Group (HSWG), Nevada Hospital Association (NHA), State Public Works Division (SPWD), Intertribal Council of Nevada (ITCN), Nevada Insurance Council (NIC), and many other educational and civic groups. Through contact with groups such as these, the Subcommittee members have much contact with the public and hear their concerns about hazard mitigation in many venues and thus are able to incorporate these concerns into their work on the Subcommittee.

2.1.3 How Other Agencies Participated in the NHMP Update Process

Other agencies participated by serving as members of the NHM Planning Subcommittee and by providing oversight and direction of the update process. When additional information was required to comply with State Mitigation Plan Review Guide elements and recommendations, the Subcommittee also solicited specific input, expertise, and data from other agencies not represented on the Subcommittee. Table 2-2 details the contributions of all agencies in the NHMP update process.

Table 2-2. Documentation of Agency Participation in Update Process	
Agency	**Mode of Participation in the Plan Update Process**
Carson City Fire Department	Provides input on WUI fire risks and mitigation strategies to reduce WUI fire risk
Carson City Office of Emergency Management	Provides input on mitigation of Wildland-Urban Interface fires, flooding, earthquake, hazardous materials, etc.
City of Las Vegas Office of Emergency Management	Represents the interests of Clark County's Hazard Mitigation Committee on the State Mitigation Planning Subcommittee.
FEMA Region IX	Provides FEMA guidance to the Subcommittee in revising the NHMP.
National Weather Service - Reno	Provides data on weather-related hazards to aid in the revision and update of the NHMP at quarterly meetings and via email.
Nevada Attorney General's Office	Provides legal counsel to the Subcommittee and language revisions used in the updated plan. Ensures compliance with Nevada Revised Statutes in all updated material in the NHMP.
Nevada Bureau of Mines and Geology	Provides geologic information, editorial and technical assistance, GIS data, and support personnel to the Subcommittee to aid in the revision and update of the NHMP.
Nevada Department of Administration/ Division of Risk Management	Provides insurance, safety, loss prevention and risk management data used to update the NHMP.
Nevada Department of Agriculture	Provides information regarding agriculture and related industries to the Subcommittee for use in updating the NHMP
Nevada Department of Cultural Affairs, State Historical Preservation Office	Provides technical assistance to the Subcommittee regarding preservation of Nevada's historic and cultural resources. Provides Unreinforced Masonry Building (URM) data regarding historical buildings to the Subcommittee to aid in the revision and update of the NHMP.
Nevada Department of Transportation	Provides leadership and direction to the Subcommittee in updating the NHMP; identified state transportation-related infrastructure vulnerable to hazards; and updated hazard data tables at quarterly meetings and via email.
Nevada Dept. of Conservation & Natural Resources	Provides data and information to the NHMP committee for use in updating the NHMP specifically pertinent to infestation, epidemic, flood, Hazmat, wildfire, and other sections.
Nevada Dept. of Wildlife	Provides expert input and data on invasive species.
Nevada Division of Emergency Management	Provides personnel, resources, research, and data used to update the NHMP. Provides a link between FEMA Region IX and the Subcommittee. Provides disaster response and recovery information to the Subcommittee.

Table 2-2. Documentation of Agency Participation in Update Process	
Nevada Division of Environmental Protection	Provides the Subcommittee with input relating to air quality, water quality, and hazardous materials used in updating the NHMP.
Nevada Division of Forestry	Provides input on Wildland Urban Interface (WUI) fire risks, and mitigation strategies to reduce WUI fire risk at quarterly meetings and via email.
Nevada Division of Insurance	Provides direction to the Subcommittee to promote hazard mitigation in the private sector to enhance its benefits to reducing risk at quarterly meetings and via email.
Nevada State Public Works Division	Provides information regarding facilities infrastructure to the Subcommittee to aid in the revision and update of the NHMP.
Nevada Division of Water Resources	Provides floodplain management data and Repetitive Loss data to the Subcommittee for use in updating the NHMP. Provided dam inspection data pertinent to dam safety, risks and mitigation.
Nevada Earthquake Safety Council	Provides input on earthquake safety and hazards used in updating the NHMP.
Nevada Public Agency Insurance Pool	Provides data on Unreinforced Masonry Buildings (URM) data to the Subcommittee to aid in the revision and update of the NHMP at quarterly meetings.
Nevada State Emergency Response Commission	Provides expertise on hazardous materials profile and permitting in plan updates.
Nevada State Fire Marshal's office	Provides information regarding fire and Hazmat hazard in the state to the Subcommittee for plan updates.
Nevada State Hospital Association	Provides critical facilities information to the Subcommittee used to update the NHMP and supports the implementation of mitigation activities in hospitals statewide.
Sierra Avalanche Center	Provides expertise and historical input regarding avalanche hazards.
U. S. Army Corps of Engineers	Provides input on mitigation of flood hazards through frequent meetings and teleconferences with committee members.
U. S. Bureau of Land Management	Provides input on mitigation of Wildland-Urban Interface fires through quarterly meetings.
U. S. Dept. of Agriculture	Provides data and information to the Subcommittee for use in updating the NHMP specifically pertinent to infestation, epidemic, Hazmat, wildfire, and other sections through interactions with committee members at a variety of meetings.
U. S. Forest Service	Provides input on mitigation of WUI fires through interaction with Subcommittee members at quarterly meetings.

Table 2-2. Documentation of Agency Participation in Update Process	
U. S. Geological Survey	Provides input on mitigation of flood and earthquake hazards through interactions with committee members at a variety of meetings.
University of Nevada, Reno Dept. of Geological Sciences	Provides geological and historical input on avalanche, tsunami, earthquake, and landslide hazards.
University of Nevada Seismological Laboratory	Provides technological, geological, and historical input on earthquake hazards through interactions with committee members at a variety of meetings.
Washoe Tribe (Nevada & California)	Provides information regarding tribal nations to the Subcommittee for use in updating the NHMP

2.1.4 How the Subcommittee Achieved the Update of Each Section of the NHMP

The Subcommittee charged the planning team with specific tasks in reviewing and analyzing each section of the plan. The planning team revised each section accordingly and presented revisions to the Subcommittee for final review. The Subcommittee Chair presented the Subcommittee's updated sections to the NHMPC for final approval. As part of the update process, local jurisdictional hazard mitigation plans were incorporated into the NHMP as they were approved by FEMA, and made available. As hazard and vulnerability assessments became available, these data were incorporated into the NHMP. Table 2-3 documents specific accomplishments of the planning team at each work session and Table 2-4 documents the progress made at NHM Planning Committee and Subcommittee quarterly meetings.

Table 2-3. Documentation of NHM Planning Team Meetings		
Date	**Update Planning Team Participants**	**What was accomplished**
March 2015	Debbie Tanaka, Karen Johnson	Grant out funds for Drought Risk Assessment to be included in the 2018 state plan update, Desert Research Institute.
26 March 2015	Debbie Tanaka, Karen Johnson, Rachel Micander, Craig dePolo, Jim Faulds, Linda Goar, Jennifer Vlcan, Irene Seelye	Coordination effort between Nevada DEM and Nevada Bureau of Mines and Geology (NBMG) in order to establish needs for the 2018 HMP update, MyPLAN, and HAZUS runs.
4 May 2015	Karen Johnson, Rachel Micander	Reviewed HMP update schedule and determined where public outreach should be incorporated into the plan.

Table 2-3. Documentation of NHM Planning Team Meetings		
20 August 2015	Karen Johnson, Rachel Micander	Discussed updates needed for the Volcano section and if there was any new data that should be taken into consideration for the Volcano, Landslide, or Expansive Soils sections. Set up shared folders in Nevada Box so data could be shared easily.
26 April 2016	Karen Johnson, Rachel Micander	Discussed what would be needed to update the public awareness section. Worked on cataloging and documenting outreach efforts. Discussed mitigation actions and updates to sections to determine responsible parties.
16 August 2016	Karen Johnson, Janell Woodward, Rachel Micander	Meeting with FEMA Region IX to discuss new requirements for 2018 enhanced plan status. Discussed a need for FEMA training catered to updating state plans. Discussed losses avoided studies, mitigation projects completed in Nevada, and future conditions and climate change incorporation into the state plan.
25 July 2017	Craig dePolo, Rachel Micander, Jennifer Vlcan	Discussed updates and needs for the October subcommittee meeting. Assigned sections and subsections to Irene Seelye for review and coordination. Sent Section 3.3.5 and 3.5 to Nevada Division of Forestry (NDF), Nevada Division of Water Resources (NDWR), and NBMG for review and updates.
8 August 2017	Rachel Micander, Irene Seelye	Determined remaining hazard profiles that needed finalization. Sent reminder emails to confirm. Sent spreadsheet for outreach tracking to subcommittee.
15 August 2017	Janell Woodward, Rachel Micander	Discussed status of the state plan update. Reviewed information needed to update Sections 5 and 6. Discussed the future update of Section 4, which Janell would send out to the Committee. Discussed the State Mitigation Plan Review Guide (formerly Crosswalk) what will be submitted to FEMA in June 2018. Reviewed guidelines and timeframe. Reviewed appendix J fire maps and differences from 2013 plan update.
August – September 2017	Rachel Micander, Irene Seelye	Incorporated all approved hazard profiles into Section 3. Update Appendix E and M. Add new Appendix J to HMP.
6 September 2017	Rachel Micander, Craig dePolo, Irene Seelye, Jennifer Vlcan	Discussed updated needed to complete Appendix F. Updated Peak Ground Acceleration map in interactive MyPLAN and MyHAZARDS map. Sent avalanche hazard profile to Richard Penniman for review.

Table 2-3. Documentation of NHM Planning Team Meetings		
13 September 2017	Rachel Micander, Craig dePolo, Irene Seelye, Jennifer Vlcan	Discussed what would be needed from NBMG staff to complete the update of the state plan prior to May 2018.
4 October 2017	Rachel Micander, Irene Seelye, Sydney Wilson, Jenniger Vlcan	Assigned tasks to Sydney and Irene. Begin updating tables 3-33 and 3-34. Received disaster declarations from Janell Woodward. Filed to incorporate into the HMP. Sent Sections 5 and 6 to Janell Woodward for review.
23 October 2017	Rachel Micander, Irene Seelye, Sydney Wilson	Work continued contacting tribes for updated HMP information. State populations updated with 2017 data. Reviewed Sections 8 and 2 and flagged questions. Edits to Sections 3.5 and 3.7 were incorporated into the HMP. Appendix F completed.
31 October 2017	Rachel Micander, Irene Seelye, Sydney Wilson, Craig dePolo	Completed Appendix H. Discussed Section 8 updates and questions. Sent revised Section 8 to Craig for review.
2 November 2017	Rachel Micander, Sydney Wilson	Reviewed Appendix P and the outreach tracking tables. Discussed what should be added or removed, and determined the best methods to capture new outreach data. New Nevada flood brochure received from the Silver Jackets. Began review of Section 2 – planning process.
13 November 2017	Rachel Micander, Irene Seelye, Sydney Wilson	Replaced crosswalks in Section 2. Sent email to Dr. Watters in Geosciences asking about input on the avalanche section.
4 December 2017	Rachel Micander, Sydney Wilson, and Janell Woodward	Discussed progress review of Sections 2, 5, 6, and 8 following the Subcommittee meeting
9 January 2018	Janell Woodward, Bill Elliot, Craig dePolo, Rachel Micander, Sydney Wilson, Jennifer Vlcan	Reviewed status of updates, delegate work to be completed, discuss upcoming subcommittee meetings
10 January 2018	Rachel Micander, Sydney Wilson	Reviewed progress, assign work, and update schedule. Created new schedule to follow for the remaining plan update period.
17 January 2018	Rachel Micander, Sydney Wilson	Completed review of Section 6 and sent red-line copy to Janell for distribution to the Subcommittee. Reviewed Section 8 and addressed questions to send to Janell. Reviewed Section 3, comment, and flag questions to send to Craig for review.
26 January 2018	Rachel Micander	Updated tracking list and sent to planning participants for review.

Table 2-3. Documentation of NHM Planning Team Meetings		
24 January 2018	Rachel Micander, Sydney Wilson	Updated Appendix I, added new meeting minutes and agendas to Appendix D, created Appendix M with new THIRA from Janell. Reviewed Infestation profile.
31 January 2018	Sydney Wilson, Rachel Micander	Began update of Section 0.
2 February 2018	Sydney Wilson	Incorporated questions for Subcommittee into Section 2.
5 February 2018	Rachel Micander, Sydney Wilson	Prepared Section 5 red-line to send to Janell. Added revised flood profile to Section 3.
13 February 2018	Jennifer Vlcan, Sydney Wilson	Discussed remaining items to prepare for the Subcommittee meeting, and updated tracking list. Flagged Section 4 and sent to Janell for review. Prepared and sent Janell Section 2 red-line.
20 February 2018	Rachel Micander, Jennifer Vlcan, Janell Woodward, Sydney Wilson	Discussed remaining questions in Sections 3, 4, and 8. Discussed remaining items that need to go out to the Subcommittee prior to the February 26, 2018 meeting.
21 February 2018	Rachel Micander, Sydney Wilson	Reviewed the buildings and critical facilities list. Continued updates to Sections 0 and 7. Climate notes added to each hazard profile. Erionite and Asbestos updated for HAZMAT profile review.
22 February 2018	Rachel Micander, Sydney Wilson	Began plan review guide check. Sent sections to Janell for distribution to subcommittee
26 February 2018	Rachel Micander, Sydney Wilson	Reviewed meeting items, printed Erionite section for distribution at Subcommittee meeting.
26 February 2018	Full Subcommittee	Reviewed questions in sections completed to date. Reviewed outreach and enhanced components. Reviewed STAPLEE.
27 February 2018	Rachel Micander, Sydney Wilson	Sent emails to Subcommittee members requesting clarification in Sections 2, 3, and 5. Compiled list of questions for distribution to the Subcommittee and highlight priorities.
28 February 2018	Rachel Micander, Sydney Wilson	Sent hazard profiles for distribution to NHMPC. Added Erionite and NOA to HAZMAT hazard profile. Edited and formatted Appendix K. Edited Section 8.4.2.
1 March 2018	Rachel Micander, Sydney Wilson	Reviewed FEMA plan review guide. Checked requirements and elements.
6 March 2018	Rachel Micander, Craig dePolo	Reviewed notes from the NHMPC meeting. Checked hazard rankings by county and updated.
7 March 2018	Rachel Micander	Updates from Bunny Bishop incorporated into Section 8.

Table 2-3. Documentation of NHM Planning Team Meetings		
8 March 2018	Rachel Micander	Reviewed all of Section 3. Edited and updated. Removed Terrorism at the request of the NHMPC. Added HAZMAT to hazard profile section. Updated critical facilities table and included number of buildings and amounts. Updated critical facilities definition.
9 March 2018	Sydney Wilson	Outreach and mitigation activities added to Appendix O and P. References added to Section 7 and formatted. Began compilation of table of contents. Table and figure numbers assigned to all appendices. New information added to Section 8.
12 March 2018	Rachel Micander	Updated Section 2 with new information from Nevada Division of Environmental Protection (NDEP). Finalized and added HAZMAT profile to Section 3.
2 April 2018	Rachel Micander, Sydney Wilson, Janell Woodward, Bunny Bishop	Reviewed entire plan. Discussed Sections 2, 5, and 8 in detail. Updated sections as needed and discussed agenda for next Subcommittee meeting. Added new information to tables in Section 5, and added detailed information regarding the planning process and local coordination.
3 April 2018	Sydney Wilson, Rachel Micander	Edited and updated all sections with new information. Posted completed sections to website for Subcommittee review, in preparation for the next Subcommittee meeting. Edited Section 5.
5 April 2018	Sydney Wilson, Rachel Micander	Posted Section 4 to website. Gathered additional information for Section 3. Completed Appendix S/T and W.
18 April 2018	Rachel Micander, Sydney Wilson	Re-lettered all appendices, checked section numbers, updated sections with additional details, made edits to HAZMAT section from NDEP, updated references, and accepted all changes for the NHMPC meeting. Posted new documents to website for committee review.
25 April 2018	Rachel Micander, Sydney Wilson	Determined formatting standards, prepared all sections and appendices for public comment. Created webpage and posted all sections of the plan to the website.
26 April 2018	Sydney Wilson, Irene Seelye	Format appendices O and P, fix table formatting in section 3. Develop cover page draft.
27 April 2018	Sydney Wilson	Format section 3
30 April 2018	Sydney Wilson, Irene Seelye	Update TOC and check links for Sections 0-4. Cover page draft and accessibility formatting

Table 2-3. Documentation of NHM Planning Team Meetings		
1 May 2018	Sydney Wilson, Irene Seelye	Update table of contents, format and check links for Sections 5, 6, and 8. Begin formatting Appendix B. Continue accessibility formatting
2 May 2018	Sydney Wilson, Irene Seelye	Format, update TOC, check links, update tracking spreadsheet for Appendices B-K. Accessibility formatting & cover page draft
3 May 2018	Sydney Wilson, Irene Seelye	Format, check links for Appendices K-P, fix broken links, accessibility formatting & cover page draft
4 May 2018	Rachel Micander, Sydney Wilson	Format and link check for Appendices O-P, start creating list of acronyms, review status of HMP. Post HMP public comment period on NBMG's Facebook page, format and fix Appendices D & I, cover page design
7 May 2018	Rachel Micander, Sydney Wilson, Irene Seelye	Review/read through sections 0-3, cover page design, Section 0 map edits, accessibility formatting
8 May 2018	Sydney Wilson, Irene Seelye	Continue review of Section 3, TOC formatting, fix page number errors, accessibility formatting for Appendices B-R, and Sections 5, 6, and 8
9 May 2018	Rachel Micander, Irene Seelye	Continue accessibility formatting for Appendices B-R, and Sections 5, 6, and 8. Cover design; coordinate with NDF about photos for cover page.
10 May 2018	Rachel Micander, Sydney Wilson, Irene Seelye	Continue accessibility formatting for Appendices B-R, and Sections 5, 6, and 8. Format/update TOC, continue review of Section 3, begin review of Section 4
14 May 2018	Rachel Micander, Sydney Wilson	Clean up edits to Sections 3, 4, 5, and 8, continue alt text for Section 3, begin Appendix S formatting. Send update to Janell Woodward
15 May 2018	Sydney Wilson, Irene Seelye	Update Appendix N, format Appendices S,T,U
16 May 2018	Rachel Micander, Sydney Wilson	Review section 8, format Section 7 and begin accessibility for 7. Public comments received and addressed in the state plan
18 May 2018	Sydney Wilson	Finalized accessibility formatting in Section 3.
29 May 2018	Sydney Wilson	Accessibility formatting for Appendices S, T, and U begin reading and reviewing Appendices
30 May 2018	Sydney Wilson	Reviewed, finalized, and converted completed sections (0-8) and appendices (B-R) to PDF. Reviewed progress with Rachel Micander

Table 2-3. Documentation of NHM Planning Team Meetings		
31 May 2018	Rachel Micander, Sydney Wilson	Review PDF documents, email Janell Woodward with status update. Proofread section 3 and update as needed. accessibility formatting for Appendix S, PDF interactivity test
1 June 2018	Sydney Wilson	Begin compiling master PDF and making it interactive
4 June 2018	Rachel Micander, Sydney Wilson	Review and fill out plan review guide (Appendix R). Update section 8 with additional information. Continue making PDF interactive
5 June 2018	Rachel Micander, Sydney Wilson	Discuss minor formatting issues, update Appendix R, fix minor formatting issues, add public comment to Section 2
6 June 2018	Rachel Micander, Sydney Wilson	Continue edits and formatting in all of plan.
7 June 2018	Rachel Micander, Sydney Wilson, Janell Woodward	Update executive summary, update plan review guide, research additional information needed in section 8. Additional information from public comment incorporated into section 3
12 June 2018	Rachel Micander	Send plan to DEM for printing and submission to FEMA.
June 2018	Shealyne Schultz	Submit state plan to FEMA for review – digital and hard copy.

Table 2-4. NHM Planning Subcommittee Meetings	
Meeting Date	**What was accomplished**
July 2014	Weather forecast and drought outlook, review drought risk assessment project.
March 2015	Discussed Nevada Mitigation Action in 2014. Review recent flood events and road repairs.
May 2015	Update on the status of mitigation actions, reviewed the benefits of the subcommittee efforts, and discussed the state hazard mitigation plan exercise.
July 2015	Update of the state enhanced hazard mitigation plan Epidemic hazard profile.
October 2015	No quorum achieved
January 2016	Update of the Volcano and Tsunami/Seiche hazard profiles of the HMP were introduced and discussed.
April 2016	Update of the Drought hazard profile was introduced and discussed. The Hazardous Materials hazard profile was introduced, but was not finalized. The Terrorism enhanced hazard profile was introduced and discussed.

Table 2-4. NHM Planning Subcommittee Meetings	
July 2016	No quorum achieved.
October 2016	A nomination and vote for a new co-chair of the Subcommittee was conducted – Bunny Bishop was elected co-chair. The updates of the Landslide, Expansive Soils, and Land Subsidence hazard profiles were introduced and discussed. The Extreme Weather hazard profile was introduced and discussed.
January 2017	Meeting canceled due to active flooding and disaster mitigation efforts in Northern Nevada.
April 2017	Discussed the collection of member input on public awareness and education in hazard mitigation and actions. The update of the Wildfire hazard profile was introduced and discussed. The update of the Flood hazard profile was discussed and determined that more updating was needed.
July 2017	Continued discussion of public awareness and education activities as it relates to hazard mitigation and planning actions.
October 2017	No quorum achieved.
December 2017	Review public awareness and education activities to date. The Infestation hazard profile update was reviewed and discussed. Final review will be discussed at the next meeting. The Earthquake hazard profile update was approved. The Flood hazard profile was approved.
February 2018	Review of public awareness and education activities to date. Asked for additional information to be sent to Janell for incorporation into the state plan. The Infestation hazard profile was reviewed and approved. The Avalanche hazard profile was reviewed and approved. The HAZMAT hazard profile was reviewed and approved pending additional changes. The STAPLEE form was discussed and, requested to be submitted within 48 hours of the Subcommittee meeting. All sections were reviewed, with questions directed at the subcommittee members requiring answers.
April 2018	Reviewed and approved the entire plan. Prep for full committee review.

2.1.5 Which Sections of the NHMP Were Revised in the Update Process

Table 2-5 below indicates which sections of the NHMP were revised as part of the 2018 update process and or added to the Plan and when each was approved by NHMPC. Details about specific revisions made to each section or subsection are included in that section and are also described in Table 2-3 above in the Planning Team meeting accomplishments.

Table 2-5. NHMP Revised Sections		
Description	**Updates Made Y/N?**	**Date Approved by NHMPC**
Introduction	Y	
Section Zero - Overview	Y	4/24/2018
Section One – Adoption	Y	4/24/2018
Section Two – Planning	Y	4/24/2018
Section Three – Risk Assessment	Y	4/24/2018
Section Four – Mitigation Strategy	Y	4/24/2018
Section Five – Local Coordination	Y	4/24/2018
Section Six – Plan Maintenance	Y	4/24/2018
Section Seven - References	Y	4/24/2018
Section Eight – Enhanced Plan	Y	4/24/2018
Appendix A - Adoption Resolution Document	Y	4/24/2018
Appendix B - Participating Organizations	Y	4/24/2018
Appendix C – NHMP Committee, Subcommittee & Bylaws	Y	4/24/2018
Appendix D - Meeting agendas and minutes	Y	4/24/2018
Appendix E - NV Admin Code Application for Emergency Assistance	N	4/24/2018
Appendix F - HAZUS Earthquake Maps	Y	4/24/2018
Appendix G – List of Dams by County	Y	4/24/2018
Appendix H –HAZUS Flood Maps for NV Rivers	Y	4/24/2018
Appendix I - Federal and State Assurances	Y	4/24/2018
Appendix J – Wildfire Maps: Counties & State-Owned Buildings	Y	4/24/2018
Appendix K – Extreme weather data	Y	4/24/2018
Appendix L – Estimated Losses from Earthquakes near Nevada Communities	Y	4/24/2018
Appendix M – (New) Threat and Hazard Identification and Risk Assessment Executive Summary (THIRA)	Y	4/24/2018
Appendix N– WSSPC Policies	Y	4/24/2018
Appendix O – Completed Mitigation Activities	Y	4/24/2018
Appendix P –Public Outreach	Y	4/24/2018
Appendix Q – Nevada Ditches List & Reno Area Map	Y	4/24/2018
Appendix R – (New) State Mitigation Plan Review Guide	Y	4/24/2018

Table 2-5. NHMP Revised Sections		
Appendix S – (New) Assessment of Drought Resiliency in Rural Northern Nevada	Y	4/24/2018
Appendix T – (New) Loss Avoidance Study	Y	4/24/2018
Appendix U – (New) Radiological Emergency Response Plan	Y	4/24/2018

2.2 COORDINATION AMONG AGENCIES

The requirements for coordination among agencies, as stipulated by the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S1. Does the plan describe the process used to develop the plan? [44 CFR §§201.4(b)[7] and (c)(1)[8]] ***Intent:*** *To demonstrate a deliberative approach to plan development.*	The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or timeframe, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the extent possible with other state planning efforts. ***Agencies and stakeholders*** means state, local, and tribal agencies, colleges and universities, private entities, or private non-profit organizations, such as multi-jurisdictional utilities, that perform a critical function. ***Special Consideration:*** The plan must describe the planning process, but supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are encouraged to retain supporting documentation as a permanent record of how decisions were made and who was involved.

ELEMENT	REQUIREMENTS
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)] ***Intent:*** To actively involve stakeholders with the data and expertise to develop the plan, but also with the responsibility or authority to implement mitigation actions and reduce risk state-wide	The plan must describe how other state and Federal agencies and other stakeholders were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and stakeholders responsible for the following sectors: h. Emergency management; i. Economic development; j. Land use and development; k. Housing; l. Health and social services; m. Infrastructure; and n. Natural and cultural resources. Where coordination with agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations. ***Involved in the process*** means engaged as participants and given the chance to provide input to affect the plan's content. ***Special Consideration*:** While coordination with other agencies and stakeholders is foundational to the success of the plan update as well as implementation, FEMA acknowledges the inherent differences in state governance and capabilities. In evaluating coordination, FEMA will credit the state's efforts to engage other agencies and stakeholders.

[7] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

[8] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

2.2.1 Involvement of Federal and State Agencies in the Planning Process

State agency personnel who also serve on the Subcommittee are listed in Table 2-1 in Section 2.1.2. Federal and state agencies that contributed to the update process are listed in Table 2-2 in Section 2.1.3. The composition of the Subcommittee adjusts to address compliance with requirements of the plan update process.

In addition to being represented on the NHM Planning Committee and Subcommittee, Nevada's Tribal nations also work directly with FEMA in their planning process due to increased funding opportunities. The state continues to provide the tribes with technical assistance in their planning as requested.

The WUI is composed of multiple state and federal agencies that include BLM, Nevada Cooperative Extension, USFS, NDF, Nevada DEM, local fire departments, and interested private citizens. The WUI meets regularly to plan an annual summit on WUI fire mitigation issues for businesses and homeowners. Mitigation goals and strategies identified at these summits are then incorporated into both the local and state planning update process.

The NESC is composed of representatives from Nevada DEM; University of Nevada, Reno (UNR); University of Nevada, Las Vegas (UNLV); Nevada Public Agency Insurance Pool; Clark County Department of Development Services; Clark County School District (CCSD); American Red Cross;

Nevada Energy; urban governments; and private engineering, insurance, consulting, and casino companies. They meet quarterly and meetings may be attended by any interested parties including FEMA representatives, local building officials, local fire departments and emergency management coordinators, U. S. Department of Energy (DOE), and tribal representatives. NESC facilitates public input, develops consensus about seismic issues within the public and private sectors, and is the public advisory body for State seismic safety policy. The Subcommittee uses these policies in the planning process.

The NHMPC includes members with expertise in floodplain management including representatives from the Clark County Regional Flood Control District (RFCD), Washoe County Water Resources, State Floodplain Manager, and Nevada Division of Water Resources (NDWR). They provide flood mitigation and dam safety goals and strategies and review proposed updates to the plan. It also includes members of the NDF with expertise in wildfire mitigation. NDF provides wildfire mitigation goals and strategies and review proposed updates to the plan. The NHMPC also includes members from agencies such as NBMG with expertise in earthquake hazard mitigation who provide mitigation goals and strategies for earthquake hazards and review proposed updates to the plan.

2.2.2 Participation of Interested Groups in the Planning Process

Participation of private businesses, PNPs, and other interested parties is documented by their representation in NESC, NHMPC, and WUI Summit Committee as described in the previous section.

Voluntary Organizations Active in Disasters (VOAD) and Community Organizations Active in Disasters (COAD) are national and local faith-based groups that coordinate with state and federal emergency management agencies in assisting communities in recovering from disasters. The Nevada DEM staff coordinates with these groups and incorporates their concerns into the planning process.

Citizens and interested groups are able to review the plan on the Nevada DEM website (www.dem.state.nv.us) and provide input directly to the SHMO for use in the planning process. Notice is also provided to these groups through Facebook and Twitter.

Additionally, all Subcommittee and Committee meetings are posted according to the Nevada Open Meeting Law and teleconferencing information is noted on the agenda.

Public involvement is considered an important part of the planning process and helps address the needs of our citizenry. The Subcommittee has determined that public involvement efforts must continue to be a component of the local planning process and counties must bring those local concerns to the state. At the state level, the intent is mainly to keep the public aware of the planning process and to keep it open, accessible, and transparent to anyone who wishes to view it, by posting it online. The maintenance of the MyPlan website has continued to greatly increase the ability of the Committee to make planning resources easily available to the locals and provides them with a medium for communication of needs as well. The NHM Planning Subcommittee and the NHMPC continue to move the NHMPC meetings to venues located around the state in local communities, in an effort to elicit more participation from the public and local officials. These efforts continue to produce much additional public participation and interaction among stakeholders at both the local and state levels. The rural meeting venues provide valuable opportunities for networking and exchange of information on mitigation resources and concerns regarding local hazards. These NHMPC meetings in the local communities will continue, while funding is available, in order to provide support for local plan maintenance and development of additional tribal plans.

In order to encourage more direct public participation in the future plan update process, a PowerPoint presentation on the purpose of the NHMPC and its mitigation program was developed and is available for educational and awareness use in public presentations and speaking engagements across the state.

NHM Planning Committee and Subcommittee members continue to present outreach and awareness activities to other groups, concerned citizens, and the public. This information can be found in Appendix P.

These are examples of some of the venues where hazard mitigation information is shared with the public. This is by no means a comprehensive listing of all such activity by NHM Planning Committee and Subcommittee members.

While there are vacant positions within the Subcommittee, the NHMPC continues to reach out to and contact individuals specializing in all aspects needed to update the state plan. The Subcommittee continues to look for additional stakeholders to assist with the planning process.

2.2.3 Changes in Federal and State Coordination

Cooperation among agencies in order to comply with Federal requirements for hazard mitigation planning has had the added effect of enhancing mutual awareness of the goals and functions of a wide variety of agencies, both federal and state. Working together on the planning and update process has helped members become more cognizant of common goals and opportunities for coordination of efforts in the mitigation planning process at the state level. One example of this is the increased coordination among the NDWR, NDEP, and Nevada DEM to leverage resources in addressing environmental concerns related to mitigation activities, such as Nevada Clean Water and U.S. Clean Air Act programs. Another example of improved coordination of federal and state agency efforts is the increased cooperation among the entities participating in the WUI Summit meetings. A WUI conference, held by the Nevada Network of Fire Adapted Communities organization, is scheduled for March 2018, and offers attendees hands-on training and interactive sessions on the challenges of wildland fire. This is the fourth annual conference

For more information about the WUI conference, see: http://www.livingwithfire.info/wui-fire-summit and/or https://www.iafc.org/events/wui/about.

This has resulted in both reduced fire risk to homes and businesses and increased awareness of funding opportunities to communities for implementing strategies.

NESC issues and strategies continue to be included in the earthquake hazard mitigation update process. The MyPLAN web application, developed during the last plan update cycle continues to be maintained and updated by NBMG. Both HAZUS and MyPLAN are used in assessing earthquake risk and loss estimation

Increased federal and state agency coordination in the planning process has greatly enhanced awareness, cooperation, and the leveraging of resources in the implementation of mitigation strategies.

In 2015, Governor Sandoval established the Nevada Drought Forum. The purpose of the Forum, according to the Department of Conservation and Natural Resources (DCNR), is to "bring together the best minds, managers and all interested stakeholders to assess the drought in Nevada, identify best conservation practices and policy needs, and make recommendations to the Governor regarding next steps." Drought Forum members and partners include a variety of federal, state, and local/regional

agencies. For a complete list of members and partners, and to learn more about the Drought Forum, please see: http://dcnr.nv.gov/divisions-boards/nevada-drought-forum/about-the-drought-forum.

The National Oceanic and Atmospheric Administration's (NOAA) Weather Ready Nation (WRN) Ambassador initiative was developed to give their partners a means to show their commitment to being prepared for environmental hazards. Ambassadors help promote the concepts of a WRN by staying weather aware, personal responsibility and setting an example. The initiative is open to the public and private sector. For more information, please see: https://www.weather.gov/wrn/ambassadors.

2.2.4 Silver Jackets Program

Federal agencies, including the U.S. Army Corps of Engineers (USACE), FEMA, the Natural Resources Conservation Service (NRCS), the National Weather Service (NWS), and the U.S. Geological Survey (USGS) are partnering to form a unified forum to address Nevada's flood risk management priorities. Developed at the state level, Nevada DEM and NDWR have formed an active Silver Jackets program (http://silverjackets.nfrmp.us/State-Teams/Nevada) that provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. The silver jackets have completed various team activities. In 2016, USACE and NDWR partnered together on Dam Safety Outreach for Non-Corps Dams, which helped raise awareness on how dams play a role in flood risk management. In February 2017, the Pyramid Lake Paiute Tribe, USACE, NDWR, and Nevada DEM worked together to create a flood management plan for the Pyramid Lake Indian Reservation. Furthermore, in 2017, the Silver Jackets developed and published the *Flood Awareness Guide for Nevada*, a booklet developed to help communities in Nevada understand their flood risks (located in Appendix P). A computer game for K-12 students called Flood Fighter: Nevada, was created in 2017, and educates its users on the importance of flood control. Involvement from other federal, state, regional, local, and tribal groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery.

2.2.5 Nevada Division of Environmental Protection

The NDEP is the primary state agency charged with coordinating state, federal and private resources to detect, identify, contain, clean up, dispose of, and minimize releases of hazardous substances; and preventing, mitigating, or minimizing the threat of potential releases. To this end, the Environmental Assistance Program (EAP) operates within the NDEP Bureau of Corrective Actions to coordinate hazard mitigation and response activities for various NDEP Bureaus. The Bureaus provide hazard mitigation through both short-term and long-term activities that reduce the cause or occurrence of hazards; reduce exposure to hazards; or reduce effects of hazards. Descriptions of individual NDEP Bureau emergency response and mitigation activities are provided below:

- Bureau of Air Pollution Control (BAPC) - As identified in Section 3.3.11.2 (Identification of Hazardous Materials Releases) in this plan, fixed site facilities are potential sources of hazardous material releases. Currently, the Chemical Accident Prevention Program (CAPP) (housed in the BAPC) requires fixed site facilities handling highly hazardous substances in quantities less than the program threshold quantities, to become subject to CAPP regulatory oversight after having two accidental releases within a 12-month period. Through mitigation plans, CAPP requires

these facilities to ensure the safe and adequate handling of hazardous chemicals that are produced used, stored or handled in the State and explosives that are manufactured for sale in the State.

- Bureau of Mining Regulation and Reclamation (BMRR) - Mining facilities in Nevada are a potential source of hazardous materials release. In response, the BMMR requires robust monitoring, leak detection, and double containment at Nevada Mining Facilities. Because of this, when releases occur and/or are discovered they tend to be small and easily managed during the course of normal facility operations. Often, the permittee is able to manage releases with existing staff and equipment, augmented by confirmatory analyses at a Nevada certified third-party laboratory. Additionally, upon closure, BMMR requires each facility to obtain adequate financial assurance to ensure mine facilities are reclaimed and closed for the long-term per the approved Final Permanent Closure Plan and do not pose a future threat to environmental or human health.
- Bureau of Federal Facilities (BFF) – BFF regulates the DOE's environmental restoration and waste management activities at the Nevada National Security Site (NNSS). All NNSS waste and water facilities permitted by BFF and all investigative and corrective actions overseen and regulated by BFF at NNSS, operate under a DOE Emergency Plan Implementing Procedure specific to the permitted facility or regulated activity.
- Bureau of Safe Drinking Water (BSDW) - In accordance with the Code of Federal Regulations, the BSDW requires all drinking water systems in the State to provide an Emergency Response Plan addressing hazard mitigation. Additionally, BSDW coordinates source water protection activities at the local, state, and federal levels, and encourages community-based protection and preventive management strategies to ensure all public drinking water resources are kept safe from future contamination. This programs aids public water systems in delineating the areas that are sources of public drinking water, identifies potential contaminant sources within the delineated area, and assesses the water systems' susceptibility to contamination.
- Bureau of Water Pollution Control (BWPC) – Regulates some stormwater discharges from three potential sources: municipal separate storm sewer systems, construction activities, and industrial activities. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters. The benefits of effective stormwater runoff management can include:
    - protection of wetlands and aquatic ecosystems,
    - improved quality of receiving waterbodies,
    - conservation of water resources,
    - protection of public health, and
    - flood control.

2.3 PROGRAM INTEGRATION

ELEMENT	REQUIREMENTS
S1. Does the plan describe the process used to develop the plan? [44 CFR §§201.4(b)[7] and (c)(1)[8]] ***Intent:*** *To demonstrate a deliberative approach to plan development.*	The plan must describe the current process used to update the plan, including how the plan was prepared, the schedule or timeframe, specific milestones and activities, the agencies and stakeholders who were involved in the process, and if the mitigation planning process was integrated to the extent possible with other state planning efforts. ***Agencies and stakeholders*** means state, local, and tribal agencies, colleges and universities, private entities, or private non-profit organizations, such as multi-jurisdictional utilities, that perform a critical function. ***Special Consideration*:** The plan must describe the planning process, but supporting documentation, such as meeting sign-in sheets and notes, does not need to be included in the plan itself. States are encouraged to retain supporting documentation as a permanent record of how decisions were made and who was involved.
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)] ***Intent:*** *To actively involve stakeholders with the data and expertise to develop the plan, but also with the responsibility or authority to implement mitigation actions and reduce risk state-wide*.	The plan must describe how other state and Federal agencies and other stakeholders were involved in the process. At a minimum, the plan must describe how the state coordinated with other agencies and stakeholders responsible for the following sectors: a. Emergency management; b. Economic development; c. Land use and development; d. Housing; e. Health and social services; f. Infrastructure; and g. Natural and cultural resources. Where coordination with agencies and stakeholders representing these sectors is not practicable, the plan must describe the limitations. ***Involved in the process*** means engaged as participants and given the chance to provide input to affect the plan's content. ***Special Consideration*:** While coordination with other agencies and stakeholders is foundational to the success of the plan update as well as implementation, FEMA acknowledges the inherent differences in state governance and capabilities. In evaluating coordination, FEMA will credit the state's efforts to engage other agencies and stakeholders.

[7] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

[8] 44 CFR §201.4(c)(1): "Description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated."

2.3.1 Integration of Existing Plans

The primary way in which Nevada integrates the State mitigation planning process with other ongoing State planning efforts is by having members of the NHM Planning Committee and Subcommittee who

also serve as primary managers of specific programs directly involved in hazard mitigation. Their expertise across a broad spectrum of hazards provides a framework for networking and integration of the NHMP with other ongoing state planning efforts. Specific examples of this mechanism for integration of plans are presented in Table 2-6 below, organized by hazard.

Table 2-6. Integration of the NHMP with other State Planning Efforts

Hazard	Name of plan/website reference	Codes and Regulations	Plan description Mechanism for Integration
All hazards	City Planning	NRS 623 - Architecture, Interior Design and Residential Design	Development Has members in common with NHMPC/Subcommittee
All hazards	Community Master Plans	NRS 278.160 – Planning and Zoning	Conservation and Development This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee
All Hazards	County Hazard Mitigation Plans		Risk analysis and mitigation plans of local hazards. This plan's goals and the NHMP's goals are both to reduce losses. Risk assessment data and action items are incorporated into Sections 3 and 4 of this plan. Has members in common with NHMPC/Subcommittee
All Hazards	Local Hazard Mitigation Plans Reference: http://dem.state.nv.us		Provide planning and project grants for hazard mitigation These plan goals and the NHMP's goals are both to reduce losses. Have members in common with NHMPC/Subcommittee
All Hazards	Nevada Natural Resource Plan Reference: http://dcnr.nv.gov/	NRS 548 – Conservation	Conservation of Nevada's natural resources This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee
All Hazards	Open Space Plan	NRS 376A – Taxes for development of open space land	Development and use for open space land for 20 years This plan's goals and the NHMP's goals are both to reduce losses.

Table 2-6. Integration of the NHMP with other State Planning Efforts			
All Hazards	State Comprehensive Emergency Management Plan	NRS 414	This is the over-arching plan for the emergency management program in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.
Dam Failure	Nevada Dam Safety Reference: http://water.nv.gov/DamsAndSafetyHome.aspx	NRS 535- Dams and other Obstructions	Promote safe construction and operation of dams and prevent loss of life and property. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee
Drought	Drought Plan -2014 Reference: http://water.nv.gov/programs/planning/NV_Long_Term_Drought_Strategic_Plan.pdf	NRS 540 – Planning and Development of Water Resources	Recording and reporting mechanism for drought management. This plan's goals and the NHMP's goals are both to reduce losses. County emergency managers participate in both this plan and NHMPC/Subcommittee.
Drought	Nevada State Water Plan Reference: http://water.nv.gov/programs/planning/stateplan/documents/NV_State_Water_Plan-complete.pdf	NRS 540 – Planning and Development of Water Resources	Framework for water planning and management This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee
Drought	Southern Nevada Water Authority Drought Plan		Sustain and promote water goals in Southern Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Earthquake	Strategic Plan for Earthquake Safety in Nevada Reference: http://www.nbmg.unr.edu/nesc/NESC_Strategic_Plan/NESC_Strategic_Plan_2013_FINAL.pdf		Goals are to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.
Earthquake	Nevada Earthquake Risk Mitigation Plan http://www.un-spider.org/sites/default/files/7-Earthquake_Mitigation_Nevada%20Earthquake%20Safety%20Council.pdf		Goal is to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.
Earthquake	Nevada Earthquake Safety Council www.nbmg.unr.edu/nesc	NRS 414	Goal is to reduce losses due to earthquakes in Nevada. This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.
Flood	Nevada Floodplain Management Program		Monitor and implement the Community Assistance Program, the Flood Mitigation Assistance Program, and the Statewide Flood Management and Mitigation Plan This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee
Flood	Statewide Floodplain Management/Mitigation Planning Reference: http://water.nv.gov/FloodProgramHome.aspx	Floodplain Management Ordinance for Nevada Communities	Minimize public and private losses due to flooding This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.

Table 2-6. Integration of the NHMP with other State Planning Efforts			
Flood	Truckee River Flood Management		"The Living River Plan" This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee.
Wildfire	Community Wildfire Protection Plans (CWPP)		Rating and risk analysis of fire danger in "Communities at Risk" by county This plan's goals and the NHMP's goals are both to reduce losses. Some goals and objectives were carried into this plan. Has members in common with NHMPC/Subcommittee
Wildfire	Western Governors Assn. 10 year Comprehensive Strategy and Implementation Plan: National Fire Plan, USFS Reference: http://www.forestsandrangelands.gov/		Agency mitigation and response to wildland fires This plan's goals and the NHMP's goals are both to reduce losses. Has members in common with NHMPC/Subcommittee

2.3.2 Implementation of State Mandates at the Local Level

In Nevada, any State mandate approved by the State legislature must also be approved by the county and city governing body before it can be implemented at the local jurisdiction. Counties are required by NRS 278.160 to integrate hazard mitigation actions with planning and development at the local level.

2.3.3 Integration of the NHMP with FEMA Programs and Initiatives

State and local mitigation efforts are enhanced and promoted by FEMA programs nationwide and in Nevada specifically. In order to apply for FEMA mitigation funding, communities must first develop their own mitigation plans that are consistent with both FEMA programs and initiatives and NHMP guidelines. All counties in Nevada either have approved plans or are in the plan re-write process, some in cooperation with other counties.

Some of the major state-administered FEMA-funded hazard mitigation programs for which communities and tribal entities can qualify by adherence to the NHMP are described in Table 2-7 below:

Table 2-7. Integration of NHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives

Hazard	Program	Mechanism for Integration
All hazards	Hazard Mitigation Grant Program (HMGP) To provide funds to governments and communities to significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds projects identified in the community's hazard mitigation plan and enables the implementation of mitigation measures during the recovery from a disaster.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
All hazards	HAZUS MH HAZUS-MH is a nationally applicable standardized methodology and software program that uses models to estimate potential losses from earthquakes, floods, and hurricane winds. Estimating losses is essential to decision making at all levels of government, providing a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.	In Nevada, UNR uses HAZUS to generate the potential loss data on which mitigation plans at all levels are based
All hazards	Pre-Disaster Mitigation Pre-Disaster Mitigation (PDM) is a Federal program administered by FEMA, which funds a) local and state mitigation planning to meet the requirements of DMA 2000 and b) mitigation projects.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Dam failure	National Dam Safety Program (NDSP) This program is a partnership of state and federal agencies with other stakeholders to encourage individual and community responsibility for dam safety. The program includes; grant assistance to states, dam safety research and dam safety training.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Earthquake	National Earthquake Hazard Reduction Program (NEHRP) has four basic goals: Promote understanding of earthquakes and their effects Work to better identify earthquake risk Improve earthquake-resistant design and construction techniques Encourage the use of earthquake-safe policies and planning practices	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans

Table 2-7. Integration of NHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
Flood	National Flood Insurance Program (NFIP) NFIP enables property owners in participating communities to purchase flood insurance as protection against flood losses, while requiring state and local governments to enforce floodplain management ordinances that reduce future flood damages.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Community Rating System (CRS) This is a voluntary program recognizing and encouraging community floodplain management activities that exceed the NFIP's minimum standards.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Cooperating Technical Partners (CTP) This program creates partnerships between FEMA and participating NFIP cooperators having an interest and capability to become more active participants in the FEMA Flood Hazard Mapping Program.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Flood Map Modernization This federal program provides up-to-date maps to support a flood insurance program that is more closely aligned with actual risk, encourage wise floodplain management, and increase the public's flood hazard awareness. In Nevada, Clark County's flood maps have been up-dated. All of Washoe County's maps are digitized.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Flood Mitigation Assistance To implement cost-effective measures that reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans
Flood	Repetitive Flood Claim To reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have one or more claim payment(s) for flood damages.	Parallel goals, objectives and action items among FEMA programs, NHMP, and local plans

Table 2-7. Integration of NHMP and Local Mitigation Plans with FEMA Mitigation Programs and Initiatives		
Flood	**Severe Repetitive Loss Program** To reduce or eliminate the long-term risk of flood damage to severe repetitive loss properties and the associated drain on the NFIP.	Parallel goals, objectives and action items among FEMA and federal programs, NHMP, and local plans

This Section includes the identification, profiling and ranking of hazards in the State of Nevada. It documents the process and resources used to asses risk and vulnerability throughout the state resulting in the foundation to build the strategy for mitigation of the identified risks. The Subcommittee ranked the hazards as low, medium, and high risk. *The winter storm and extreme snowfall hazard was renamed to severe storms. The severe storm hazard now encompasses windstorm, winter storms, and extreme snowfall. Revisions were made to several of the hazard profiles to update them with recent events. Naturally occurring asbestos (NOA) was included in the HAZMAT profile to reflect recent discoveries of materials where the substance was present. Terrorism and Weapons of Mass Destruction (WMD) was discussed by the NHMPC. Since these hazards are not natural, the NHMPC determined that they should be removed from this plan update. The Terrorism and WMD hazard profile can be included in the state plan in the future should the Committee decide otherwise. Human-caused hazards, including Hazmat release, cyber-attacks, and others are addressed in the Threat and Hazard Identification and Risk Assessment (THIRA), located in Appendix M. A single condensed Vulnerability Analysis section for highest-ranked hazards, Earthquake, Flood, and Wildfire is included at the end of Section Three.*

The requirements for risk assessment are described below:

ELEMENT	REQUIREMENTS
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)[17]] ***Intent:*** *To ensure that the mitigation strategy addresses the risk and vulnerabilities to existing and potential development, and takes into consideration possible future conditions that can impact statewide* vulnerability.	The plan must provide a summary of the changes in development that have occurred or are projected to occur in hazard prone areas based on the state, local, and tribal, as applicable, risk assessments, specifically: a. Changes in land use and the built environment b. Changes in population demographics that may affect vulnerability to hazard events; and c. Changes to the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities. ***Changes in development*** means recent development, potential and projected land use and development, or conditions that may affect risk and vulnerability to the state and jurisdictions within the state, such as changes in population demographics.

[17] 44 CFR §201.4(d): "Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years."

3.1 OVERVIEW OF RISK ASSESSMENT

A risk assessment requires the collection and analysis of hazard-related data to enable the State to identify and prioritize mitigation actions that will reduce losses from potential hazards. There are five risk assessment steps in the hazard mitigation planning process, as outlined below:

Step 1: Identify and Screen Hazards

Hazard identification is the process of recognizing natural and human-caused events that threaten an area. There are two general categories of hazards: Natural and human-caused:

- Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude to cause damage.
- Human-caused hazards result from human activity and include technological hazards and terrorism.

Hazards are identified by investigating past history of occurrence of these hazards and by gathering scientific data indicating prehistoric occurrences and likelihood of recurrence of these hazards. Even though a particular hazard may not have occurred in recent history in the study area, all hazards that may potentially affect the study area are initially considered. This screening and categorization process will allow us to concentrate efforts on developing mitigation strategies for those hazards categorized as higher risk.

Step 2: Profile Hazards

Hazards are profiled by first collecting data on the location, previous occurrence and probability of future occurrence of each natural hazard. After these data are collected, each hazard is categorized based on these data. It is helpful in the profiling process to review existing plans and studies and use maps where appropriate.

Step 3: Identify Assets

Assets are defined as population; buildings; critical facilities and infrastructures; economic resources; cultural and environmental resources that may be affected by hazard events.

Step 4: Assess Vulnerabilities

A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The assessment provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing the State to focus attention on areas with the greatest risk of damage.

Step 5: Analyze Potential Losses

The final stage of the risk assessment process provides a general overview of vulnerable populations, structures, critical facilities and resources in hazardous areas. This information provides groundwork for decisions about where the mitigation strategies would be most effective. A useful modeling tool to accomplish this is HAZUS, a risk assessment software program developed by FEMA to analyze potential losses from floods, hurricane winds, and earthquakes. HAZUS couples current scientific and engineering data with GIS technology to produce estimates of hazard-related damage before, or after, a disaster occurs.

3.2 NEVADA'S RISK ASSESSMENT PROCESS

The requirements for hazard identification, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)[11]] ***Intent:*** To understand natural hazards across the state in order to identify which hazard risks have been or may be the most significant and the locations that have been or may be the most adversely affected.	a. The plan must include a current summary of the natural hazards that can affect the state. The summary must include information on location, extent, and previous occurrences for each natural hazard, using maps where appropriate. b. If any commonly recognized natural hazards are omitted, the plan must provide an explanation. ***Manmade or human-caused hazards*** may be included in the risk assessment but are not required. FEMA will neither review these hazards nor require the removal of this extra information prior to plan approval. ***Natural hazards*** are a source of harm or difficulty created by a meteorological, environmental, or geological phenomenon or combination of phenomena.[12] ***Risk*** for the purpose of hazard mitigation planning is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources. ***Extent*** means the strength or magnitude of the hazard. Extent is not the same as impacts. ***Impacts*** are the consequences or effect of the hazard on the state, including assets and jurisdictions. The type and severity of the impact depend on the vulnerability of the asset, as well as the capabilities in place to mitigate, prepare for, respond to, and recover from events. The exposure of people and assets to natural hazards can result in disasters, depending on the impacts.

[11] 44 CFR §201.4(c)(2)(i): "An overview of the type and location of all natural hazards that can affect the state, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;"

[12] U.S. Department of Homeland Security Risk Lexicon, 2010 Edition.

3.2.1 Identifying and Screening Hazards

NHM Planning Subcommittee reviewed FEMA's listing of hazards to ascertain if any new hazards specific to Nevada were missing from the FEMA list or if any hazards previously removed needed to be reconsidered as pertinent to Nevada. The Subcommittee then used state-specific data, recent occurrence of natural disasters, local plans, and the individual expertise of its members to screen the list for those hazards that should be profiled for Nevada. The data in Table 3-1 below are the result of this screening process. There were some slight modifications to the list from the 2013 plan based on re-categorization and regrouping of hazards, specifically: severe storms has encompassed windstorm and winter storms. Severe weather hazards (not including winter storms, extreme snowfall, and windstorms) were identified and profiled individually according to their character. Effects of climate change on individually profiled hazards was discussed where appropriate and included in the profile. Technological

failure and cyber-attacks were discussed by the Subcommittee, but were not added to this iteration of the state plan.

Table 3-1. Identification and Screening of Hazards Affecting Nevada

Hazard Type	Should It Be Profiled?	Explanation
Natural Hazards		
Avalanche	Yes	Avalanches affect a small portion of the State, including: Tahoe, Lee Canyon, and Ruby Mountains.
Coastal storm	No	Nevada is not located in an area prone to coastal storms.
Coastal erosion	No	Nevada is not located in an area prone to coastal erosion.
Drought	Yes	Statewide drought declarations were issued in 2002 and 2004.
Earthquake	Yes	Nevada ranks as the third state in frequency of large earthquakes over the last 150 years.
Epidemic	Yes	This hazard could cause an extreme economic downturn for the State of Nevada, particularly in the casino industry.
Expansive soil	Yes	Expansive soils have caused infrastructure damage in the Reno-Sparks area and around Las Vegas.
Flood	Yes	Flood damage occurs regularly in Nevada. Flooding may result from rapid snow-melt, thunderstorm-induced flash floods, mudslides, dam failure, or failure of canal walls.
Hail and thunderstorm	Yes	The entire state is susceptible to thunderstorms which may cause localized flooding and wildfire.
Heat extreme	Yes	This hazard can affect areas across the entire state.
Infestation	Yes	Infestations impact Nevada's economy through the direct destruction of crops and natural resources as well as indirectly by increasing susceptibility to wildfire.
Landslide	Yes	In Nevada, rockslides are more common than the normal landslide seen in other areas. They tend to be localized; however, this hazard can occur with earthquakes, major storms, floods, and melting ice and snow.
Severe storm and extreme snowfall	Yes	Normally Nevada can handle winter storms except when these storms are severe. Previous occurrences include extreme precipitation events, snow and windstorms. *(Definition has been expanded to include windstorms)*

Table 3-1. Identification and Screening of Hazards Affecting Nevada		
Hazard Type	**Should It Be Profiled?**	**Explanation**
Land subsidence and ground failure	Yes	The southern part of the State is particularly vulnerable to land subsidence due to groundwater extraction. Other parts of the state are also affected by subsidence or more rapid ground failure due to mine dewatering or the presence of underground mine workings adjacent to populated areas.
Tornado	Yes	Although tornados in Nevada are rare, they do occur.
Tsunami/Seiche	Yes	Lakes in Nevada could have 10-meter-high waves generated by an earthquake under or adjacent to the lake.
Volcano	Yes	Nevada is downwind from potential volcanic eruptions, most importantly Mammoth Lakes, Mt. Lassen, and Mt. Shasta, California. Major eruptions could cause ashfall in Nevada.
Wildland Fire	Yes	The terrain, vegetation and weather conditions in the State of Nevada are favorable for the ignition and rapid spread of wildland fires.
Windstorm (combined with Severe Weather)	Yes	All counties in Nevada are susceptible to severe and strong windstorms which have caused property damage.
Human-caused		
Hazmat	Yes	All Hazardous Materials events preparedness, planning, response and mitigation efforts are addressed by the SERC, the State Fire Marshal, and the DCNR. The Hazmat profile was written with significant input from many Subcommittee members, including NDOT, under whose jurisdiction highway hazmat incidents fall.
Terrorism/WMD	No	The Committee determined that since this was not a natural hazard or related to natural hazards that it should be removed from this update. These threats have been included in appendix M for reference.

3.2.2 Prioritization of Hazards

The NHMPC used four criteria to prioritize the hazards likely to affect the State of Nevada. These four criteria are as follows:

- Probability/frequency
- Magnitude/severity (includes economic impact, area affected, and vulnerability)

- Warning time
- Duration of loss of critical facilities and services

The Subcommittee members assigned values of 1 through 5 for each criterion based on the descriptions given in the hazard prioritization criteria table below, Table 3-2. This allowed the planning team to assign some numerical values to the criteria in order to arrive at the rankings of the screened hazards shown on the Hazard Prioritization Worksheet Results, Table 3-3. Some of the criteria, however, are difficult to quantify numerically and compare so the various expertise of Subcommittee members was relied upon in discussions to finalize rankings of profiled hazards.

Table 3-2. Hazard Prioritization Criteria

Criterion	Value	Category	Description
Probability/Frequency	1	Very Low	Occurs less than once in 1000 years
	2	Low	Occurs less than once in 100 to once in 1000 years
	3	Medium	Occurs less than once in 10 to once in 100 years
	4	High	Occurs less than once in 5 to once in 10 years
	5	Very High	Occurs more frequently than once in 5 years
Magnitude/ Severity (includes Economic Impact, Area Affected and vulnerability)	1	Very Low	▪ Negligible property damages (less than 5% of all buildings and infrastructure) ▪ Negligible loss of quality of life ▪ Local emergency response capability is sufficient to manage the hazard
	2	Low	▪ Slight property damages (5% to 15%) of all buildings and infrastructure) ▪ Slight loss of quality of life ▪ Emergency response capability of the city or surrounding community is sufficient to manage the hazard
	3	Medium	▪ Moderate property damages (15% to 30% of all buildings and infrastructure) ▪ Some loss of quality of life ▪ Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to involve one or more counties
	4	High	▪ Moderate property damages (30% to 50% of all buildings and infrastructure) ▪ Moderate loss of quality of life ▪ Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to require state assistance
	5	Very High	▪ Property damages to greater than 50% of all buildings and infrastructure. ▪ Significant loss of quality of life ▪ Emergency response capability, economic, and geographic effects of the hazard are of sufficient magnitude to require federal assistance
Warning Time	1	Very Low	> 48hrs
	2	Low	24 to 48 hrs
	3	Medium	12 -24 hrs

Table 3-2. Hazard Prioritization Criteria			
Criterion	**Value**	**Category**	**Description**
	4	High	12 - 6 hrs
	5	Very High	<6 hrs
Duration of loss of critical facilities and services.	1	Very Low	1 to 3 days
	2	Low	4 to 7 days
	3	Medium	8 to 14 days
	4	High	15 to 20 days
	5	Very High	More than 20 days

Table 3-3. Hazard Prioritization Worksheet Results						
Hazard	Probability/Frequency (1 to 5)	Magnitude/ Severity (1 to 5)	Warning Time (1 to 5)	Duration (1 to 5)	**Overall Total**	**Rank**
Totals from subcommittee members						
Natural Hazards						
Avalanche	31	18	34	10	**93**	**6**
Drought	28	22	13	30	**93**	**6**
Earthquake	37	34	38	34	**143**	**1**
Epidemic	21	20	16	22	**79**	**14**
Expansive soil	21	11	16	11	**59**	**19**
Flood (includes flash flood, canal wall failure, dam failure, mudslide)	38	31	26	31	**126**	**3**
Hail and thunderstorm	35	16	24	11	**86**	**9**
Heat, extreme	35	17	13	17	**82**	**12**
Infestation	25	15	14	16	**70**	**16**
Land subsidence/ ground failure	23	13	19	11	**66**	**17**
Landslide	27	17	33	13	**90**	**8**
Tornado	15	12	28	11	**66**	**17**
Tsunami/seiche	13	20	32	16	**81**	**13**
Volcano	10	22	24	20	**76**	**15**
Wildfire	40	34	37	32	**143**	**1**
Windstorm*	34	19	20	13	**86**	**9**
Severe Storm (includes extreme snowfall)	34	18	19	14	**85**	**11**
Human- Caused Hazards						
Hazardous materials	33	17	34	15	**99**	**4**
Terrorism/ WMD**	25	24	28	21	**98**	**5**

* Combined with Severe Storm

** The Committee determined that Terrorism/WMD should be removed from this update

3.2.3 Categorization of Screened Hazards

Using the above values for the four criteria listed, the 2011 NHM Planning Subcommittee assigned each of the profiled hazards to one of the following risk categories based on an evaluation of the factors listed for each. Subcommittee members also provided input to the final ranking based on their respective areas of expertise.

- **High Risk:** Immediate action necessary. Beyond the State's available resources and ability to respond alone. Causes substantial property loss and financial impact to the entire State. Critical facilities and/or services may be lost for 15-20 days or more. May occur often or once in five to ten years. Up to 26 to 35% of property (or more) is lost or damaged in the affected area.
- **Medium/Significant Risk:** Prompt action necessary, which ranges from being beyond the State's available resources and ability to respond to handle at county level. Critical facilities and/or services may be lost for 8-14 days. Effects are felt at the county level. May occur frequently to less than once in 10 to 100 years. Between 11% and 25% of property is lost or damaged within the affected area.
- **Low Risk:** Should be planned for in the future. Within the State's or affected community's ability to respond with available resources. Critical facilities and/or services may be lost for 1-7 days. An entire town or city may be affected, may occur frequently or less than once in 100 to 1000 years, or less than 5% to 10 % of property lost or damaged within the affected area

After assessing the information from the NHM Planning Subcommittee members' Hazard Prioritization Worksheets, risk categories of High, Medium/Significant, or Low were assigned to the hazards most likely to occur in the State of Nevada as shown below in Table 3-4. The Subcommittee continues to use three categories as was done in the 2013 plan update and what is done in many of the local mitigation plans in the state. Due to the limited resources available, the NHM Planning Subcommittee will focus on the development of mitigation strategies for those hazards categorized as High Risk. As more resources become available and mitigation activities are completed, additional mitigation strategies can be developed for lower-ranked hazards.

Table 3-4. Risk Categories Assigned to Nevada Hazards

High Risk	Medium/Significant Risk	Low Risk
Earthquake	Extreme heat	Tsunami/seiche
Wildfire	Hazardous Materials	Hail and thunderstorm
Flood	Drought	Avalanche
	Severe storms and extreme snowfall, windstorm	Epidemic
		Landslide
		Tornado
		Infestation
		Land Subsidence and ground failure
		Volcano
		Expansive Soil

3.3 PROFILING HAZARDS

Once the screening and prioritization process was completed, the Subcommittee moved on to Step 2 of the Risk Assessment process; the profiling of hazards. The requirements for profiling hazards as stipulated in DMA 2000 and its implementing regulations are described below.

ELEMENT	REQUIREMENTS
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)[11]] ***Intent:*** *To understand natural hazards across the state in order to identify which hazard risks have been or may be the most significant and the locations that have been or may be the most adversely affected.*	a. The plan must include a current summary of the natural hazards that can affect the state. The summary must include information on location, extent, and previous occurrences for each natural hazard, using maps where appropriate. b. If any commonly recognized natural hazards are omitted, the plan must provide an explanation. ***Manmade or human-caused hazards*** may be included in the risk assessment but are not required. FEMA will neither review these hazards nor require the removal of this extra information prior to plan approval. ***Natural hazards*** are a source of harm or difficulty created by a meteorological, environmental, or geological phenomenon or combination of phenomena.[12] ***Risk*** for the purpose of hazard mitigation planning is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources. ***Extent*** means the strength or magnitude of the hazard. Extent is not the same as impacts. ***Impacts*** are the consequences or effect of the hazard on the state, including assets and jurisdictions. The type and severity of the impact depend on the vulnerability of the asset, as well as the capabilities in place to mitigate, prepare for, respond to, and recover from events. The exposure of people and assets to natural hazards can result in disasters, depending on the impacts.

[11] 44 CFR §201.4(c)(2)(i): "An overview of the type and location of all natural hazards that can affect the state, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate;"

[12] U.S. Department of Homeland Security Risk Lexicon, 2010 Edition.

The specific hazards profiled in the Nevada HMP have been examined in a methodical manner based on the following factors:

- Nature
- History (previous occurrences)
- Location, severity, and probability of future events

All of the screened hazards were profiled. However, a vulnerability assessment to include loss estimates to State facilities was conducted only for those natural hazards categorized as High Risk: wildfire, flood, and earthquake.

The National Weather Service representative on the Subcommittee was consulted and provided statements regarding the effect of climate change on severity and probability of future events that are included in all weather-related hazard profiles.

The table of hazard ratings for the local jurisdictions (counties, communities, or tribal entities) that was included in each profile of the 2010 iteration of the NHMP was not included in the 2013 iteration of the NHMP or present plan. These data are summarized in Tables 3-35 and 3-36 in Section 3.4, following the hazard profiles. For the present plan, the tables were updated using information derived from each County's current hazard mitigation plan (all approved or in update process) or from tribal hazard mitigation plans.

The profiled hazards are presented below in Section 3.3 in alphabetical order. The order of presentation does not signify the level of importance or risk.

3.3.1 **Avalanche** (Low Risk)

3.3.1.1 Nature

An avalanche occurs when a mass of snow detaches from a mountainside and slides or falls downward. Snow avalanches can be subdivided into loose-snow avalanches and slab (dry or wet) avalanches. Wet slide avalanches may occur during and after (a) a rapid rise in air temperature inducing a melting snow pack, (b) a rain-on-snow event, and (c) during the spring thaw. The majority of slab avalanches occur on natural slopes between 25 to 50 degrees, although snow avalanches have been recorded on slopes as low as 15 degrees depending on snow type, water content, temperature, and snow- and wind-loading on the existing snow pack. Over 90% of fatalities are triggered by the victims themselves as a result of loading the snowpack by skiing, snowboarding, climbing, or snowmobiling. The snowpack varies within the state, with a maritime snow climate, relatively heavy snowfall and mild temperatures in western and southern Nevada, whereas northeastern Nevada (Ruby Mountains) is somewhat transitional between maritime and continental (Utah and Colorado), characterized by low snowfall and colder temperatures.

The following three variables interact to determine whether an avalanche is possible:

1. Terrain: the slope must be steep enough to avalanche.
2. Snowpack: the snow must be unstable enough to avalanche.
3. Weather: Weather is another important variable. Changing weather can quickly change snowpack stability.

3.3.1.2 History

The avalanche history in Table 3-5 below was gathered from a variety of resources and includes adjacent areas of the northern Sierra Nevada in California that would impact emergency services in northern Nevada. It includes data from the annual reports of the Sierra Avalanche Center (SAC) Annual Reports. This information is used in creating daily avalanche advisories available to the general public. It generally includes only those avalanches which caused injury, death, evacuations, or substantial property damage. Additionally, data was included from the USFS National Avalanche Center, Colorado Avalanche Information Center, and American Avalanche Association's (A3) educational website, www.avalanche.org.

Table 3-5. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences		
Date	**Location**	**Description/injuries/damages**
7 April 1882	Genoa area, NV	18 deaths and many residences destroyed.
13-19 January 1952	Sierra Nevada west of Reno, Yuba Pass	Avalanches trapped a Southern Pacific Railroad's City of San Francisco passenger train for several days, causing many illnesses and one death.
1968	Echo Subdivision Kyle Canyon, Clark Co, NV	Two deaths.
2 January 1969	Slide Mountain at Mount Rose ski area, NV	One death.
29 January 1972	Mount Rose Ski area, NV	Seven injuries and two deaths at "The Chutes" ski area. The ski area was closed.
31 March 1982	Alpine Meadows Ski Area, near Lake Tahoe, CA	Seven people killed, five others injured, several buildings, chair lifts and vehicles destroyed or damaged; total monetary loss of approximately 1.6 million dollars.
Feb 9, 1985	Squaw Valley, CA	100 houses evacuated; I-80 and U.S. 50 closed; no deaths or injuries.
18 February 1986	Sierra Nevada, NV	Avalanches blocked both I-80 and Amtrak train tracks west of Reno. No deaths or injuries directly related.
23 December 1996	Sugar Bowl ski area, Sierra Nevada CA	An avalanche buried and killed a snowboarder.
December 1997	Mount Rose Highway, NV	An avalanche was triggered by an explosive in the Beehive area of the Chutes. The highway was closed, no injuries or deaths.
12 Feb 1998	Donner Summit, near Truckee, CA	A snowboarder was swept away and killed in an avalanche.
6 Feb 1999	Lake Mary area, near Tahoe-Donner Summit, Truckee, CA	An avalanche buried four people, killing one, and injuring three along the shore of a lake 35 miles west of Reno.
21 February 2001	Alpine Meadows ski area, Sierra Nevada	The incident occurred between Squaw Valley and Alpine Meadows. Two 17-year-old boys skied out of bounds in a closed area, and were killed by a Class II avalanche.
15 December 2002	Mt. Rose ski resort, NV	East of Mt. Rose, one snowboarder caught and killed, two injured by an avalanche in out out-of-bounds area.
8 March 2002	Donner Pass Ski area, Sierra Nevada	Avalanche kills one skier.
26 April 2003	Charity Valley, Alpine County, CA	One snowmobiler was killed in an avalanche, and probably triggered the avalanche
1 Jan 2004	Castle Peak, North of Donner Summit,	An avalanche caused one fatality.

Table 3-5. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences		
Date	**Location**	**Description/injuries/damages**
	Sierra Nevada	
4 Jan 2004	Sierra Nevada near Truckee, CA	An avalanche buries skiers and snowboarders; multiple injuries.
9 Jan 2005	Lee Canyon, Mount Charleston, NV	An avalanche swept one boy off a ski chair lift, and was caught, buried, and killed at Las Vegas Ski & Snowboard Resort.
10 Jan 2005	Sierra Nevada, CA, NV	Avalanche danger closed the main highways over the Sierra Nevada. No injuries.
25 March 2005	Mt. Tom, Elderberry Canyon, CA	Two separate avalanches occurred along the CA-NV border. Five skiers were caught, one was injured and two were buried and killed. Two skiers were caught in the first avalanche, and as the three remaining skiers began their decent to rescue the two, another avalanche was triggered. The deaths occurred from the first avalanche, all were able to escape with minor injuries from the second avalanche.
20 February 2005	North Bowl of Mt. Anderson- behind Sugar Bowl Ski Area, Truckee, CA.	Avalanche caught three backcountry skiers north of Lake Tahoe. Two were partially buried and dug out with minor injuries. They searched for the buried skier, and recovered the victim's body with a beacon search and probing.
2 February 2006	Blacksmith Creek drainage, Twin Lakes area, Sawtooth Range, CA	Avalanche in Sierra Nevada .Three skiers were caught, two of the three were carried, and one was partially buried. Of the two carried by the avalanche, one was killed, and one was revived by a member of the party.
March 2006	Washoe County, NV	Avalanche advisories were issued for Crystal Bay Subdivision and Third Creek area.
12 February 2007	Mount Rose ski area, NV	An avalanche severely injured one ski patrol member at Extreme Chutes of Ski Tahoe resort, the skier was not buried.
27 February 2007	Ruby Mountains Elko County, NV	Avalanches in Ruby Mountains threatened snowmobilers and skiers. No deaths or injuries.
25 Dec 2008	Squaw Valley ski resort, CA	An avalanche kills one skier near Pulsen's Gully. The avalanche occurred in bounds in an open area. Ski patrol had conducted avalanche control work with explosives on the slope prior to the accident.
3 March 2009	Squaw Valley ski resort, Sierra Nevada	An avalanche killed one ski patrol member working on avalanche control. The victim's partner dug him out, however, he died at a hospital due to multiple fractures and trauma.
22-23 Dec 2010	Kyle Canyon and Echo Canyon in Mt. Charleston area, near	Three avalanches in Clark County caused power outages and home evacuations, buried vehicles, and closed ski areas.

Table 3-5. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences		
Date	**Location**	**Description/injuries/damages**
	Las Vegas, NV	
26 April 2011	Split Mountain near Bishop, CA, Sierra Nevada	An avalanche in Sierra Nevada caught two skiers in the backcountry, and were partially buried and died.
2 March 2012	Blackwood Canyon, Ward Canyon, Sierra Nevada, near Lake Tahoe	An avalanche was triggered by a skier and subsequently buried him. He was rescued and later died at the hospital from his injuries.
2 March 2012	Forestdale Divide in Carson Pass area near Kirkwood, Sierra Nevada	An avalanche triggered by a snowmobiler buried and killed him and destroyed his snowmobile.
22-23 Dec 2012	Sierra Nevada	Up to 5 feet of snow in the Sierra Nevada caught several skiers and snowboarders, most of whom were able to dig themselves out and survived, but an Alpine Meadows veteran ski patroller was caught and died in a "controlled" avalanche released by a detonated charge and a snowboarder was buried and died in a separate avalanche event at Donner Ski Ranch a day earlier.
14 Jan 2016	Sugar Bowl ski area, Mount Judah, near Lake Tahoe	An avalanche caught, buried, and killed a ski instructor who skied in an out-of-area location. His body was found on February 29, 2016.
20 Jan 2016	Tinker Knob, Donner Lake area, near Truckee, CA. Northwest of Lake Tahoe	An avalanche caught and buried a professional skier in the backcountry, who was with a group of eight people. The skier lost consciousness, and was buried between three feet of snow, and was rescued by the group-some had had avalanche safety training.
18 February 2016	Alpine Meadows Road, CA, near Lake Tahoe	Three natural avalanches closed Alpine Meadows Road. Two vehicles were impacted by the avalanches, one was trapped, and no one was injured. Alpine Meadows ski resort closed due to the avalanche danger.
10 Dec 2016	Mt. Rose Chutes-Closed Area, Nevada	Two skiers hiked/traversed into closed, uncontrolled terrain at Mt. Rose. The first skier triggered a large avalanche and was swept away 600-1,000 ft downslope. The skier's body was found the next day.
5 January 2017	Mt. Rose ski area, Nevada	Two backcountry skiers escaped an avalanche unharmed, the avalanche closed down Mt. Rose Highway, about 30 miles southwest of Reno. Two vehicles were stuck.
20 February 2017	Mt. Rose ski area, Nevada	An avalanche buried Mt. Rose highway with about 20 feet of snow. No injuries were reported. Mt. Rose ski area closed the following day due to the avalanche.

Table 3-5. History of Nevada and Adjacent Sierra Nevada Avalanche Occurrences		
Date	**Location**	**Description/injuries/damages**
16 Nov 2017	Hourglass Bowl, Tamarack Peak, Mt. Rose Ski Area	Three skiers were caught and partially buried, one suffered minor injuries.
2 March 2018	Squaw Valley Ski Resort, Lake Tahoe, CA	Five people were trapped in an avalanche at Squaw Valley Ski Resort. The avalanche occurred in an area open to skiers and snowboarders. Two people were injured, (one severely injured) and the resort closed down for the rest of the day.
3 March 2018	Mammoth Mountain Ski Area, Sierra Nevada. CA	Eight people were partially buried in an inbounds avalanche at Mammoth Mountain. Mammoth Mountain Ski Patrol was performing avalanche control in a closed area. A large avalanche released, and terminated at the bottom of a lift terminal. Two guests were partially buried and escaped without injury, and six employees were partially buried and escaped with minor injuries.

Avalanche accident data can be found at: https://avalanche.org/avalanche-accidents/

3.3.1.3 Location, Severity, and Probability of Future Events

Avalanche possibilities exist in Douglas, Elko, Clark, and Washoe Counties, although there have been no written records of avalanches occurring in the more populated areas of these counties. Incline Village and Crystal Bay are under avalanche advisory several times during the winter months. The Ruby Mountains in Elko County also have this risk, but only in unpopulated areas. Care must be exercised by those snowmobiling or backcountry skiing in Ruby Mountains when accessed by Lamoille Canyon drainage (road closed in winter), as the slopes are prone to avalanche, and the canyon is considered the most vulnerable to avalanching. Avalanches can also occur in Clark County. In January 2017, there was a voluntary evacuation for Mount Charleston communities due to an avalanche risk. About 58 inches of snow accumulated at Kyle Canyon Fire Station, and Lee Canyon Ski Area reported a depth of 94 inches. In February 2017, an avalanche occurred in Kyle Canyon, near Cathedral Rock. The avalanche stopped 200 yards from a subdivision, and Clark County closed down a road, no injuries were reported.

Research done by the NWS representative on our NHM Planning Subcommittee indicates that climate change could have some minor effects on the frequency of avalanches in the future. Snow levels, on average, may be higher in Nevada if climate change trends continue. This could lead to greater variability in the stability of snow layers between warmer and colder winter storms, potentially triggering more avalanches.



Figure 3-1. Map of Sierra Avalanche Center's Forecast Area

SAC maintains a website, http://www.sierraavalanchecenter.org , with avalanche advisories for the Sierra Nevada, posted by professional avalanche forecasters. This avalanche advisory is provided through a partnership between the Tahoe National Forest and SAC. This advisory describes general avalanche conditions in the Central Sierra Nevada including both California and Nevada, and applies only to backcountry areas outside established ski area boundaries (avalanche forecast area shown above in Figure 3-1). SAC's website includes avalanche facts, FAQs, myths, snowpack and avalanche observations, and useful safety information as well as links to other sites. An example of SAC's avalanche observations can be seen in Figures 3-2 and 3-3 below.

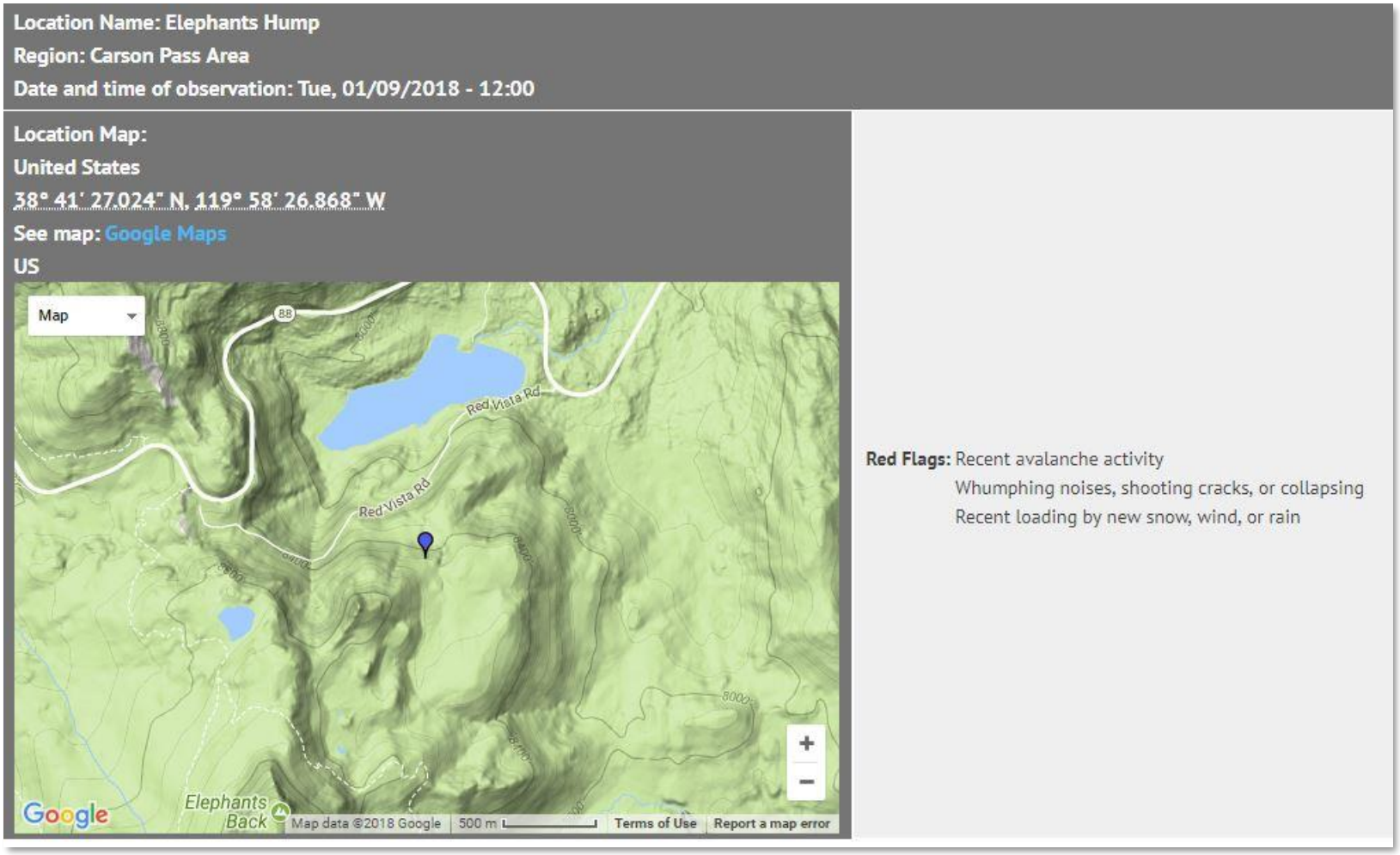


Figure 3-2. Avalanche Observation of Elephants Hump, Carson Pass Area

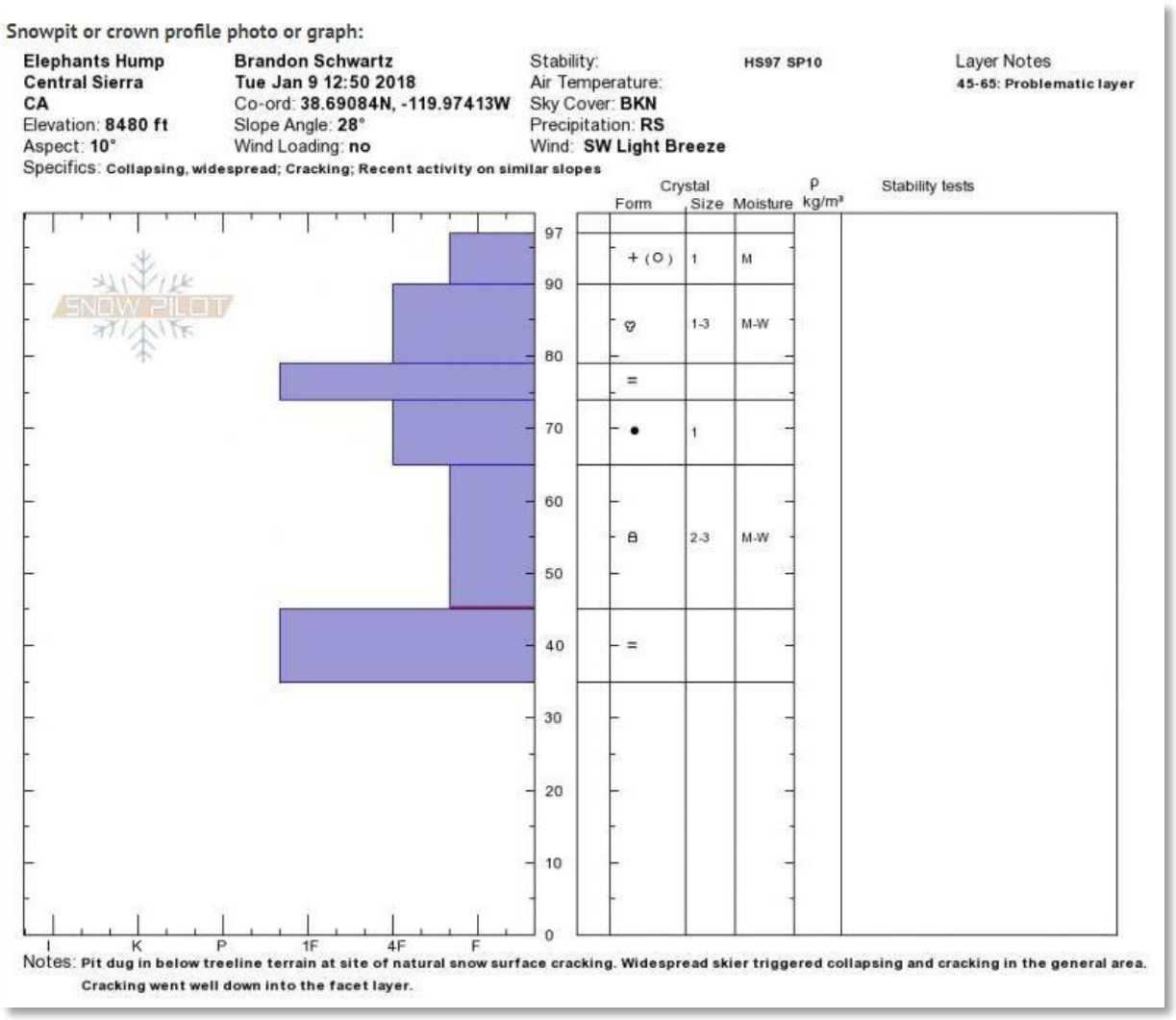


Figure 3-3. Snowpit or crown profile graph of Elephants Hump, Carson Pass Area

Wherever possible, transportation corridors have been constructed to avoid avalanche hazards and are well maintained with state and local resources. When avalanches do occur, they generally affect only roads in the Tahoe basin and those that cross the Sierra Nevada. These roads are closely monitored during periods of heavy snowfall and closed if avalanche danger threatens motorists. Active avalanche mitigation measures are employed on some transportation routes, such as the Nevada Department of Transportation's (NDOT) closures for avalanche control work on SR 431, the Mount Rose Highway. These road closures may cause long delays and/or detours for motorists and truckers. Most avalanche events are located in unpopulated areas that fall under the ownership of USFS, where damage to current and future structures is minimal. Danger to humans increases with winter recreation in these areas such as snowmobiling, backcountry skiing and snowboarding, climbing, cross country skiing, and snowshoeing. Although avalanches can occur within the boundaries of ski resorts, accidents primarily occur in a backcountry setting, according to the National Ski Areas Association (NSAA). For example, NSAA noted that in the 2013-2014 ski season, all of the fatalities from avalanches in the U.S. occurred in the backcountry, in out-of-bounds areas.

Avalanches are considered to be in the "Low Risk" hazard category because they are likely to affect few people in Nevada. The avalanches that do occur will most likely be handled efficiently by ski resorts, local authorities, NDOT, and/or USFS. As shown in Figure 3-4, Nevada has had few avalanche fatalities compared to other states.

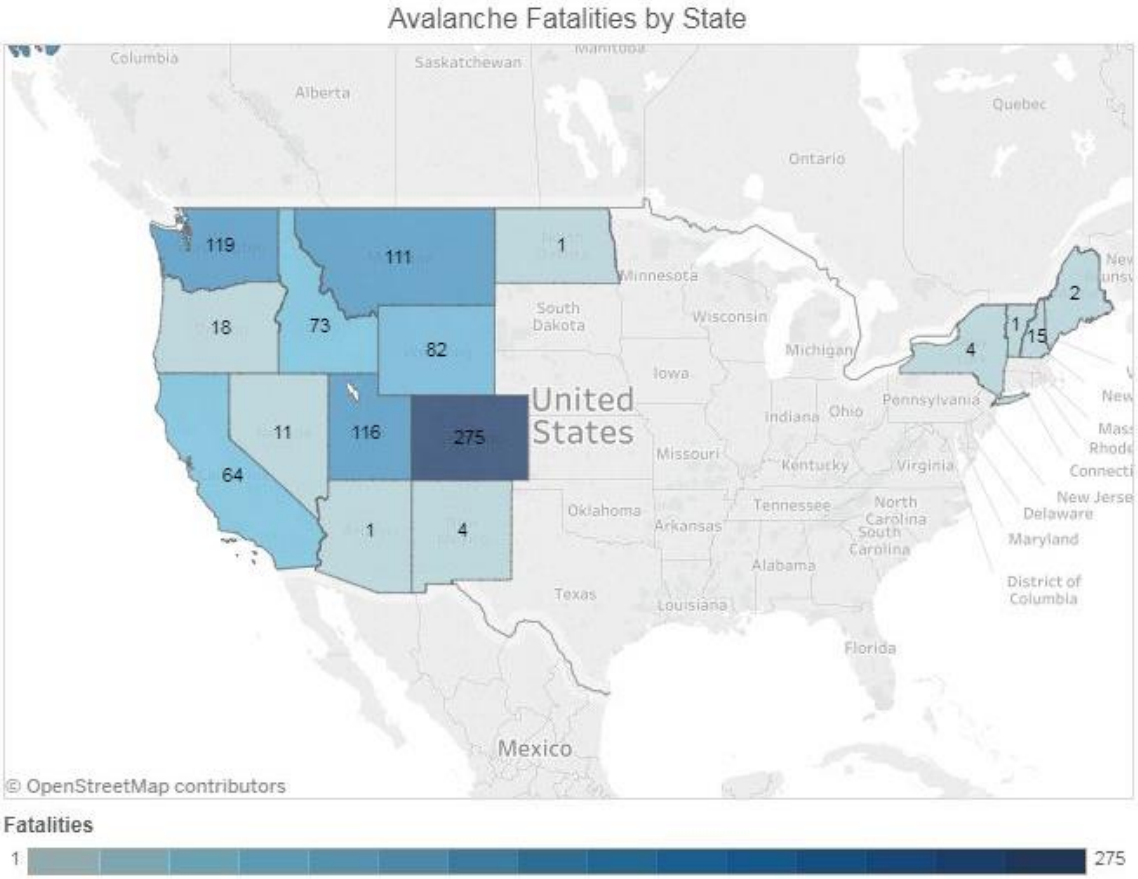


Figure 3-4. Avalanche fatalities by state, from 1951-2016. Courtesy of Colorado Avalanche Information Center, http://avalanche.state.co.us/?s=avalanche+statistics

Most avalanche-related injuries and fatalities will likely continue to be related to recreationalists drawn to the steep snow-covered slopes prone to avalanches and most developed ski areas have avalanche control measures and rescue teams on site to deal with avalanche-related emergencies. However, an ever-increasing number of outdoor enthusiasts are using snowmobiles in undeveloped areas with no avalanche controls or available emergency personnel. In 2009, twice as many snowmobilers died in avalanches in the U.S. as did participants in any other winter sports activities. Currently, snowmobiles and backcountry tourers are the top activities triggering avalanches, as shown in Figure 3-5. As population increases and as more snowmobilers venture into the winter backcountry, avalanches may become an increasing threat in Nevada in the future, but currently, they do not account for a large number of deaths or injuries in this state. As shown in Figure 3-6, there has been only two snowmobiler fatalities in Nevada between 1951 and 2016.

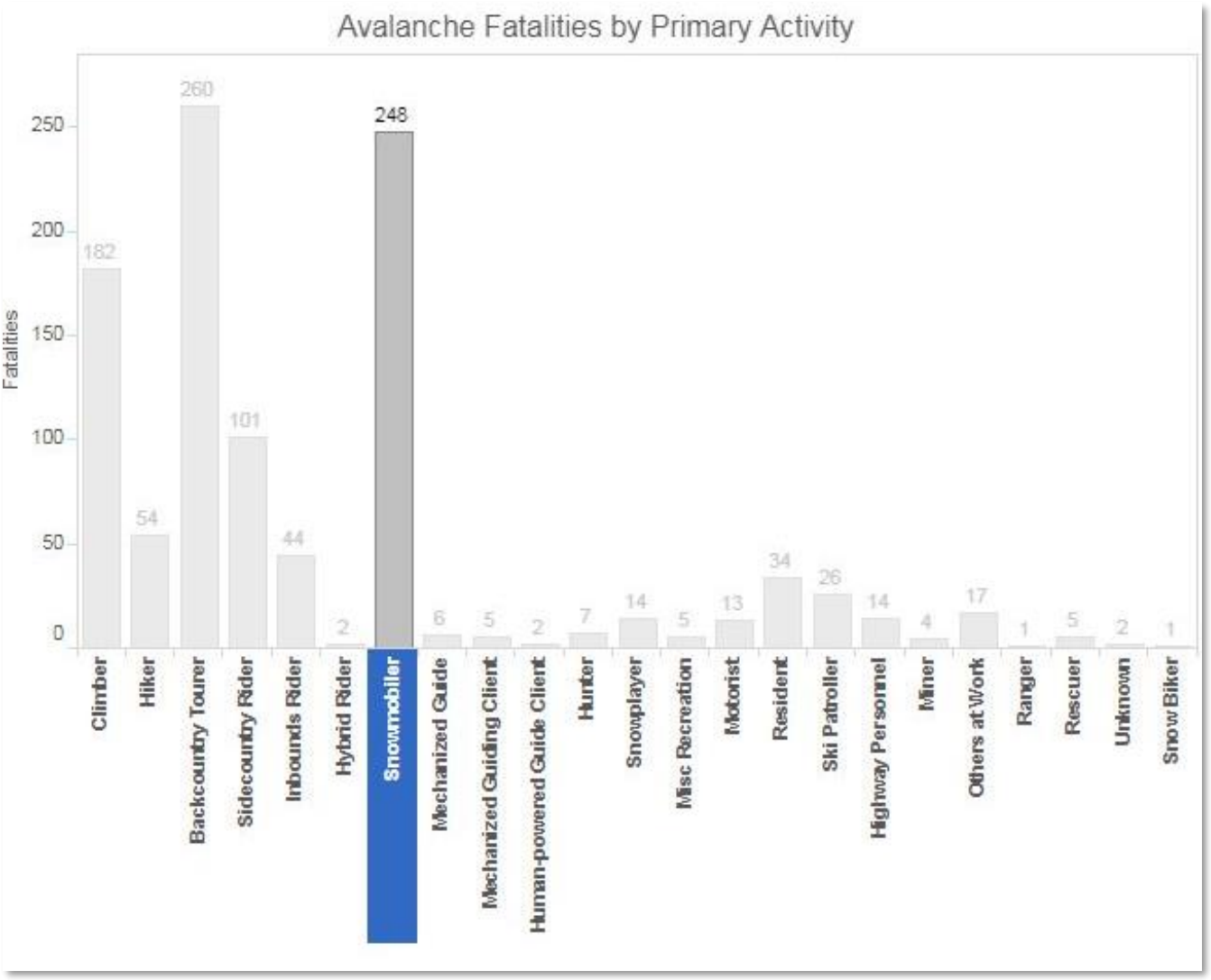


Figure 3-5. Avalanche fatalities by activity in all states, from 1951-2016. Courtesy of Colorado Avalanche Information Center, http://avalanche.state.co.us/?s=avalanche+statistics

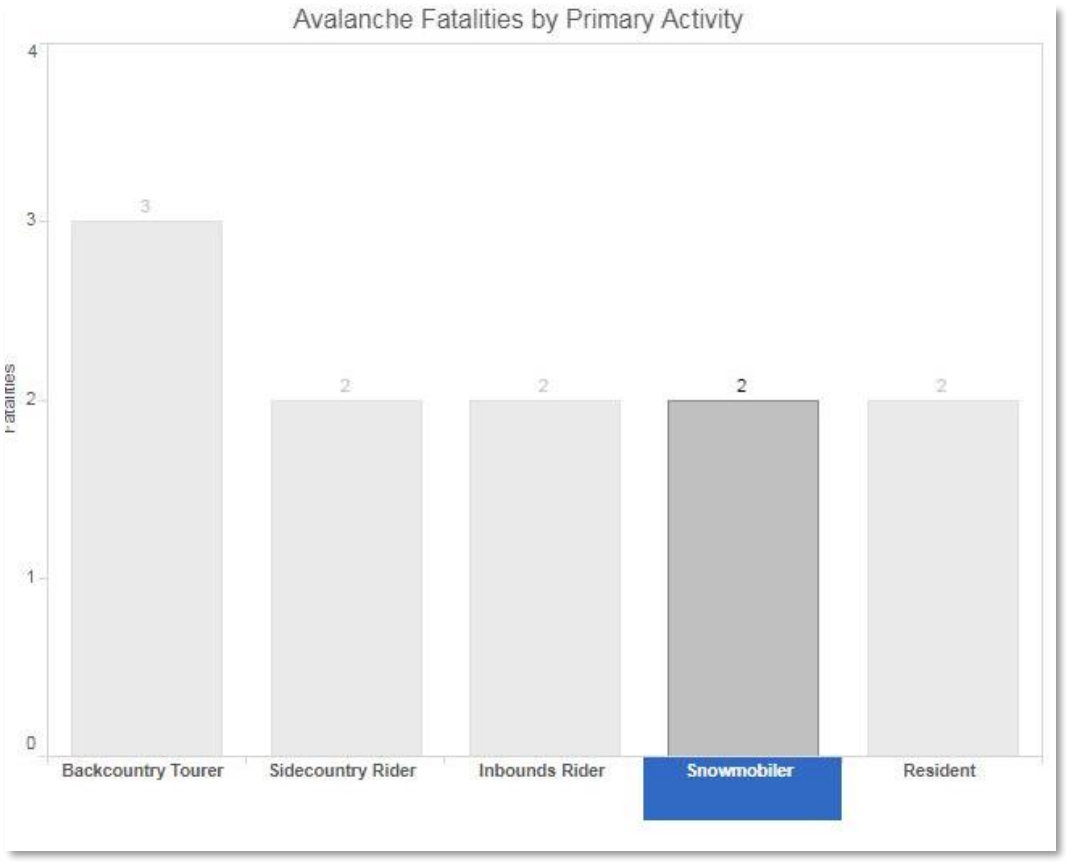


Figure 3-6. Avalanche fatalities by activity in Nevada, from 1951-2016. Courtesy of Colorado Avalanche Information Center http://avalanche.state.co.us/?s=avalanche+statistics

Due to the location and severity of avalanche hazard, mitigation actions are relegated to the local jurisdictions where the hazards exist. The State will support local jurisdiction activities in lessening this hazard where it occurs.

3.3.2 **Drought** (Medium/Significant Risk)

3.3.2.1 Nature

According to NWS, drought is defined as a prolonged period of time during which there is an extended deficit of precipitation below normal amounts over one or more seasons spread over a considerable geographical area. This differs from normal desert conditions that exist in Nevada where county-average annual precipitation ranges from four inches per year in Clark County to 12 inches in Storey County, averaging nine inches per year statewide making it the driest state in the U.S. Severity of drought can be aggravated by other factors such as high temperature, high wind, and low relative humidity. Drought damages agriculture, tourism, fish and wildlife, water and sewer systems, which in turn impacts the economic, environmental, social, and municipal structure of the state.

NOAA in partnership with United States Department of Agriculture (USDA) and the National Drought Mitigation Center, provides the weekly U.S. Drought Monitor viewable by state as shown in Figure 3-7 and by region as shown in Figure 3-8 to help the public in mitigating losses and maximizing economic gains relative to drought. Since the drought outlook changes constantly and could change significantly before this report is revised, real-time current updates for these maps are available at this link: droughtmonitor.unl.edu

The site includes seasonal temperature and precipitation predictions out to 12 months, and drought forecasts out to three months in advance.

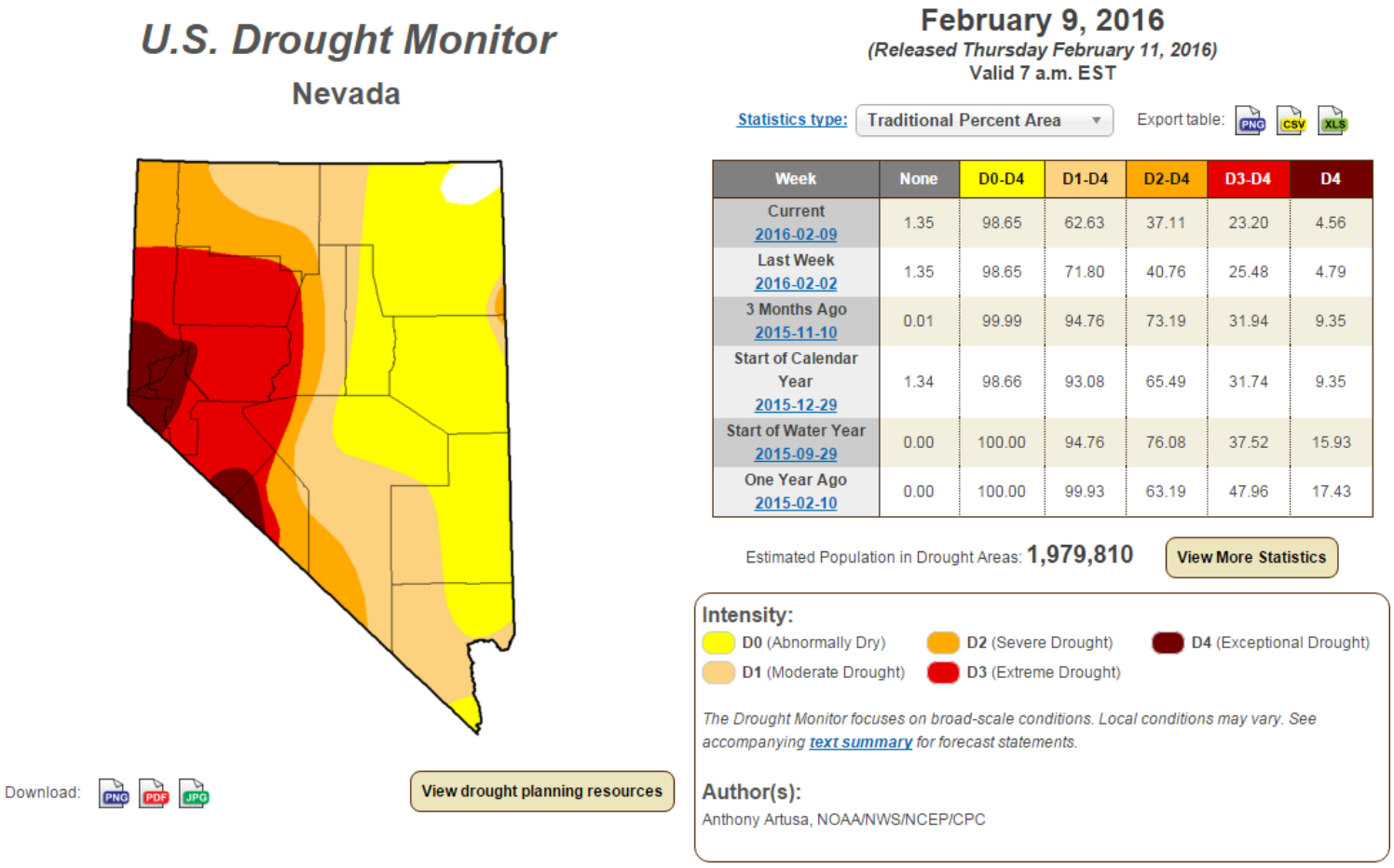


Figure 3-7. U.S. Drought Monitor Map for Nevada as of February 9, 2016

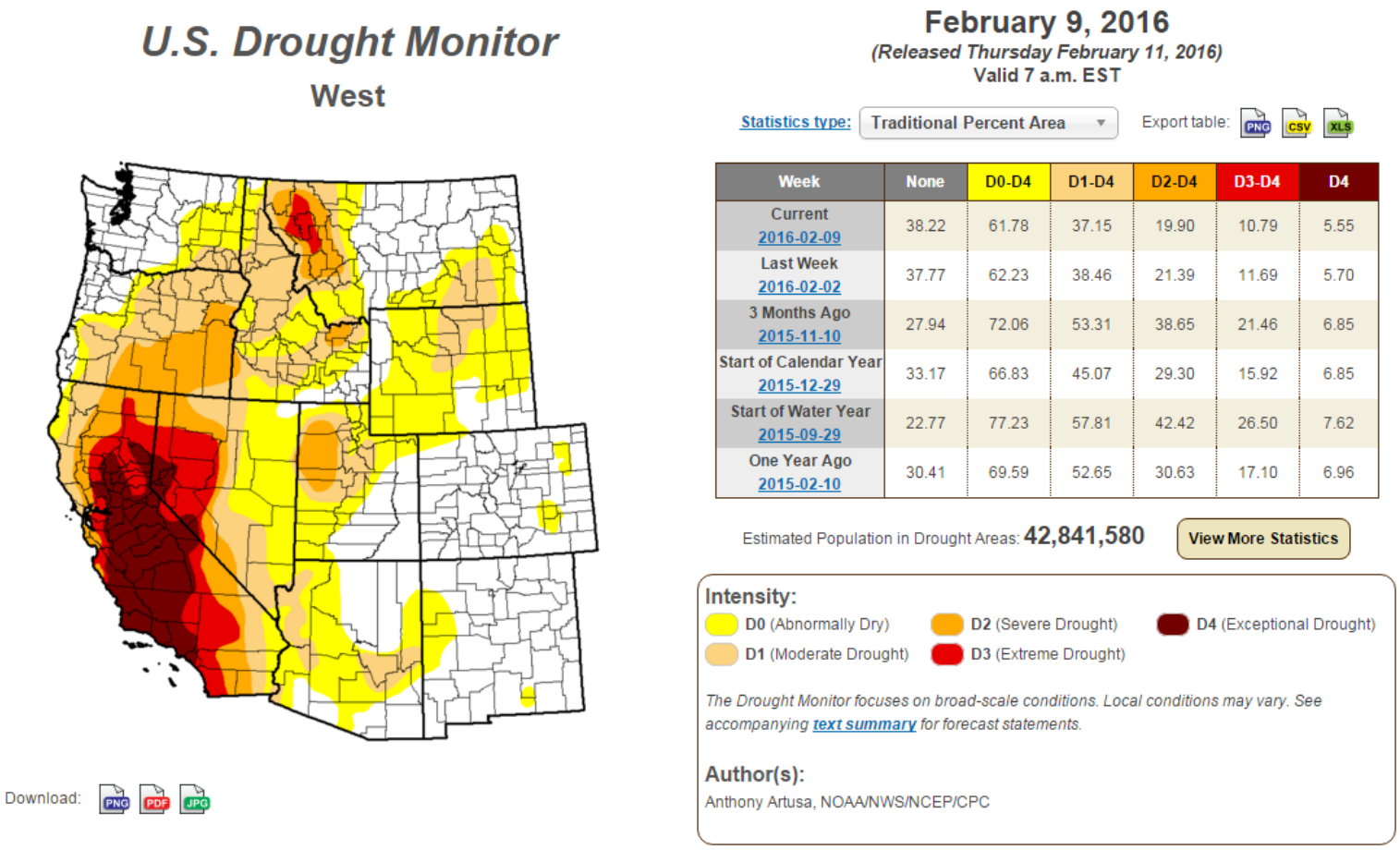


Figure 3-8. U.S. Drought Monitor by Region for Western U.S., valid as of February 9, 2016

3.3.2.2 History

Droughts have been a major cause of economic loss and environmental damage throughout the history of the State of Nevada. Prolonged drought has caused crop failures, loss of livestock and wildlife, and shortage of potable water. Additionally, drought has caused insect infestations, dust storms, and WUI fires.

The State Climatologist prepared historical data on drought for each county from National Climatic Data Center (NCDC) records from 1895 to 2007 that is presented in Appendix K. In a brief anecdotal summary of this history, the years 1992, 2002, and 2003 saw the most months of extreme and severe drought ratings in the northwest counties of the state as ranked by the NCDC. During the same time period, the northeastern and southern and central counties of the state all rated 1934 as by far the worst drought year in Nevada history. Clark County suffered severe to extreme drought in 1996, 1997, and 2002 as well. All the details of drought year ratings are listed in Appendix K.

By November 7 of 2012, all of Nevada's 17 counties had been designated by USDA to be in severe drought and classified as primary natural disaster areas due to losses caused by ongoing drought. Nevadans also qualify for natural disaster benefits because their counties are contiguous. By July 2013, all of Nevada's counties still had some degree classified as Severe or higher drought, and 10 counties were in part classified as Extreme drought conditions. Three counties had areas classified as Exceptional drought conditions.

3.3.2.3 Location, Severity, and Probability of Future Events

The historical data presented by the State Climatologist in Appendix K will assist each county in its preparedness and response planning. These data demonstrate the recurrence of drought in every county throughout the state and provide a basis for the probability of recurrence of drought throughout the state. The probability of a prolonged drought exists in all counties of the state of Nevada and can affect the entire state. Analysis of the data above show that in 2002 and 2004, the U.S. Department of Agriculture designated all seventeen counties in Nevada as drought affected, and by 2004, most of Nevada and much of the southwestern U. S. were in the fifth year of prolonged drought.

Drought is one of the least predictable weather-related hazards, due primarily to current limitations of technology/science on seasonal and annual weather prediction. Drought is a creeping hazard that often starts gradually, which we've seen with the ongoing exceptional drought since 2012. Conversely, droughts can often end rather suddenly in the west with extraordinary wet winters and occasionally floods.

The region receives roughly 60-80% of annual precipitation during the winter months (highest N/W Nevada, lowest S Nevada), and a significant amount of that winter precipitation comes in just a handful of large storms called atmospheric rivers. Missing even just a couple of these big storms puts the region in a significant rain/snow deficit, underscoring the vulnerability to drought.

Drought was ranked as a "Medium/Significant Risk" hazard to Nevada by the NHM Planning Subcommittee.

Drought effects are mitigated through the Nevada Drought Response Plan, which defines the stages of drought in the state and outlines the state's response during a drought. The State of Nevada Drought Response Plan is administered by the Drought Response Committee chaired by the Nevada State Climatologist. The Nevada Drought Plan was first written in 1991 to address the need to know when drought conditions become severe enough to require action by the state to mitigate impact on the state's resources. The State Drought Plan was revised in 2003 and superseded by the State of Nevada Drought Response Plan in 2012. The new plan was authored by NDWR, Nevada DEM and the State Climate Office, and is available online at the following link:

http://water.nv.gov/programs/planning/StateDroughtResponsePlan2012.pdf

The plan establishes the system of coordination among affected stakeholders to provide assistance in mitigating the impact of drought. These include a broad cross-section of agricultural, municipal, tribal, and economic stakeholders who would be affected by drought. The plan also establishes the process for obtaining federal assistance if required.

Recent publications from the climate science community indicate that climate change may be expected to lead to more frequent, longer duration and more extreme drought conditions in the future. Nevada's desert climate characterized by hot summers and low humidity may become more extreme. In addition,

higher snow elevations would lead to less overall mountain snowpack and less spring and summer runoff, lessening water availability for farmland, ranchland, and natural vegetation.

3.3.2.4 Impacts to Rural Nevada

Rural Nevada communities typically rely on groundwater resources for municipal and domestic water supply. Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length droughts may increase under changing climate conditions. Under these conditions rural water supplies may be more vulnerable to drought conditions.

An accompanied report referenced in Appendix S (Pohll et al., 2016) describes a drought resiliency analysis for ten rural communities in northern Nevada. The analysis was organized by hydrographic basin for the following communities: Lovelock, Winnemucca, Battle Mountain, Carlin, Elko, Spring Creek, Wendover, Austin, Eureka, and Ely. The analysis included an assessment of groundwater pumping rates from all sources (e.g. municipal, domestic, agriculture, etc.) and estimates of average annual groundwater recharge. For those basins with total groundwater pumping rates in excess of 20 percent of groundwater recharge rates, a computer groundwater model was built to assess groundwater drawdown rates under drought and normal climate conditions. Three communities (Winnemucca, Carlin, and Wendover) have total pumping rates less than 20 percent of groundwater recharge and should not be vulnerable to drought conditions.

Two groundwater models were run to determine the impact of a severe drought on groundwater levels. One model assumed the mountains receive the full quantity and the other simulation was run with the mountains receiving only 50 percent of average recharge over a 15 year period (i.e. 15 year drought). Differences in water levels between the two scenarios after 15 years of drought were mapped throughout the hydrographic basin to show regions of greater and lesser sensitivity.

The modeling results indicate that reduced mountain block recharge (i.e. drought conditions) only causes 1-2 feet decline in groundwater levels near municipal wells. Greater declines in water levels during drought periods are found in the mountains which may impact a small number of domestic wells at higher elevations.

The most significant impacts of drought occur first in the mountains, where groundwater is recharged. Wells in and near the mountain block tend to be affected earlier and more severely by a sudden reduction in recharge. For that reason, it recommended that consideration should be made to drill any new municipal wells toward the center of the valley when possible.

Further, the largest simulated drawdown tends to occur where wells are closely spaced and where pumping rates are large. Though resilient to drought conditions, municipal water supplies in some basins may be at risk due to over pumping of municipal or irrigation wells. This is particularly true in Diamond Valley (Eureka), Lovelock Valley (Lovelock), Dixie Creek-Tenmile Creek Area (Spring Creek), and Elko Segment (Elko). It is important that pumping in these areas should not exceed groundwater recharge rates and any new municipal wells be located as far from existing wells of all usage categories as is economically feasible.

Water level records are available at varying temporal resolution for some wells. Additional water level monitoring in basins with substantial pumping rates should be done at least annually, and at or near municipal wells.

While the effects of a simulated drought were small compared to the effect of pumping, the decline due to pumping alone is cause for concern, as it poses the greatest present threat to the resilience of municipal water resources.

References

Pohll, G., R. Schumer, S. Rybarski, J. Crews, and C. Pearson, 2016. Assessment of Drought Resilience in Rural Northern Nevada, Desert Research Institute, Division of Hydrologic Sciences Report.

3.3.3 **Earthquakes** (High Risk)

3.3.3.1 Nature

Nevada is earthquake country. Over 250,000 earthquakes have been recorded within or adjacent to the state since 1857. During this same period another one million earthquakes (estimated) occurred but were not recorded. The Nevada Seismological Laboratory (Seismo Lab) records between 8,000 and 17,000 background earthquakes each year in Nevada. The largest earthquakes were over magnitude 7 and shook the entire state. More than 25 Nevada communities have experienced damage from earthquakes during this same time period, at least eight of these communities experienced repetitive earthquake damage, and every community has felt significant shaking (Figure 3-9). Fifteen out of 17 counties have experienced historical earthquake damage or surface faulting. Earthquakes are responsible for the formation of the Nevada mountain ranges, which continue to develop. Seismicity, earthquake faults, and geodetically measured deformation all indicate that future large earthquakes can occur anywhere in the state. In the short term, personal preparedness, emergency response planning, and community recovery planning are critical. In the long term, constructing seismically resilient buildings, planning future development around earthquake faults, and developing earthquake early warning systems will help reduce injuries and damage from future earthquakes.



Figure 3-9. 2008 Wells, Nevada earthquake damage to Front Street. Several of these buildings were seismically vulnerable unreinforced masonry buildings. *Photograph by Craig dePolo, NBMG.*

Nevada is undergoing two fundamental Earth forces that create the stresses that cause earthquakes. One is extension, or the pulling apart, of the crust. Extension occurs throughout Nevada. As the crust extends, some portions drop down, creating valleys, while other areas are uplifted and become mountains. Normal dip-slip faults, faults with principally downward motion on a dipping surface, bound most mountain ranges in Nevada. The second force is from the boundary between the Pacific Plate and the North American Plate located primarily along the coast of California (where there is also an earthquake hazard). This boundary displays lateral motion and creates strike-slip faults. About a fifth of this plate boundary motion is accommodated in western Nevada in a region known as the Walker Lane belt. This region and has experienced large strike-slip and normal dip-slip earthquakes. Earthquakes recorded in and around Nevada are shown in Figure 3-10.

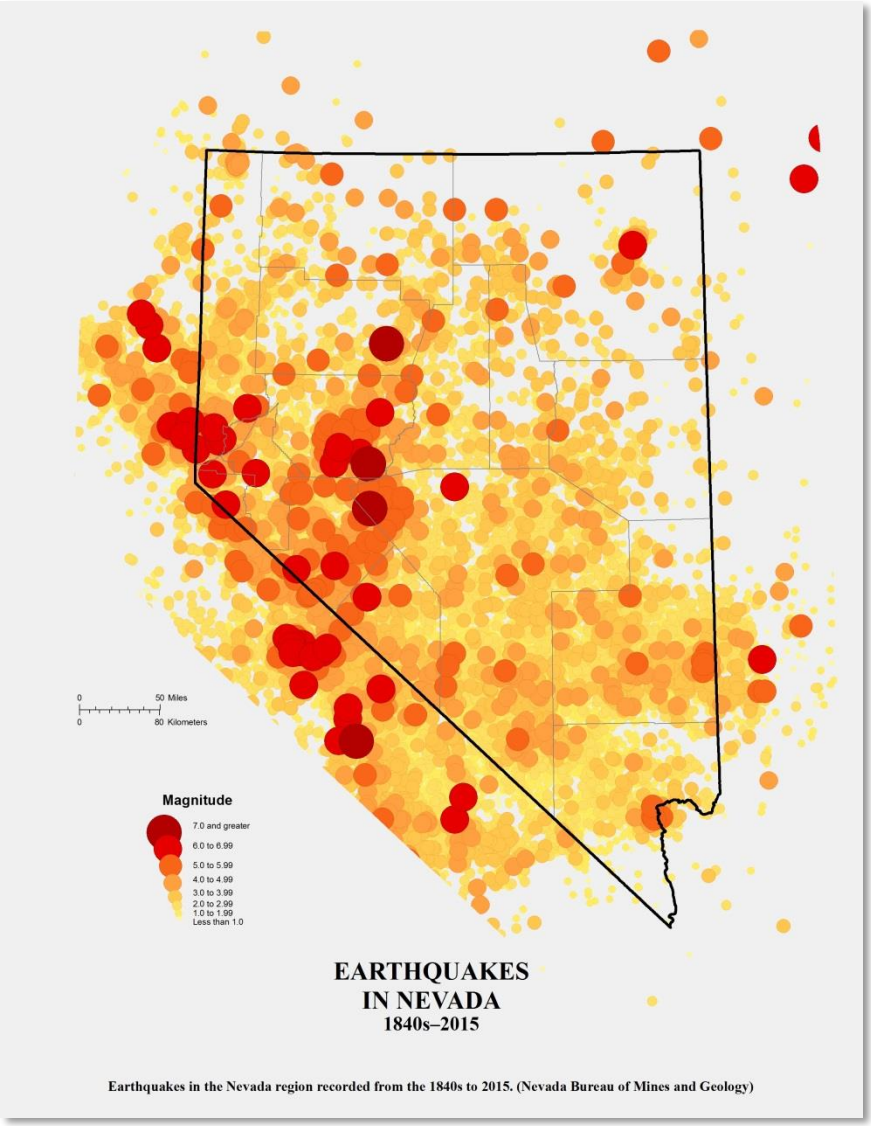


Figure 3-10. All earthquakes recorded in and adjacent to Nevada. The higher occurrence of earthquakes in the western half of Nevada is real, but many earthquakes have not been recorded in the rest of Nevada because of historically poor station coverage. These data are from the Seismo Lab and NBMG.

Earthquakes commonly occur without warning and can damage areas far beyond their place of origin. After just a few seconds, earthquakes can cause massive damage and extensive casualties and injuries. In addition to the shaking, when earthquakes become large enough and/or are close enough to the surface, the ground can be offset by tens of feet along the causative fault (Figure 3-11). Surface faulting can cause severe damage to buildings, highways, railways, pipelines, and tunnels. Several historic Nevada earthquakes have ruptured the ground surface for tens of miles. It is best to avoid construction across earthquake faults. If pipelines or other features must cross a fault, it is possible to design them to survive potential surface displacement. Other earthquake-related hazards include landslides, rock falls, and liquefaction, where saturated ground becomes temporarily fluidized.

Figure 3-11. Fault Scarp in the Fairview Peak area of Nevada, formed by the December 16, 1954 Earthquake (Magnitude 7.3). A building cannot survive this kind of deformation so it is best to avoid building over active faults. *Photograph from the National Geophysical data Center.*



The severity of ground movement generally increases with the size of an earthquake and decreases with distance from the fault or epicenter. Earthquakes cause waves in the Earth's interior, called body waves, and waves along the Earth's surface, called surface waves. There are two types of body waves: primary and secondary waves. Primary waves (P waves), are longitudinal or compressional waves similar in character to sound waves that cause back-and-forth oscillation along the direction of travel. Secondary waves (S waves), are also known as shear waves. They are slower than P waves and cause the ground to vibrate from side-to-side. There are also two kinds of surface waves: Rayleigh waves, which cause a rolling motion like ocean waves, and Love waves, which shake from side-to-side. Buildings and other structures in Nevada must be designed to withstand the shaking from earthquakes and people must be aware of the potential threat from the contents of buildings being shaken down.

The size of an earthquake and its effects are described using earthquake magnitude and earthquake intensity scales, respectively. The size of an earthquake is measured by a magnitude scale, usually moment-magnitude (M_w) based on how large an earthquake rupture is and how much movement occurs across the causative fault. The moment-magnitude scale is logarithmic and there are large differences from one magnitude value to the next on the scale. For instance, the amount of shaking caused by a magnitude 5 earthquake would be 10 times that of a magnitude 4 earthquake. In the United States, earthquake intensity is measured by the Modified Mercalli Intensity Scale (MMI). It consists of rankings of human behavior, building effects, and ground deformation in response to an earthquake. The MMI scale uses Roman numerals I-XII as described in Table 3-6 so as not to be confused with earthquake magnitude.

Many factors influence earthquake intensity, especially the seismic response of buildings. Strong shaking in an area with seismically resistant buildings will have a lower intensity than the same level of shaking where buildings are seismically weak. Thus, how much "intensity" results from an earthquake can be influenced by good engineering and planning efforts by a community. Maximum intensities that have occurred historically in Nevada are shown in Figure 3-12.

Earthquake-related ground failure due to liquefaction has occurred during many historical Nevada earthquakes. Liquefaction occurs when seismic waves pass through saturated granular soil, causing the granules to collapse into the empty spaces between grains. The water expelled from these spaces causes water pore pressure to increase sufficiently to make the soil behave like a fluid for a brief period. Liquefaction causes lateral spreads (horizontal ground movements commonly 10 to 15 feet, but as much

as 100 feet), flow failures (massive flows of soil, typically hundreds of feet), and loss of bearing strength (structures sink into the ground or tip). Severe property damage due to liquefaction during an earthquake can be mitigated by identifying potential liquefaction areas, avoiding them, and engineering buildings with preventative features, such as foundation pilings, in areas that are potentially susceptible to liquefaction.

Table 3-6. Modified Mercalli Intensity Scale

MMI	Description
I	Barely felt.
II	Felt by a few sensitive people, some suspended objects may swing.
III	Slightly felt indoors as though a large truck were passing.
IV	Felt indoors by many people, most suspended objects swing, windows and dishes rattle, and standing autos rock.
V	Felt by almost everyone, sleeping people are awakened, dishes can fall out of cupboards and windows can break.
VI	Felt by everyone, some are frightened and run outside, some chimneys break, some furniture moves, and slight damage.
VII	Considerable damage in poorly built structures, felt by people driving, most are frightened and run outside, some chimney's fall.
VIII	Slight damage to well-built structures, heavy damage to poorly built structures.
IX	Underground pipes breaks, foundations of buildings are damaged and buildings shift off foundations, considerable damage to well-built structures.
X	Few structures survive, most foundations destroyed, water moved out of riverbanks and lakes, avalanches and rockslides, railroad rails are bent.
XI	Few structures remain standing, total panic, large cracks in the ground.
XII	Total destruction, objects thrown into the air, the land appears to be liquid and is visibly rolling like waves, fault displacement of the ground.

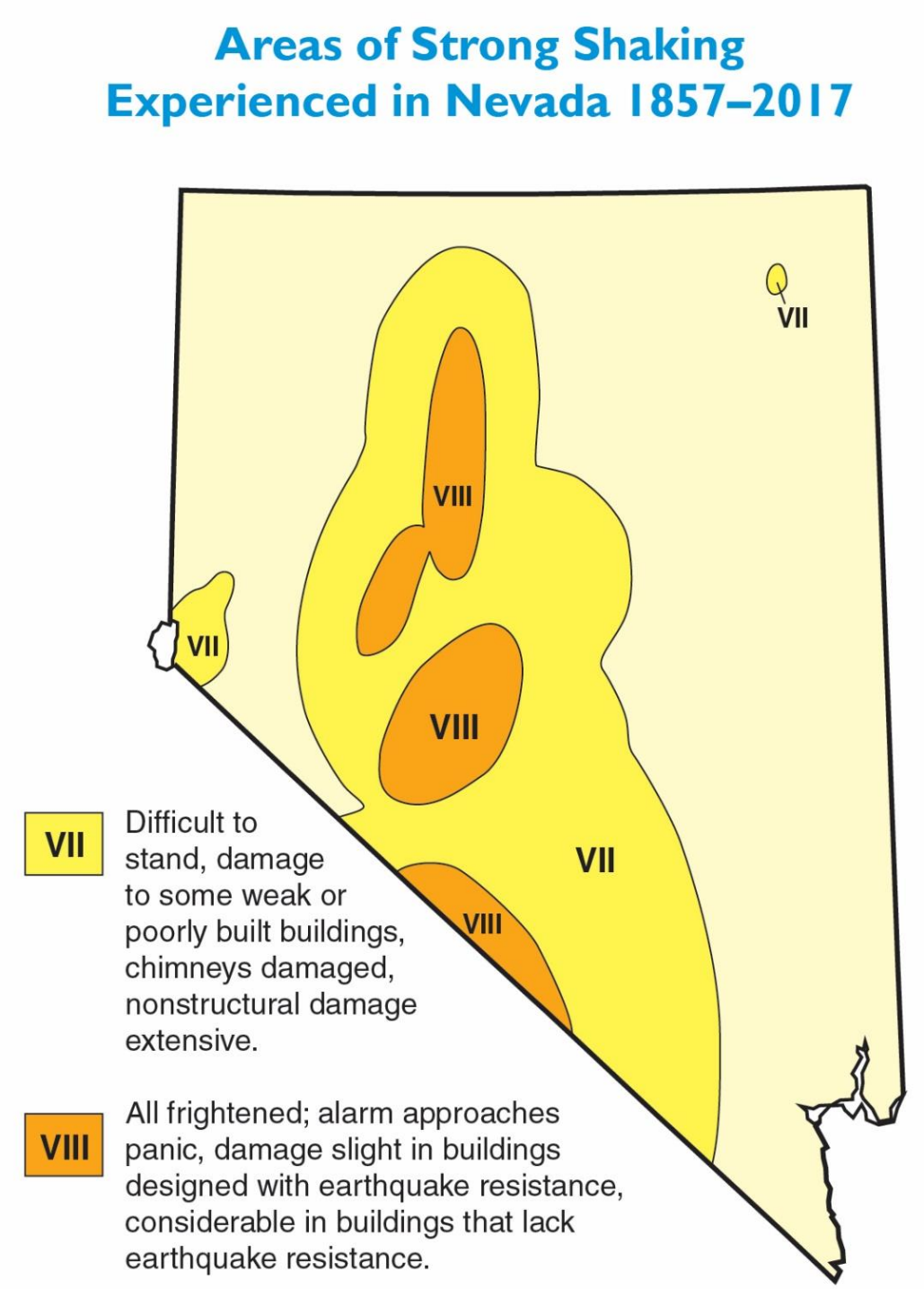


Figure 3-12. Composite Modified Mercalli Intensity map of Nevada showing the highest intensities experienced since 1857. Some small areas of higher intensities occurred locally but are too small to show at this scale.

3.3.3.2 History

The State of Nevada is one of the most seismically active states in the Union. It ranks in the top three states subject to the largest earthquakes over the last 150 years, with only Alaska and California having experienced more events. Figure 3-13 shows the locations of magnitude ≥4 earthquakes in Nevada and adjacent parts of California from the 1840s to 2015. The figure shows earthquake activity throughout the state and a high level of activity in the western part of the state. Table 3-7 is a partial listing of significant historical earthquakes in Nevada from 1860 to 2008 with magnitudes of 4.9 or greater.

Historical earthquakes clearly show that Nevada is in earthquake country (Fig. 3-10). There have been 23 earthquakes of magnitude 6 or greater since 1857 and three events of magnitude 7.1 or greater. This gives an overall average of a magnitude ≥6 event once every 6.9 years and a magnitude ≥7 event once every 53 years. Earthquakes have not occurred regularly, though and the shortest time between events of magnitude ≥6 is 4 minutes and 20 seconds. Two major events occurring within several hours of each other in the same area is effectively a double earthquake. Several "double" major earthquakes have occurred in the state. These are especially hazardous for emergency responders who are in the area for the first earthquake. Table 3-8 presents some earthquakes that have occurred in Nevada in the last decade; many were near populated areas. This table only includes the largest events. In some cases, these events were accompanied by hundreds of microearthquakes.

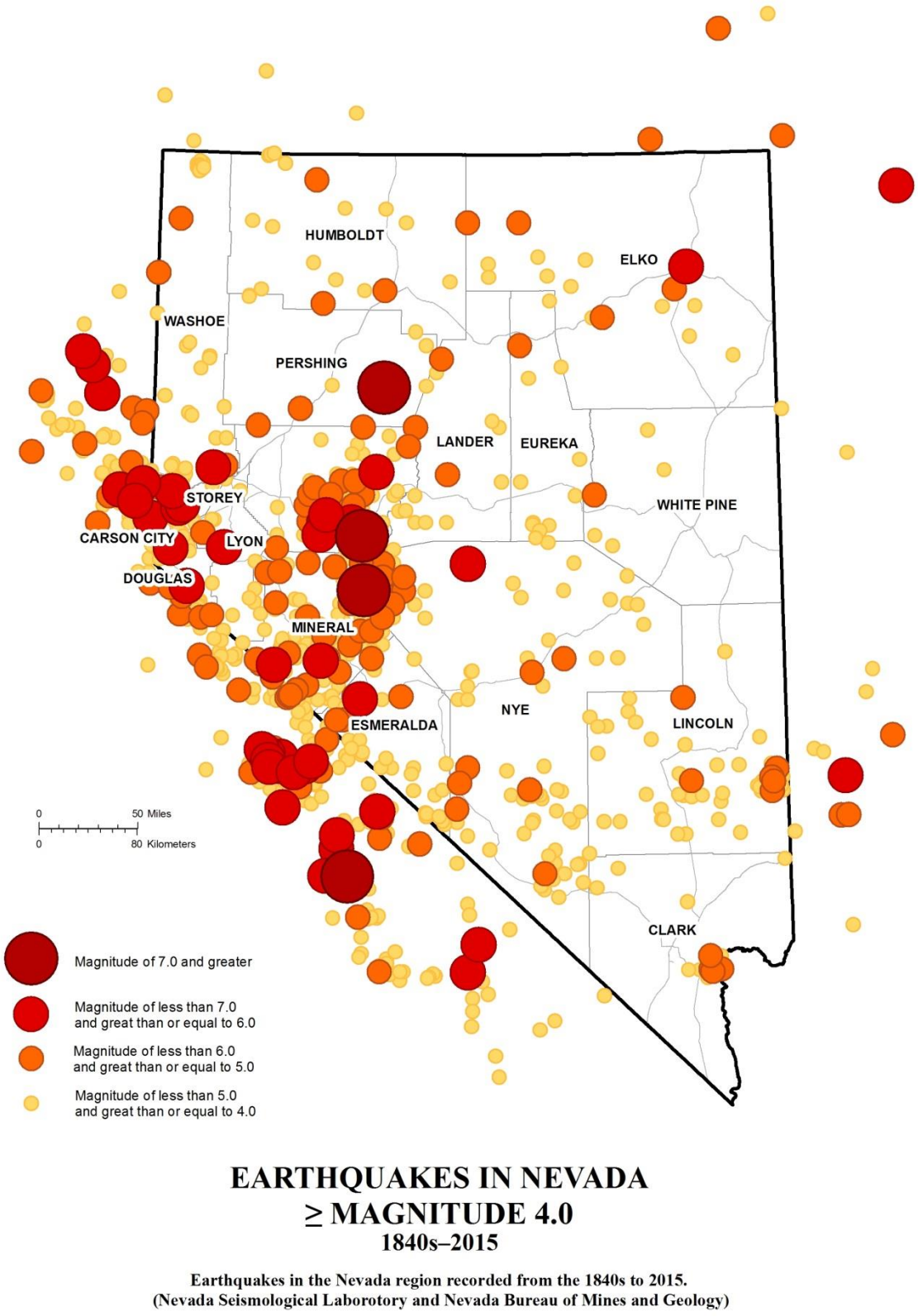


Figure 3-13. Earthquakes of magnitude ≥4 in Nevada and Adjacent States, 1840s-2015.

Table 3-7. Significant Historical Earthquakes in Nevada from the 1840s to 2016			
Date	**Magnitude**	**Location**	**Nearest Community[1]**
1840s	7+ (?)	Western Nevada	Winnemucca area
Sept. XX, 1857	6.0?	N. Lake Tahoe	Incline Village
Mar. 15, 1860	6.8	Western Nevada	Virginia City
Dec. 27, 1869	6.7	Virginia Range	Virginia City
Dec. 27, 1869	6.1	Virginia Range	Virginia City
Jun. 3, 1887	6.3	Carson City	Carson City
Feb. XX, 1914	6.0	Reno area	Reno
Apr. 24, 1914	6.4	Reno area	Reno
Oct. 3, 1915	6.1	Pleasant Valley	Winnemucca
Oct. 3, 1915	7.3	Pleasant Valley	Winnemucca
Dec. 21, 1932	7.1	Cedar Mountain	Gabbs
June XX, 1933	6.0	Mason Valley	Wabuska
Jan. 30, 1934	6.3	Excelsior Mtns.	Mina
Dec. 29, 1948	6.0	Verdi area	Verdi
May 24, 1952	5.0	Lake Mead area	Boulder City
Jul. 7, 1954	6.6	Rainbow Mtn.	Fallon
Aug. 8, 1954	7.0	Rainbow Mtn.	Fallon
Dec. 16, 1954	7.2	Fairview Peak	Fallon
Dec. 16, 1954	7.1	Dixie Valley	Fallon
Sep. 22, 1966	6.0	Clover Mountain	Caliente
Sep. 12, 1994	5.8	Double Spring Flat	Gardnerville
Feb. 21, 2008	6.0	Town Creek Flat	Wells
May 25, 2008	4.9	Mogul	Mogul; W. Reno

[1] Not necessarily the only communities affected by the earthquake. Source: UNR Seismo Lab, Nevada Bureau of Mines and Geology

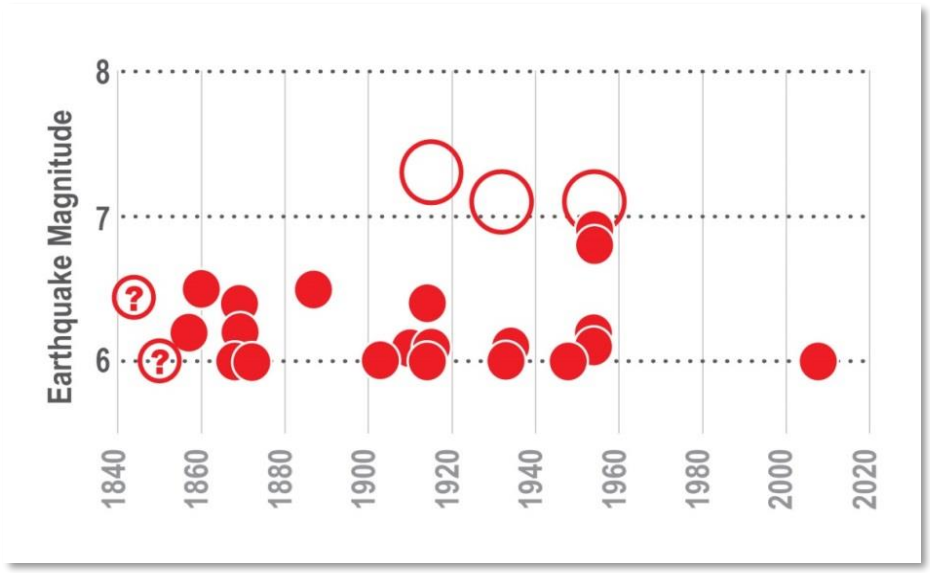


Figure 3-14. Earthquakes in Nevada of magnitude ≥6 through time. Note that Nevada has had major earthquakes year-after-year and multiple major earthquakes in the same year.

Table 3-8. Nevada Earthquakes in the Last Decade		
County; Location	**Date; time**	**Magnitude; description; damage**
Douglas County, 22.7 miles S of Wellington	March 8, 2007 19:17:32 (PST)	Mw = 4.8;
Elko County, Wells area; epicenter located about 5.5 miles (9 km) NE of the town of Wells	February 21, 2008 6:16 am (PST)	Mw = 6.0; there were at least three quake-related injuries, and extensive damage to unreinforced masonry buildings in and around the town of Wells. There were several propane leaks and widespread non-structural damage.
Washoe County, Mogul-Somersett area, densely populated residential suburb of NW Reno	April 25, 2008 11:38 PM (PST)	Mw 4.9 right-lateral strike-slip event; located in densely populated residential suburb of northwest Reno, Nevada. It caused approximately $2 million in damage. The ShakeMap for this event is shown in Figure 3-15.
Mineral County, near Hawthorne	April 13 to May 28, 2011	Eight or more earthquakes of magnitude 3.5 to 4.4 were centered about 9-14 miles east to SE of Hawthorne NV; no reports of injuries or damage.
Mineral County, N of Walker Lake, 22 miles ESE of Yerington	October 1, 2011 00:07 (PDT)	M_W 4.1 earthquake centered 22 miles ESE of Yerington, no damage reported; strike-slip event
Washoe County, 4.5 mi NNW of Incline Village	Jun 22, 2012 20:51 (PDT)	Mw 4.0 earthquake; strike-slip event
Washoe County, 20.9 mi N of Pyramid Lake	Aug 14, 2012 15:17 (PDT)	Mw 3.7 earthquake; normal oblique-slip event
Clark County, 17.8 mi SW of Moapa	Sep 25, 2012 09:03 (PDT)	Mw 3.3 earthquake; normal oblique-slip event
Washoe County, 12.7 mi NW of Fernley	Oct 3, 2012 12:51 (PDT)	Mw 3.4 earthquake; normal oblique-slip event
10.0 mi SSW of Topaz Lake	Jan 24, 2013 15:25 (PST)	Mw 4.0 earthquake; strike-slip event
Esmeralda County, 24.3 mi N of Dyer	Feb 12, 2013 16:10 (PST)	Mw 5.1 earthquake; at least 7 aftershocks Mw 3.3 - 3.9 from Feb 12-13, 2013; strike-slip event
24.4 mi S of Mina	Feb 12, 2013 16:49 (PST)	Mw 3.7 earthquake; normal dip-slip event
18.9 mi SSE of Caliente, NV	Apr 13, 2013 12:23 (PDT)	Mw 3.7 earthquake; strike-slip event
Carson City, 4.5 mi SE of Carson City	Jun 05, 2013 05:59 (PDT	Mw 3.0 earthquake; normal dip-slip event
Washoe County, 7.0 mi NE Sun Valley	Aug 27, 2013 17:51 (PDT)	Mw 4.1 earthquake; strike-slip event
White Pine County, 35.6 mi WSW of Ely	Aug 29, 2013 04:20 (PDT)	Mw 3.6 earthquake; normal oblique-slip event
Lincoln County, 20.2 mi WNW of Alamo	Sep 16, 2013 07:12 (PST)	Mw 3.5 earthquake; strike-slip event

Table 3-8. Nevada Earthquakes in the Last Decade		
County; Location	**Date; time**	**Magnitude; description; damage**
Nye County, 23 mi ENE of Pinnacles Ridge	Oct 25, 2013 04:29 (PDT)	Mw 3.3 earthquake; normal oblique-slip event
Washoe County, 4.3 mi W of Mt Rose	Dec 6, 2013 12:20 (PST)	Mw 3.1 earthquake; strike-slip event
Lincoln County, 24.9 mi N of Alamo	Dec 21, 2013 15:02 (PST)	Mw 3.6 earthquake; normal dip-slip event
Lincoln County, 29.2 mi SE of Caliente	Jan 28, 2014 17:30 (PST)	Mw 3.9 earthquake; normal oblique-slip event
Mineral County, 10.5 mi ENE of Hawthorne	Apr 25, 2014 17:12 (PDT)	Mw 3.8 earthquake; normal oblique-slip event
Lincoln County, 5.2 mi ESE of Alamo, NV	Aug 10, 2014 03:40 (PDT)	Mw 3.7 earthquake; strike-slip event
6.3 mi NNE of Tahoe City, CA	Sep 10, 2014 17:08 (PDT)	Mw 3.2 earthquake; strike-slip event
Washoe County, 51-52 mi W of Denio	Oct 1, 2014 05:46 (PDT)	Mw 4.0 earthquake, five events Mw 3.4 – 3.7 between Aug 18 – Sep 14, 2014; normal-oblique event
Clark County, 20.3 mi WSW of Henderson, NV	Oct 5, 2014 03:11 (PDT)	Mw 3.2 earthquake; strike-slip event
Washoe County, 31 mi SW Gerlach, NV	Oct 6, 2014 04:01 (PDT)	Mw 3.3 earthquake; lateral normal-oblique event
Esmeralda County, 14.4 mi N of Scotty's Castle	Oct 12, 2014 20:27 (PDT)	Mw 3.4 earthquake; normal dip-slip event
Nye County, 44.1 mi SSW of Eureka, NV	Nov 3, 2014 22:20 (PST)	Mw 3.4 earthquake; normal oblique-slip event
Washoe County, 50-52 mi W of Denio, NV	Nov 4, 2014 23:23 (PST)	Mw 4.6 earthquake, 10 events Mw4.0 – 4.6 from November 6 – December 10, 2014.
Washoe County, 23.2 mi NNE of Vya, NV	Jan 22, 2015 01:09 (PST)	Mw 4.7 earthquake, Preceded by Mw 4.1 earthquake on 4 January 2015 and Mw 4.0 earthquake on 12 January 2015. Followed by Mw 4.3 earthquake on 29 January 2015; normal oblique-slip and normal dip-slip events.
Esmeralda County, 8.8 mi NNE of Scotty's Castle	Feb 13, 2015 18:28 (PST)	Mw 4.7 earthquake; normal dip-slip event
White Pine County, 36.1 mi SW of Ely	Feb 28, 2015 02:41 (PST)	Mw 3.9 earthquake; normal dip-slip event
5.8 mi W of Mt Rose	Apr 7, 2015 22:06 (PDT)	Mw 3.4 earthquake; strike-slip event
Nye County, 33.1 mi SSE of Eureka	May 4, 2015 04:56 (PDT)	Mw 3.4 earthquake; normal dip-slip event
Lincoln County, 23.5 mi SSW	May 22, 2015	Mw 4.8 earthquake, felt in Las Vegas, six

Table 3-8. Nevada Earthquakes in the Last Decade		
County; Location	**Date; time**	**Magnitude; description; damage**
of Caliente	11:47 (PDT)	earthquakes Mw 3.2 – 3.5 from May 22 – June 12, 2015; all strike-slip events
Nye County, 37.3 mi S of Eureka	May 24, 2015 10:06 (PDT)	Mw 3.8 earthquake; normal dip-slip event
Esmeralda County, 22.8 mi W of Goldfield	Jun 10, 2015 18:50 (PDT)	Mw 3.2 earthquake; normal dip-slip event
Washoe County, 24.1 mi NNE of Vya	July 15, 2015 18:52 (PDT)	Mw 4.5 earthquake, followed 5 minutes later by Mw 4.1 earthquake; normal dip-slip events
1.5 mi ENE of Independence Lake	July 18, 2015 18:36 (PDT)	Mw 3.2 earthquake; lateral oblique-normal-slip event
Washoe County, 23.8 mi NNE of Vya	July 26, 2015 18:05 (PDT)	Mw 4.6 earthquake, followed by Mw 4.0 earthquake on August 13, 2015; normal dip-slip event
Mineral County, 13 mi NW of Hawthorne	Sep 7, 2015 19:15 (PDT)	Mw 4.0 earthquake; strike-slip event
22 mi NNE of Vya, NV	Sep 14, 2015 06:55 (PDT)	Mw 4.8 earthquake, followed by three M_W 4.0 – 4.3 earthquakes from September 26 and November 18, 2015; normal oblique-slip event
Washoe County, 2.9 mi NNW of Galena High School	Dec 22, 2015 22:46 (PST)	Mw 4.3 earthquake; normal dip-slip event
Washoe County, 24.4 mi NE of Vya	Dec 24,2015 12:30 (PST)	Mw 4.6 earthquake; normal oblique-slip event
Washoe County, 39.4 mi SSW of Denio	Dec 28, 2015 07:10 (PST)	Mw 4.0 earthquake; normal dip-slip event
Mineral County, 14.4 mi ESE of Hawthorne	Mar 21, 2016 00:37 (PDT)	Mw 4.1 earthquake, followed by Mw 3.8 on March 22, 2016; strike-slip and normal dip-slip events, respectively
Clark County, 22.9 mi S of Mesquite	May 5, 2016 06:49 (PDT)	Mw 3.8 earthquake; normal dip-slip event
Washoe County, 5.2 mi W of Gerlach, NV	May 14, 2016 07:20 (PDT)	Mw 3.8 earthquake; strike-slip event
Eureka County, 8.7 mi NE of Eureka	Jun 3, 2016 00:19 (PDT)	Mw 3.6 earthquake; normal dip-slip event
Mineral County, 12.6 mi NW of Hawthorne	Jul 7, 2016 16:40 (PDT)	Mw 4.2 earthquake; preceded by Mw 3.9 earthquake at 16:14 (PDT); both normal oblique-slip events
Lincoln County 20.1 mi SSW of Alamo	Sep 3, 2016 05:06 (PDT)	Mw 3.5 earthquake; normal dip-slip event
Mineral County, 6.8 mi N of Schurz	Dec 3, 2016 23:40 (PST)	Mw 3.6 earthquake; normal-oblique-slip event
Mineral County, 18.3 mi SW of Hawthorne, NV	Dec 28, 2016 00:18 (PST)	Mw 5.6 earthquake; followed by Mw 5.4 earthquake four minutes later, 00:22 (PST) and Mw 5.5 earthquake 55 minutes later at 01:13 (PST);

Table 3-8. Nevada Earthquakes in the Last Decade		
County; Location	**Date; time**	**Magnitude; description; damage**
		moderate damage to Nine Mile Ranch house and barn; events were strike-slip and normal oblique slip
Douglas County, 2.2 mi SSE of Double Springs Flat, NV	Jun 6, 2017 15:45 (PDT)	Mw 3.8 earthquake; strike-slip event

Source: Nevada Seismological Lab

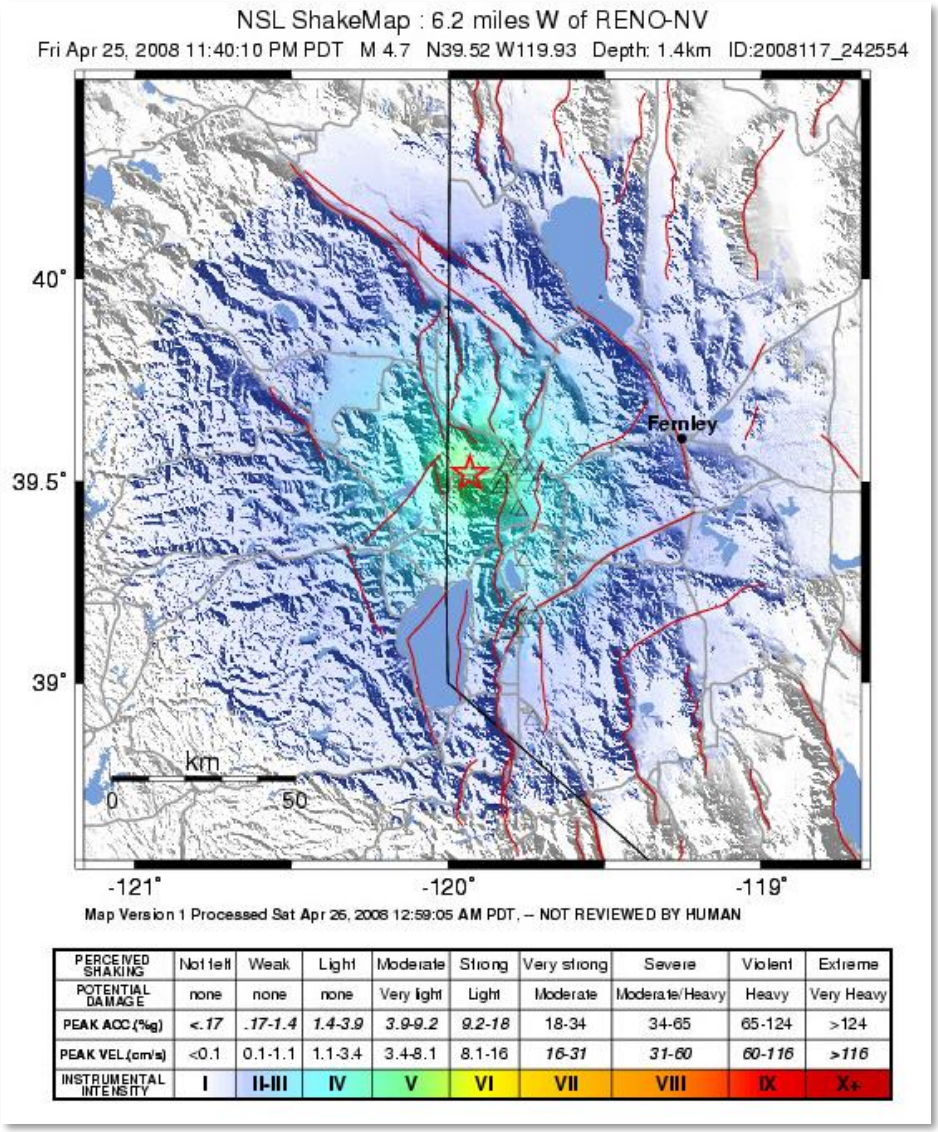


Figure 3-15. Seismo Lab ShakeMap for the 2008 Mogul earthquake. These maps are produced rapidly by the Laboratory and can assist in the situational awareness of an earthquake event.

3.3.3.3 Location, Severity, and Probability of Future Events

In Nevada, earthquake faults occur along many of the range fronts, within ranges, and within valleys. Normal dip-slip faults, those that down-drop the ground during earthquakes, commonly appear as steps in the landscape because of the vertical offset. Strike-slip faults, that offset the ground sideways, are usually expressed as linear features in the landscape, such as elongate valleys, and alignments of features, such as springs and vegetation. Historical earthquakes have ruptured both kinds of faults in Nevada.

An indicator of future earthquakes is recent past earthquake activity of faults. Faults have been created throughout Earth's history. Old faults are commonly inactive and are not considered threatening. For earthquake hazards, the most recently active faults are of concern. Figure 3-16 shows the known rupture history on Quaternary faults in Nevada and adjacent areas. Quaternary, (the past 2.6 million years), is a common age of faults that are observed to be hazards. Only a small number of the faults shown on Figure 3-16 have been investigated. For many of these faults, activity has been inferred by geomorphic surface expression. Faults with movement in the last 130,000 years are active and considered potential earthquake hazards; some of the other faults that have poor surface expression will fall into this category as well. These faults should be considered when investigating local earthquake hazards and building across them should be avoided, if possible.

A probability of having an earthquake can be inferred from the National Seismic Hazard Map and has been done so by the USGS (Figure 3-17). This probability is indexed to a time frame and an area, the later defined as a distance from a location. Figure 3-17 shows the calculated probability for an earthquake of magnitude ≥6 occurring within 50 km (31 miles) and over a 50-year time period in Nevada. Although we know the map is not an exact calculation of the real probability of having an event, it does appear to mimic the earthquake hazard. This map is based on data that was generated before the 2008 Wells, Nevada earthquake. Prior to the event, there was a 12% chance of a M6 earthquake occurring in Wells, within 31 miles and 50 years. This earthquake occurred in February 2008. Figure 3-17 indicates a similar probability was calculated for the Las Vegas Valley area. The figure also indicates westernmost Nevada has probabilities of a magnitude 6 or greater event occurring to be well in excess of 50%.

Climate change:

No significant impacts to the frequency or magnitude of earthquakes in Nevada are expected as a result of climate change.

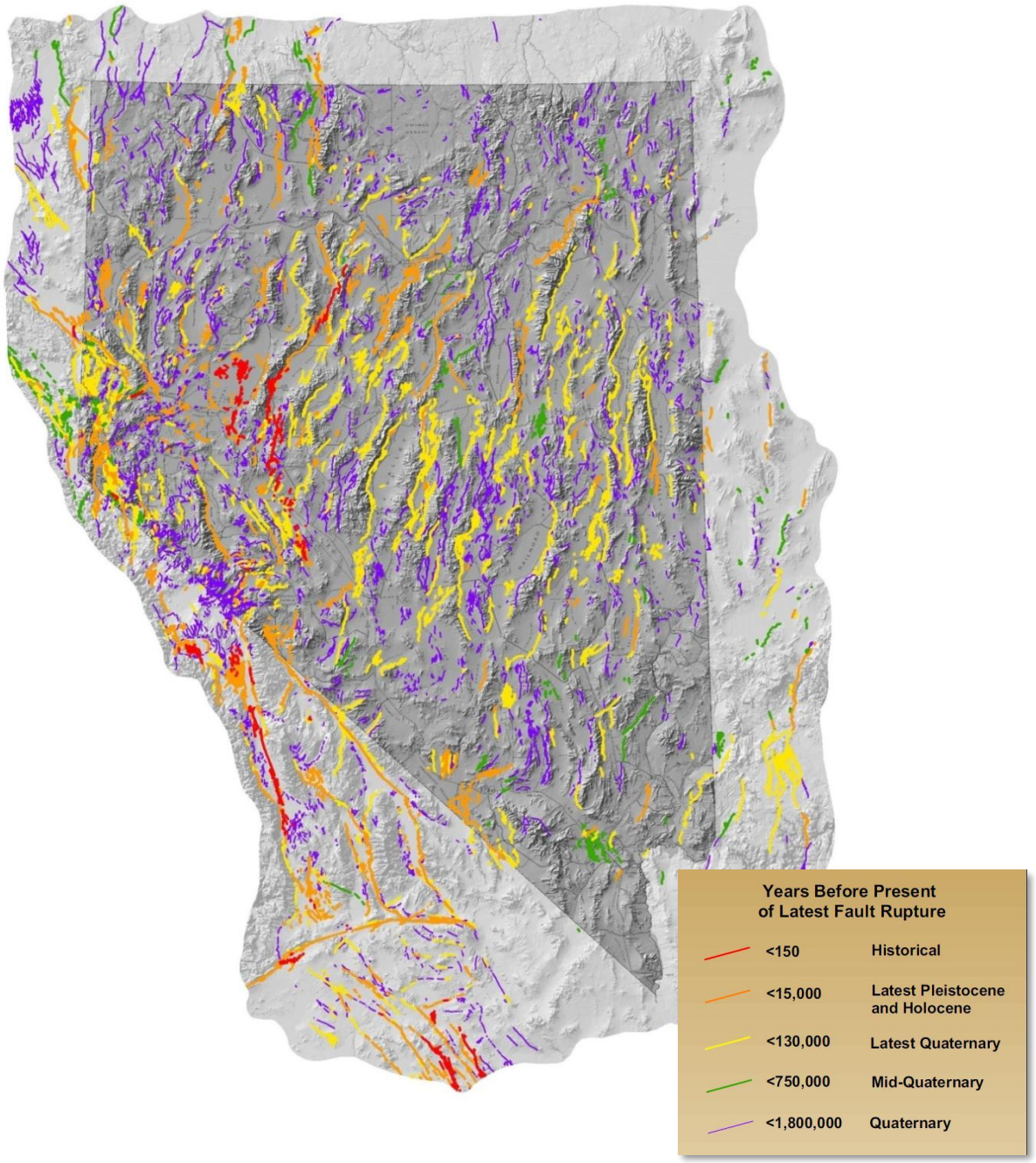


Figure 3-16. Map of Quaternary fault activity in Nevada. The map is from NBMG and is based on a database developed by the USGS.

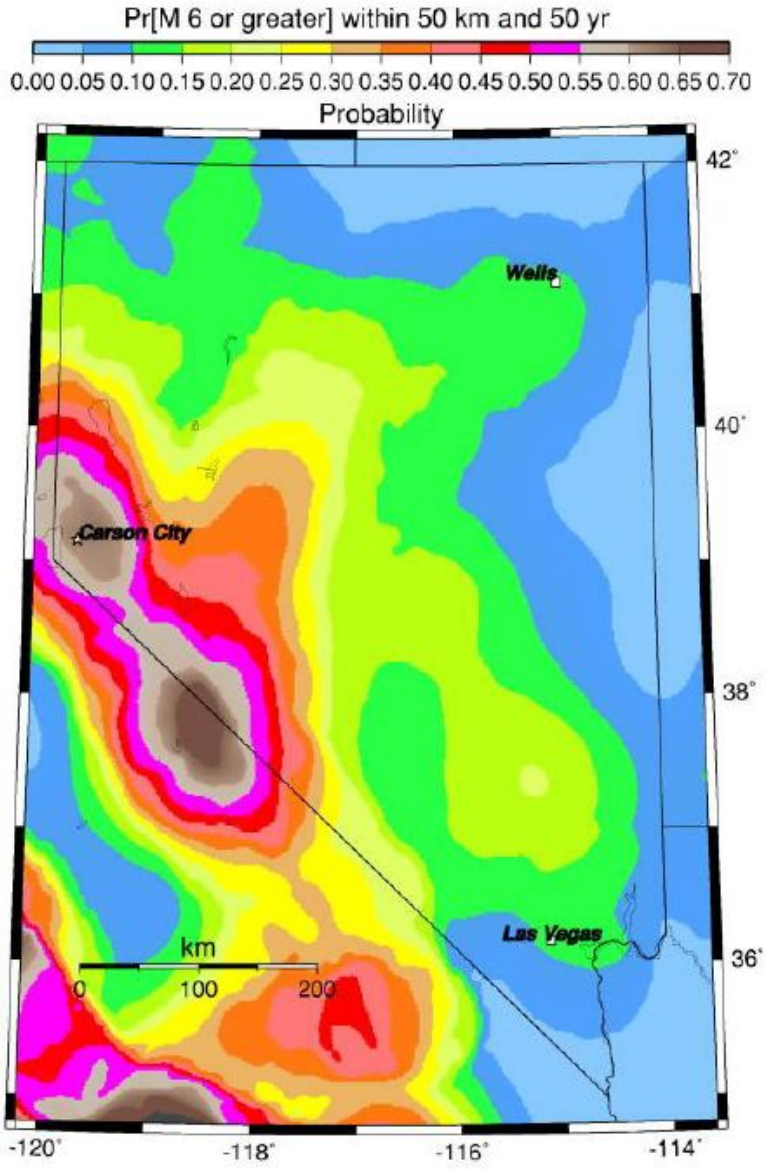


Figure 3-17. Calculated probabilities for a magnitude ≥6 earthquake in Nevada, within 31 miles and 50 years of a location. This figure was produced by the USGS.

Table 3-43 in Section 3.7.1 shows the probabilities of major earthquakes occurring within 50 years within 31 miles of 38 major Nevada communities, based on the USGS's information. A shaking potential map for Nevada is also found in Section 3.7.1, Figure 3-55.

3.3.4 Epidemic (Low Risk)

3.3.4.1 Nature

An infectious disease that appears suddenly or presents in greater than normal numbers for a particular location is considered an outbreak. An infectious disease that occurs in greater than normal numbers in several communities or that crosses geographical boundaries is considered an epidemic. The same infectious disease that involves a large population in several countries or continents is considered a pandemic. The use of these terms is somewhat subjective and frequently used interchangeably. Infectious diseases emerge, suddenly or gradually, in various environments, and may spread across a region or even the world. If the disease was previously unknown, than the disease is said to be an *emerging disease*. These terms are used to illustrate the number of occurrences, size or scope of the disease impact and/or the healthcare sector's familiarity with the disease; the terms do not indicate the virulence, mortality or morbidity of a particular illness. Epidemics are described as contemporary health catastrophes by the World Health Organization (WHO). Epidemics are commonplace in the world. According to the WHO, every country on earth has experienced at least one epidemic since the year 2000. Some epidemics such as the H1N1 (2009), SARS, and Ebola have developed into pandemics with a global reach, but far more often epidemics strike at lessor geographic levels causing loss of life and livelihoods on a more regional or local level.

Although epidemics and outbreaks of disease have traditionally been associated with disease caused by infectious agents, in the second half of the 20th century the term epidemic has also become associated with non-infectious disease such as obesity and diabetes, or disease caused by lifestyle and environmental factors such as smoking-related heart disease and cancer clusters. In this plan, we will address only epidemic disease caused by infectious agents.

The impact of outbreaks of pathogens on communities differs depending upon the disease, the population of the community, the age of the primary targets, socio-economic situation of the community affected and the public health response capabilities of the affected community. For example, 100 cases of meningitis across Las Vegas may be a concern, but 10 cases of the same meningitis may close the entire school system in Fallon. Four deaths from an infectious disease may not stretch public health resources in Reno, but may create an emergency in Yerington.

Disease outbreaks and epidemics are not confined to human populations. Diseases such as hoof-and-mouth disease and mad cow disease, if introduced into the livestock population, could decimate the beef industry for decades. In the past, global pandemics involving avian influenza and birds have occurred and there is currently a global influenza pandemic affecting birds. The H5N1 avian influenza virus infects mainly wild birds, but can also infect poultry. This virus has been known to transmit infection from chickens to humans with deadly results. Finding H5N1 in a domestic bird population could result in the culling of a state's entire population of poultry in an attempt to isolate the virus from transmission into the human population.

Pandemic influenza and other emerging diseases present a major threat to life, economies and security in an increasingly globalized world. The impact of disease epidemics has increased dramatically as the world becomes ever more interconnected. In the past 25 years, emerging diseases have included: HIV/AIDS, Hepatitis C, Ebola, Lyme disease, Hantavirus, SARS, MERS, Enterovirus D68 and Chikunguny virus. Additionally, some "old-school" diseases are now re-emerging as the disease becomes resistant to anti-microbial medications and vaccines. These diseases include things such as: measles, TB, pertussis (whooping cough) and bacterial pneumonia. Trade, commerce and financial

markets are increasingly interrelated. In 2009, Mexico reported an outbreak of a novel strain of influenza which had not been previously recorded in human circulation. Because there was little immunity to this strain of influenza, and because of modern routes of travel and transmission, it became a global pandemic within 4 months.

Some challenges presented by epidemics:

- Epidemics associated with emerging and re-emerging infectious diseases are now occurring in historically unprecedented numbers. Since 2001, the WHO has verified more than 1100 epidemics of international importance.
- Over 70% of new and emerging diseases originate in animals. This requires improved cooperation between animal and human health sectors at the national and international level, especially in the areas of detection, risk assessment and risk reduction.
- National public health systems are weak in many areas and are further stressed by poverty and political instability. The lack of disease surveillance and response capacity in one part of the world is a threat to all. Investment in strong national alert and response systems is a vital investment in global health security.

The Centers for Disease Control and Prevention (CDC) have a list of reportable diseases that is updated each year. Additionally, the CDC post information related to all current disease outbreaks that are being investigated.

For the listing or current reportable diseases, go to the CDC website:
www.cdc.gov/nndss/conditions/notifiable/2015

For the list of current disease outbreaks, go to the CDC website:
www.cdc.gov/outbreaks/index.html

The Nevada Department of Agriculture (NDA) has 66 reportable diseases. For a full listing go to their website:
http://agri.nv.gov/uploadedFiles/agrinvgov/Content/Animals/Animal_Disease/NV_Reportable_Disease_Aug_2011.pdf

Some recent emerging and re-emerging infectious diseases globally are shown on the map in Figure 3-18 below.

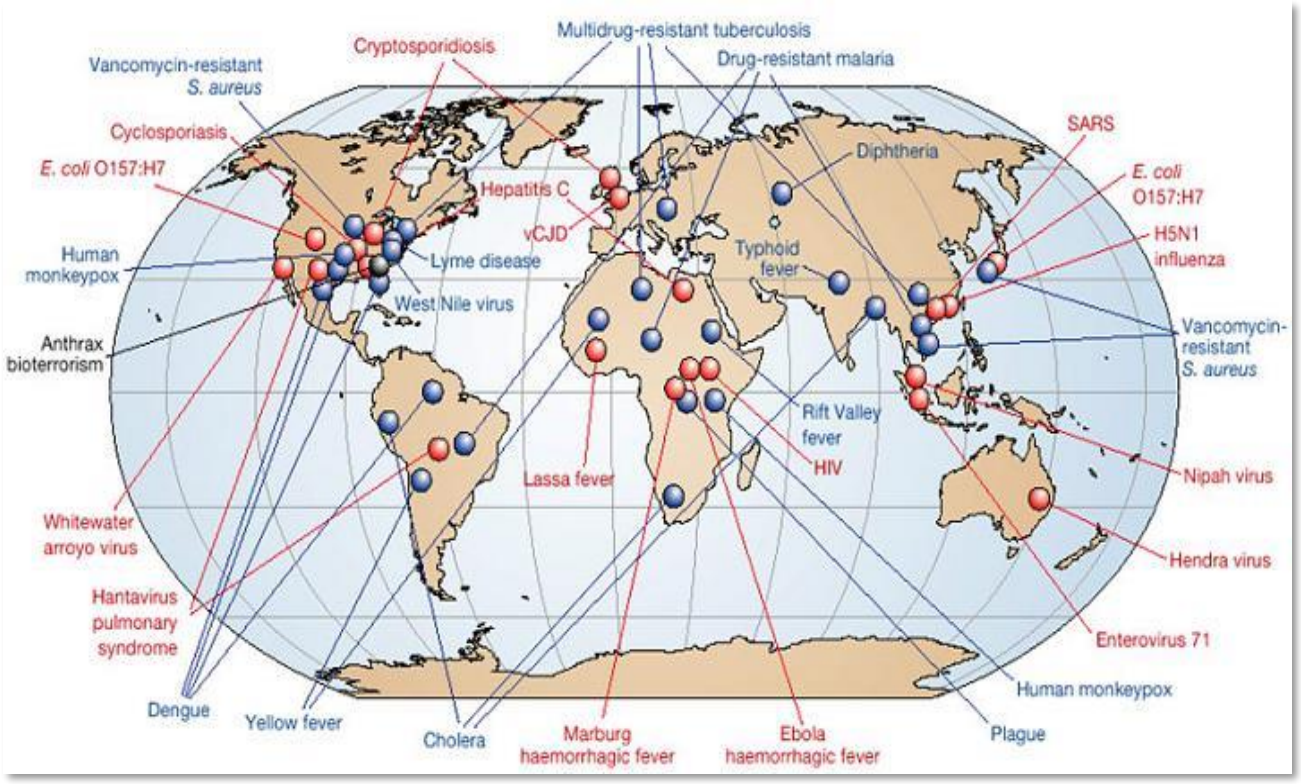


Figure 3-18. WHO Emerging & Re-Emerging Infectious Diseases. *Nature, 2013*

In Nevada, we have seen occurrences of anthrax, whooping cough, and measles. Some of our rodents carry the plague bacteria and the Hantavirus pathogen. In 2009-1010, the H1N1 influenza affected the population in each county and strained our public health capacity. Unless there is significant immunity built up for emerging or re-emerging diseases, any population can be vulnerable.

3.3.4.2 History

Table 3-9 below presents 20th Century incidences of pandemics, epidemics, and major infectious disease affecting people in the U.S.

Table 3-9. 20th Century U.S. Pandemics and Epidemic Occurrences

Date	Details
1918-1919	The influenza pandemic of 1918 and 1919, known as the Spanish Flu or Swine Flu, had the highest mortality rate in recent history for an infectious disease. More than 20 million persons were killed worldwide, some 500,000 of which were in the U.S. alone (CDC, October 1998).
1916, 1949	Polio epidemics prior to the advent of the polio vaccine killed over 7,000 people in 1916 and over 3,000 in 1949.
1957, 1968	In the 20th century the world also experienced influenza pandemics in 1957 and 1968, which although were less virulent than the 1918 Spanish Flu, caused millions to be infected and many deaths.

Table 3-9. 20th Century U.S. Pandemics and Epidemic Occurrences	
Date	**Details**
1999, 2002	West Nile Virus (WNV), a seasonal infection transmitted by mosquitoes, caused an epidemic which grew from an initial U.S. outbreak of 62 disease cases in 1999 to 4,156 reported cases, including 284 deaths, in 2002 (CDC, July 8, 2003).
1980 – 2000	Physicians began seeing immunodeficiency disorders in gay men. This was the beginning of the AIDS pandemic. In twenty years AIDS claimed over 40 million people worldwide.
2003	Severe acute respiratory syndrome (SARS) was estimated to have killed 915 and infected 8,422 worldwide by mid-August 2003 (WHO, August 15, 2003). In the U.S., there were 175 suspect cases and 36 probably cases, although no reported deaths (CDC, July 17, 2003).
2003-present	Although most cases go unrecognized, Norovirus is believed to affect over 20 million people in the U.S. each year. Norovirus accounts for 96 percent of all non-bacterial outbreaks of gastroenteritis (Arizona Department of Health Services, March/April 2003).
2009 – 2010	In April of 2009, novel H1N1 influenza virus started to circulate in Mexico. It soon spread to the United States and within 2 months of its first isolation the virus became a global pandemic.
2014-2015	Enterovirus D68 (EV-D68), a non-polio enterovirus, re-emerges in the US. More than 1,150 patients in 49 states experience severe respiratory illness. Most of these cases are in children with a previous history of asthma. 14 deaths occurred and likely millions of others had a mild form of the disease but didn't seek medical attention.
2015	An outbreak of Measles tracked back to an amusement park in CA, resulted in 104 confirmed cases in 14 states. The majority of cases were not vaccinated, or did not know if they had ever been vaccinated.
2015	West Africa experiences an epidemic of Ebola which effects more than 28,000 people and results in more than 11,000 deaths worldwide. Cases spread to multiple continents via the air transportation grid, including the USA. Ebola becomes an occupational illness in the US spreading to 2 healthcare professionals who were treating an Ebola patient.
2015	Chikunguny virus is discovered in MX and 29 other countries, after spreading from the Caribbean. CDC adds this to the National Notifiable Disease Surveillance System as a reportable condition starting in Jan. 2016.
2015	Prior to 2015, Zika virus outbreaks occurred in Africa, Southeast Asia, and the Pacific Islands. In July of 2015, Brazil reported an association between Zika and Guillain-Barre syndrome. The Zika virus is spread through mosquito bites, and can cause birth defects and neurological disorders. In the U.S., Zika local mosquito-borne transmission has been reported in Brownsville, Texas and South Florida. There has been one symptomatic disease case in Nevada.

Table 3-10 below presents recent occurrences and outbreaks of infectious of major infectious disease affecting people in Nevada.

Table 3-10. Recent Historical Occurrences or Outbreaks in Nevada	
Date	**Details**
February 1992	Cholera outbreak confirmed. At least 26 passengers from Aerolineas Argentina Flight 386 that brought a cholera outbreak to Los Angeles traveled on to Las Vegas, where 10 showed symptoms of the disease. Cholera or cholera-like symptoms developed in 67 passengers of Flight 386.
Spring 2000	Five cases of the measles confirmed. Outbreak identified and confirmed, Clark County Health District (CCHD) Office of Epidemiology (OOE) worked with the Immunization Clinic and the media to alert the community about preventing the spread of the disease.
Oct 2004	Norovirus confirmed at a major public accommodation facility on the Strip in Las Vegas.
2004	During October 13-19, a total of 200 cases of human West Nile Virus were reported in 20 states, which included Nevada. During 2004, 40 states including Nevada reported a total of 2,151 cases of human West Nile Virus.
Fall 2004	Chickenpox (varicella) outbreak in Clark County, Nevada elementary school. 32 students from all grades were infected.
April 2006	Norovirus outbreak at a Reno, Nevada daycare. 30 Norovirus cases were confirmed. 2 additional people were infected after the daycare had been cleaned and sanitized.
March 2007	A norovirus outbreak in Las Vegas, Nevada sickened at least 215 inmates and 41 staff members at the Clark County Detention Center. Most of those sickened complained of stomach-related distress such as diarrhea, vomiting and cramps. None were hospitalized.
2009 - 2012	The novel H1N1 influenza virus became a global pandemic and in Nevada thousands of people were infected leading to 40 deaths.
2014-current	Outbreaks of Bovine Trichomoniasis are frequently dealt with by the Nevada Department of Agriculture.
2015	While no cases of Ebola present in NV, the heightened awareness and, to some extent, fear within the public causes the governor to form an Ebola Task Force to monitor the situation and develop medical response plans. Approximately, 32 persons in NV required active monitoring during this timeframe.
2015	Nevada healthcare personnel treat multiple cases of Measles related to the CA outbreak. Approximately 11 Nevadans were diagnosed or evaluated for measles.

3.3.4.3 Location, Extent, and Probability of Future Events

The past history of outbreaks including the 2009–2012 H1N1 influenza pandemic and the recent Ebola scare, have shown us that the state is vulnerable to emerging disease epidemics. The nature of jet travel has brought an unprecedented mode of disease transmission from an affected area to any other country in the world. The existence of Las Vegas and Reno as major world-class vacation destinations provides the potential for an influx of epidemic-causing pathogens from other countries. The Subcommittee ranked epidemic as a "low risk" hazard in Nevada.

In Nevada, the Nevada Division of Public and Behavioral Health (DPBH) and Local Health Authorities (LHAs) have surveillance systems in place, in cooperation with CDC to actively test for communicable diseases. Local sentinel providers send specimens to the Nevada State Health Laboratories and are required to report findings to DPBH. Epidemiologists track symptoms and diseases to determine if outbreaks are occurring and if mitigation practices need to be employed.

New cutting edge technologies are also being developed and refined that often provide early warning of potential outbreaks or epidemics. These *Epidemic Intelligence* systems forecast and automatically provide advisory of unusual disease activity similar to the operations of NWS. These systems are being developed through public-private partnerships, and the warnings are transmitted through TV news, social media or press releases directly to the public before any public health threat can fully develop. This enables proactive awareness and the opportunity to mitigate socio-economic disruption. Once these systems are fully functional, the WHO anticipates a fundamental shift in disease management from one of reaction to one of anticipation and pre-planning. One of the leading Epidemic Intelligence systems in the world is the Ascel Bio World Infectious Disease Forecast Center located at the University of Nevada Reno, School of Community Health Sciences.

Public health professionals have many ways to keep communicable diseases from becoming epidemics. Required immunizations are the most effective way to protect a community from some infectious diseases. Other ways include public information, personal hygiene, social distancing and in certain cases, isolation and quarantine measures are employed.

For animal disease mitigation, immunizations and disease screenings are used to protect domesticated animals. A large majority of the animals imported into the state of Nevada are required at a minimum to have an examination performed by a licensed veterinarian and a health certificate issued to further aid in animal disease mitigation (pasture to pasture movements are excluded).

If a disease outbreak is present in a localized herd, quarantines, movement restrictions, and possibly culling are options that may be utilized to prevent spread of disease.

It is unknown how climate change will affect the frequency or occurrences of epidemic in Nevada.

3.3.5 Expansive Soils (Low Risk)

3.3.5.1 Nature

Expansive soils are soils and soft rock that tends to swell or shrink as a result of changes in the moisture content. Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets, but building foundations are susceptible to distortion if built on expansive soils as well.

In the United States, two major groups of rocks serve as parent materials of expansive soils, and occur more commonly in the West than in the East. The first group consists of ash, glass, and other rocks of volcanic origin. Glass and aluminosilicate minerals in these volcanic materials often decompose to form expansive clay minerals (most commonly smectite, a group of clay minerals that incorporates significant amounts of water in their crystal structures). The second group consists of sedimentary rock containing clay minerals. Because clay materials are most susceptible to swelling and shrinking, expansive soils are often referred to as swelling clays. Expansive soils also include soils with sodium sulfate, which occur in the Las Vegas Valley. Expansive soils can be recognized by visual inspection in the field. Shales, claystones, weathered volcanic rocks, and residual soils containing smectite often have characteristic "popcorn" texture or "badlands" topography, especially in semi-arid areas.

Collapsible soils are related to expansive soils, such as soils in Las Vegas Valley that contain gypsum (hydrated calcium sulfate); gypsum can be dissolved by groundwater and the resultant loss of volume can cause collapse of the soil.

Most engineering problems caused by swelling clays involve soils underneath areas covered by buildings and slabs or layers of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. Houses and one-story commercial buildings are more prone to damage from expansive soils than multi-story buildings, which usually are heavy enough to counter the swelling pressures. If constructed on wet clay, multi-story buildings may be damaged by shrinkage of the clay if moisture levels are substantially reduced, such as by evaporation from beneath heated buildings.

3.3.5.2 History

Expansive soils are defined as soils that expand when water is added and contract when the soil dries out. This change in soil volume may cause homes built on these soils to move and foundations to crack as a result. Expansive soils are found throughout the US and cause billions of dollars in damage every year. Expansive soils will not generally cause problems if their water content remains unchanged – the greatest damage from expansive soils occurs when there are repeated or significant moisture content changes to these soils.

Expansive soils and clays occur in and near urban areas of Washoe and Storey Counties where hydrothermal alteration (associated with volcanism several million years ago) has converted volcanic rocks to smectite. The problem has been most acute to date in the hills on the north side of Reno and Sparks, but similar rocks occur in the foothills of Peavine Mountain, the Virginia Range, and the Carson Range. One example is a section of U.S. 395 between Clearacre Lane and Parr Boulevard that was reconstructed by NDOT in the early 1990s due to damage from expansive soils in a large cut area of the freeway's original construction. As development encroaches on higher elevations of surrounding foothills and slopes, expansive soils will become more of a risk to homeowners. As of 2012, the Washoe County construction design requirements dictate that "The Footings or foundations placed on or within the active zone of expansive soils shall be designed to resist differential volume changes and to prevent structural damage to the supported structure". In addition it states that "foundations extending into or penetrating expansive soils shall be designed to prevent uplift of the supported structure" and "foundations penetrating expansive soils shall be designed to resist forces exerted on the foundation due to soil volume changes or shall be isolated from the expansive soil".

In 1957, the Las Vegas and Eldorado Valleys Area Survey of soil was completed. The area had problems with displacement of house roofs up to 18 inches and concrete slab floors rising as much as 3 feet. In the report, the soil scientists found that these homes were destroyed by swelling soils. Salts in the soil became deliquescent at air temperatures of 41° to 45°F (5° to 7.2°C). Upon becoming deliquescent, the salts (sodium sulfate) in the soils took on 10 molecules of water from the atmosphere, causing the damage to homes and other buildings.

Between 1994 and 1999, Beazer Homes constructed and sold 206 single-family residences on a 40-acre residential subdivision in North Las Vegas. In April 2000, three homeowners filed a complaint against Beazer Homes for construction defects to their homes. The complaint alleged that their houses' foundations and concrete slabs were damaged by expansive soils *Shuette v. Beazer Homes Holding Corp., 121 Nev. Adv. Op. 82* (2005). The amendments to the Clark County building code include a required test to determine where expansive soils exist and that foundation design and special inspection for grading/foundations shall be based upon results obtained from this test.

In Nye County on the northwest side of Pahrump Valley, expansive soils were blamed for causing foundation and septic damage to homes in the area. Because of the septic damage, some of the land in

the area was contaminated. In response, the Nye County Commission passed a bill in October 2006, requiring disclosure of soil conditions to the buyer.

3.3.5.3 Location, Severity and Probability of Future Events

At this time, the risk of damage due to expansive soils occurs near the higher populated areas of Clark, Nye, and Washoe counties. Figure 3-19 is a swelling clay soil map of Nevada showing in general the locations of areas in the southern part of the state with soils containing a high percentage of high-swelling-potential clay. More detailed mapping on a much more localized scale is necessary to closely define these areas.

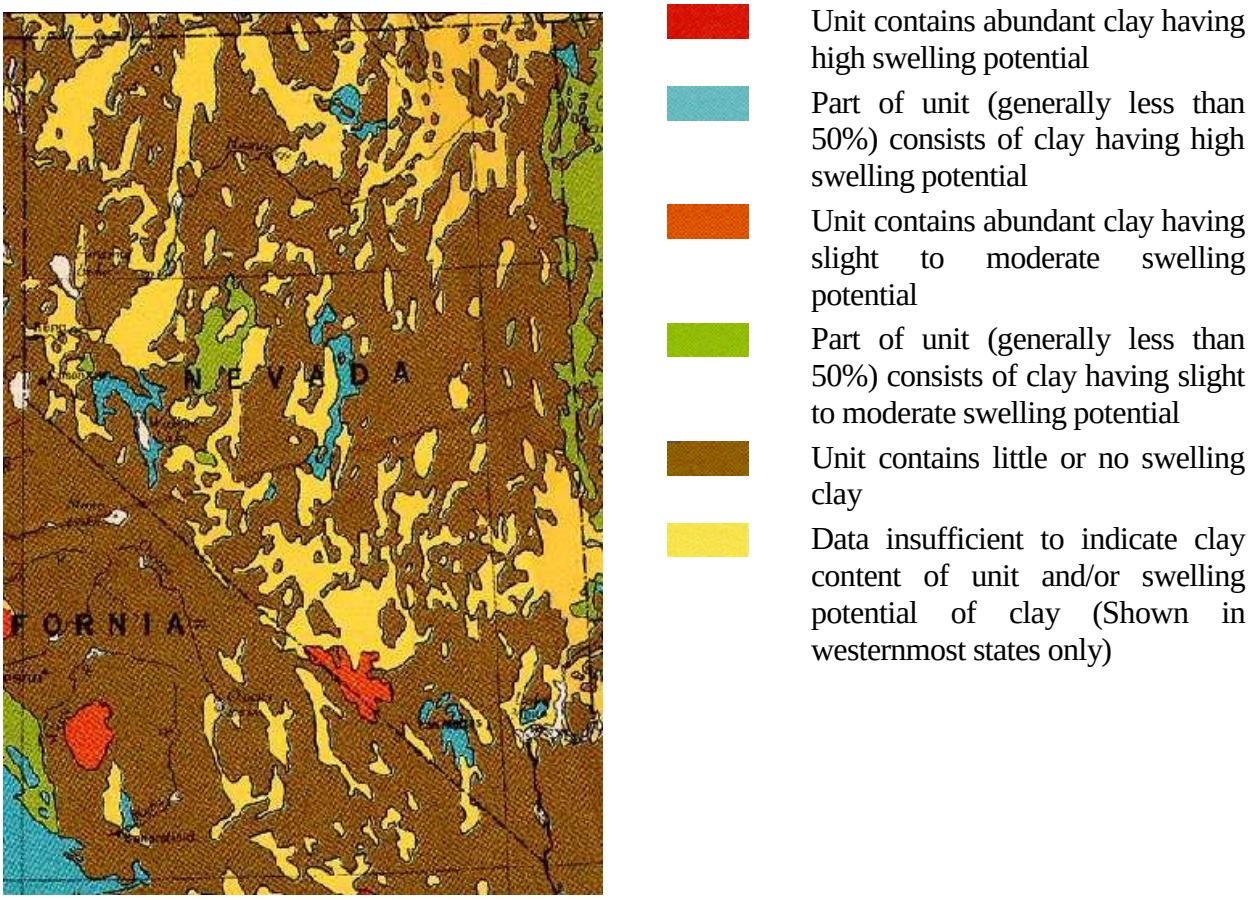


Figure 3-19. Swelling Clay Soil Map of Nevada

Source: 1989 U.S. Geological Survey, Swelling Clays Map of the Conterminous U.S. by W.W. Olive, A.F. Chleborad, C.W. Frahme. Julius Schlocker, R.R. Schneider, and R.I. Shuster; 1989

The best method to prevent or reduce damage from expansive soils is avoidance. When other choices are not possible, applied engineering practices such as removal of the soil, application of heavy loads, preventing access to water, presetting, or stabilization are necessary. No significant impacts to the occurrence of expansive soils in Nevada are expected as a result of climate change

Expansive soils are considered to be in the "Low Risk" hazard category from a State perspective because this hazard will most likely be handled efficiently by local authorities through their building codes or by NDOT through its building practices in areas prone to this hazard.

3.3.6 Extreme Heat (Medium Risk)

3.3.6.1 Nature

Heat may kill by pushing the human body beyond its limits. In extreme heat and humidity, evaporative cooling is diminished and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat.

Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect."

Heat waves kill more people in the United States than any other disaster. It was estimated by the University of Delaware that, on the average, 1,500 American city dwellers die each year due to heat. By comparison, annual deaths from tornados, earthquakes and floods combined average fewer than 200 nationwide.

Excessive heat during the nighttime hours is a predictor of heat-related injury and deaths. Nighttime temperatures in the 85th percentile of the temperature distribution are likely to set the stage for an increase in heat-related deaths and injuries.

Livestock and pets are also at great risk for heat-related death or injury during long periods of temperatures in the 85th percentile.

Extreme heat coupled with higher elevation produces a hazard to air-traffic due to lower density of hot air. In July of 2006 Las Vegas McCarran International Airport canceled or delayed commercial flights because of heat and altitude density guidelines. Smaller, less powerful aircraft are more at risk of heat related performance problems. Local and regional power infrastructure can also be stressed due to heavy demand for air conditioning during prolonged heat waves. This has been seen extensively in California with occasional more localized impacts in Nevada. Other effects of heat waves include buckled roadways and train derailments.

The current predictability of heat waves is very good, with broad heads-up possible 5-10 days in advance, with more specific details and impacts 1-4 days ahead. Currently, NWS is experimenting with Heat Impact Levels data which can attempt to correlate health impacts to forecast temperatures up to 7 days in advance.

3.3.6.2 History

Las Vegas is located in a broad desert valley in extreme southern Nevada extending over about 600 square miles elongate from northwest to southeast. Mountains surrounding the valley rise 2,000 to 10,000 feet above the valley floor. The valley is bounded on the north by the Sheep Range, while Boulder City and the Lake Mead National Recreation Area are considered its southern extent. To the west are the Spring Mountains, which include Mt. Charleston, the region's highest peak at 11,918 feet. Several smaller ranges line the eastern rim of the valley, including the Muddy Mountains, the Black Mountains and the Eldorado Range.

Official weather observations began in 1937 at what is now Nellis Air Force Base. In late 1948, the U.S. Weather Bureau moved to McCarran Field, now McCarran International Airport. The Las Vegas Valley summers display classic desert southwest characteristics. Daily high temperatures typically exceed 100 degrees with lows in the 70s. The summer heat is tempered by the extremely low relative humidity. Because of the valley's typical summer temperatures, residents who are not careful can be overcome by heat-related illness such as sunburn, heat exhaustion, heat cramps, and heat stroke.

Table 3-11 is a sampling of recent extreme heat events in southern Nevada which have resulted in impacts, the worst being the prolonged extreme heatwave of late June into early July 2013. None were received for central and northern Nevada since 2007.

Table 3-11: Recent Extreme Heat Events in Southern Nevada

Date	Impacts
June 19-21, 2016	Temperatures reached Excessive Heat Warning levels June 19th through the 21st, and then persisted just below those levels through the 29th. The heat caused or contributed to nine direct and eight indirect fatalities from the 20th through the 29th. High temperature at Las Vegas on June 20 was 115.
June 3-8, 2016	High temperatures in Las Vegas ranged from 105F to 109F for six days, with five of the six reaching 107F or higher. The excessive heat caused or contributed to ten deaths.
July, August 2015	Multiple excessive heatwaves resulted in 22 direct heat related deaths in the Las Vegas vicinity. Peak temperatures were 110°.
June, July 2014	Multiple excessive heatwaves resulted in 9 direct heat related deaths in the Las Vegas vicinity. Peak temperatures in late June hit 112°.
July 1-4, 2013	Excessive Heat Warning criteria were reached each day from the 1st through the 4th. Hundreds of people were overcome by the heat. An unusually high mortality rate persisted until July 11th, by which time 39 people had died (including two in June). Another man died in September after being found unresponsive on July 5th. Temperatures ranged from 111-115°. The overnight low on July 1 was an all-time record 95°.
June 28-30, 2013	Excessive Heat Warning criteria were reached each day from June 28th through 30th, and continued into July. Hundreds of people were overcome by heat in the Las Vegas Valley, including two fatalities. The heat also knocked out power to 132 customers for less than two hours on the afternoon of the 29th. Temperatures ranged from 114-117°.

Northern Nevada also experiences extreme heat conditions in the summer months. The month of July 2002 set records for high temperatures. On July 10th and 11th, the Reno Airport reached 108º F, setting an all-time record for that area with records dating back to 1893. This reading was reached again July 5, 2007 with 106º F the day before. Reno has seen 13 days of 105º F or higher since records began, with the vast majority since 2002. For comparison Elko has seen 11 days at 105º F or higher, but interestingly all of these occurred before 1982. As a side note, to show the extreme heat contrasts from north to south across Nevada, Las Vegas averages 38 days of 105º + each year!

These extreme heat days for northern Nevada are mitigated some by the fact that most of these days saw sufficient cooling at night, with low temperatures dipping into the 60s or sometimes even the 50s. Informal conversations between NWS and local and state health departments have not revealed widespread heat health incidents in the general public across northern Nevada, even during longer heatwaves. Due to the hotter temperatures, southern Nevada has seen these health impacts more frequently.

Extreme Heat Events

Table 3-12 is a summary of heat extreme data prepared by the State Climatologist for each county in Nevada, showing the average number of days per year with temperatures greater than 100 º F. This is based on the historical record of available climate summary data for representative sites within each county. The data will assist each county in its emergency preparedness and response planning for heat extremes. The complete report of heat extremes throughout Nevada from which this table is summarized is contained in Appendix K.

Table 3-12. Heat Extreme Events by Community

County	Community	Average number of days per year with temperature above 100°F
Carson City	Carson City	1.34
Churchill	Fallon NAS	10.65
Churchill	Hawthorne Airport	8.98
Clark	Searchlight	24.87
Clark	Las Vegas Airport	74.48
Clark	Indian Springs	68.15
Clark	Valley of Fire	83.31
Clark	Mesquite	96.8
Douglas	Minden	2.79
Douglas	Glenbrook	0.00
Douglas	Topaz Lake	1.92
Elko	Elko Airport	3.01
Elko	Jiggs	0.46
Elko	Tuscarora	0.00
Elko	Clover Valley	0.00
Elko	San Jacinto	0.60
Esmeralda	Coaldale Junction	32.10
Esmeralda	Goldfield	0.73
Esmeralda	Silverpeak	23.45
Eureka	Eureka	0.35
Eureka	Beowawe	5.06
Humboldt	Winnemucca Airport	5.86
Humboldt	Quinn River Crossing	3.73
Lander	Battle Mountain	9.55

Table 3-12. Heat Extreme Events by Community		
County	**Community**	**Average number of days per year with temperature above 100°F**
Lander	Austin	0.18
Lincoln	Elgin	29.81
Lincoln	Caliente	13.84
Lincoln	Pioche	1.49
Lincoln	Pahranagat	28.36
Lyon	Wellington	0.33
Lyon	Yerington	3.62
Lyon	Fernley	10.28
Mineral	Mina	12.65
Mineral	Thorne	8.69
Nye	Tonopah	2.03
Nye	Pahrump	50.71
Nye	Sarcobatus	28.10
Nye	Duckwater	1.12
Nye	Smoky Valley	0.84
Pershing	Imlay	7.64
Pershing	Lovelock Derby Field	11.11
Pershing	Paris Ranch	20.26
Pershing	Derby Field	6.02
Storey	Virginia City	0.02
Washoe	Reno Airport	3.5
Washoe	Vya	0.06
Washoe	Sand Pass	5.57
Washoe	Nixon	4.72
White Pine	Ely Yelland Field	0.04
White Pine	Lund	0.35
White Pine	McGill	0.20

Source: NV State Climatologist

3.3.6.3 Location, Severity, and Probability of Future Events

Although extreme temperature hazard occurs mainly in the southern portion of the state, all of the counties reach high temperatures in the summer months, mainly in June and July. Nevada's dry desert climate often leads to very low relative humidity during extreme heat episodes. This "dry heat" minimizes the effects of stress on the body, keeping the Heat Index to tolerable values.

The NHM Planning Subcommittee rated extreme heat as a "Medium Risk" hazard in Nevada; most communities are able to deal with it with normal emergency preparedness and response planning.

Climate Change

Based on the most recent long range simulations, climate change can be expected to lead to more episodes of extreme heat in Nevada, especially southern Nevada. The number of 105°+ days will likely increase, making the duration and severity of heat waves more extreme. Perhaps of more importance – based on the scientific consensus and what has already been observed, average, overnight low temperatures are projected to increase perhaps considerably in the coming decades. This will remove the mitigating effect of cooling off at night which has helped northern Nevada minimize health impacts from recent heatwaves.

3.3.7 **Floods** (High Risk)

3.3.7.1 Nature

Flooding is the accumulation of water where there usually is none, or the overflow of excess water from a stream, river, lake, canal, reservoir, or coastal body of water onto adjacent floodplains. Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Flooding may occur slowly over several days as a result of rainfall or snowmelt, or rapidly due to an event such as an earthquake or dam failure. Flooding due to dam failure is a special case addressed in a separate subsection at the end of the Flood section.

Floods also occur along streams and arroyos (stream channels that are normally dry) that do not have classic floodplains. These include flash floods in mountains (sometimes with rapidly rising water several tens of feet deep) and on alluvial fans, which are typically fan-shaped, gently sloping areas between the steep parts of mountain ranges and the nearly flat valley floors. Because much of Nevada is part of the Great Basin (an area of internal drainage, in which streams are not connected to rivers that flow to the oceans), flood waters commonly drain into interior lakes (e.g. Walker Lake at the terminus of the Walker River, Pyramid Lake at the terminus of the Truckee River), wetland areas (e.g. Carson Sink at the terminus of both the Carson and Humboldt Rivers), or playas (normally dry lake beds, such as Roach Lake, south of Las Vegas, where a new airport is planned).

Floods are described in terms of their extent (including both the horizontal surface area affected and the vertical depth of floodwaters) and the related probability of occurrence.

Factors contributing to the frequency and severity of flooding include the following:

- Time of year and temperature
- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- Changes in landscape resulting from wild fires (loss of moisture-trapping vegetation and increased sediment available for runoff)
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams, irrigation ditches, canals, and roadways

- The existence of flood control features, such as levees, flood control channels, and detention basins
- Velocity of flow
- Availability of sediment for transport, and the susceptibility of the bed and banks of the watercourse to erosion

Floods from snow-melt caused by heavy, long-duration rainfall can occur anytime between October and March. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions, when the ground is frozen and infiltration is minimal, or when warm rain on the snow in higher elevations of the tributary areas adds snow melts to rain flood run-off. These storms are also known as wet-mantle storms.

Severe but localized flooding may also result from cloudburst storms centered over tributary basins. These storms may occur from late spring to early fall, but generally occur in June, July, and August. Runoff from cloud bursts is characterized by high peak flows with a short duration. These storms are also known as dry-mantle storms, causing flash floods or debris flows.

Floods are natural events that are considered hazards only when people and property are affected. Nationwide, on an annual basis, floods have resulted in more property damage than any other natural hazard. Physical damage from floods includes the following:

- Injury or loss of life
- Inundation of structures, causing water damage to structural elements and contents.
- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features rendering them unstable or useless.
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects.
- Inundation of cars, trucks, and other types of vehicles.
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands.
- Release of sewage and hazardous or toxic materials as wastewater treatment plants are inundated, storage tanks are damaged, and pipelines severed.

Floods also cause economic losses through closure of businesses and government facilities; disrupt communication; disrupt utilities such as water and sewer service; result in excessive expenditures for emergency response; and generally disrupt the normal function of a community.

3.3.7.2 History

The history of flooding on Nevada provides the factual basis for establishing the location, severity and probability of future flooding in Nevada. A chronology of major flooding information is presented below in two tables, Table 3-13 for northern Nevada (includes the Truckee, Carson, Walker and Humboldt watersheds) and Table 3-14 for southern Nevada (includes the Las Vegas area, the lower Colorado River watersheds, and Lincoln County). In addition to major flooding along Nevada's rivers, localized flooding has occurred as a result of dam failure, flash floods, debris flows, and mudslides, and failure of canal walls and other irrigation structures, some of which have caused declarations of disaster

in parts of Nevada. Major flooding events of this type are also included in the tabulated flood chronologies. Flood studies often use historical records, such as stream flow gauges, to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed as a percentage for the chance of a flood of a specific extent occurring in any given year.

Table 3-13. Chronology of Major Flooding in Northern Nevada

Date	Location	Description	Estimated Losses
December 1852	Carson Valley	Two days of heavy snowfall followed by four days of warm rain caused flooding reported in the Carson Valley and likely along other western Nevada rivers as well.	Little damage occurred because most settlements were located away from the low areas. No figures available.
December 1861-January 1862	Carson and Truckee River Basins	Warm rain following heavy snow in December 1861 caused widespread flooding that caused Carson Valley to become a lake.	Little reported damage because most settlements were located along the eastern slope of the Sierra Nevada away from the low areas. No figures available.
1862	Humboldt River Basin	Earliest year in which widespread flooding was recorded throughout the Humboldt River and its sub-basins.	Due to limited human inhabitation, little is known of the damage or effects of the flood. No figures available.
December 1867-January 1868	Carson and Truckee River Basins	Unseasonably warm rain from late December through early January melted heavy snow pack in the Sierra Nevada. Carson Valley became a lake and flooding exceeded the 1861 flood crest. All bridges in the Carson Valley were swept away.	No figures available.
December 1867-January 1868	Humboldt River Basin	Wet-mantle flooding in the South Fork of the Humboldt River and its tributaries caused localized flooding.	Few records of damage are available.
January-June 1870	Humboldt River Basin	Wet-mantle flooding in the South Fork of the Humboldt River and its tributaries caused localized flooding.	Few records of damage are available.
April 25 1876	Humboldt River Basin	Failure of an irrigation dam across the Humboldt River at Shoshone Canyon, about 22 miles east of Battle Mountain near present-day Dunphy resulted in a	No figures available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		huge volume of water rushing through the canyon and flooding several ranches in the river bottom below.	
July 23 1876	Humboldt River Basin	A series of heavy thunderstorms in the headwaters of Maysville, Crum, Dean and Lewis canyons draining Mount Lewis, southeast of Battle Mountain caused severe localized dry-mantle floods downstream. The most severe was the Lewis Canyon flood that destroyed nearly every building in the mining town of Lewis. Heavy rain. Along the stream bottoms, 50-foot high cottonwoods and willow thickets were uprooted and mixed together with bottom soil and huge boulders into debris flows that traveled up to 10-12 miles downstream.	No figures available.
August 15 1878	Humboldt River Basin	Thunderstorm-induced dry-mantle flooding caused a wall of water, mud and rocks up to ten feet high to flow down Pony Canyon and along Main Street in Austin. The flood destroyed both residential and commercial buildings, and left a three-foot layer of mud and debris in Austin's streets. It took three months of intense efforts to fully repair the damage.	No figures available.
January-May 1881	Little Humboldt River Basin	Sustained rains on heavy winter snow pack caused extensive localized flooding. All reservoir dams along Kelly Creek and in Squaw Valley were completely destroyed and were never rebuilt. Mines were flooded, mill dams and roads were washed out, bridges were damaged and livestock drowned.	No figures available.
June 27 1883	Humboldt River Basin	The last remaining dam on the Humboldt River at Lovelock broke leaving a number of the largest ranchers without irrigation water.	No figures available.
May-June 1884	Humboldt River Basin	Rapid snow melt and heavy spring rains caused an extensive period of wet-mantle flooding in the Humboldt River Basin	Few records of damage are available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		and its tributaries. In Austin, flooding damaged the Manhattan Mill and the sawmill. Reese River washed out the Nevada Central Railroad line 40 miles south of Battle Mountain. Flooding along the lower Humboldt formed a vast lake extending over thirty miles from Beowawe to Battle Mountain, covering the railroad track and damaging the road bridge across the Humboldt River in Battle Mountain. Later in June, the dam at the Humboldt dike outflow of the Humboldt River and Toulon Lakes, was blown up by local ranchers after which it was never rebuilt.	
January-February 1886	Reese River sub-basin of the Humboldt River Basin	Heavy rain on snow pack caused flooding along the entire Reese River drainage system and Humboldt from Austin to Battle Mountain causing extensive erosion and sedimentation damage.	No figures available.
March-June 1890	Humboldt River Basin	Spring melting of the huge snow pack from the 1889-1890 "Winter of White Death" caused flooding that destroyed bridges on the only two main N-S roads between Elko and the White Pine mines, closing those roads. Maggie and Susie Creeks flooded low-lying areas of Carlin. Flooding caused heavy livestock losses along the Reese River drainage, near Battle Mountain, and in Paradise Valley that eventually drove the large cattle companies into liquidation. Two of Lovelock Valley's five irrigation dams along the Humboldt River were completely washed away.	No figures available.
May 1906	Humboldt River Basin	Heavy rainfall caused the failure of a reservoir dam with six deaths resulting. Various structures were damaged and horses and mules died. Southern Pacific railroad tracks were undermined.	Six lives were lost. No figures available on other losses.
March	Walker,	Snow and later rain from March 16 through	No figures available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
1907	Carson and Truckee River Basins	March 20 flooded the Truckee, Carson and Walker Rivers. The Truckee River severely damaged the Electric Light Bridge. In Carson Valley, all bridges on the East and West Forks and the main-stem of the Carson River as well as Carson River were destroyed or seriously damaged.	
February - April 1907	Humboldt River Basin	Heavy rains melted deep winter snow pack in the lower Humboldt River Basin below Battle Mountain caused flooding along the entire lengths of both the Little Humboldt River and the main Humboldt River, and their tributaries. Flooding drowned one person and some livestock.	No figures available.
February-April 1910	Humboldt River Basin including Mary's River	Warm rain on snowpack caused the worst flooding in history with a greater than 100 year recurrence interval. Carlin, Elko, Battle Mountain, Winnemucca, and Lovelock areas were all severely flooded. Flooding severely damaged mining camps and all railroad bridges and tracks in the region. All major irrigation dams and canals were washed out throughout the region	No figures available.
July 1913	Little Humboldt River Sub-basin	Dry mantle flooding from severe thunder and rainstorms. Widespread damage to hay fields in Paradise Valley, Humboldt County. A stranded automobile was covered with 25 to 30 feet of debris.	No figures available.
January-April 1914	South fork Humboldt River	Rain on melting snow caused wet mantle flooding that damaged multiple bridges, roads, trestles, reservoirs, diversion channels, and farms.	No figures available.
February - March 1917	Humboldt River Basin	Wet-mantle flooding along the lower reaches of the Humboldt River Basin caused considerable road and bridge damage below Lamoille Creek. High water in the South Fork drainages washed out roads and bridges between Jiggs and Elko and lowlands around Ryndon were inundated. Pine Creek flooding damaged or destroyed the railroad grade and bridges disrupting	No figures available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		railroad traffic for two weeks.	
June 22 1918	Humboldt River Basin	Heavy rains in the Santa Rosa Mountains caused dry-mantle flooding in the Paradise Valley area of the Little Humboldt River sub-basin. There was localized flooding along drainages west and northwest of Paradise Valley.	No figures available.
January 1921	Truckee Canal, part of the TCID irrigation system	The Truckee Canal was breached at approximately Station 1100+00. (later identified by the Regional Engineer in field review following 2008 breach).	No figures available.
February-March 1921	Humboldt River Basin	Wet mantle flooding caused moderate damage to railroad track and bridges and extensive damage to meadow lands in the basin.	No figures available.
April–June 1922	Humboldt River Basin	Wet mantle flood event locally within the Maggie Creek and Little Humboldt River sub-basins. (Maggie Creek experienced its highest flow on record, which stood until 1962).	No figures available.
July 1927.	Browns Creek, SW of Reno, Washoe County	More than two inches of rainfall per hour caused the Grass Lake irrigation reservoir to fail flooding land below.	No figures available.
March 1928	Walker, Carson and Truckee River Basins	Snow and rain from March 23 through March 26 caused flooding in the Carson Valley, where both forks of the Carson River and the main-stem Carson River overflowed their banks, but little damage was caused.	No figures available.
March–June 1932	Humboldt River Basin	Rapid heavy snowmelt caused flooding in the Humboldt River Basin, especially in Lovelock Valley. The Big Five Diversion was washed out (damaged earlier in 1910 and 1914)	No figures available.
December 1937	Carson and Truckee River Basins	Heavy rain on snowpack from December 9 through December 13 caused flooding. On the East Fork Carson River, the Douglas Power (Ruhenstroth) Dam was severely damaged. In the south end of Carson Valley near Gardnerville, the flood on the	No figures available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		East Fork Carson River crested at 10,300 cfs late in the afternoon of December 11.	
December 1937-May 1938	Humboldt River Basin	Heavy snows and rain caused extensive flooding in the Little Humboldt River sub-basin and bridge damage in Paradise Valley.	No figures available.
April-May 1942	Humboldt River Basin	Severe wet mantle event caused extensive flooding in Elko with water several feet deep in the streets, as well as Battle Mountain. Extensive damage to bridges, roads, irrigation structures, dams, canals, ranch buildings and erosion damage to cropland range areas.	No figures available.
January 1943	Upper Humboldt River Basin	Severe wet mantle flooding washed out Hot Creek reservoir and levees in Elko County. Flooding closed highways and caused severe damage to railroads, roads, bridges, and structures throughout the basin.	No figures available.
November December 1950	Walker, Carson and Truckee River Basins.	From November 13 to December 8, continued rain and high temperatures melted early snow pack in the Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. The greatest discharge was in the urban areas of Reno and Sparks, where water stood 4 feet deep in the main floor of the Riverside Hotel. Over 3,500 acres of agricultural land in the Truckee Meadows East of Reno was flooded.	The estimate of damages in the three river basins was $4.4 million (USGS, 1954; $27.6 million in 1997 dollars); half in Reno. Two deaths were reported, and about 200 persons were evacuated from their homes.
February-May 1952	Humboldt River Basin	Wet mantle flood due to rapid melting of the snowpack caused considerable damage throughout the basin to roads, bridges, railroad tracks, ranches. Much watershed erosion and extensive damage to dams and levees.	No figures available.
July 1952	Humboldt River	Reese River sub-basin. Violent summer thunderstorms caused extensive mud- and debris flows of water, mud, rocks, and logs on many of the Toiyabe Range drainages south of Austin. Extensive gullying, channel head-cutting and sheet erosion damaged crop irrigation systems.	No figures available.
December	Truckee,	Intense late December storm dropped 10 to	The estimate of

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
1955	Carson and Walker River Basins	13 inches of rain that melted snow pack in the Northern Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. Downtown Reno area flooding was as extensive as in 1950 but damage to buildings was not as severe as that of the 1950 flood due in part to pumping and erection of sandbag dikes. The Reno airport was flooded to a depth of 4 feet. Derby Dam on the Truckee River east of Vista failed, and Hobart Dam, at the headwaters of Franktown Creek failed and released water that severely damaged U.S. 395.	damages in the three river basins was $3,992,000 ($22,327,000 in 1997 dollars). One life was lost.
December 1955	Truckee, Carson and Walker River basins	Flooding on tributary streams draining the area surrounding Reno and Sparks caused damage to property in areas away from the Truckee River.	No figures available.
August 6-28 1961	Humboldt River Basin	Battle Mountain sub basin. A series of thunderstorms resulted in severe channel cutting, mud & rock flows and sedimentation in streams draining the western slopes of the Cortez Range in Crescent Valley.	No figures available.
February 1962	Humboldt River Basin	Wet mantle flooding caused extensive damage to Battle Mountain, where over 200 residents were evacuated due to water depth of up to 5 feet. Up to 1,500 head of cattle drowned. There was extensive railroad damage and damage to buildings, diversion structures, irrigation ditches, and cultivated fields throughout the basin.	Estimated 1962 value of losses was approximately $1.5 million.
January February 1963	Truckee, Walker and Carson River Basins	After months of drought, an intense high-temperature storm lasted from January 28 through February 1, dropping up to 13 inches of precipitation. There was extensive flooding in Reno with about 20 square blocks in the downtown area inundated up to 4 feet deep. The airport was flooded as in 1955.	Damage in the three river basins at the time was estimated at $3,248,000.
December 1964	Truckee and Carson River Basins	Torrential warm rains over December 21-23, melted part of the snow pack causing flooding similar to the December 1955	The estimate of damages in these two river basins at the time

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		flood.	was $2,236,000.
January 1969	Humboldt River Basin	Heavy rain on snow caused flooding on the Little Humboldt River and on Martin Creek which enters Paradise Valley. Peak outflows of the Little Humboldt were recorded at 2,380 cfs	No figures available
May 1983	Ophir Creek, Washoe Valley, Washoe County	A landslide off Slide Mountain hit Upper Price Lake and sent a 15- to 20-foot-high mudflow of water, mud, and boulders traveling 40 mph, down Ophir Creek into Washoe Valley killing one person and covering a 1,800-foot stretch of U.S. Highway 395 with mud and debris.	One person was killed, several injured and multiple residences damaged; No figures on damages.
April-June 1984	Humboldt River Basin	Extensive snow melt with a recurrence interval >100	No figures available.
February 1986	Truckee and Carson River Basins	Unprecedented rains over a 10-day period in February 1986 caused severe flooding along the in the Truckee and Carson River Basins and to a lesser extent along the Walker River. Maximum precipitation for the period was 12 inches in valley areas, 20 inches in the foothills of the Sierra Nevada, and 30 inches in the higher mountains. Flows in the Truckee River in the Reno-Sparks area and in the Carson River at Carson City were the greatest since 1963. Downstream on the Carson River near Fort Churchill, the flow was the greatest since record-keeping began in 1911 in the Truckee Meadows. All but two bridges in Reno over the Truckee Rivers were closed. The rains caused several small landslides. Some residents became stranded or were evacuated.	Damage resulting from this flood was estimated at the time to be $12,700,000.
March 1995	Long Valley Creek, Truckee River Storey County	Flooding occurred in the Rainbow Bend subdivision at Lockwood where Long Valley Creek enters the Truckee River in Storey County	Caused over $2.5 million in damage.
December 1996	Truckee Canal – part of the Truckee-	The Truckee Canal (part of the TCID irrigation system) was breached early on in the Truckee River flood event, flooding 60 homes in the Fernley area. Canal breach	More than 60 homes were flooded.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
	Carson Irrigation District (TCID) irrigation system	occurred at approximate Canal Station 800+00 on the north embankment. The breach site was identified by the Regional Engineer in field review following the 2008 canal breach.	
December 1996 - January 1997	Truckee, Carson, and Walker River Basins	Heavy snow and rain from December 1996 into January 1997 melted Sierra Nevada snow pack causing widespread flooding over approximately 63,800 acres. Floods inundated many residences and businesses in the Truckee Meadows, closed most bridges across the Truckee in Reno, closed the Reno/Tahoe International Airport, and flooded warehouses up to 6 feet deep in the industrial sections of Sparks and east Reno.	Two lives were lost: one in Washoe County and one in Douglas County. Direct damages estimated between $167 million and $169 million. Additional hundreds of millions of dollars in lost business and travel.
January 1997	Carson, Douglas, Lyon, Storey and Washoe	Flooding, mudslides and debris flows along smaller drainages in Carson, Douglas, Lyon, Storey and Washoe counties were coincident with the flooding on the major rivers in northern Nevada.	No figures available.
June 2002	Northern Reno-Sparks area	Flash flood and debris flow/mudslide occurred on the alluvial fan where the new Spanish Springs High School was in the final stages of completion, Washoe County.	More than $500,000 damage to the new Spanish Springs High School
Dec., 2005-Jan. 2006	Elko County	In Elko County, winter flooding damaged two bridges in Jarbidge, the Midas Road, and irrigation structures and cattle guards along the Tuscarora Road.	No figures available.
Dec. 31, 2005-Jan 1 2006	Truckee River	Up to 6-8 inches of rain in the Lake Tahoe basin caused widespread localized flooding along the eastern Sierra. The Truckee River crested at about 13.6 feet, 2.6 feet above flood stage in downtown Reno, flooding several buildings in the downtown area and an undetermined number of businesses downstream in the Sparks industrial area where it crested at 19.2 feet, 4.2 feet above flood stage. The State EOC was activated and reported that five counties made local declarations.	No figures available.
Jan 1 2006	Carson	Widespread heavy rain from December	No figures available.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
	River Basin including tributaries in Carson Valley, Carson City and the Dayton Valley area	30-31, 2005 caused flooding throughout the Carson River Basin. USGS stream flow data indicate the flow at East Fork Carson River near Gardnerville, Nev., peaked at 8,920 cfs; the flow at Carson River near Carson City, Nev. at 13,200 cfs, and the flow at Carson River at Fort Churchill, Nev. at 10,300 cfs.	
January 5-8 2008	South of Cottonwood Lane, Fernley area, Lyon County	The Truckee irrigation canal breached at 4:19 AM flooding about 800 homes and displacing about 1,500 residents from flooded homes in the Green Valley, Tuscany Villa, Aspen Meadows, Shady Grove and Farm Lane areas.	There were 3.92 million estimated damages to public infrastructure. There was a ten million dollar settlement collectively from insurance, the irrigation companies, and the counties involved.
August 2014	Douglas County	Johnson Lane Flash Flooding on an alluvial fan.	No figures available.
July 2015	Douglas County flash flooding	Flash Flooding on an alluvial fan.	No figures available.
July 2015	Douglas, Lyon, Storey, and Washoe Counties	Flash Flooding.	No figures available.
October 2015	Lyon County	Walker River Flooding.	No figures available.
January 5-14 2017	Truckee River and Carson River Basins	Winter flooding resulted in a Presidential Disaster Declaration due to Severe Winter Storms, Flooding, and Mudslides. Areas included in this disaster declaration were the independent city of Carson City, Douglas, Lyon, Storey, and Washoe Counties as well as for the Pyramid Lake Paiute Tribe of the Pyramid Lake	Estimated damages from this flood were $12,521,846.

Table 3-13. Chronology of Major Flooding in Northern Nevada			
Date	**Location**	**Description**	**Estimated Losses**
		Reservation, the Reno-Sparks Indian Colony and the Washoe Tribe of Nevada and California.	
February 5-22 2017	Truckee River, Carson River, and Humboldt River Basins	Winter flooding resulted in a Presidential Disaster Declaration due to Severe Winter Storms, Flooding, and Mudslides. The areas included in this disaster declaration were the counties of Douglas (including the Washoe Tribe of Nevada and California within the State of Nevada), Elko (including the Te-Moak Tribe of Western Shoshone Indians of Nevada – South Fork Band), Humboldt, and Washoe and the independent city of Carson City.	Estimated damages from this flood were $17,715,152.



Figure 3-20. January 9, 2017 Flooding, Sparks Residential Area.

Photo courtesy of Jack Hursh.

The history of flooding in southern Nevada is summarized below in Table 3-14. Please see Appendix K for additional State Climatologist data pertaining to precipitation extremes by county and Section 7 for flood history sources.

Table 3-14. Summary of Major Flooding in Southern Nevada

Date	Location	Description	Estimated losses
March 31, 1906	Las Vegas Valley	Flooding: 70 miles of track, bridges, and fills were swept away.	No property damage estimate is available.
August 25, 1906	Las Vegas Valley	Heavy rains: the water washed through the streets in heavy torrents.	No property damage estimate is available.
August 15, 1908	Indian Springs area, Las Vegas Valley	Cloudburst: 10 miles west of Las Vegas. Flooding washed out one mile of road.	No property damage estimate is available.
August 21, 1909	Las Vegas Valley	Heavy rains caused flooding that damaged 30 feet of railroad track north of Las Vegas.	No property damage estimate is available.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
January 8, 1910	Las Vegas Valley	Melting snow and torrential storms: major flooding, washed away farms, trains, roads, etc. A train was washed away in Caliente area. Muddy Valley had the largest flood in years.	No property damage estimate is available.
January 15, 1910	Virgin Valley area, Las Vegas Valley	Flooding in the Virgin Valley area washed away a home, dams, livestock and crops.	No property damage estimate is available.
January 18, 1911	Las Vegas Valley	The Salt Lake Railway was washed out by flooding.	No property damage estimate is available.
March 18, 1911	Las Vegas Valley	Snowstorms and rain flooded out the Salt Lake Railway.	No property damage estimate is available.
February 28, 1914	Las Vegas Valley	Several washouts took out the railway. It also took out two farms.	No property damage estimate is available.
May 12, 1917	Las Vegas Valley	Large flood: road between Goodsprings and Jean was damaged.	No property damage estimate is available.
August 4, 1917	Las Vegas Valley	Large flood damaged alfalfa crops on the Moapa Indian Reservation.	No property damage estimate is available.
March 16, 1918	Las Vegas Valley	Large flood damaged farms in Mesquite and Bunkerville.	No property damage estimate is available.
July 24, 1920	Las Vegas Valley	Heavy storm: crops and boarding house were destroyed.	No property damage estimate is available.
August 27, 1921	Las Vegas Valley	Heavy torrential rain: Las Vegas had no damage, Moapa Valley had damaged roads, Rio Virgin Valley had a lot of damage.	No property damage estimate is available.
January 7, 1922	Las Vegas Valley	Flashflood through Meadow Valley Wash. Damaged railroad tracks to Caliente.	No property damage estimate is available.
July 14, 1923	Las Vegas Valley	Flashflood: damage to farms, damage to the road from Las Vegas to Searchlight.	No property damage estimate is available.
July 28, 1923	Las Vegas Valley	Thunderstorm in Las Vegas caused damage to commercial, residential, and public buildings. Severe fiscal damage to the railroad company.	No property damage estimate is available.
August 28, 1925	Las Vegas Valley	Heavy storm: Las Vegas to Searchlight road damaged.	No property damage estimate is available.
Sep. 19, 1925	Las Vegas Valley	Flash flood caused considerable damage to farms.	No property damage estimate is available.
August 30, 1927	Las Vegas Valley	Highways around Las Vegas were flooded.	No property damage estimate is available.
August 5, 1929	Las Vegas Valley	Heavy deluge washed out highways around Las Vegas and several roads in the city.	No property damage estimate is available.
August 27, 1929	Las Vegas Valley	Heavy deluge wrecked a state highway near Charleston turnoff.	No property damage estimate is available.
August 23, 1930	Las Vegas Valley	Cloudburst damaged Arrowhead Trail, section of an underpass, and the highway.	No property damage estimate is available.
August 12, 1931	Las Vegas Valley	Heavy rainstorm, cloudburst, caused structural damage to commercial property.	No property damage estimate is available.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
July 11, 1932	Las Vegas Valley	Heavy storm caused much structural damage.	No property damage estimate is available.
August 27, 1932	Las Vegas Valley	Lower Virgin River Bridge was washed out from three cloudbursts.	No property damage estimate is available.
August 29, 1932	Las Vegas Valley	Heavy deluge: farms around Mesquite covered in one to three feet of mud.	No property damage estimate is available.
August 21, 1933	Las Vegas Valley	Heavy deluge: Midway residents reported mud in their homes.	No property damage estimate is available.
August 21, 1934	Las Vegas Valley	Heavy deluge: Fremont Street became a raging river.	No property damage estimate is available.
September 24, 1935	Las Vegas Valley	Cloudburst washed away roads on the Los Angeles highway.	No property damage estimate is available.
July 31, 1936	Las Vegas Valley	Cloudburst: two feet of water on Arden Highway. Washed out Charleston Highway.	No property damage estimate is available.
September 24, 1937	Las Vegas Valley	Cloudburst near Glendale washed a car over a culvert.	No property damage estimate is available.
March 3, 1938	Las Vegas Valley	Continuous rain and flooding caused damage to Boulder City.	No property damage estimate is available.
June 28, 1938	Las Vegas Valley	Rain at Indian Springs sent flood water to Las Vegas. Telephone lines in Las Vegas were down.	No property damage estimate is available.
September 5, 1939	Las Vegas Valley	Heavy rains in Southern Nevada and Southern Utah; also severe damage to the Moapa Indian Reservation.	No property damage estimate is available.
September 10, 1939	Las Vegas Valley	Heavy rains caused damage to Eldorado Canyon district between Boulder City and Kingman.	No property damage estimate is available.
February 2, 1940	Las Vegas Valley	Heavy rains caused washouts on the Charleston highway.	No property damage estimate is available.
August 13, 1941	Las Vegas Valley	Two railway bridges were swept away in the flood.	No property damage estimate is available.
August 10, 1942	Las Vegas Valley	Rain and hail, trailer camps were devastated.	No property damage estimate is available.
July 9, 1945	Las Vegas Valley	Flooding in Overton. Union Pacific railway main line was washed out.	No property damage estimate is available.
August 1, 1945	Las Vegas Valley	Moapa Valley flooded, damaging crops.	No property damage estimate is available.
July 25, 1946	Las Vegas Valley	Cloudburst in Mesquite, killing one person.	One person died. No property damage estimate is available.
October 13, 1947	Las Vegas Valley	Flooding in Las Vegas; Fremont Street flooded; worst storm since 1945.	No property damage estimate is available.
September 8, 1950	Las Vegas Valley	Torrents of water roared down Fremont Street.	No property damage estimate is available.
July 20, 1951	Las Vegas Valley	Two cloudbursts; standing water in the homes near Boulder highway.	No property damage estimate is available.
August 28,	Las Vegas Valley	Windstorm and cloudburst caused property	No property damage

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
1951		damage in North Las Vegas.	estimate is available.
September 21, 1952	Las Vegas Valley	Heavy rainfall caused power outage in Henderson.	No property damage estimate is available.
June 27, 1954	Las Vegas Valley	Heavy rainfall and several cloudbursts, Las Vegas Wash boiled over, several homes were filled with mud.	No property damage estimate is available.
July 26, 1954	Las Vegas Valley	Flood torrents throughout the Las Vegas Valley, affected power lines, roads, and homes.	No property damage estimate is available.
August 25, 1955	Las Vegas Valley	Worst storm, Union Pacific railroad was disrupted for eight hours.	No property damage estimate is available.
July 26, 1957	Las Vegas Valley	Cloudburst, phones out of service, damage to low-level homes near Charleston Blvd.	No property damage estimate is available.
August 21, 1957	Las Vegas Valley	Flooding damaged city streets and shut down highways out of Las Vegas.	No property damage estimate is available.
June 22, 1958	Las Vegas Valley	Flash flood washed out a five-mile section of Nelson Road.	No property damage estimate is available.
November 11, 1958	Las Vegas Valley	Flash flood in Las Vegas.	$60,000 worth of damage to Las Vegas including debris cleanup.
July 22, 1960	Las Vegas Valley	Flash thunderstorm in Las Vegas; phone lines were downed.	No property damage estimate is available.
August 29, 1961	Las Vegas Valley	Heavy rainfall, some mobile homes had to be evacuated.	No property damage estimate is available.
September 18, 1961	Las Vegas Valley	Lamb Blvd was washed out by the deluge; power was knocked out throughout the valley.	No property damage estimate is available.
April 8, 1965	Las Vegas Valley	Rain washed out road beds in Clark County.	No property damage estimate is available.
August 7, 1967	Las Vegas Valley	Flooding in Las Vegas; 14th and 25th Streets caved in.	No property damage estimate is available.
August 19, 1967	Las Vegas Valley	Flash flood: damaged US Highway 95 between Las Vegas and Searchlight.	No property damage estimate is available.
September 6, 1967	Las Vegas Valley	Severe flooding Tonopah Highway (US 95) was damaged.	No property damage estimate is available.
January 24, 1969	Las Vegas Valley	Rainstorms washed out roads and buried cars in mud.	No property damage estimate is available.
February 1969	Amargosa River drainage basin and Amargosa Valley, Nye County	Largest recorded flood in 25 years in the Amargosa River drainage.	No property damage estimate is available.
August 20, 1973	Las Vegas Valley	Las Vegas Wash Marina was severely damaged by a thunderstorm.	No property damage estimate is available.
September 14, 1974	Eldorado Canyon, Las Vegas Valley, Clark County	A flash flood/debris flow swept away mobile homes, cars, a restaurant, and drowned at least nine people in Eldorado Canyon. Water depth was up to 20 feet, and up to 40 feet of sediment was	At least 9 people were killed. No property damage estimate is available.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
		deposited near Nelson's Landing on the shore of Lake Mead.	
July 3-4, 1975	Las Vegas Valley	Heavy thunderstorm precipitation exceeding 3 inches between Las Vegas and the mountains to the south, west, and north, caused record peak flows of Tropicana Wash, Flamingo Wash, Las Vegas Creek, and Las Vegas Wash.	Two people were drowned. Total property damage was estimated by the Clark County Flood Control District at $4.5 - $5 million.
August 10, 1981	California Wash, Logan Wash, Overton Wash, Valley of Fire Wash and the lower Muddy River. Moapa Valley area, Lake Mead Recreation area and Las Vegas	Thunderstorm-related intense rains up to 6.5 inches in less than an hour fell on southern Nevada. Major flooding and record runoff. Record floods in the Moapa Valley area did the most serious damage. California Wash flooding heavily damaged Hidden Valley Ranch dairy farm, where approximately 500 cows drowned, and twenty mobile homes were destroyed or damaged. Muddy River at Glendale below California Wash overflowed the bridge by 5 to 6 feet.	Tens of millions of dollars' worth of damage to the Moapa Valley area, Overton, Lake Mead Recreation area and Las Vegas.
August 14 - 16, 1984	Southern Clark County	Fourth episode of flooding in a month. Up to 3.5 inches of rain from southern Las Vegas to Boulder City caused floods the damaged roads, injured people, caused power outages, engulfed vehicles and flooded four homes in Henderson and 3 units of an apartment complex on East Lake Mead Boulevard.	Officials estimated damage to be more than $2 million.
June 9-10, 1990	Las Vegas Valley, Overton area, Jean area	Floods due to intense rainfall caused road closures in the Overton area and wide-spread damage in the Las Vegas Valley. The most intense rainfall was recorded in an area bounded by Tropicana Avenue, Las Vegas Boulevard, Washington Avenue, and Hollywood Boulevard and approximated a 50-year rainfall event in places. Many streets were flooded and there were widespread power outages.	Two flood-related deaths in the Las Vegas Valley. Wide-spread property damage; no estimate is available.
August 14-16, 1990	CalNevAri, Las Vegas Valley, Moapa Valley, Glendale, Muddy River, Meadow Valley Wash	Intense localized rainstorms dropped up to 2.5 inches of rain in Las Vegas Valley and In Moapa Valley causing floods that damaged the roads, bridges, railways, businesses, vehicles and flooded at least 26 homes.	$250,000 in damages to the UPRR tracks near Logandale due to flooding of Logan (Benson) Wash. $100,000 estimated damages to public facilities in the Moapa Valley. No estimate of private property damage is available.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
September 6-8, 1991	Clark County/Las Vegas Valley	Localized intense rainfall totaling 1.77 inches on the west side of the Las Vegas Valley flooded streets and caused some damage to sidewalk, curbs, gutters, street pavement and a bridge under construction.	The Clark County Public Works Department estimated the cost of cleanup from this event at $6000 in overtime and equipment.
August 8, 1994	Las Vegas Valley/ Clark County	Intense, localized thunderstorm dropped up to 1.57 inches of rain in NW Las Vegas Valley causing local street flooding and damage to storm drains, vehicles and a number of residences were flooded.	No property damage estimate is available.
March 10-11, 1995	Amargosa River drainage basin and Amargosa Valley, Nye County	Nevada Test Site area: U.S. 95 was closed, Stockade Wash culverts were damaged at Airport Road, H Road crossing and other roads were covered with sediment, and debris and a Nevada Test Site worker was swept away by the flood waters in Fortymile Wash, but managed to escape.	No property damage estimate is available.
August 22-23, 1995	Las Vegas Valley/ County	Two localized intense storms each dumped nearly 3/4" of rain in 15 minutes in the Las Vegas Valley on both August 22 and August 23, causing localized flooding of streets where debris blocked culverts.	One person was swept away and drowned. No property damage estimate is available.
August 9-10, 1997	Las Vegas Valley/ County	Line of thunderstorms caused severe flooding in Las Vegas and Boulder City, severe damage to public and private property.	No property damage estimate is available.
February 22-23, 1998	Amargosa River drainage, Amargosa Valley, Nye County	A regional storm produced up to 2.81 inches of rain resulting in minor flooding throughout the Amargosa River drainage basin. Floods severely eroded the channel In Fortymile Wash and caused extensive damage to U.S. Highway 95 and to Nevada Test Site roads.	No property damage estimate is available.
July 20-24, 1998	Urban areas of the south end of the Las Vegas Valley	Repeated intervals of more than an inch of rainfall in less than an hour in caused localized flooding of streets, damage to drainage systems, and deposition of debris, silt, and sediment on roadways.	Two flood-related deaths were reported. No property damage estimate is available.
September 11, 1998	Las Vegas/County	A storm produced up to 2 inches of rainfall in parts of Las Vegas Valley and more than 3 inches of rain in Moapa Valley, causing extensive flooding.	The Clark County Public Works Department estimated that Moapa Valley sustained damage to roadways amounting to approximately $400,000.
December 2004 to	Las Vegas Valley/Lincoln	Sustained heavy rains in late Dec. 2004 and early Jan. 2005 caused widespread flooding	Total flood and storm damage for Lincoln County

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
January 10-11, 2005	County	in Las Vegas Valley, along Meadow Valley Wash, Muddy River, and Virgin River in both Clark and Lincoln Counties.	was estimated at $9.4 million and $4.5 million for Clark County.
August 27, 2007	SW Las Vegas	Up to 3.11 inches of rainfall caused localized residential flooding and numerous reports of swift water rescues.	No property damage estimate is available.
December 17-23, 2010	Virgin River, and Muddy River	An average of 1.77" of rain fell in a seven day period over Clark and Lincoln Counties. Street closures in Las Vegas Valley and in Moapa. Mesquite on the Virgin River was subject to flooding when the river topped its banks. Two homes were flooded.	City's cost for flood response and clean up was $422,000. Clark County Public Works repairs totaled $170,000.
August 22, 2012	Las Vegas Valley, Clark Co.	1.5" to 2" of rain in four hours caused one death, numerous water rescues, and limited damages to private and public facilities. Clark Co. - approx. 117 buildings flooded with public infrastructure damage in Mesquite and Overton. (Figures 3-20, 3-21)	One death-Henderson: Approximately $976,689 in public infrastructure damage.
September 11, 2012	Las Vegas Valley, Clark Co.	1.15" of rain in about 2 hours at McCarran International Airport.	Henderson damages estimated at $78,500. Las Vegas Valley damages were estimated at $1.4 million.
October 11, 2012	Las Vegas Valley, Clark County	Rainfall totals, measured by at least eighteen of the Regional Flood Control District's Flood Threat Recognition System (FTRS). FTRS rain gages, measured more than two inches of rainfall during this event; an additional sixty-seven gages recorded rainfall totals in excess of one inch. The large volume of rainfall over a large area resulted in wide-spread street flooding and significant flow in some of the area's washes.	No property damage estimate is available.
August 25, 2013	Las Vegas Valley, Clark County	A severe rainfall event in the northwest sector of the Las Vegas Valley resulted in significant runoff, some of which damaged local roadways. The rainfall event is believed to have been exacerbated by the lack of vegetative cover in part of the upstream drainage area, notably the Carpenter 1 burn area. Some locations experienced rainfall totals in less than four hours that exceeded the average annual rainfall for Las Vegas.	No reports of damages to residences, businesses, or public infrastructure.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
September 8, 2014	Las Vegas Valley, Clark County	Tropical moisture associated with Hurricane Norbert generated intense rainfall over large areas of Clark County. Rainfall over a large area that drains to the Muddy River, Meadow Valley Wash and Weiser Wash ranged from 2.5" to 4.6" according to Regional Flood Control District rain gauges. Runoff from this large storm event resulted in significant flow across several major roadways and closure of those roadways for varying amounts of time. Flow in Weiser Wash caused extensive damage to approximately 2 miles of travel lanes and the median of I-15 near mile marker 92. The USGS preliminary estimate of the flow in Weiser Wash upstream of I-15 is 12000 cfs (subject to change). The Governor's office and the Clark County Commission declared a state of emergency.	Estimated damages in excess of $1 million to County maintained roadways as a result of the September 8 event. NDOT estimated $5 million in damages to I-15.
September 8, 2014	Moapa/ Clark County	A dam north of the Moapa River Indian Reservation failed and released an unknown volume of water. A post-event inspection of this facility indicated that the failure was likely due to internal erosion. There were no known injuries resulting from this failure.	Damages estimated at $5,052,307.
September 26, 2014	Las Vegas Valley, Clark County	Las Vegas Valley and parts of northeast Clark County were flooded by a series of fast moving narrow bands of intense rain, dropping about 1.50" – 1.75" of rain between 2PM and 5PM. The intense rainfall caused minor street flooding on the west side of the valley and more significant flooding in the rural areas of the Muddy River drainage. Flow in the Muddy River at Warm Springs Road, believed to be one of the largest in the nearly 100 years of record for this site, prompted the evacuation of properties within the Warm Springs Road loop. Sections of I-15 near mile marker 111 suffered damages which resulted in traffic restrictions for several days.	No property damage estimate is available.
July 2015	Caliente, Lincoln County	Flash Flooding.	No property damage estimate is available.

Table 3-14. Summary of Major Flooding in Southern Nevada			
Date	**Location**	**Description**	**Estimated losses**
March 2016	Nye County	Flooding.	No property damage estimate is available.
June 30, 2016	Las Vegas Valley, Clark County	Thunderstorms over the Spring Mountains west of the Las Vegas Valley moved eastward into the southern half of the valley. Rainfall was very intense, highly localized, and occurred with little warning. Reported rainfall totals were in excess of 1-inch, most of which occurred in less than 15-30 minutes. There were several instances of debris and localized flooding of roadways in the Las Vegas area, but there were no reports of flooding of residences or businesses. There were two flood-related deaths and several instances of swift-water rescues as a result of rapidly rising runoff.	No property damage estimate is available.
August 4, 2017	Las Vegas Valley, Clark County	Afternoon thunderstorms began developing in the Spring Mountains and in the Las Vegas Valley. Flash flood warnings were issued by NWS for Las Vegas Valley, Kyle Canyon and Lee Canyon areas, and Clark County. There were a few road closures as a result of flash flooding. Within the Flamingo Wash, there were multiple rescues of people by Clark County firefighters and the general public. There was one flood related death.	No property damage estimate is available.



Figure 3-21. April 10, 2016 Flooding, Las Vegas Neighborhood.

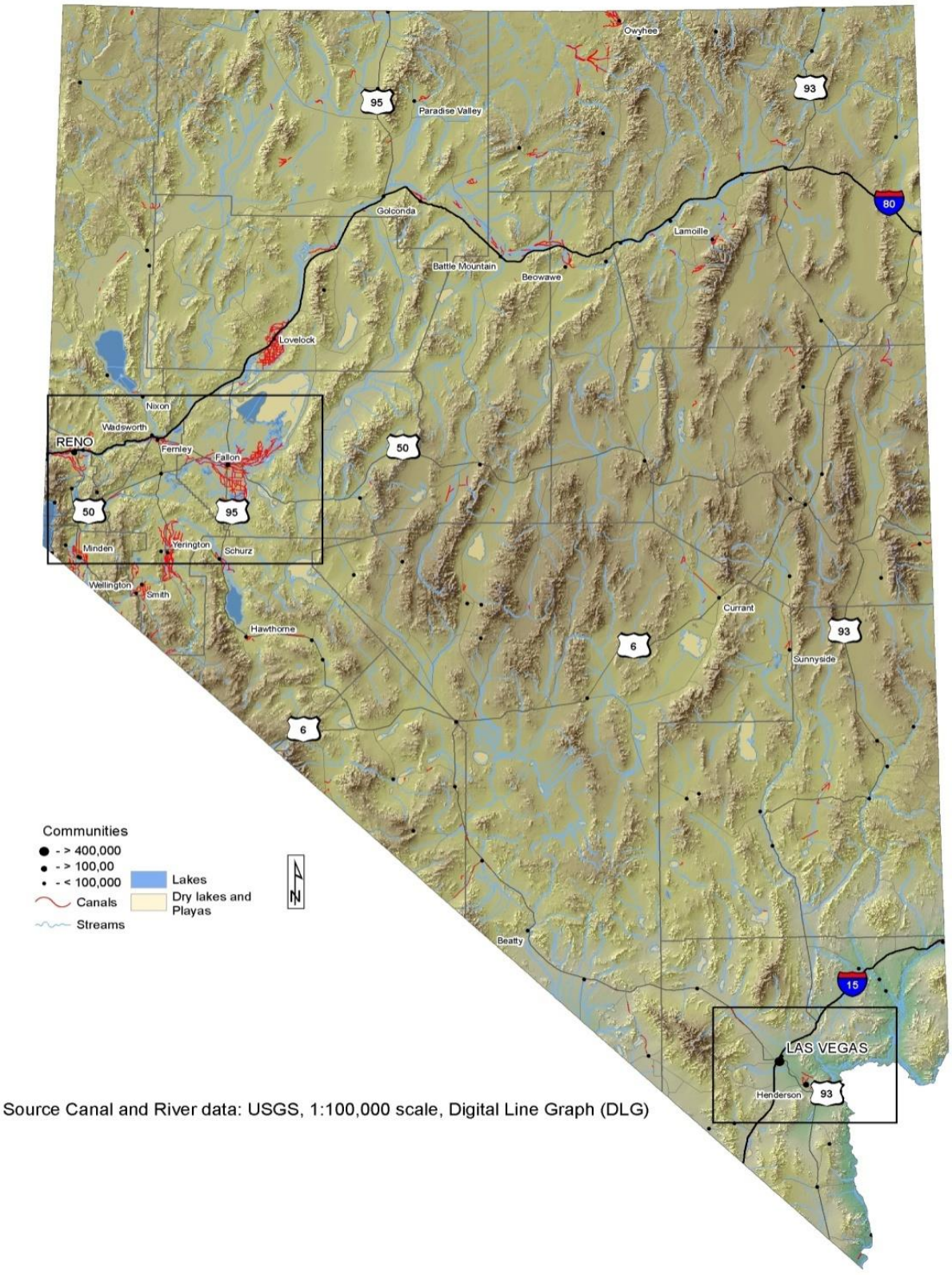
Photo courtesy of Clark County Regional Flood Control District, Las Vegas, NV.

3.3.7.3 Location, Severity, and Probability of Future Events

3.3.7.3.1 Location

Section 3.3.7.2 on the history of flooding in Nevada provides the basis for probable location of future flooding in the state. Major river systems in Nevada along which normal riverine flooding has occurred in the past and will likely occur again are the Carson, Truckee, Walker, Humboldt, Amargosa rivers and the lower Colorado River including its tributaries, the Virgin and Muddy Rivers. Locations of these rivers as well as the locations of major canals, cities, and towns in the state are shown in Figure 3-22 and in Appendix H. Canals and ditches are listed by county in Appendix Q.

Another source for information about the probable location and severity of future flooding in Nevada can be found on the United States Environmental Protection Agency (EPA) website. The EPA compiled data relevant to a set of key climate change indicators from over 40 government agencies, academic institutions and other organization to look at how the Earth's climate is changing. These indicators were published the 2016 *Climate Change Indicators in the United States* report. The report examines changes in inland riverine flood events which is relevant to Nevada. More information about this report can be found at https://www.epa.gov/climate-indicators.



Source Canal and River data: USGS, 1:100,000 scale, Digital Line Graph (DLG)

Northern Nevada



Miles
0 10 20 30 40 50

Southern Nevada



Miles
0 5 10 15 20

Source Canal and River data: USGS, 1:100,000 scale, Digital Line Graph (DLG)

Another view of the location and probability of future flood damages can be obtained from reviewing where levees were built to try to control floodwaters. Data from the National Levee database, developed by the USACE and FEMA, are available and enhanced by local knowledge. Many levees do not meet the current standards to be recognized as accredited by FEMA, and thus are reflected as Earthen Embankments. To meet the standard of design set out in the Code of Federal Regulations, a Professional Engineer must certify the levee structure in order for FEMA to show the area protected from the 1% annual chance of flood. Table 3-15 below attempts to summarize levee information in Nevada from best sources available at this time**.**

Table 3-15. Levee Names and Lengths by County in Nevada*

Levee Information in NV	Sum of Length (miles)
Earthen Embankment	
Clark	
Colorado River	2.157
Las Vegas Wash	2.270
Unnamed Wash	
US-95	2.118
(blank)	5.921
Douglas	
East Fork Carson River	
East Fork Carson River	2.070
Lyon	
Truckee Canal	1.725
Walker River	0.897
Mineral	
Corey Creek Overflow	
Hawthorne, Bawthom, Corey Creek Overflow	1.397
Pershing	
Humboldt River	3.205
Humboldt Lake	21.249
Pitt-Taylor Diversion Canal	11.657
Washoe	
Bailey Canyon Creek	0.248
Steamboat Creek	0.302
Thomas Creek	0.938
Truckee River	1.154
Unnamed	0.092
Whites Creek	
P11 in City of Reno	0.692
White Pine	
Steptoe Slough	
Steptoe Slough Levee	12.045
(blank)	5.228

FEMA Accredited	
Clark	
Las Vegas Wash	0.271
Muddy R. Wells Siding	
Muddy R. Wells Siding	0.478
Range Wash	
Range Wash Fan	4.965
(blank)	3.452
Washoe	
Truckee River	1.441
USACE	
Lander	
Reese River	
Reese River Levee at Battle Mountain	1.575
GRAND TOTAL	87.546

*Carson City levees will be added to Table 3-15 in the next iteration of the plan.

Flash floods, debris flows and mudslides have also occurred in the past in the drainages described in the flood chronology tables. However, flash floods, debris flows and mudslides can occur anywhere in the state where there is unstable wet unconsolidated material located on slopes.

3.3.7.3.2 Severity

The National Flood Insurance Program (NFIP) is a Federal program which enables property owners in participating communities to purchase insurance protection against losses from flooding. Data on NFIP flood insurance policies have been collected and compiled by FEMA since 1978. Table 3-16 shows flood insurance policy and claims data from 1978 to 2012 for Nevada counties participating in the NFIP. The dollar amounts of claims paid provides a measure of the severity of flood damages in each county.

As the data indicates, flooding in Washoe County (including the cities of Reno and Sparks) accounts for the largest amount of flood insurance claims paid among counties in Nevada, followed by Clark County (which includes Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas) and Douglas County.

Table 3-16. Summary of Total NFIP Insurance Coverage, Premiums Paid and Claims in Nevada Since 1978.

NFIP Policy and Claims Report for Nevada as of October 2017

County	Number of Policies	Total Coverage	Total Premiums	Total Claims Since 1978	Total Paid Since 1978	NFIP claims as a % of total policies
Carson City	499	$ 141,261,800	$ 314,370	89	$ 578,251	17.84%
Churchill County	678	$ 186,577,000	$ 415,016	5	$9,851	0.74%
Clark County	3,010	$ 873,369,000	$ 1,583,598	603	$ 8,648,256	20.03%
Douglas County	1,148	$ 318,019,800	$ 778,986	210	$ 3,644,166	18.29%
Elko County	99	$ 21,518,700	$ 134,994	29	$ 130,772	29.29%
Eureka County	11	$ 2,472,300	$ 14,423	1	$588	9.09%
Humboldt County	20	$ 3,501,000	$ 10,790	15	$ 47,273	75.00%
Lander County	138	$ 22,797,700	$ 159,976	3	$1,058	2.17%
Lincoln County	114	$ 21,246,600	$ 64,114	3	$0	2.63%
Lyon County	575	$ 148,711,700	$ 366,373	18	$ 472,591	3.13%
Mineral County	184	$ 26,097,300	$ 110,094	2	$2,663	1.09%
Nye County	3,068	$ 671,925,900	$ 1,280,944	68	$ 280,408	2.22%
Pershing County	6	$ 1,650,000	$ 3,701	4	$18,853	66.67%
Storey County	211	$ 40,575,400	$ 104,927	11	$40,963	5.21%
Washoe County	2,612	$ 753,698,200	$ 2,944,851	713	$ 29,989,527	27.30%
White Pine County	137	$ 20,998,700	$ 135,953	7	$390	5.11%
State Total:	12,510	$ 3,254,421,100	$ 8,423,110	1,781	$ 43,865,610	14.24%

Up until 2012, severe repetitive loss and repetitive flood properties were handled under two separate FEMA programs Severe Repetitive Loss (SRL) Program and the Repetitive Flood Claims (RFC) grant program. The SRL Program provided funding to reduce or eliminate long-term risk of flood damage to SRL structures insured under the NFIP. The RFC grant program assisted States and communities in reducing flood damages to insured properties that had one or more claims to the NFIP.

Since then, legislative changes made in the Biggert-Waters Flood insurance Reform Act of 2012 have redefined severe repetitive loss and repetitive loss properties in the following manner:

A severe repetitive loss property is a structure that:

(a) Is covered under a contract for flood insurance made available under NFIP; and

(b) Has incurred flood-related damage –

(i) For which 4 or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claim payments exceeding $20,000; or

(ii) For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

By this definition, Nevada has one severe repetitive loss properties.

A repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that:

(a) Has incurred flood-related damage on two occasions in which the cost of the repair on the average equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and

(b) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

By this definition, Nevada has two repetitive loss properties.

Table 3-17 below is a summary of repetitive loss and severe repetitive cases and claims paid due to floods for communities in the State of Nevada. As is consistent with NFIP claims data in Table 3-16, the majority of Repetitive Losses have occurred in the Cities of Sparks and Reno and in Washoe County.

Table 3-17. Summary of Repetitive Loss and Severe Repetitive Loss Properties Due to Flood for Communities in the State of Nevada as of 2017

Community Name	Number of RL Properties	Number of SRL Properties	Total Claims Paid
City of Las Vegas	4	0	$2,351,499
City of Reno	12	0	$7,767,495

Data are current as of August 31, 2017. *Source: NV State Flood Plain Manager*

3.3.7.3.3 Reducing Flood Damage in Areas of High Flood Probability

The state is working with a variety of stakeholders to reduce the number of properties considered to be at-risk from flooding and to prevent unwise development of properties in high-risk areas due to flooding. If an area has been flooded in the past, it is a best management practice to rebuild infrastructure so it will be more resilient to future flooding. This in turn would result in less threat to life, and damage to property, saving taxpayers money in the long run because money would not be spent on replacing the same buildings and roads over and over again.

An appropriate time for flood risk mitigation activities is often after a recent flood event while the impacted areas are being rebuilt. If a Presidential Disaster Declaration has been made, communities could leverage 406 mitigation. 406 mitigation projects are managed by the Nevada DEM under the Public Assistance, or Infrastructure, program. Mitigating flood risk can be done many ways including having a plan for mitigation activities, floodplain permitting, and adopting higher codes and standards.

Carson Water Subconservancy District

The Carson Water Subconservancy District (CWSD) is a unique multi-county, bi-state agency dedicated to establishing a balance between the needs of the communities within the Carson River watershed and the function of the river system. The thirteen-member Board of Directors consists of representatives from each of the five counties within the Carson River watershed plus two representatives from the agricultural community. Granted no regulatory authority of its own, the CWSD's mission is to work within existing governmental frameworks to promote cooperative action for the watershed that crosses both agency and political boundaries. One of their guiding principles is to maintain the riverine and alluvial fan floodplains of the Carson River watershed to accommodate flood events. The CWSD strives to involve all counties and communities within the watershed in the efforts to preserve the rich history and unique resources of the Carson River watershed.

Clark County Regional Flood Control District

The Clark County Regional Flood Control District (RFCD) was created in 1985 to develop a coordinated and comprehensive Master Plan to solve flooding problems, to regulate land use in flood-hazard areas, to fund and coordinate the construction of flood-control facilities, and to develop and contribute to the funding of a maintenance program for Master Plan flood-control facilities. The District also provides public education regarding flood dangers and monitors rainfall and flow data during storms, disseminating information to appropriate public works and safety crews. The service area for the District includes Clark County and the incorporated cities of Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas.

Truckee River Flood Management Authority and the "Living River Plan"

The "Living River Plan" for the Truckee River is a project of cooperative action among state, county, tribal, and PNPs. In the Reno-Sparks-Washoe County area along the Truckee River where the greatest number of repetitive loss properties occurs, several state agencies are cooperating with the Truckee River Flood Management Authority (TRFMA) on their "Living River Plan" which has common goals to reduce flood hazards. The Authority's mission includes preventing the disruption of commerce, transportation, communication and essential services which have adverse economic impacts; preventing the waste of water resulting from floods; providing for the conservation, development, use and disposal of water and improved quality of water; providing for ecosystem restoration and enhanced recreational facilities; and providing for the safeguarding of the public health. The plan includes replacement of and improvements to many bridges, levees, and floodwalls, as well as construction of terraces and berms. The project will also include the acquisition, elevation, and/or demolition of repetitive loss buildings.

Silver Jackets Program

Federal agencies, including USACE and FEMA are partnering to form a unified forum to address Nevada's flood risk management priorities. Developed at the state level, Nevada DEM and NDWR have formed an active Silver Jackets program that provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. Involvement from other federal, state, regional, local, and tribal groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery.

Flood Insurance Rate Maps / Special Flood Hazard Areas

The magnitude of flooding used as the standard for floodplain management in the United States is a flood having a 1 percent probability of occurrence in any given year. This 1% annual chance flood is also known as the 100-year flood or base flood. The 100-year floodplain boundaries for identified flooding sources are shown on Flood Insurance Rate Maps (FIRMs) that are prepared by FEMA to show areas with the highest probability of flooding. FIRMs are readily available from FEMA through the Map Service Center website at https://msc.fema.gov/portal/. The areas bounded by 100-year floodplain boundaries are also referred to as SFHAs and are the basis for both flood insurance and floodplain management requirements of the National Flood Insurance Program. The FIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year. Nevada has approximately 3,250 square miles of mapped Special Flood Hazard Areas (SFHAs) (including lakes and reservoirs). Of 3,250 square miles, only about 7% (250 sq. mi.) has had a detailed analysis to determine the base flood (or 100-year flood) elevation or the depth of flooding of the base or 100-year flood. Where available, the base flood elevation or base flood depth is shown on the FIRMs.

Locations of mapped SFHAs in Nevada are shown below in Figure 3-23. In Nevada, SFHAs are labeled as Zone A, Zone AO, Zone AH, or Zone AE. Federal mandatory flood insurance purchase requirements apply in each of these zones. The definitions for the various types of SFHAs found in Nevada are:

(a) Zone A – Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown on FIRMs.

(b) Zone AE – Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base flood elevations are shown on FIRMs within these zones.

(c) Zone AH – Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1-3 feet. Base flood elevations derived from detailed hydraulic analyses are shown on FIRMs in this zone.

(d) Zone AO – Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain), including areas of alluvial fan flooding, where average depths are 1-3 feet. Average flood depths derived from detailed hydraulic analyses are shown on FIRMs within this zone.

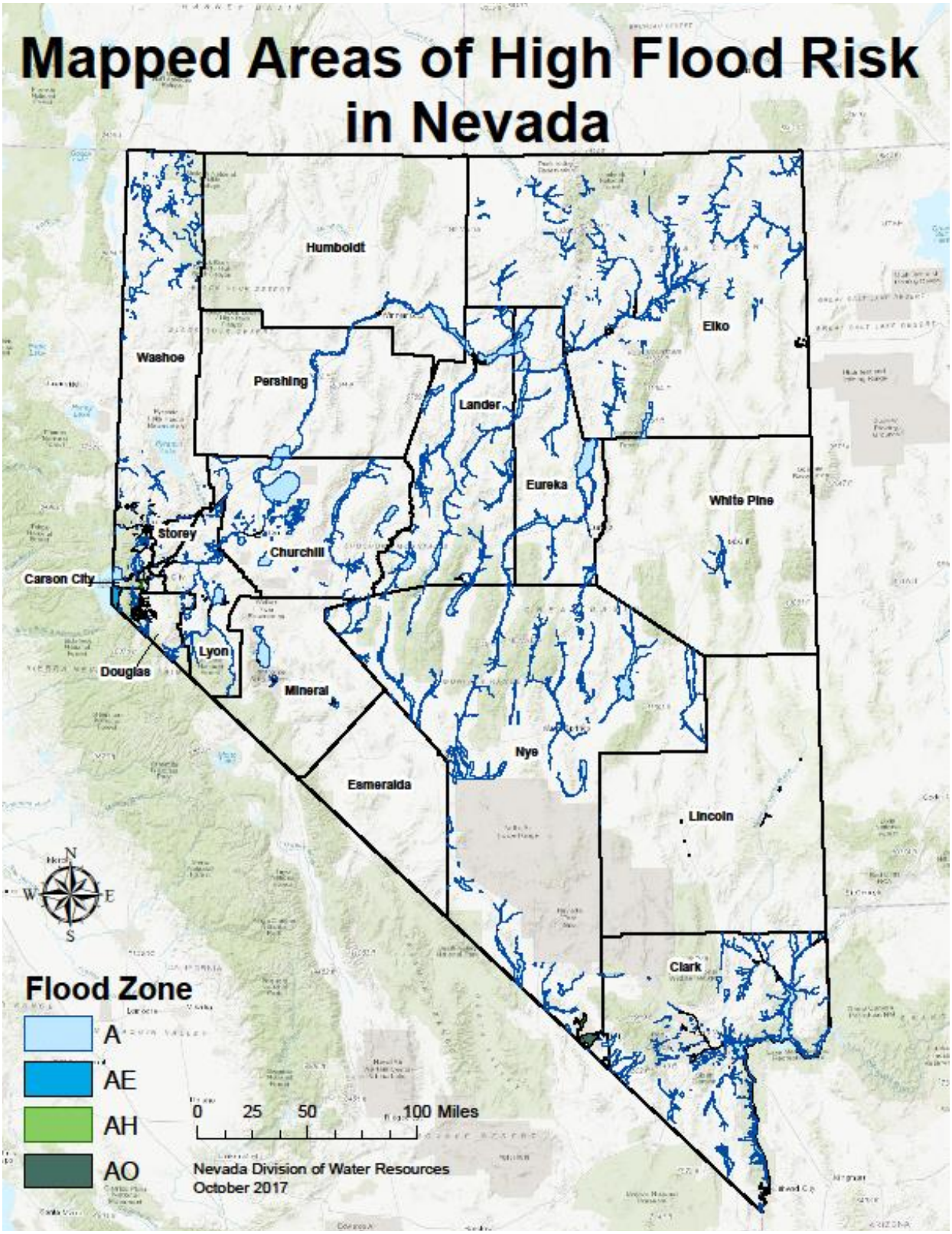


Figure 3-23. Areas Mapped as SFHAs in Nevada

from FEMA Flood Insurance Rate Maps

A SFHA is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.

In 2010, FEMA initiated its Risk Mapping, Assessment and Planning (Risk MAP) program for flood hazard mapping. The Risk MAP program builds on flood hazard data and maps produced during the Flood Map Modernization (MapMod) program, available at this link http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/map-modernization . During the MapMod program, Nevada's SFHAs, and FEMA's flood maps were brought into the digital age. With the use of GIS, the new maps use aerial imagery and other graphics to communicate flood risks. All of Nevada's counties, except Esmeralda, have or will have Digital Flood Insurance Rate Maps (DFIRMS) shortly. These products are a great tool for flood risk assessment and identifying areas of mitigation interest. In Risk MAP, the vision is to deliver quality data that increases public awareness and leads to action that reduces risk to life and property. Much of the emphasis of Risk MAP is on supporting local communities' planning actions that mitigate flood risks.

Flooding caused by dam failure is a special category described in the section below.

3.3.8 Flooding due to Dam Failure

3.3.8.1 Nature

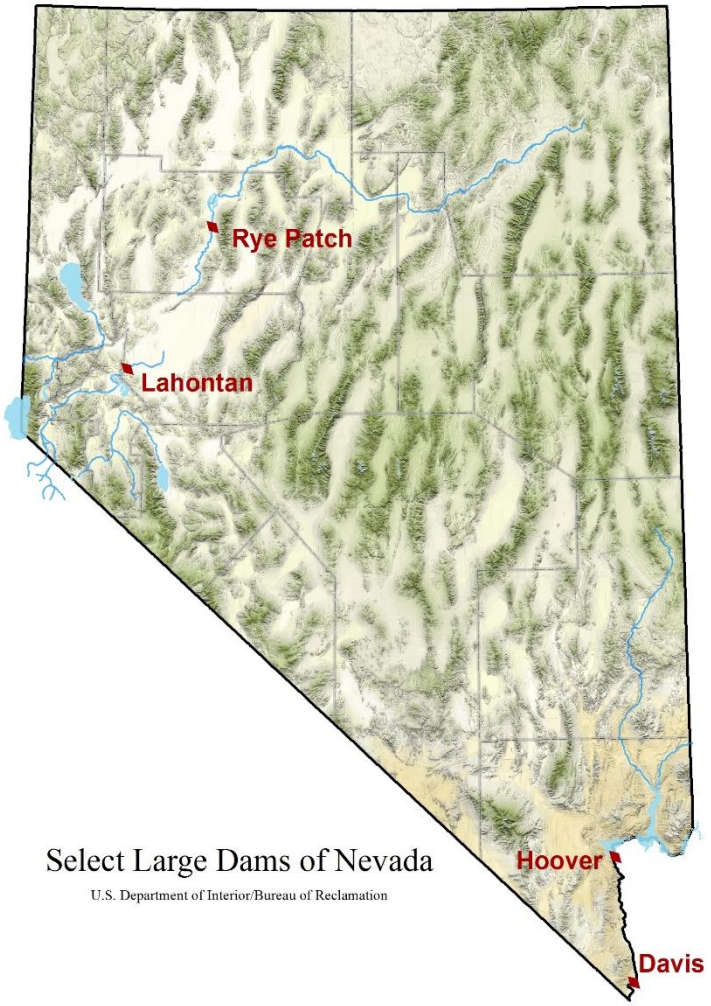


Figure 3-24. Location of Some of Nevada's Larger Dams. *Courtesy of U.S. Department of Interior/Bureau of Reclamation*

Dam failures involve unintended releases or surges of impounded water resulting in downstream flooding. The high-velocity, debris-laden wall of water released from dam failures results in the potential for human casualties, economic loss, lifeline disruption, and environmental damage. Dam failures may involve either the total collapse of a dam, or other hazardous situations such as damaged spillways, overtopping from prolonged rainfall, or unintended consequences from normal operations. Severe storms with unusually high amounts of rainfall within a drainage basin, earthquakes, or landslides may cause or increase the severity of dam failure.

Factors causing dam failure may include natural or human-caused events, or a combination of both. Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam. Piping, when internal erosion through the dam foundation occurs, is another factor in a dam failure. Structural deficiencies from poor initial design or construction, lack of maintenance or repair, or gradual weakening from aging are factors that contribute to this hazard.

Many dams in Nevada suffer from encroachment of development onto the potential floodplains below dams. As a result, many dams fail to pass the Inflow Design Flood (IDF) inspection commensurate with their hazard potential and size (Association of State Dam Officials, 2002).

3.3.8.2 History

In Nevada history, there have been no incidents resulting in dam failure emergency or disaster declarations; however, there have been some dam failure incidents recorded, listed below in Table 3-18:

Table 3-18. Chronology of Dam Failure in Nevada

Date	Location	Description	Estimated Losses
April 25 1876	Humboldt River Basin	Failure of an irrigation dam across the Humboldt River at Shoshone Canyon, about 22 miles east of Battle Mountain near present-day Dunphy resulted in a huge volume of water rushing through the canyon and flooding several ranches in the river bottom below.	No figures available.
January-May 1881		Sustained rains on heavy winter snow pack caused extensive localized flooding. All reservoir dams along Kelly Creek and in Squaw Valley were completely destroyed and were never rebuilt. Mines were flooded, mill dams and roads were washed out, bridges were damaged and livestock drowned.	No figures available.
June 27 1883	Humboldt River Basin	The last remaining dam on the Humboldt River at Lovelock broke leaving a number of the largest ranchers without irrigation water.	No figures available.
May-June	Humboldt	Rapid snow melt and heavy spring rains	Few records of

Table 3-18. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
1884	River Basin	caused an extensive period of wet-mantle flooding in the Humboldt River Basin and its tributaries. Flooding along the lower Humboldt formed a vast lake extending over thirty miles from Beowawe to Battle Mountain, covering the railroad track and damaging the road bridge across the Humboldt River in Battle Mountain. Later in June, the dam at the Humboldt dike outflow of the Humboldt River and Toulon Lakes, was blown up by local ranchers after which it was never rebuilt.	damage are available.
May 1906	Humboldt River Basin	Heavy rainfall caused the failure of a reservoir dam with six deaths resulting. Various structures were damaged and horses and mules died. Southern Pacific railroad tracks were undermined.	Six lives were lost. No figures available on other losses.
March–June 1932	Humboldt River Basin	Rapid heavy snowmelt caused flooding in the Humboldt River Basin, especially in Lovelock Valley. The Big Five Diversion Dam was washed out (damaged earlier in 1910 and 1914)	No figures available.
December 1937	Carson River Basins	Heavy rain on snowpack from December 9 through December 13 caused flooding. On the East Fork Carson River, the Douglas Power (Rithenstrothf) Dam was severely damaged. In the south end of Carson Valley near Gardnerville, the flood on the East Fork Carson River crested at 10,300 cfs late in the afternoon of December 11.	No figures available.
December 1955	Truckee, Carson and Walker River Basins	An intense late December storm dropped 10 to 13 inches of rain that melted snow pack in the Northern Sierra Nevada causing flooding along the Walker, Carson and Truckee Rivers. Derby Dam on the Truckee River east of Vista failed, and Hobart Dam, at the headwaters of Franktown Creek failed and released water that severely damaged U.S. 395.	The estimate of damages in the three river basins was $3,992,000 ($22,327,000 in 1997 dollars). One life was lost.

Table 3-18. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
In 1984	Elko County	The concrete liner of the Bishop Creek Dam in Elko County failed, resulting in a 25 cubic feet per second seep. The seep eventually removed approximately 800 cubic yards of material from the toe of the dam (Association of State Dam Safety Officials, 2002).	No figures available.
1985	Olinghouse, near Wadsworth, Washoe County	A mine tailings dam owned by the Olinghouse Mining Company failed from an embankment collapse due to oversaturation in Wadsworth, Nevada. Tailings were reportedly deposited up to 1.5 km downstream.	No figures available.
2005	Near Panaca, Lincoln County	Rainfall runoff overtopped the Schroeder Dam in Beaver Dam State Park located in eastern Nevada by one foot. The top surface of the dam was not damaged, but the downstream face of the dam was severely eroded. Erosion in several of the gullies may have reached as far as the core material. The dam was an earth-fill dam with a thirty-five foot concrete spillway on the east side. Prior to this event the dam was considered a low-hazard dam. Mitigation at this site is ongoing under declaration FEMA-NV-DR1583.	No figures available.
September 8, 2014	Near Moapa, Overton and Mesquite, NV	On September 8, intense thunderstorms created a flash flood effect that brought rivers, small streams and washes to overtop flood stages in Northeast Clark County. White Narrows Detention Dam (aka Dead End Dam, a Low Hazard Dam Failed. Historically, this dam was not maintained and its failure might have been influenced by many factors. This dam is located on tribal land is not within the jurisdiction of the State, however courtesy inspections were conducted prior to the breach.	No figures available.
January 22, 2016	Near Wabuska,	Homestretch Geothermal 2010 LLC had a dam fail that was never permitted. The dam	No injuries or damages were

Table 3-18. Chronology of Dam Failure in Nevada			
Date	**Location**	**Description**	**Estimated Losses**
	NV	(or aka "containment berm") was a dirt barrier, approximately 7 feet high and 18 feet wide at its base, constructed using a bulldozer. Homestretch estimates that the total volume of water released from the storage area was approximately 364 acre-feet of water. The portion of the berm that was breached is approximately 50 feet wide. When the Spill occurred, water flowed North, across the Wabuska drain, and settled in the low-lying area north of the drain From the Spill location, the Wabuska drain is approximately 1,100 feet to the Northwest. Once water entered the drain at the closest point to the spill site, (1,100 feet away) it would have to travel 2.5 miles through the Wabuska Drain, in order to enter the Walker River.	reported.
February 8, 2017	Winecup Gamble Ranch, north of Montello, NV	Twenty-one Mile Dam (aka Twenty-three mile) failed possibly from overtopping. Widespread snows had melted during a rapid warm up, which combined with rains caused flooding. The entire Elko region experienced some type of flooding. This dam was classified as a low hazard dam. The flows from this dam were detained in another reservoir downstream (DAKE Reservoir) before making its way to the highway and railroad.	No figures available.

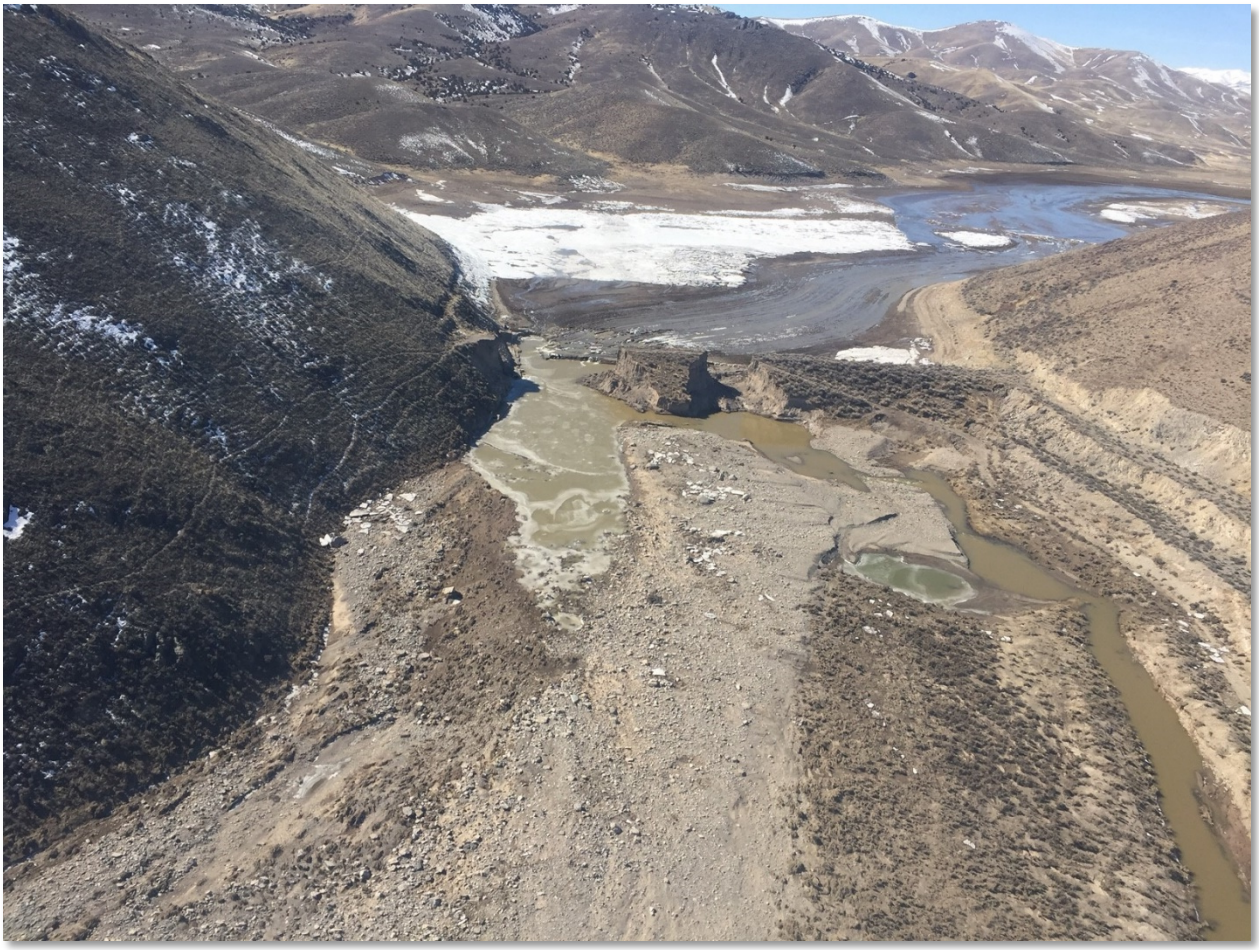


Figure 3-25. Twenty One Mile Dam near Montello, NV February 2017.

Earthen dam failure. *Picture courtesy of Nevada DEM.*

3.3.8.3 Location, Severity, and Probability of Future Events

The State of Nevada has approximately 600 public and privately owned dams. Many of these dams are dry storm-water detention facilities. About 130 of these dams are rated by the DCNR as "High Hazard." This hazard classification is based on life and/or property loss potential.

A listing of existing dams by county is found in Appendix G and location of a few major dams is shown in Figure 3-24. The listing includes the national identification number, the state identification number, name, county where it is located, legal description, height, normal storage, tributary area, owner, hazard rating, written emergency action plan (EAP), and date of last inspection. The information was obtained through the NDWR website http://water.nv.gov/DamsAndSafetyHome.aspx. Hazard designations for dams are assigned based on downstream hazard potential in the event of a dam failure (Nevada Administrative Code [NAC] 535.140). A high hazard designation (H) is assigned to a dam if there is reasonable potential for loss of life and/or extreme economic loss. A significant hazard designation (S) is assigned to a dam if there is a low potential for loss of life but an appreciable economic loss. Lastly, a low hazard designation (L) is assigned to a dam if there is a vanishingly small potential for loss of life and the economic loss is minor or confined entirely to the dam owner's own property. These hazard

designations are initially determined at the time dam design plans are reviewed, however, hazard designations can and do change as downstream conditions alter as a result of development and with the aging of the dams and levees.

The hazard designation is not dependent on type of dam and **in no way** reflects the safety or condition of the dam.

In 2007, the NHM Planning Subcommittee sent out a hazard mitigation survey to the counties and tribal entities to collect data on dam failure hazard. All counties except Esmeralda and Nye have at least one dam that is considered high hazard.

In its hazard mitigation plan, Esmeralda County does not list dam failure as a potential hazard of consideration. In their hazard mitigation surveys and/or county hazard mitigation plans, Eureka, Clark, and Douglas considered this hazard as low risk. Clark County has over 90 dry storm water detention facilities to help with flash floods. Churchill and Storey Counties consider the hazard of failing dams as medium risk. Churchill County mentioned that the Lahontan Dam is aging. This dam is watched closely by Churchill County officials. Elko lists dam failure as a moderate hazard with Bishop Creek Dam as their main concern.

Washoe County, in its 2005 hazard mitigation plan, lists dam failure as a high hazard and includes inundation maps due to possible failure of the Boca and Stampede Dams on the Truckee River upstream in California.

In the tribal hazard mitigation surveys, Shoshone-Paiute Tribes of the Duck Valley Reservation and the South Fork Band of the Te-Moak Tribe of Western Shoshone Indians of Nevada consider the hazard of dam failure a low risk. On the Wildhorse Reservation, there is a 38-year old dam that is in good condition. On the South Fork Band of the Te-Moak Tribe of Western Shoshone Indians of Nevada reservation, there is a diversion dam for irrigation. The Elko band of the Te-Moak Tribe of the Western Shoshone Indians of Nevada did not consider dam failure as a hazard to their community.

In the 2004 plan, the steering committee recognized the WMD/Terrorism threat rating to all dams (including Hoover and Davis Dams) as potential terrorist targets. The Bureau of Reclamation, Lower-Colorado Region considers the following factors in declaring an emergency at Hoover Dam:

- Structural or slope stability problems during a post-earthquake inspection
- Identification of new cracks or settlement, abnormal seepage
- Instrumentation readings outside of normal range limits
- Potential landslides in the vicinity of the dams or appurtenant structures
- A situation at Hoover Dam in which the average daily water releases exceed 19,000 cubic feet per second for 30 days or more
- A situation where Lake Mead is expected to reach elevation 1219.61 feet (top of joint use) and the National Weather Service forecasts heavy rain or runoff.
- A situation where an earthquake occurs with a magnitude of 3.9 (Richter-Scale) or greater occurs within a distance of 15 miles from the dam.

- A situation wherein a technological (man-caused) emergency occurs within the vicinity of the dam that would impact normal dam and/or power plant operations. Such emergencies could include a facility fire, explosion, terrorist incident, hostage situation or toxic spill on the highway or dam crest.
- A situation wherein Glen Canyon Dam has an unusual event that impacts the structural integrity of the Hoover Dam or power plant.
- Flooding due to dam failure is considered a "high hazard." The hazard itself is difficult to quantify because dams could fail from earthquakes, excessive rainstorms, landslides, or human-induced factors. But the consequences can be severe on a local level.

At this time, NDWR is in the process of developing emergency plans for all "high" and "significant" hazard rated dams in the State. Action items from these plans will be incorporated into this Plan upon their completion. The representatives on this subcommittee expect to increase the capability to mitigate these hazards by greater coordination between NDWR, Nevada DEM, NDOT, and SPWD. Additionally, it is anticipated that there will be greater opportunity to leverage funding from existing resources. The State of Nevada supports NDWR's efforts in mitigation action items related to this hazard.

3.3.9 Flooding Along Irrigation Ditches and Canals

3.3.9.1 Nature



Figure 3-26. Flooded Intersection in a Residential Area of SW Reno.

Flooding was caused by overflow of Last Chance Ditch in 2006.

Most flooding occurs along canals and ditches in areas not mapped or designated by FEMA as floodplain because the canals and ditches are not natural waterways, but manmade waterways. Most canals and ditches in Nevada were constructed in the late 1800s and early 1900s to deliver agricultural water from Nevada's few rivers to otherwise dry farms and ranches located at some distance from those

rivers. Since that time, urban expansion has extended to areas adjacent to these irrigation ditches such that in some places they are now surrounded by residential, commercial, industrial, and other development. In some cases, buildings have been built immediately adjacent to ditches and are often at elevations lower than the elevations of the ditches. The ditches are generally operated for several months of the year from spring to early fall, often coinciding with times of heavy rainfall and runoff that exacerbate flooding.

A listing of most ditches and canals in Nevada and their county and topographic quadrangle is shown in Appendix Q and available online at this link:

http://nevada.hometownlocator.com/features/cultural,class,canal,startrow,1.cfm

Failure of canals and ditches can be aggravated by any of the following factors acting individually or in combination:

- Structural weakness of levee walls
- Overwhelming by excess storm water runoff
- Strong earthquake shaking
- Rodent burrowing
- Diversion of river water into ditches during storms
- Clogging with debris

Canal and ditch failures can lead to inundation of homes and businesses as well as damage to personal property, such as parked cars, stored motor homes and warehoused materials. Infrastructure damage can include roads and utilities, as well as the structural damage to the canal or ditch itself. In some cases, the flooding can be deep and fast enough to endanger the lives of people who are caught in it or who might attempt to cross flooded areas.

3.3.9.2 History

There have likely been many breaks in ditches and canals in Nevada that were unrecorded because there were few people to witness or little property that was damaged. Most damage has been caused by severe storms, but some canal failure has been documented by strong shaking from earthquakes.

Storm runoff into a canal can quickly increase hydraulic loads and potentially overwhelm its water-carrying capacity. The rapid increase in storm water can find the weaker parts of a canal embankment, potentially causing them to fail. Rodent burrowing was a contributing factor in weakening the canal embankment that failed after heavy rains on January 5, 2008 in Fernley and flooded 800 homes. This canal failure resulted in a presidential disaster declaration.

Strong ground motion or surface rupture from earthquakes can also damage and fail canal embankments. In the July 6, 1954 Rainbow Mountain earthquake near Fallon, canal embankments liquefied and flowed into the canal and several breaches also occurred to embankments in the canal system (Steinbrugge and Moran, 1956). During the April 25, 2008 Mogul earthquake, an elevated section of the Chalk Bluffs Ditch was collapsed by a rockslide. Fortunately, the water flowed into a

small runoff channel and away from homes in the immediate area. There are sparse records of flooding associated with canal and ditch failure; some instances are listed in Table 3-19.

Table 3-19. Nevada Canal and Ditch Flood History

Date	Location	Description; injuries; damage cost
6-Jul-1954	Fallon, NV	Canal damage caused by earthquake; embankment failures; 0 injuries; ~$1M estimated cost
1-Jan-1997	Reno, NV	At least 5 washouts of ditch; 0 injuries; no estimates of cost
31-Dec-2005	Reno, NV	Emergency declaration; Multiple canal breaks and houses flooded;0 injuries; no estimates of cost
5-Jan-2008	Fernley, NV	800 homes flooded; >1500 people evacuated;0 injuries;
25-Apr-2008	Mogul, NV	Canal damage caused by earthquake; 0 injuries; $1.8M cost
11-Jun-2008	Fernley, NV	Disaster declaration 1738; Substantial damages; 0 injuries; Approximate cost $3.5M

3.3.9.3 Location, Severity, and Probability of Future Events

Generally, the greatest hazard from canal and ditch flooding is in developed areas, although damage to an important roadway in a rural environment can have serious consequences as well. Flooding in open fields or on agricultural lands is usually limited to economic loss of crops or livestock. Within developed areas, the most vulnerable structures are those closest to the canals or ditches, in potential flood paths, or where flooding may be concentrated. Within areas of dense building development, flooding will commonly follow the relatively unrestricted roadways. Where the flood can spread out, become shallower in water depth, and have a lower flow velocity, the hazard and severity decreases. Areas that can be the most severely affected occur where canal or ditch flow can join other water flow, such as at stream channel intersections.

The probability of flooding from canals and ditches is largely tied to large storm events, occurrence of local earthquakes, and to development adjacent to ditches and canals. The probability of recurrence is likely based on historical events, unless mitigation activities such as new codes and regulations for land use planning are successful in restricting new development in flood-prone areas adjacent to ditches and canals.

In the western United States, climate change has led to warmer overall climate conditions compared to what has been observed in the past, with the trend is expected to continue. Nevada will likely see more frequent flooding events under a warmer climate, as snow levels on average, will be higher during winter storms, resulting in more precipitation falling as rain over river basins. This will allow much larger portions of river basins to contribute to runoff, leading to higher flows resulting in more frequent flooding events. In addition, warmer air can hold more moisture (water vapor) which can potentially be converted into heavy precipitation, making flood events more extreme in the future.

Table 3-20. Flood Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 1: ***Reduce the loss of life and injuries*** ***Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee***	1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability and measures to protect life safety and health.	
	1.B	Provide current information and workshops about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies.	
	1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new development and redevelopment practices.	
	1.D	Promote the modification of structures to meet life safety standards.	
	1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy.	
	1.F	Encourage local governments, special districts and tribal organizations to develop, adopt, implement maintain and update hazard mitigation plans.	The words "maintain and update" were added because a majority of local plans are developed or in progress and will require only maintenance and updating from now on
	1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning for multiple hazards, including earthquakes and wildfires.	
Goal 2: ***Improve Local Hazard Mitigation Plans Technical Assistance*** ***Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee***	2.A	~~Promote local hazard evaluation and mitigation planning and assist in developing local hazard mitigation plans~~ Provide technical assistance, guidance, resources and tools to local governments and tribal entities to promote hazard evaluation and to develop and update hazard mitigation plans.	Combined 2a and 2b The majority of local plans are developed or area in progress and will require only updating from now on; while most tribes still require plan development.
	~~2.B~~	~~Provide technical assistance, guidance, resources and tools to local governments for all aspects of local hazard mitigation planning~~	Combined 2a and 2b The majority of local plans are developed or in progress and will require only updating from now on; while most tribes still require plan development.
	2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program.	

	2.C	~~Develop~~ Maintain a tracking system for local and state government mitigation plans and projects.	Deleted word "Develop" and added "Maintain" because plan is already developed; and requires only maintenance
	2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures.	
	2.E	~~Develop~~ Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations about how local governments can incorporate these in support of the state's mitigation program efforts.	Deleted word "Develop" and added "Maintain" because NHMPC is this system that has been implemented and requires only maintenance
	2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	
	2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	
	2.H	Promote coordination among state agencies, local governments and tribal organizations of regional hazard mitigation activities	
	2.I	Identify, enhance and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	
Goal 4: ***Reduce the possibility of damage and losses due to flooding*** ***Div. of Water Resources, NHMPC***	4.A	Protect existing assets, as well as future development, from the effects of flooding.	
	4.B	Identify and prioritize areas in the State where existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas.	
	4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments.	
	4.D	Retrofit State buildings to meet NFIP standards.	
	4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.	Added SRL structures
	4.F	Assist communities and State with programs dealing with repetitive loss structures and severe repetitive loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	Added SRL structures and broadened possible mitigation strategies to deal with them.
	4.G	Upgrade State-owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State-owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services.	
	4.H	Protect existing assets as well as future development from the	

		effects of dam failure.	
	4.I	Maintain inventory of existing dams and add to the inventory as dams are discovered or constructed.	Added "Maintain" because inventory is already developed; and requires only maintenance
	4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	
	4.K	Install early warning weather stations in watersheds with dams above populated areas.	
	4.L	Assist communities and State in structural mitigation measures, updates, repairs and maintenance to dams, ditches, and canals.	Added the words "maintenance, ditches, and canals" to incorporate mitigation activities for canals and ditches.
	4. M	Encourage local ordinances and regulations to reduce encroachment into flood-prone zones resulting from dam impoundment or high (non-failure) releases.	
	4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances.	
	4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood hazards.	
	4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency.	

3.3.10 Hail and Thunderstorms (Low Risk)

Appendix K contains a summary by county of damage-causing storm events prepared by the Nevada Climate Office with damage costs. This section takes into account the primary risks of hail and thunderstorms, not secondary risks. Many of Nevada's flash floods and wildfires are caused by thunderstorms. These hazards are covered in their respective sections in this report.

3.3.10.1 Nature



Thunderstorms are formed from a combination of moisture, rapidly rising warm air, and a force capable of lifting air, such as warm and cold fronts or a mountain. A thunderstorm can produce lightning, thunder, and rainfall that may also lead to the formation of tornados, hail, downbursts, and microbursts of wind. Thunderstorms may occur singly, in clusters, or in lines. As a result, it is possible for several thunderstorms to affect one location in the course of a few hours.

Figure 3-27. Thunderstorm developing over Mt Rose near Reno, 6/4/2013 Credit: NWS Reno

Thunder and lightning are most commonly associated with thunderstorms. Lightning occurs when the rising and descending motion of air within clouds produces a separation of positively and negatively charged particles. This separation produces an enormous electrical potential both within the cloud and between the cloud and the ground. Lightning results as the energy between the positive and negative charge areas is discharged. As the lightning channel moves through the atmosphere, heat is generated by the electrical discharge to the order of 20,000 degrees (three times the temperature of the sun). This heat compresses the surrounding clear air, producing a shock wave that decays to an acoustic wave as it moves away from the lightning channel, resulting in thunder.



Figure 3-28. Cloud to ground lightning near Spanish Springs, Nevada. Credit: Scott McGuire, NWS Reno

In addition, hail can occur as part of a severe thunderstorm. Hail develops within a low-pressure front as warm air rises rapidly in the upper atmosphere and is subsequently cooled, leading to the formation of ice crystals. This cycle continues until the hailstone is too heavy to be lifted by the updraft winds and falls to the earth. The higher the temperature at the earth's surface, the stronger the updraft, thereby increasing the amount of time the hailstones are developed. As hailstones are suspended longer within the atmosphere, they become larger. Other factors impacting the size of hailstones include storm scale wind profile, elevation of freezing level, and the mean temperature and relative humidity of the downdraft air.

Also, downbursts and microbursts are associated with thunderstorms. Downbursts are strong, straight-line winds created by falling rain and sinking rain that my reach speeds of 125 miles per hour (mph). Microbursts are more concentrated than downbursts, with speeds reaching up to 150 mph. Both downbursts and microbursts can typically last 5 to 7 minutes. Microburst wind gusts of 50-70 mph are very common with Nevada thunderstorms due to the extremely dry lower layers near the surface being able to evaporate precipitation, creating strong winds. Typical microburst damage is to power lines and trees being blown down, roof and fence damage to homes and businesses.

Damaging microburst winds are fairly common in Nevada thunderstorms, while large damaging hail is less of a risk. That being said, there have been isolated large hail events recently which have resulted in property and vehicle damage. By far the greatest threats imposed by thunderstorms in Nevada are the associated lightning-caused wildfires and flash flooding due to cloudbursts. These risks are more completely discussed in the sections on Flood and Wildfire.

The current predictability of severe thunderstorms is marginal to poor. The current state of the science and forecasting technologies results in a broad heads up of days with numerous or severe thunderstorms to about 1-3 days in advance. Specific storm-scale warning lead time of severe thunderstorms and flash flooding is generally 15-30 minutes but can be zero.

3.3.10.2 History

In Nevada, thunderstorms usually occur from the spring to the fall. The most dangerous thunderstorms are during the summer due to the low humidity and high lightning and microburst potential.

Table 3-14 in the flood section shows that much of the historic flooding in Las Vegas Valley was caused by thunderstorms and cloudbursts. This is not unique to the Las Vegas Valley, but true for the entire state.

Table 3-21 below documents the various effects that some thunderstorms have had in recent years on the State of Nevada:

Table 3-21. Significant Nevada Hail and Thunderstorm Events, 2001-2016

Date	Event
August 9, 2001	FEMA authorized the use of federal funds today to help Nevada fight the uncontrolled lightning-caused Antelope fire burning in Washoe County. The state's request for federal fire suppression assistance was approved immediately after the blaze threatened farm areas and 150 homes in the Antelope Valley subdivision, located about eight miles northwest of Reno. The fire started by lightning and burned 800 acres of land, forcing the evacuation of 100 people at the time of the request.
July 12-13, 2002	Numerous high wind and downburst reports in western NV with areas of blowing dust.
August 2, 2002	Thunderstorm-induced flash floods over parts of Reno, and near Virginia City and Dayton.
June 26, 2006	Elko - A lightning storm touched off at least nine fires in northeastern Nevada, forcing interstate closures and threatening the small ranching community. A wildfire about 20 miles west of Elko burned about 5,000 acres, while another blaze had scorched about 3,000 acres northeast of Elko and forced residents in nearby Elburz to evacuate. Two sections of Interstate 80 were closed as a result.
July 10, 2011	A severe thunderstorm developed near downtown Las Vegas and moved through North Las Vegas. The ASOS at North Las Vegas Airport (KVGT) measured a gust to 64 mph. At least two trees were blown down, one onto a house; numerous power poles and lines were blown down; and one child suffered minor injuries when part of a roof blew off an apartment building, flew into the building next door, and broke two windows and damaged four doors.
September 30, 2011	Lightning-caused wildfires burned about 205,000 acres and threatened the towns of Tuscarora and Midas. An unspecified number of cattle and horses were lost, as well as a recreational vehicle.
July 15, 2012	Hail up to 1.25 inches in diameter fell in a swath from Summerlin to North Las Vegas. According to a local body shop, ten thousand insurance claims were filed for hail damage to vehicles.
August 13, 2012	Thunderstorm winds downed 16 power poles along U.S. highway 95 about 15 miles north of Orovada. The downed wires then started a fire. Based on damage, wind gust was estimated to be 78 knots.

Table 3-21. Significant Nevada Hail and Thunderstorm Events, 2001-2016	
Date	**Event**
June 28, 2013	Five lightning strikes associated with a severe thunderstorm hit the Washoe County Emergency Operations Center's communications tower. The strikes disabled the primary communications repeater although backups were not disabled. Hail between 0.75 and 1.5 inches in diameter was reported by several spotters in the North Valleys of Reno. The largest hail report was near the Stead airport which had between 1.25 and 1.50 inch diameter hail. Cold Springs (northwest part of hail track) only had hail to 0.75 inches in diameter.
July 19, 2013	A cluster of severe thunderstorms raked the Las Vegas Valley for over an hour, and also produced widespread flash flooding. Numerous trees were blown down, including 243 at the Desert Pines Golf Course. Some trees fell onto and damaged buildings and vehicles, and some ripped out gas and water lines as they were uprooted. Numerous power lines blew down, and several buildings were damaged. The peak measured gust of 62 knots occurred at Nellis AFB at the onset of the event.
July 8, 2014	Thunderstorm winds over Lake Mead triggered swells up to eight feet that sank at least one vessel. Eleven people had to be rescued.
August 13, 2014	Hail did significant damage to vehicles parked at the end of the road in Lamoille Canyon in Elko County.
June 27, 2015	Thunderstorms brought severe outflow winds on the 27th. Peak wind gusts of 68 knots were reported.
July 1, 2015	A thunderstorm gust of 73 mph was measured five miles WNW of Laughlin, and a gust of 100 mph was measured at the mid-span of the Hoover Dam Bypass Bridge.
July 16, 2015	Thunderstorm winds snapped 10 power poles southwest of Austin.
August 13, 2015	Las Vegas area severe thunderstorms. A wooden fence, an awning, a large metal billboard, several trees, and 27 power poles were blown down. Minor roof damage also occurred.
January 31, 2016	Rare winter severe thunderstorm in southern Nevada. Lightning set fire to a house and tree at the Las Vegas Country Club. Damage estimated $200K.
June 5, 2016	Near Orovada in Humboldt County. Downburst winds from collapsing thunderstorm damaged buildings, bee houses, irrigation sprinklers, as well as blew down trees. The observer estimated that winds were over 50 mph. Time estimated based off radar and nearby wind observations. Damages are estimated.
June 30, 2016	One to two inch hail fell in a swath across the Las Vegas Valley. Numerous vehicles were damaged. Damages were estimated near $50M.

These reports listed are merely a summary of severe thunderstorm impacts in Nevada. A more extensive listing of data can be found at NOAA's National Centers for Environmental Information website. Note that there are severe limitations in the coverage of severe weather reports in Nevada due to large areas of low or no population, so the reports are heavily biased toward populated areas and transportation routes. The data provided in Table 3-22 below by the State Climatologist demonstrate the common frequency of thunderstorms in Nevada. The complete report is contained in Appendix K.

Table 3-22. County Thunderstorm Historical Data	
County	**Average number of thunderstorms per year**
Carson City	No data
Churchill	19
Clark	26
Douglas	No data
Elko	38
Esmeralda	No data
Eureka	No data
Humboldt	12
Lander	23
Lincoln	No data
Lyon	No data
Mineral	No data
Nye	42
Pershing	10
Storey	No data
Washoe	20
White Pine	57

3.3.10.3 Location, Severity, and Probability of Future Events

The location and frequency of this hazard by county were compiled by the State Climatologist and are summarized in Table 3-22 with the full report shown in Appendix K. Based on these data of past occurrences, the probability of future events in all locations in the state is high. There is probably a slight favoring toward central and southern sections of Nevada where, based on National Weather Service experiences, severe thunderstorms are more common.

Hazards directly associated with hailstorms and thunderstorms were considered by the Subcommittee to be a "Low Risk" hazard. Although these events are common, their consequences are usually concentrated in small areas and don't affect enough people to normally warrant a request for federal assistance, unless they start large wildfires or cause significant flash floods.

The probability of future events for this hazard overall is high. Hailstorms are not as high a threat in the State and are generally very localized. NDOT reports that as the transportation infrastructure within the state is rather robust, weather- related events such as severe thunderstorms and hail do not generally have much effect on the state highway system; such weather events may cause temporary closures, but generally do not cause damage. An exception is severe flooding, which may be caused by such a weather event, which can cause significant damage to roads, rail, airports, etc.

Climate Change

It is unknown how climate change will affect the frequency and intensity of Nevada severe thunderstorms. This is due to uncertainties in the future frequency of summertime moisture, instability, and wind shear in the atmosphere – three of the main ingredients for severe thunderstorms. Example: Warming temperatures in theory would fuel more and perhaps stronger thunderstorms through increased energy (unstable atmosphere) and capacity to hold moisture. However if the atmosphere also

warms aloft that would limit the increases in energy, thereby restricting increases in the number or intensity of thunderstorms.

3.3.11 Hazardous Materials (Medium/Significant Risk)

3.3.11.1 Nature

Hazardous materials are substances that pose a significant risk to life or to the environment. Environment includes surface water, groundwater, drinking water supply, land surface, subsurface strata, ambient air, dry gullies and storm sewers that discharge to surface waters. Hazardous materials are substances that may be toxic, reactive/oxidizing, corrosive, flammable/combustible, radioactive, or explosive. Incidents involving hazardous materials can result in the evacuation of a few people to entire communities. Costs associated with hazardous material releases can easily run into millions of dollars for damages and cleanup.

NAC 445A.3454 definition of a hazardous substance:

"Hazardous substance" includes, without limitation, any of the following:

1. A contaminant as defined in NRS 445A.325;
2. A hazardous material as defined in NRS 459.7024;
3. A hazardous substance as defined in 40 C.F.R. Part 302;
4. A pollutant as defined in NRS 445A.400; and
5. A regulated substance as defined in NRS 459.448.

NRS defines a Hazardous Material as any substance or combination of substances, including any hazardous material, hazardous waste, hazardous substance or marine pollutant:

1. Of a type and amount for which a vehicle transporting the substance must be placarded pursuant to 49 CFR Part 172;
2. Of a type and amount for which a uniform hazardous waste manifest is required pursuant to 40 C.F.R. Part 262; or
3. Which is transported in bulk packaging, as defined by 49 CFR § 171.8

Source: Nevada NRS and NAC as identified above.

In Nevada, hazardous materials are regulated by numerous Federal, State, and local agencies including EPA, U.S. Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), National Fire Protection Association, FEMA, Department of Homeland Security (DHS), U.S. Army, International Maritime Organization, Nevada State Fire Marshal's Office, Nevada SERC, NDEP, Nevada Department of Public Safety (NDPS), Nevada Public Utilities Commission, and Nevada Counties and Cities.

Applicable Federal Laws governing hazardous materials include the Comprehensive Environmental Response, Compensation, and Liability Act *(CERCLA) of 1980*, Superfund and Reauthorization Act (SARA) (amendment to CERCLA) of 1986, Resource Conservation and Recovery Act (RCRA) of 1976, Hazardous Materials Transportation Act (HMTA) of 1975, OSHA of 1970, Toxic Substances

Control Act (TSCA) of 1976, Clean Air Acts of 1955-1990, and the Clean Water Act of 1972.

Unless exempted, facilities that use, manufacture, or store hazardous materials in the United States fall under the regulatory requirements of the Emergency Planning and Community Right to Know Act (EPCRA) of 1986, enacted as Title III SARA (42 USC 11001-11040; 1988). Under EPCRA regulations, hazardous materials that pose the greatest risk for causing catastrophic emergencies are identified as Extremely Hazardous Substances (EHS). These chemicals are identified by the EPA in the "*List of Lists – Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act" (https://www.epa.gov/epcra/consolidated-list-lists).*In addition to accidental human-caused hazardous material events, natural hazards may cause the release of hazardous materials and complicate response activities. The impact of earthquakes, flooding, and forest fires on fixed facilities may be particularly serious due to impairment or failure of the physical integrity of their containment facilities. The threat of any hazardous materials event may be magnified due to restricted access, reduced fire suppression and spill containment, and even complete cut-off of response personnel and equipment. In addition, the risk of terrorism involving hazardous materials is considered a major threat due to the location of hazardous material facilities and transport routes throughout communities.

On behalf of several Federal agencies including the EPA and DOT, the National Response Center (NRC) serves as the point of contact for reporting oil, chemical, radiological, biological, and etiological discharges into the environment within the United States.

Nevada DEM operates the State Emergency Operations Center (SEOC). In the event of an emergency in Nevada that poses a significant threat to human health, property and/or the environment, Nevada DEM may opt to stand up the SEOC. Under the federally mandated Incident Command System, 15 Emergency Support Functions (ESF) exist to provide technical support, resources, program implementation and services that are most likely needed to save lives, protect property and the environment, restore essential services and critical infrastructure, and help affected communities return to normal. NDEP is the primary agency responsible for ESF 10 – Oil and Hazardous Materials Response in the State of Nevada. NDEP fulfills this role by providing technical support with respect to the detection, identification, cleanup and disposal of hazardous substances in the event of a State-wide incident. As detailed in the Nevada State Comprehensive Emergency Management Plan (SCEMP), January 2014, "NDEP is responsible for providing guidance regarding the response of the State and the assistance it would render in an actual or potential disaster or emergency involving the release of hazardous materials to the environment, which includes soil, air, and water quality. NDEP is the primary state agency to coordinate state, federal and/or private resources to detect, identify, contain, cleanup, dispose of, and minimize releases of hazardous substances; and prevent, mitigate or minimize the threat of potential releases."

The primary bureau within NDEP that manages and coordinates the capabilities described above is the Bureau of Corrective Actions (BCA). BCA coordinates activities of remediation contractors, as applicable, and ensures that all cleanup meets state regulatory standards. To this end, the Environmental Assistance Program (EAP) within the BCA maintains the State Hazardous Material Response Plan and Guidance Manual and operates/manages the Nevada 24-hour Spill/Complaint reporting hotline to receive hazardous substance spill reports and public drinking water system related calls and complaints 24 hours a day, seven days a week. Once the call information is documented, the information is routed to the appropriate agency for follow up. EAP staff participate in meetings, exercises and State-wide

emergency management plan preparation to help plan, prevent, mitigate or minimize the threat of potential releases. Additionally, upon request by Nevada DEM during a State emergency, staff from the EAP activate to the SEOC to coordinate ESF 10 activities and become the liaison between Nevada DEM and NDEP during the emergency.

3.3.11.2 Identification of Hazardous Materials Releases

Hazardous materials are regulated, monitored and inspected regularly by various entities in the State of Nevada. The following list provides information regarding identification of hazardous materials releases:

1. Fixed site facilities such as, but not limited to, chemical plants, storage facilities, manufacturing facilities, warehouses, mine sites, water and wastewater treatment plants, swimming pools, dry cleaners, automotive sales/repair sites, and gas stations exist throughout the State. In Nevada, NDEP (under the DCNR), the State Fire Marshal's Office and the SERC share responsibility for monitoring hazardous materials. The State Fire Marshal and the SERC have a combined database that stores data about fixed facilities with hazardous materials meeting: a) the most current International Fire Code, and/or b) the EPCRA requirements. The total number of permitted/reported fixed facilities in Nevada is over 5,860. The EPCRA facilities with highly hazardous/extremely hazardous substances is over 1,580. Fees are imposed on EPCRA fixed facilities for planning, training and equipment for first responders. The funding is managed by the SERC who provides grants to the local emergency planning committees (LEPCs) in the State; there is one LEPC per county in Nevada. Each LEPC develops and annually reviews a hazardous materials response plan for their county and provides updates. The plans and updates are reviewed annually by the SERC's standing Planning and Training Subcommittee. Each plan must be approved in order to receive operating funds and grants from SERC.

2. All transportation including highway, rail and air is monitored for hazardous material releases by DOT. Figure 3-29 shows highway and rail routes. For a listing of annual Nevada highway incidents, see Table 3-23. Some special transport cases specific to Nevada are listed below:
    - Proposed nuclear transportation to Yucca Mountain (currently tabled but may come up again in future administrations)
    - Waste Isolation Pilot Project transportation of transuranic waste in and through Nevada
    - Transportation storage of DOE elemental mercury stockpile at the Hawthorne Army Base in Hawthorne Nevada.
3. Pipeline transit of liquid petroleum, natural gas, or other chemicals is monitored for releases by DOT.
4. Non-terrorist related intentional or accidental acts that result in the release of a hazardous material by private persons or groups are monitored by DCNR and DPS. Examples include clandestine methamphetamine laboratories and hazardous materials released in private and public settings.
5. Terrorist-related acts resulting in the release of chemical, biological, radiological, nuclear, or explosive materials (CBRNE) are monitored and responded to by DPS and the Nevada National Guard (NNG).

6. Historic release sites are regulated or managed by NDEP. Examples include the Sparks solvent fuel site in Washoe County, the Basic Management Incorporated (BMI) Complex in Clark County, perchloroethylene (PCE) plumes in Washoe and Clark counties, the Hawthorne Army Depot in Mineral County, the Carson River Mercury Superfund Site, and the Anaconda Copper Mine Site.

7. Naturally occurring geological formations containing potentially hazardous substances exist within the state. An example is erionite, an asbestos-like substance. Erionite is discussed in detail below.

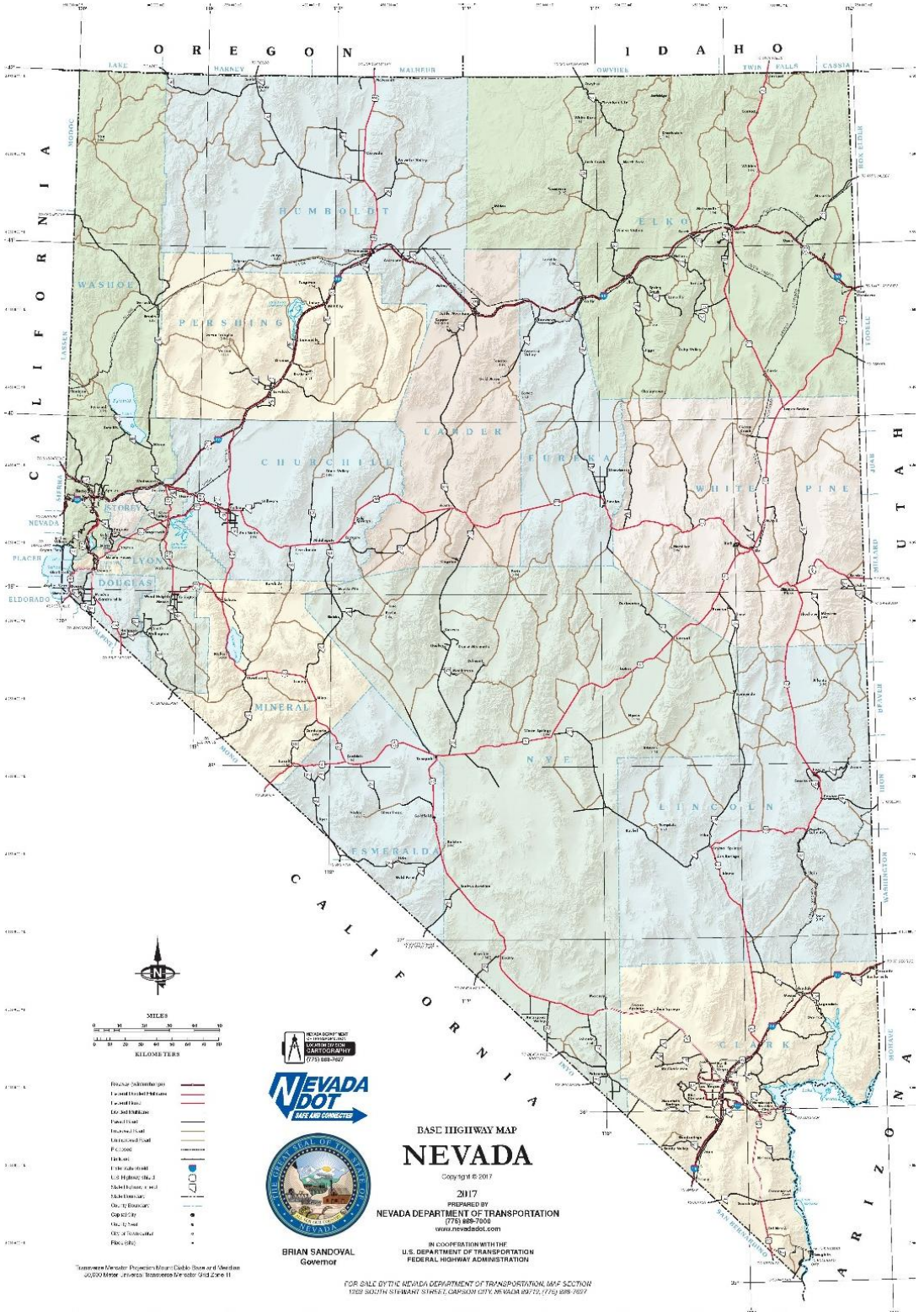


Figure 3-29. Map of Nevada Showing Major Transportation Routes Including Highway and Rail. The online link to this map is: https://www.nevadadot.com/home/showdocument?id=122

3.3.11.3 History

Hazardous material events are no longer unusual in Nevada. Table 3-23 lists the number and location of highway accidents involving Hazardous Materials from January 2013 through October 2017 on Nevada highways as recorded by NDOT. Tables 3-24 and 3-25 provide enumerations of hazardous material event spill calls from 2000 through 2017. These types of events should be planned for due to the amount of hazardous materials located in, and shipped through the State.

Table 3-23. Nevada Highway HAZMAT Incidents from January, 2013 through October, 2017

County/Street	# of Events	County/Street	# of Events
CARSON CITY		*HUMBOLDT*	
Surface streets	2	Interstate 80	1
SR529	1	*LANDER*	
CHURCHILL		Interstate 80	1
Interstate 80	2	*LINCOLN*	
US50	1	SR319	1
US95	1	US93	
CLARK		*LYON*	
Surface streets	24	SR427	
Interstate 15	46	US95A	1
Interstate 215	2	*MINERAL*	
SR159	1	SR362	1
SR160	1	US95	
SR562	1	*NYE*	
SR573	3	Surface Streets	
SR574	7	SR160	1
SR589	2	SR373	
SR592	1	US95	2
SR594	1	*PERSHING*	
SR596	1	FRPE15	1
SR599	1	Interstate 80	
SR604	2	*STOREY*	
SR612	4	Surface Streets	
US 95	4	*WASHOE*	
US 93	15	Surface Streets	
DOUGLAS		Interstate 80	12
SR28	1	Interstate 580	
US395	4	SR445	2
ELKO		SR468	
Surface Streets	1	SR659	3
Interstate 80	10	US 395	
US93A	1	*WHITE PINE*	

Table 3-23. Nevada Highway HAZMAT Incidents from January, 2013 through October, 2017			
County/Street	**# of Events**	**County/Street**	**# of Events**
US93			
ESMERALDA		US6	1
US95	1	US50	1
EUREKA		US93	5
Surface Streets	1		
Interstate 80	4		
SR306	1		
SR766	1		

Source: NDOT, crashinfo@dot.state.nv.us

Radiation Control and the Nevada Test Site:

DPBH is designated by NRS 459 as the state radiation control agency. Consequently, the DPBH, Radiation Control Program is the state agency having primary responsibility to respond, in the state, to any radiological emergency, or non-emergency incident. For more information, refer to the State of Nevada Radiological Emergency Response Plan or call (775) 687-7550 for nonemergency inquiries. Please refer to Appendix U for the complete "State of Nevada Radiological Emergency Response Plan". The state has also recently developed a "State of Nevada Radiological and Nuclear Detection Sustainment Guidance and Concept of Operations".

Table 3-24. Nevada Spill Calls By Year, 2000-2017	
Year	**Total Spill Reports**
2000	520
2001	447
2002	439
2003	465
2004	533
2005	639
2006	640
2007	650
2008	628
2009	487
2010	452
2011	548
2012	566
2013	548
2014	514
2015	609
2016	533
2017	665
Total	**9883**

Table 3-25. Nevada Spill Calls by County, 2000-2017	
County	**Spill Reports 2000-2017**
Carson City	295
Churchill	308
Clark	3595
Douglas	356
Elko	620
Esmeralda	39
Eureka	356
Humboldt	413
Lander	158
Lincoln	75
Lyon	556
Mineral	117
Nye	453
Pershing	104
Storey	95
Washoe	1740
White Pine	173

The following hazardous materials events were chosen to represent the various types of incidents which have occurred in Nevada. These events help illustrate the hazards Nevada may face in the future. This list is not intended to be comprehensive. These events have been divided into two types: **Discovery event**: an historic or otherwise unobserved, release that is inferred to have occurred based on the discovery of contaminated soil or groundwater. A reporting determination is based on the magnitude and extent of discovered contamination. **Contemporaneous event**: a release that occurs in real-time that is observable or measurable such that a reporting determination can be made based on the volume or quantity of the hazardous substance released.

Source: https://ndep.nv.gov/environmental-cleanup

Discovery Event Releases:

Carson River Mercury Superfund Site

During the 1850s Comstock Lode mining era, mercury was imported and used for processing gold and silver. Over 250 historic mill sites are located near Carson River and Steamboat Creek. During the height of the mining era, the mills discharged an estimated 14,000,000 pounds of mercury into the two drainages, primarily in the form of mercury contaminated tailings. The rivers then conveyed and dispersed the mercury throughout their entire networks. The Carson River Mercury Site (CRMS) was added to the National Priority List (NPL) in August of 1990 under CERCLA (Superfund Act) and is jointly managed by NDEP and EPA, Region 9. The original EPA CRMS study area spans Washoe,

Carson City, Storey, Lyon and Churchill Counties. In 2010, an effort was made to compress the CRMS into smaller investigative footprint areas where the contamination is most prevalent: mill sites, tailing piles, current and historic river channels and canals, Washoe Lake, Lahontan reservoir, Carson Lake, Carson sink, Stillwater Marsh and areas of sediment deposition (e.g. the 100 year flood plain). The two smaller investigative footprint areas created in 2010 are called Operable Units One and Two (OU-1 and OU-2). OU-1 in general is the land above the Carson River's banks and includes the historic mill sites, tailing piles and the Carson River floodplain from Carson City to the Six-Mile Canyon alluvial fan. OU-2 is comprised of sediments and biota found in the main channel of the Carson River below the customary and high water mark from Carson City to the terminal water bodies and wetlands east of Lahontan Reservoir, including contaminated floodplain deposits due to overbank deposits and/or flood irrigation practices downstream (east) of the Six-Mile Canyon alluvial fan. Many areas in the CRMS have yet to be characterized so the investigation into the extent of mercury contamination in these two areas is ongoing.

Source: https://ndep.nv.gov/environmental-cleanup

Anaconda Copper Mine Site

The approximately 3,400 acre former Anaconda Copper Mine Site (Site) is located west of the City of Yerington, in Lyon County, Nevada. The Site includes both private land owned by Singatse Peak Services (SPS) and public lands managed by BLM. Since the Site was abandoned in 2000, EPA and NDEP have addressed environmental concerns working towards long-term closure. The bulk of the Anaconda operations occurred before modern environmental regulations were in place, so many of the operational practices did not meet current regulatory standards. The Anaconda Site has many areas of potential concern and risk with the highest priorities being the heap leach pads and fluid management system, groundwater impacts, and potential source areas associated with the evaporation ponds. Use of unlined evaporation ponds has resulted in contamination of groundwater. Concentrations of metals above drinking water standards, including arsenic and uranium, occur at the north end of the mine in the area of the former evaporation ponds. These contaminants have also migrated off-site in the area immediately north of the mine site. The extent and magnitude of this contamination has been extensively studied with over 350 monitoring wells installed. The City of Yerington water supply is safe and has never been impacted by the Anaconda Site. There are no City water supply wells located in the vicinity of the mine and the water is regularly tested and complies with state and federal drinking water requirements. Atlantic Richfield Company (ARC) remains responsible for addressing issues related to the former Anaconda operations, including groundwater contamination. When Arimetco abandoned its operations in 2000, the immediate concern was management of the process fluids since the heap leach pads were fully charged with sulfuric acid process solution. The heap leach pads are all constructed on synthetic liners; therefore, the fluids are collected in lined ditches, pipes and lined pond systems. As the heap leach pads have drained down naturally over time, the fluid flow rates have declined from over 3,000 gallons per minute in 2000 to about 10 gallons per minute currently, but the fluids, which are acidic and high in total dissolved solids, require continued management. With voluntary financial support from ARC and SPS, NDEP constructed two new evaporation ponds in 2013 to contain the drain down fluids as a stop-gap measure, but the ponds will continue to fill with evaporative salts over time, which will ultimately exceed capacity. A long-term remedy is to cap and close the heaps to reduce infiltration of rainwater.

Source: https://ndep.nv.gov/land/abandoned-mine-lands/anaconda-site

Basic Management Incorporated Complex

In 1941, the U.S. Government deeded approximately 5,000 acres of vacant desert in the southeastern part of the Las Vegas Valley that would become the site of the world's largest magnesium plant – a plant that played a critical role in the World War II effort. Following the war, portions of the plant and adjacent land were leased to various industrial, government and business entities primarily involved in the production of chemicals and products containing chemicals. During the ensuing years, operations at these plants produced a variety of industrial and municipal effluents that were historically disposed of on-site in unlined evaporation ponds, transported off-site via ditches, or disposed of on the land surface. These disposal practices were industry-standard and legal at the time. Some of the wastes migrated into the Las Vegas Wash, a waterway that flows into Lake Mead (a primary source of drinking water for southern Nevada and millions of downstream users). Current waste disposal practices are consistent with all local, state and federal guidelines and regulations. The area is now referred to as the BMI Complex.

Source: https://ndep.nv.gov/environmental-cleanup

Central Truckee Meadows Remediation District and Clark County

In the 1980s, the EPA identified PCE as a possible human carcinogen and required municipal water systems nationwide to initiate systematic monitoring for PCE. Locally, the first sampling of drinking water wells in 1987 showed that five of the municipal water supply wells located in the central Truckee Meadows had PCE concentrations exceeding the drinking water quality standard. PCE was used extensively from the 1940s through the 1980s as a product in chemical manufacturing, as a cleaner/degreaser by automotive repair shops, paint shops, machine shops, and dry cleaning businesses. It was later determined that approximately 16 square miles of the Truckee Meadows ground water system is affected and other drinking water wells are threatened. In addition, in Clark County, PCE contamination has also been identified at multiple sites. Assessment and remediation of many of these sites are still in progress with oversight provided by NDEP.

Source: https://ndep.nv.gov/environmental-cleanup

Sparks Solvent Fuel Site

The Sparks Solvent/Fuel Site (SSFS) is a rail yard and fuel terminal tank farm located in Sparks, Nevada. Industrial activities at the site over the past century led to contamination of groundwater and soils by gasoline, solvents, diesel fuels, and other petroleum products. The rail yard was constructed in the late 1800s and has served as a major east-west thoroughfare for railroad traffic since its construction. The site has been used as a refueling and service area for Southern Pacific Railroad since about 1907 and has been a fuel storage and distribution facility since 1957. Current and past operations at the terminal include the storage, distribution, and loading of gasoline, heating oil, diesel fuels, military fuels, and fuel additives.

In mid-1987 the NDEP was informed of the presence of soil and ground water contamination at the fuel terminal tank farm located just south of Interstate 80 in Sparks, Nevada. In November 1988, petroleum hydrocarbon contamination was noted in the Helms Gravel Pit located approximately 4200 feet east of the fuel terminal. It was determined that the contamination in the gravel pit was from the terminal. In 1989, the NDEP issued an order to Santa Fe Pacific Pipeline Partners (now known as Kinder Morgan Energy Partners) to investigate contamination.

In 1991, the terminal and rail yard landowners and tenants began coordinated environmental investigations at the site through the Vista Canyon Group (VCG).

Investigation of soil and groundwater at the SSFS has been ongoing since 1991. Active site-wide remediation began in 1995. Free-phase petroleum product is no longer present at the site. Currently, the primary chemicals of concern are benzene, methyl tert-butyl ether (MTBE), trichloroethylene (TCE), and PCE. From 1995 to 2009, approximately 4.8 billion gallons of groundwater have been extracted and treated on site.

Contemporaneous Releases

Table 3-26 below provides data on some significant contemporaneous HAZMAT releases recorded in Nevada from 1988 through 2018.

Table 3-26. Historical HAZMAT Events in Nevada

Date	Location	Details and Damages
May 1988	Henderson – Clark County	The PEPCON facility exploded when a welding operation started a fire. The fire spread to AP storage an oxidizer for solid rocket propellant. The explosion resulted, in two deaths, 372 injuries and damage to 7,000 homes and businesses. Damages estimated at 100 million dollars.
May 1991	Henderson – Clark County	A massive leak of liquefied chlorine at Pioneer Chlor-Alkali Company created a cloud of poisonous gas over the city of Henderson, Nevada. Over 200 persons were examined at a local hospital for respiratory distress caused by inhalation of the chlorine and approximately 30 were admitted for treatment. Approximately 700 individuals were taken to shelters. It is estimated that from 2,000 to 7,000 individuals were taken elsewhere.
January 1998	Kean Canyon 10 miles east of Reno – Washoe County	January 7, 1998, two massive explosions just seconds apart destroyed the Sierra Chemical Company's Kean Canyon explosives manufacturing plant ten miles east of Reno, Washoe County, Nevada, killing four workers and injuring six others.
July 2000	Dayton – Lyon County	An explosion of hydrogen trifluoride gas seriously damaged an industrial plant in Dayton, Lyon County, Nevada.
April 2002	Interstate 80 at the California and Nevada Border	A twenty-one car pileup occurred on I-80 at Union Mills Grade just east of the California Highway Patrol scales. Six big rigs were involved, spreading metal debris, gasoline, and furniture across both lanes of eastbound I-80 traffic.
January 2004	Fernley – Lyon County	There was an evacuation of Fernley's Nevada Pacific Industrial Park in Lyon County, due to a strange vapor emanating from a disposal bin at the Philip Services Corporation (PSC) facility. PSC recycles chemicals including acids, alkaline substances, cyanide, and battery waste. The smoke-like vapor was found to be nontoxic.

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
January 2004	Gardnerville – Douglas County	Pau Wa Lu Middle School. A student brought approximately one pound of elemental mercury to the school and shared it with his classmates. 60 students were decontaminated and the school was closed for 14 days while a cleanup was conducted.
February 2006	Southern Nevada Transportation Corridors	A tanker transporting 4,500 gallons of radioactive wastewater from the San Onofre Nuclear Power Plant leaked while *en route* to the disposal site in Utah. This particular tanker's route was through Las Vegas, Nevada. According to the driver, he was unaware of the leak until he stopped at Parowan, Utah.
April 2007	Carson City/County	The Carson City Fire, Sheriff Office and the Quad-County Hazmat Team responded to All Metals Plating facility for the report of an orange gas cloud coming from the facility. A chemical mixing mistake caused a chemical reaction occurred that produced an orange plume of acid vapors that migrated out of the facility. The Plating Shop and adjacent businesses were evacuated. One employee from the Plating Shop was taken to the Hospital for possible exposure to the vapors. NDEP and EPA Region 9 mobilized to the incident to provide assistance to the Incident Commander. The Quad-County Hazmat Team set up a decontamination corridor and performed an entry into the Plating Shop to collect a sample of the waste mixture to be able to identify the substances involved. An environmental contractor worked with the responders to stabilize the hazardous waste for disposal.
August: 2007	Las Vegas – Clark County	A rail tanker containing chlorine gas escaped from the Arden train yard outside of Las Vegas. Reaching a speed of approximately 50 mph the tanker traveled through populated areas of Las Vegas and North Las Vegas. No release occurred.
October, 2007	Reno/Sparks – Washoe County	A breach in the high pressure Kinder-Morgan fuel pipeline caused a 35'X100' petroleum impact area with puddles of Jet-A fuel reported. The site is 1,000 feet from the Truckee River. Estimated release amount was 500 gallons.
January 2008	Fernley – Lyon County	Following intense rain and snowmelt, a canal bank gave way flooding a residential portion of the City of Fernley. Local, State and Federal Disasters were declared. Potentially damaged household hazardous material was identified as a potential threat to the community. NDEP, EPA Region 9, the United States Coast Guard, and FEMA cooperated to hold a household hazardous waste collection event for the flood-impacted residents.
August 25, 2009	Carson City/County	Bella Lago Apartment Complex, 1600 Airport Road, Carson City. Initially the Fire Dept. was called on report of a mercury discovery beneath carpeting in one apartment of a 20-unit apt. building. 220 tenants were evacuated from the building and Hazmat with oversight from NDEP took over to proceed with cleanup which involved

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		removing both the concrete floor and 20 inches of dirt below it. Ultimately more than 35 pounds of elemental mercury were recovered from the floor and underlying dirt. Cleanup took several months, and high blood mercury levels were measured in many residents of the complex; seven of those individuals received on-going medical treatment for mercury exposure, including several children. Mercury was traced to a previous tenant who was probably using it to recover placer gold.
June 2010	Elko County	Tanker truck accident. A tanker truck driver turned too tight around a locomotive, the tanker was breached in the middle and 3,500-4,000 gallons of diesel was released to the ground.
July 2010	Elko County	A two-trailer tanker truck's rear tank overturned, caught fire and exploded on Highway 93 causing the closure of the Highway. Approximately 4,500 gallons of gasoline was released to the soil.
August 2010	Churchill County	Approximately 10,000 gallons of hydrochloric acid was released to a chemical room in the City of Fallon New River Water Treatment Plant due to failure of a plumbing fitting during filling of the acid storage tank. The chemical room and an adjacent business were evacuated. An Incident Management Team was activated by the Nevada DEM at the request of the City of Fallon. Both the Washoe County and the Quad-County Hazmat Teams responded to the incident. The hazmat teams, a private hazmat contractor and the City of Fallon worked to pump the acid out of the building. The response lasted five days. The chemical building suffered significant damage. During the response, a temporary water treatment system was set up to provide water to the city.
July 2011	Lincoln County	Tanker Truck Accident. A tanker transporting naphtha (a petroleum hydrocarbon mixture) rolled over, exploded and caught fire near Hiko, Nevada. It was estimated that 8,000 to 9,000 gallons was released. The driver was reported to be injured in the accident.
February 2012	Clark County	Environmental company reported that a valve on a tanker truck holding sodium hydroxide failed, releasing 700 gallons to the warehouse floor. The fire department contained the spill and diluted the product, causing sodium hydroxide solution to enter the storm drain. NDEP worked with the facility to ensure cleanup of the storm drain.
March 2012	Clark County	More than 10 pounds of gas chlorine was vented to the atmosphere at the Titanium Metals Corporation when pH control of the SOX scrubber in the chlorination process was lost.
April 2012	Clark County	City of Las Vegas sewer main broken by a contractor causing over 1,000 gallons of raw sewage to enter storm drain. NDEP worked with the City of Las Vegas to isolate the break for repairs and to clean up the affected storm drain.

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
June 2012	Lyon County	A trucking facility in Fernley reported that a tote containing 10-15% nitric acid and 30% sulfuric acid fell from a forklift spilling 150 gallons which flowed across pavement to a storm water sump. NDEP worked with the facility and its contractor to clean the pavement and excavate the sand filter in the storm water sump.
August 2012	Clark County	Sanitary sewer (raw sewage) overflow from a manhole in Las Vegas. 25,000 gallons of raw sewage entered a storm drain. NDEP worked with the City of Las Vegas and their contractor to isolate and clean the affected storm drain.
September 2012	Douglas County	A resort in the county and Douglas County Utilities ran sewer pumps at the same time, overwhelming the system. 500 to 1,000 gallons of raw sewage was released into a wetlands area. NDEP worked with Douglas County Utilities to clean up standing water and to sanitize the spill area.
March 2013	Clark County	A plastic container containing 10 pounds of mercury was spilled in a homeowner's garage; 2 pounds of the mercury spilled onto the garage floor and some of it also was transported outside to landscaping. EPA worked with the Henderson Fire Department and H2O Environmental to clean up the contaminated areas.
March 2013	Clark County	Sewer main blockage in Las Vegas caused over 83,000 gallons of raw sewage to be released and flow to a storm drain. NDEP worked with the water reclamation district to ensure the sewer main blockage was cleared and the affected ground surface and storm drain were cleaned up and disinfected.
August 2013	Lyon County	Sewer force main break in Fernley caused 200 gallons of raw sewage to flow into a storm drain ditch. NDEP worked with the City of Fernley to ensure that the standing water was removed and the affected storm drain ditch was disinfected.
September 2013	Washoe County	City-owned sewer line blockage in Reno caused release of 200 gallons of raw sewage into a storm drain. NDEP worked with City of Reno Environmental Control to ensure the blockage was cleared and that the storm drain was cleaned and disinfected.
November 2013	Clark County	An apartment complex private sewer manhole overflowed releasing 6,450 gallons of raw sewage which flowed to a storm drain. NDEP worked with Clark County Water Reclamation, Clark County RFCD and Southern Nevada Health District to ensure sewer blockage was cleared and affected ground surface and storm drain were cleaned up and disinfected.
March 2014	Washoe County	Private sewer blockage in Reno discovered by City of Reno staff. Approximately 300 gallons of raw sewage flowed to the storm drain system and a storm ditch. NDEP worked with City of Reno to ensure blockage was cleared and the storm drain system and storm ditch were cleaned up and disinfected.

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
May 2014	Clark County	Onsite remediation system in Las Vegas became clogged resulting in numerous failures and eventually a release of 1,500 gallons of untreated groundwater to a parking lot and nearby storm drain. The groundwater contained TCE. NDEP worked with Clark County RFCD and the responsible party to ensure the remediation system was repaired and the affected ground and storm drain were cleaned up.
July 2014	Washoe County	Sewer line blockage in City of Reno caused release of 1,470 gallons of raw sewage to flow across the pavement to a storm drain. NDEP worked with City of Reno Environmental Control to ensure the blockage was cleared and the pavement and storm drain were cleaned up and disinfected.
December 2014	Lyon County	City of Fernley lift station failure caused 30,000 gallon spill of raw sewage onto soil. NDEP worked with the City of Fernley to ensure lift station repairs were completed and to ensure affected area was disinfected.
February 2015	Humboldt County	A student brought a salt shaker filled with mercury to a school exposing at least 4 others directly by playing with it. Mercury was spilled into a hallway where an unknown number of other school children walked through it. 498 students and 40 school district staff were decontaminated by first responders. EPA had their START contractor use lumexes to evaluate areas of concern. School district hired an environmental firm to conduct cleanup of contaminated areas.
May 2015	Churchill County	A tractor overturned into an irrigation canal in Churchill County, releasing 40 gallons of diesel and hydraulic fluid. The irrigation canal is part of the Truckee-Carson Irrigation District and flows to Stillwater Wildlife Refuge. NDEP worked with the Fallon Fire Department to ensure that booms were placed to capture the release in the irrigation canal.
May 2015	Clark County	Sewer line blockage caused release of 7,200 gallons of raw sewage onto pavement and into a storm drain. NDEP worked with Clark County RFCD to ensure blockage was cleared and that affected pavement and the storm drain were cleaned up and disinfected.
August 2015	Animas River, CO and Colorado River, NV	EPA was conducting an investigation of the Gold King Mine near Silverton, CO. While excavating above the old adit, pressurized water began leaking above the mine tunnel, spilling about three million gallons of water stored behind the collapsed material into Cement Creek, a tributary of the Animas River. The Animas River flows into the Colorado River and eventually Lake Mead, NV. Lake Mead supplies Las Vegas with drinking water. NDEP participated in the regional damage and danger assessments advising the Southern Nevada Water Authority on the spill tracers. To date, no impact has been detected in Lake Mead.

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
October 2015	Elko County	Mining company drilling activity incident caused 60,000 gallons of drilling fluid containing barite, native soil and water into Stormy Creek. NDEP worked with the mining company to ensure that erosion controls were deployed around the impacted area and that creek cleanup was conducted.
October 2015	Nye County	A fire was reported by US Ecology Nevada. US Ecology manages a hazardous waste treatment, disposal, and metals recycling facility near Beatty, NV. Initially, the exact extent and cause of the fire was unknown. Due to the proximity to Nevada's low-level radioactive waste site, the Nevada Emergency Operation Center activated. The Civil Support Team was activated to coordinate with Nye County officials, DOE, NDEP, and the EPA to determine damage and danger assessment. The fire was out within one day and no injuries were reported. Follow-up assessment included updating remedial design for the facility.
January 2016	Humboldt County	A mine in Humboldt County reported that 6,000 gallons of process solution spilled onto soil due to a valve failure; the solution contained 3.12 pounds of cyanide. NDEP worked with the mine to ensure affected soil was cleaned up and disposed of properly.
March 2016	Clark County	A dairy reported that equipment failure caused nearly 100 pounds of anhydrous ammonia to be released to the air at their facility. Evacuation was ordered. NDEP worked with Clark County Air and Southern Nevada Health District to determine the cause. Evaporating water on a diffusion tank wall (inside the tank) left residual ammonia, which tripped an in-tank alarm. The reported amount of released anhydrous ammonia was significantly downgraded and it was determined that there was negligible release to the atmosphere. No injuries reported, and evacuation and return were successful.
June 2016	Lyon County	A viral video surfaced showing employees dumping 55-gallon drums with unknown liquid contents through the chain-link fence of a facility. NDEP contacted EPA regarding the incident. The day the video surfaced, NDEP Bureaus of Corrective Actions, Water Pollution Control and Waste Management visited the facility to conduct inspections and inquire about the dumping. Subsequently, NDEP worked with EPA to conduct soil sampling outside the fence where the liquids were poured. Analytical results showed that the soil was not impacted with harmful chemicals. The facility was ordered to discontinue dumping drums through the fence and to provide documentation of all future disposal activities.
June 2016	Douglas County	A vehicle accident caused 45 gallons of diesel to spill on the Lutheran Bridge over the Carson River. Two to three gallons of the diesel impacted the Carson River. NDEP routed the spill report to Bureaus of Water Pollution Control, Safe Drinking Water and Corrective Actions,

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		NDWR and Douglas County. EPA worked with NDOT and H2O Environmental to ensure that the spill was cleaned up with no additional impact to the Carson River.
August 2016	Storey County	A building products facility reported equipment failure and overflow (within and outside of the building) of their water ionizing treatment plant. The overflow fluid contained up to 54% sulfuric acid and did reach a storm drain. NDEP worked with the facility to determine that although the storm drain pipe was impacted, no fluid reached the outfall of the pipe. The storm drain pipe, pavement and affected building interior were cleaned up by Clean Harbors.
August 2016	Douglas County	Tahoe Queen fire reported in Zephyr Cove. EPA, Douglas County, Tahoe Regional Planning Agency and Tahoe Water Suppliers Association notified. Personnel from the Bureaus of Water Pollution Control and Corrective Actions traveled to Zephyr Cove to inspect the firefighting activities. U.S. Coast Guard had boomed around the vessel and there was no evidence of spilled oil on the surface of the lake. Within the boom there was fire debris and ash as well as biodegradable firefighting foam on the water surface. Firefighters put out the fire and absorbent pads were used to absorb the foam within the boom area. Nets were then used to remove fire debris and ash.
September 2016	Clark County	Clark County reported a mercury release at Walter Johnson Middle School and requested EPA Emergency Response Team (ERT) activation to the school. The mercury release apparently occurred at least a week prior to the report and mercury contamination had been spread through various portions of the school. The school was locked down and the EPA ERT screened over 1,200 students for many hours, releasing them in small groups as they were cleared. This was one of the largest health-related school lock down's in the country. EPA oversaw cleanup of the mercury in the school and even at the homes of some students who had the most contact with the mercury.
November 2016	Elko County	An airplane crash was reported in a parking lot in downtown Elko. The crash caused a large fire. Firefighting water and foam entered a storm drain. NDEP worked with City of Elko Environmental and H2O Environmental to determine that flow of the material did not reach the river and environmental impacts from hydrocarbons were negligible because the fire burned off the hydrocarbons.
December 2016	Clark County	A Henderson grocery store reported that an employee broke an industrial thermometer spilling 6 to 8 ounces of mercury near the commercial fryer. The employee tried to clean up the mercury and was contaminated. The store was closed until Henderson Fire could assess the situation and contamination could be cleaned up. NDEP informed

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
		Southern Nevada Health District who took lead on cleanup as the facility is a food establishment.
April 2017	Storey County	A facility in the Tahoe Reno Industrial Park reported that a 55-gallon drum of ethyl methyl carbonate fell off a trailer and contents flowed into a storm drain. NDEP worked with Quad County HazMat and Clean Harbors to ensure that the spill was cleaned up. Although the material reached the storm drain, flow did not make it to the Truckee River.
May 2017	Washoe County	A casino in Reno reported that an equipment malfunction caused release of 30,000 gallons of untreated PCE-contaminated water to the storm drain. Bureau of Water Pollution Control (BWPC) worked with the permitted facility to determine the cause and ensure that repairs were completed in a timely manner to minimize release of the untreated groundwater. BWPC also informed the City of Reno, Truckee Meadows Water Authority, the Water Master and the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation of the release.
June 2017	Lovelock – Pershing County	A triple trailer overturned on an off ramp into Lovelock, spilling an unknown chemical into the nearby flowing irrigation ditch. Due to the pungent smell the nearby residents were evacuated. NDEP worked with the UPS Hazmat team, H2O Environmental, and Reno Hazmat team to identify the hazardous substance (ethyl mercaptan – the chemical odorant added to propane) and coordinate clean up.
July 2017	Clark County	A metal processing facility in Henderson reported that equipment failure caused a release of 11.7 pounds of chlorine gas from a pollution control unit. NDEP worked with the company and Clark County Air Quality to ensure the release was secured and the equipment was repaired.
July 2017	Washoe County	A stainless steel plant reported a fire and a breach of a tank which caused a release of Potassium Hydroxide. Fire suppressant water mixed with the Potassium Hydroxide spilled under a doorway and into a private property storm drain. NDEP worked with the Washoe County Health District overseeing Clean Harbors' cleanup of the spill.
July 2017	Esmeralda County	A lithium mine reported a metal fire caused by spontaneous combustion. The fire occurred in slag drums and burned for 12 to 14 hours. The drums were then buried in sand to cool and NDEP worked with the mine personnel and Patriot Environmental to ensure cleanup and proper disposal of the burned metal was completed.
September 2017	Carson City/County	A government office building reported a mercury spill. An office desk was moved and 280 grams of mercury was spilled from an unknown source. NDEP informed EPA, State Health, and Carson City Environmental. Following NDEP webpage directions for on-site small cleanups, personnel in personal protective equipment used eye droppers to remove as much mercury as possible. H2O Environmental was called for further remediation as needed.

Table 3-26. Historical HAZMAT Events in Nevada		
Date	**Location**	**Details and Damages**
October 2017	Clark County	A dairy reported the accidental release of 882 pounds of anhydrous ammonia to NDEP during the annual site inspection. The facility stated that the leak took place over a 2 week period from a condenser on the roof of one of their buildings. NDEP worked with the facility to isolate the condenser, determine the cause and repair it.
October 2017	Elko County	A tanker truck crash on I-80 near Elko caused a spill of 4,000 gallons of Ammonium Bisulfate. Both directions of I-80 were closed for a day and NDEP worked with EPA and NDOT to ensure prevention of the spill reaching the Humboldt River and cleanup of the spill by Clean Harbors.
February 2018	Clark County	A big box store sewer line blockage caused 750 gallons of raw sewage to be released to pavement and a storm drain. NDEP worked with Clark County Water Reclamation District and Southern Nevada Health District to ensure the blockage was cleared and the affected pavement and storm drain were cleaned up and disinfected.

Naturally-occurring potentially hazardous substances:

Naturally occurring potentially hazardous substances may include but are not limited to: erionite, asbestos, radionuclides, radon, lead, mercury, arsenic, crude oil, selenium, nitrates, and sulfur.

Erionite and naturally occurring asbestos are addressed below. The other substances listed above will be addressed in subsequent updates of the Nevada Hazard Mitigation Plan.

3.3.11.4 Erionite and Naturally Occurring Asbestos

Not all hazardous materials are manmade and not all hazardous events are human-caused. Erionite is a naturally occurring, microscopic, fibrous zeolite-group mineral, with the chemical formula $(Na_2,K_2,Ca)_2Al_4Si_{14}O_{36}•15H_2O$, commonly found in volcanic ash that has been altered by weathering and ground water. It forms brittle, wool-like fibrous masses in the hollows of volcanic rocks. Although erionite is not currently regulated by the EPA as one of the six asbestos fibers, some properties of erionite are similar to the properties of asbestos and it is known to be a human carcinogen listed by the International Agency for Research on Cancer as a Group 1 Carcinogen. Erionite has been identified as the cause of deaths from mesothelioma in some villages in Turkey (Pratt, 2012). It occurs in Nevada and other western states in altered sedimentary deposits derived from volcanic ash (Papke, 1972; Sheppard, 1996). North Dakota's Department of Transportation has banned the use of erionite gravels on state roads, recognizing that erionite-bearing crushed stone had already been used as aggregate on some dirt roads in the western part of the state.

Naturally occurring asbestos (NOA) is found in rocks and soils. Asbestos refers to a group of silicate minerals that share similar fibrous characteristics. There are six types of NOA recognized by the EPA (asbestos.com), five of which are found in Nevada. These five types are known as Amphibole asbestos and include crocidolite, also known as riebeckite ($Na_2Fe_3^{2+}Fe_2^{3+}Si_8O_{22}(OH)_2$), amosite, a variety of cummingtonite, anthophyllite ($Mg_7(Si_8O_{22})(OH)_2$), tremolite, and actinolite ( ).

They are also known as fibrous amphiboles. NOA can release mineral fibers in the air during weathering processes or human disturbance. These fibers pose a potential risk for exposure by inhalation. It is important to note that NOA does not refer to commercially processed asbestos materials (asbestos siding or insulation, among other materials).

Asbestos fibers can become trapped in the body after exposure as they do not dissolve and the body has difficulty expelling them (asbestos.com). Sickness related to asbestos often take years to develop, but can lead to genetic damage to cells, mesothelioma, and lung cancer in the affected person's body.

3.3.11.4.1 History

Inhalation of fibrous dust particles such as NOA and erionite has been linked with diseases including mesothelioma According to Pratt (2012), "high rates of mesothelioma observed among residents of the Turkish villages of Karain, Tuzkoy, Old Sarihidir, Karlik, and Boyali have been related to erionite, not exposure to asbestos." Residents in these villages built homes with volcanic tuff containing erionite. In North Dakota, the EPA has been working with state and county officials to minimize the risks to children in areas where erionite-bearing gravel was used at baseball fields, playgrounds, and schools. Fibrous minerals inhalation has been associated with causing disease in Libby, MT (Meeker et al., 2003; Shannahan et al., 2012).

3.3.11.4.2 Location, Severity and Probability of Future Events

At this time, we are not aware of any use of erionite-bearing crushed stone or gravel in Nevada highways or roads. NDOT (Robert Piekarz, personal communication, 15 December 2011) is concerned that individuals testing potential sources of crushed stone or gravel for use in highway construction and repairs may be exposed to erionite. The rocks containing erionite (tuffs and volcaniclastic sediments with high contents of ash) typically are of too low a quality to be quarried or mined for road construction. The NHMPC therefore believes the risk of this hazard in Nevada is low.

Sheppard (1996) summarized the following observations about erionite in Nevada:

> "Except for two localities (Figure 3-30, localities 19 and 20) near Beatty, the occurrences of erionite are in the northern and central parts of Nevada. Deffeyes (1959) was first to report that erionite was not as rare as had been previously believed. He documented the common and abundant occurrence of erionite in silicic, vitric tuffs that had been deposited in Cenozoic lakes of central Nevada. Papke (1972) mapped and studied in detail four of the erionite deposits (localities 23, 27, 29, and 30) that had been prospected by several companies, including Union Carbide Corporation, Shell Development Company, and Mobil Oil Corporation. Of all the high-grade erionite deposits in Nevada, only several hundred tons of erionite-rich tuff were mined from Jersey Valley (locality 27) by Mobil Oil Corporation."

Most erionite occurrences in Nevada are in upper Cenozoic tuffaceous, lacustrine rocks. The thickness of the erionite-bearing tuff is less than 1 cm to more than 1 m, and the erionite content ranges from a trace to nearly 100 percent. At Jersey Valley (locality 27), two erionite-rich beds can be traced along strike for about 5.5 km. Most erionite-rich tuff is yellow or light orange. Erionite coexists with analcime, chabazite, clinoptilolite, mordenite, and phillipsite, but the association with clinoptilolite is most common. At the Reese River occurrence (locality 29), some erionite has a woolly appearance (Gude and Sheppard, 1981) and resembles the type erionite from Durkee, Oregon (locality 44). Most erionite from the lacustrine deposits occurs as acicular or prismatic crystals or as bundles or aggregates of radiating acicular crystals.

Ash-flow tuffs at Yucca Mountain (locality 20) and near Fish Creek (locality 28) rarely contain trace amounts of erionite. Erionite has been recognized only in the subsurface at Yucca Mountain. At both localities, the erionite coexists with clinoptilolite."

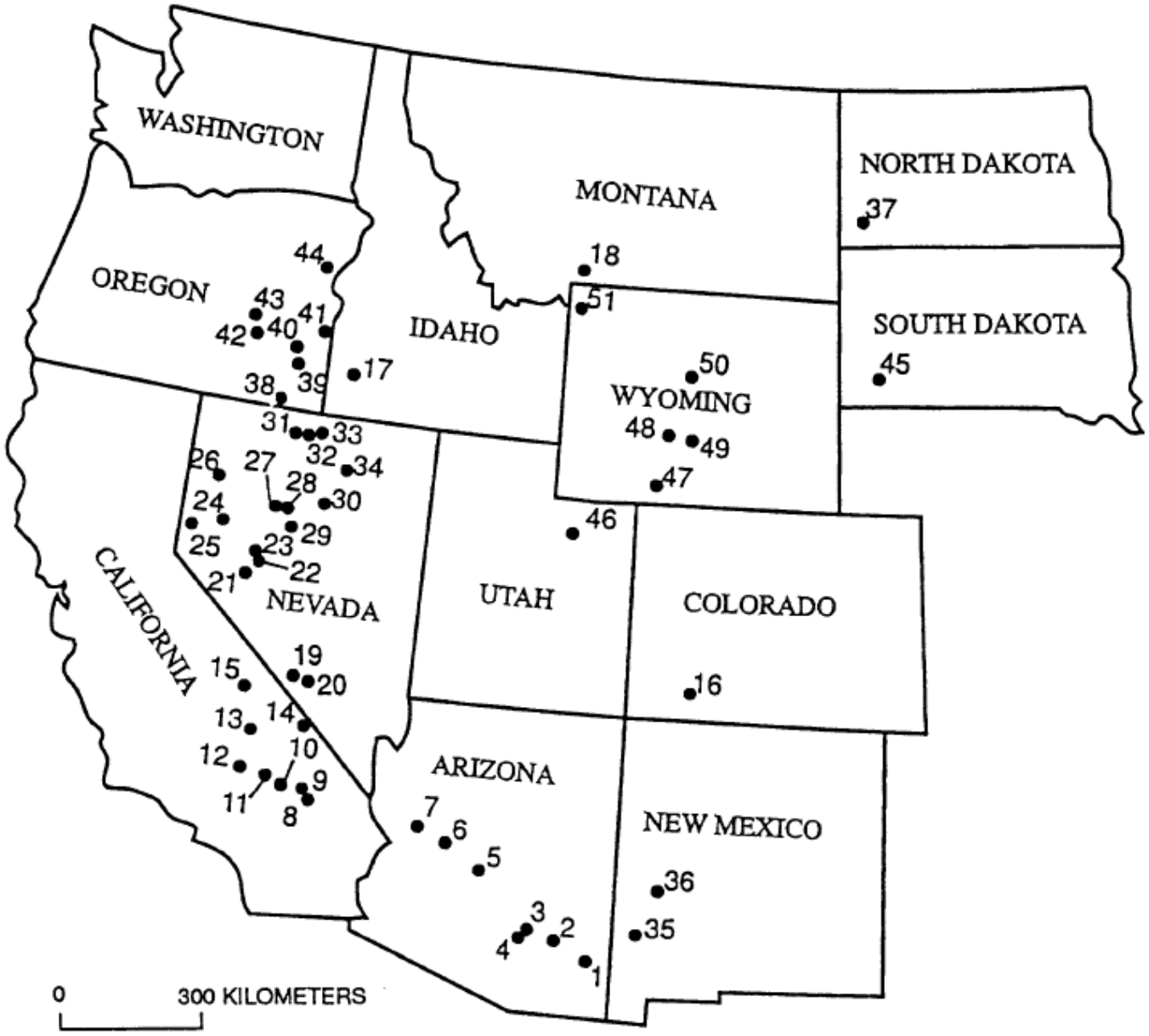


Figure 3-30. Some known Occurrences of Erionite in the Western United States

from Sheppard, 1996

19. Near Beatty, Nye County
20. Drill holes (UE-25a#I, about 395.1 m depth; J-12, about 189.0-192.0m depth; USW G-4, about 400.5 m depth; USW GU-3, about 362.5 m depth) at Yucca Mountain, Nye County
21. Gabbs Valley, northwest of Gabbs, Nye County

22. Southern Desatoya Mountains, Churchill County
23. Near Eastgate, Churchill County
24. Trinity Range, Churchill County
25. Near Hungary Valley, Washoe County
26. Near Windy Basin, east of Gerlach, Pershing County
27. Jersey Valley, Pershing County
28. Near Fish Creek, Lander County
29. Near Reese River, Lander County
30. Pine Valley, Eureka County
31. Along Spring Creek, Humboldt County
32. Eastern fork of Chimney Reservoir, Humboldt County
33. Along South Fork Little Humboldt River, Elko County
34. Near Susie Creek, Elko County

Amphibole NOA minerals are rare, and the growth of asbestiform mineral fibers requires specific geologic processes such as the deformation of amphibole during or after mineral growth (Ahn and Buseck, 1991; Virta, 2002). NOA has been documented at four localities in Nevada. Three of which were compiled by Van Gossen (2008) and include sites at the Segerstrom-Heizer mine, the Windous magnesite deposit, and in the Tonopah district (Table 3-27). A fourth NOA site was documented in a 2013 study done by researchers from UNLV in southern Nevada, around Boulder City, southeast Henderson, and surrounding regions (Buck et al., 2013). Two subsequent studies by NDOT were conducted in 2014 and 2016 that confirmed the presence of NOA in the phase one and two projects of the Boulder City Bypass – a highway built to alleviate traffic though Boulder City, NV (Tetra Tech, 2014; Kleinfelder, 2014; NDOT Presentation on NOA and Erionite, 2016). While scientists are aware that there is a hazard, more research and air sampling are needed to determine how NOA in this area of Clark County is affecting the population. Researchers are continuing to locate additional deposits of NOA in the region.

Table 3-27. NOA Occurrences in Nevada from Van Gosen, 2008 – Reported Historic Asbestos Mines

State	Historic Site Name	Asbestiform Mineral(s)	Associated Mineral(s)	Host Rock(s)	References
NV	Segerstrom-Heizer mine (Pershing County)	crocidolite	magnetite, hematite, apatite, pyrite, marcasite, chlorite, calcite, actinolite-tremolite	iron ore body replacing diorite	Reeves and Kral (1955, p. 25-28); Castor and Ferdock (2004, p. 389)
NV	Windous magnesite deposit (White Pine County)	clinochrysotile	magnesite, serpentine (deweylite), dolomite, calcite, quartz	calcareous tuff	Faust and Callaghan (1948); Vitaliano (1951, p. 13-16); Faust and Fahey (1962, p. 10); Hose and others (1976, p. 50-51)
NV	Tonopah district	tremolite asbestos	not reported	not reported	Castor and Ferdock (2004, p. 440)

Buck et al. (2013) summarized the impact of NOA in southern Nevada:

> "Evidence of fibrous amphiboles on car tires and on clothing after recreational activities shows that they can be brought back to family members and thus increase the risk of exposure for other populations besides those directly exposed through outdoor dust emissions. Because health effects may occur even at low levels of exposure to fibrous amphiboles (Alexander et al., 2011; Hillerdal, 1999), our data indicate a potential public health threat in southern Nevada. Any potential future land-use projects should carefully determine the risks to both workers and the regional populations because disturbances to these natural desert surfaces cause increased dust emissions (Goossens et al., 2012). Social behaviors and land management practices that limit dust production in areas where fibers are present could be implemented to reduce human exposure. There is a compelling need for epidemiology studies, additional geologic and mineral studies, and significantly more research on their location, emission, airborne concentration, and pathways of human exposure."

References

Ahn, J.H., and P.R. Buseck. 1991. Microstructures and fiber-formation mechanisms of crocidolite asbestos. Am. Mineral. 76:1467–1478.

Buck, B.J., Goossens, Dirk, Metcalf, R.V., McLaurin, Brett, Ren, Minghua, and Freudenberger, Frederick, 2013, Naturally Occurring Asbestos: Potential for Human Exposure, Southern Nevada, USA: Soil Science Society of America J. 77, p. 2192-2204.

Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, 2011, Erionite: an emerging North American hazard, http://blogs.cdc.gov/niosh-science-blog/2011/11/erionite/, downloaded 23 May 2012.

Deffeyes, K.S., 1959, Erionite from Cenozoic tuffaceous sediments, central Nevada: American Minealogist, v. 44, p. 501-509.Kleinfelder, 2014, INTERSTATE 11- Boulder City Bypass Phase 2 Design Build Project Geologic Evaluation, Sampling, And Testing For Naturally-Occurring Asbestos Boulder City, Clark County, Nevada, Kleinfelder Project No.: 137120 prepared for the Clark County Regional Transportation Commission.

Meeker, G., A. Bern, I. Brownfield, H. Lowers, S. Sutley, T. Hoefen, and J. Vance. 2003. The composition and morphology of amphiboles from the Rainy Creek Complex near Libby, Montana. Am. Mineral. 88:1955–1969.

The Mesothelioma Center, What is Asbestos? Retrieved from https://www.asbestos.com/asbestos/

Papke, K.G., 1972, Erionite and other associated zeolites in Nevada: Nevada Bureau of Mines and Geology Bulletin 79, 32 p.

Pratt, S.E., 2012, Dangerous dust: erionite – an asbestos-like mineral causing a cancer epidemic in Turkey – is found in at least 13 U.S. states: Earth, p. 36-43.

Shannahan, J., M. Schladweiler, R. Thomas, W. Ward, A. Ghio, S. Gavett, and U. Kodavanti. 2012. Vascular and thrombogenic effects of pulmonary exposure to Libby amphibole. J. Toxicol. Environ. Health A 75:213–231.

Sheppard, R., 1996, Occurrences of erionite in sedimentary rocks of the western United States: U.S. Geological Survey Open-File Report 96-018.

Terry, J. M., 2016, Naturally Occurring Asbestos and Erionite: Nevada Department of Transportation Board Meeting, Presentation: https://www.nevadadot.com/Home/ShowDocument?id=2607

Tetra Tech, 2014, Phase I Site Characterization Report Boulder City Bypass Naturally Occurring Asbestos (Noa) Project, Prepared for the Nevada Department of Transportation.

Van Gosen, B.S., 2008, Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Natural Asbestos Occurrences in the Southwestern United States (Arizona, Nevada, and Utah). USGS Open-File Report 2008-1095 version 1.0.

Virta, R. 2002. Asbestos: Geology, mineralogy, mining, and uses. USGS Open-File Rep. 02-149. USGS, Reston, VA.

3.3.11.5 Location, Severity, and Probability of Future Events

The probability of future events for this category is considered high for a number of reasons which are listed below:

1. As previously mentioned, the EPA placed the Carson River on the Superfund National Priorities List (NPL). As of February, 2018, the CRMS is the only site in Nevada under this listing which is under direct control of the EPA. Mitigation of this site and other historic mining release sites are often complex and may take many years to complete. In addition, due to historic hazardous materials practices prior to Federal, State and Local regulations and ordinances, future discovery events in Nevada are probable. In response to this possibility, the Abandoned Mine Lands Program (AML) was established within BCA to evaluate the potential human health and ecological concerns associated with contamination from legacy heavy metal mining operations by assessing AML throughout Nevada. The sites are evaluated and prioritized for future site restoration activities.
2. The use of State highway and rail routes to transport hazardous materials cannot be avoided. The Waste Isolation Pilot Program (WIPP) transports transuranic waste through Nevada highway corridors *en route* to the Nevada Test Site (located in Nye County) and other locations in the country. Transuranic waste is radioactive waste consisting of material containing elements having an atomic number greater than 92, the atomic number of uranium. As of January, 2018, the Nevada Test Site has received a total of 48 shipments of transuranic waste according to the DOE website, www.wipp.energy.gov/shipments.htm.
3. Air transportation of hazardous materials across Nevada cannot be avoided.
4. Approximately 84% of the territory in Nevada is federally managed. Federal land stewardship can present a challenge to the enforcement of state and local laws.
5. Natural hazards such as earthquakes, flooding, and forest fires are unpredictable and may not only cause releases of hazardous substances, but can also severely complicate response activities.
6. Terrorist acts present an unpredictable threat and could be especially catastrophic due to the locations of facilities that store, transport or manufacture hazardous substances.
7. There are specific hazards posed to the water supplies for the two major population centers (Reno-Sparks [Truckee River] and Las Vegas [Colorado River-Lake Mead]) by possible hazardous materials contamination originating out-of-state. California contaminants can impact the Truckee River (as well as the Carson and Walker Rivers), and Arizona contaminants can impact the Colorado River.

8. Hazardous materials releases can occur at natural resource sites. The minerals industry is important in hazardous materials transportation, production, and use in Nevada. In 2017, UNR-NBMG reported about 34 active mines, 12 oil fields and 25 geothermal plants statewide.

   Source: http://pubs.nbmg.unr.edu (revised 2017)

9. The volume of hazardous substances stored and manufactured in Nevada communities along with the transport of these substances in and through the State are factors that help determine the potential release and community exposure to these substances. These factors are variable and make the probability of future releases difficult to predict. However, the number of facilities that store, manufacture and transport hazardous substances is likely to increase in coming years as the population of the State increases and more businesses locate to Nevada. Therefore, the potential of hazardous material releases is likely to increase.

3.3.12 **Infestation** (Low Risk)

3.3.12.1 Nature

An "invasive species" is defined as a species that is:

1) Non-native (or alien) to the ecosystem under consideration and

2) Whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Invasive species can be plants, animals (including aquatic species) and other organisms (e.g., microbes). *Source: USDA, National Agriculture Library (10/5/2007)*

Infestations impact Nevada's economy through the destruction of crops and natural resources, which also impacts recreation and tourism. Some of the plant infestations are highly flammable and assist in the spread of wildfires. Human actions are the primary means of introduction and spread of invasive species.

3.3.12.2 History

NDA monitors the introduction and spread of noxious weeds in the state. They have developed a categorization scheme for control of noxious weeds with Category "C" being the most .widespread. Below is the NDA's Noxious Weed List as designated by application of NRS 555.010.

Nevada Noxious Weed List:

NRS 555.130 Designation of noxious weeds. The State Quarantine Officer may declare by regulation the weeds of the state that are noxious weeds, but a weed must not be designated as noxious which is already introduced and established in the State to such an extent as to make its control or eradication impracticable in the judgment of the State Quarantine Officer.

NAC 555.010 Designation and categorization of noxious weeds. (NRS 555.130)

Regardless of category, per statutes, all landowners are responsible to control any noxious weeds found on their property. The plants listed below are designated noxious weeds and categorized as follows:

- **Category A** weeds are generally not found or limited in distribution throughout the State. Such weeds are subject to active exclusion from the State and active eradication wherever found and active eradication from the premises of a dealer of nursery stock.

- **Category B** weeds are generally established in scattered populations in some counties of the State. Such weeds are subject to active exclusion where possible and active eradication from the premises of a dealer of nursery stock
- **Category C** weeds are generally established and widespread in many counties of the State and are subject to active eradication from the premises of a dealer of nursery stock. Abatement is at the discretion of the state quarantine officer.

Table 3-28 contains a listing of noxious weeds that threaten Nevada; it is maintained online by NDA at this link: http://agri.nv.gov/Plant/Noxious_Weeds/Noxious_Weed_List/

Table 3-28. Noxious Weeds that Threaten Nevada

Category A Weeds	
African rue	*(Peganum harmala)*
Austrian fieldcress	*(Rorippa austriaca*
Barbed goatgrass	*(Aegilops triuncialis)*
Buffelgrass	*(Pennisetum ciliare)*
Camelthorn	*(Alhagi pseudalhagi)*
Common crupina	*(Crupina vulgaris)*
Curly leaf pondweed	*(Potamogton crispus)*
Desert knapweed	*(Volutaria tubuliflora)*
Dyer's woad	*(Isatis tinctoria)*
Eurasian water-milfoil	*(Myriophllum spicatum)*
Flowering rush	*(Butomus umbellatus)*
Giant salvinia	*(Salvinia molesta)*
Goats rue	*(Galega officinalis)*
Green fountain grass	*(Pennisetum setaceum)*
Houndstongue	*(Cynoglossum officinalis)*
Hydrilla	*(Hydrilla verticillate)*
Iberian starthistle	*(Centaurea iberica)*
Jointed goatgrass	*(Aegilops cylindrical)*
Klamath weed	*(Hypericum perforatum)*
Malta starthislte	*(Centaurea melitensis)*
Mediterranean sage	*(Salvia aethiopis)*
Purple loosestrife	*(Lythrum salicaria & virgatum)*
Purple starthistle	*(Centaurea calcitrapa)*
Rush skeletonweed	*(Chondrilla juncea)*
Stinkwort	*(Dittrichia graveleons)*
Squarrose knapweed	*(Centaurea virgata)*
Sulfur cinquefoil	*(Potentilla recta)*
Syrian bean caper	*(Zygophyllum fabago)*
Swainsopea	*(Sphaerophysa salsula)*
Ventenata	*(Ventanata dubia)*
Yellow starthistle	*(Centaurea solstitialis)*
Yellow toadflax	*(Linaria vulgaris)*

Table 3-28. Noxious Weeds that Threaten Nevada	
Category B Weeds	
Black henbane	(Hysocyamus niger)
Carolina horse nettle	*(Solanum carolinense)*
Dalmatian toad flax	(*Linaria dalmatica)*
Diffuse knapweed	(*Centaurea diffusa)*
Giant reed	*(Arundo donax)*
Leafy spurge	*(Euphorbia esula)*
Medusahead	(Taeniatherum caput-medusae)
Mayweed chamomile	*(Anthemis cotula)*
Perennial sowthistle	(Sonchus arvensis)
Sahara mustard	*(Brassica tournefortii)*
Silver leaf nightshade	*(Solanum elaegnifolium)*
Spotted knapweed	*(Centaurea maculosa)*
Category C Weeds	
Canada thistle	(*Cirsium arvense*)
Hoary cress	(*Cardaria draba*)
Johnsongrass	(*Sorghum halepense*)
Musk thistle	(*Carduus nutans)*
Perennial pepperweed	(*Lepidium latifolium)*
Poison hemlock	(*Conium maculatum)*
Puncture vine	*(Tribulus terrestris*)
Russian knapweed	(*Acroptilon repens)*
Salt cedar	*(Tamarix spp.)*
Scotch thistle	*(Onopordum acanthium)*
Water hemlock	*(Cicuta maculata)*

Other invasive plants that are too widely distributed in Nevada to be included in the noxious weed list but present problems in Nevada are listed below:

- *Bromus tectorum* L. or Cheatgrass: is an annual grass that forms tufts up to 2 feet tall. The leaves and sheathes are covered in short soft hairs. The flowers occur as drooping, open, terminal clusters that can have a greenish, red, or purple hue. These annual plants will germinate in fall or spring (fall is more common) and senescence usually occurs in summer. Cheatgrass invades rangelands, pastures, prairies, and other open areas. Cheatgrass has the potential to completely alter the ecosystems it invades. It can completely replace native vegetation and change fire regimes. It occurs throughout the United States and Canada, but is most problematic in areas of the western United States with lower precipitation levels such as Nevada. Cheatgrass is native to Europe and parts of Africa and Asia. It was first introduced into the United States accidentally in the mid-1800s.
- *Bromus rubens L.* or Red brome*:* In the North American region red brome is reported to be invasive because it faces low herbaceous competition. Once established, it has the potential to compete with other grasses. The accumulation of litter and necromass has the potential to increase fire frequency in the desert. Red brome-fueled fires result in the loss of native perennial species in invaded areas, resulting in disturbed areas that are ideal for increased growth of red brome.

For further information or comments specific to noxious or invasive plants and/or the NDA Noxious Weed Programs please contact:

Sean Gephart, Noxious Weeds Coordinator at 775-353-3640 or Sgephart@agri.nv.gov

Animal infestations - Insects

The USDA National Invasive Species Information Center maintains a website with up-to-date information on invasive species affecting each state at the following link:
http://www.invasivespeciesinfo.gov/animals/main.shtml

Invertebrate Species

Invertebrate species are animals which lack a spine or backbone. Example species include spiders and other insects; round, segmented, and flat worms; jellyfish; squids; sponges; and others.

The following is a list of invasive invertebrate species infestations currently affecting or are threats to Nevada:

Africanized Honeybee (Apis mellifera scutellata)

Asian Citrus Psyllid (Diaphorina citri)

Asian Long-Horned Beetle (Anoplophora glabripennis)

Asian Tiger Mosquito (Aedes albopictus)

Brown Marmorated Stink Bug (Halyomorpha halys)

Cactus Moth (Cactoblastis cactorum)

Chilli Thrips (Scirtothrips dorsalis)

Citrus Longhorned Beetle (Anoplophora chinensis)

Common Pine Shoot Beetle (Tomicus piniperda)

Emerald Ash Borer (Agrilus planipennis)

European Gypsy Moth (Lymantria dispar)

European Spruce Bark Beetle (Ips typographus)

Formosan Subterranean Termite (Coptotermes formosanus)

Giant African Snail (Lissachatina fulica)

Glassy-Winged Sharpshooter (Homalodisca vitripennis)

Hemlock Woolly Adelgid (Adelges tsugae)

Light Brown Apple Moth (Epiphyas postvittana)

Mediterranean Fruit Fly (Ceratitis capitata)

Mexican Fruit Fly (Anastrepha ludens)

Pink Bollworm (Pectinophora gossypiella)

Pink Hibiscus Mealybug (Maconellicoccus hirsutus)

Red Imported Fire Ant (Solenopsis invicta)

Russian Wheat Aphid (Diuraphis noxia)

Silverleaf Whitefly (Bemisia argentifolii)

Sirex Woodwasp (Sirex noctilio)

Soybean Cyst Nematode (Heterodera glycines)

Vertebrate Species

Vertebrate species are animals with backbones or spinal columns. In some cases closely related species such as the hagfish which lack a spine but have a bony skull or cranium are included in the group. Example species include: bony fish; sharks; rays; amphibians; reptiles; mammals; and birds.

The following is a list of invasive vertebrate species infestations currently affecting Nevada:

Burmese Python *(Python molurus bivittatus)*

Brown Tree Snake *(Boiga irregularis)*

Cane Toad *(Rhinella marina)*

European Starling *(Sturnus vulgaris)*

Wild Boar *(Sus scrofa)*

Although not listed as an invasive species, *Anabrus simplex* or Mormon crickets are flightless, ground-dwelling insects native to the western United States that cause periodic infestations in Nevada. They eat native, herbaceous perennials (forbs), grasses, shrubs, and cultivated forage crops, reducing feed for grazing wildlife and livestock. In large numbers, their feeding can contribute to soil erosion, poor water quality, nutrient depleted soils, and potentially cause damage to range and cropland ecosystems. Drought encourages Mormon cricket outbreaks, which may last several years (historically 5 to 21 years) and cause substantial economic losses to rangeland, cropland, and home gardens. Regional distribution of Mormon crickets is shown in Figure 3-31.

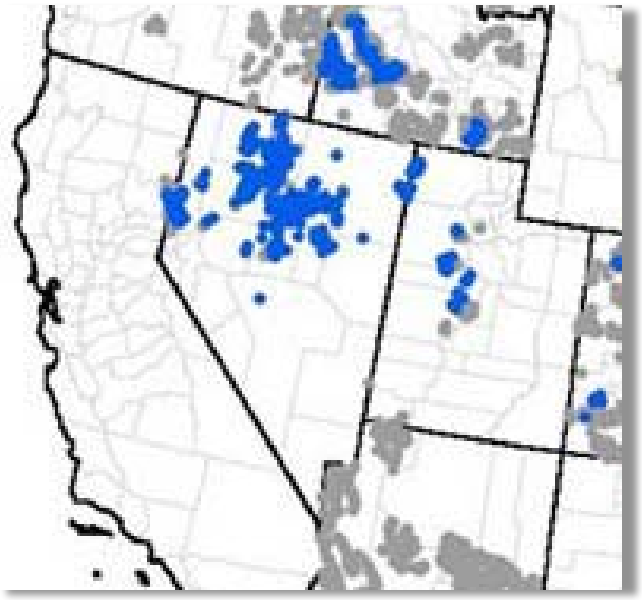


Figure 3-31. Regional Distribution of Mormon Crickets, August 2005. Blue = high density, gray =low density *Source: University of Nevada Cooperative Extension*

Animal infestations – aquatic species

In June, 2011, AB 167 was passed directing the Nevada Department of Wildlife (NDOW) to develop a coordinated statewide aquatic invasive species (AIS) management plan to control and prevent the spread of species such as quagga mussels and many others. The bill makes it illegal to deliberately introduce any aquatic invasive species into Nevada waters. NDOW has implemented a statewide boat inspection and decontamination program for high risk waters, exclusive of the Lake Tahoe basin where that program is conducted by the Tahoe Regional Planning Agency (TRPA). NDOW also has implemented an early detection monitoring program and a rapid response plan for new invasions. A comprehensive Nevada AIS Management Plan was completed in 2017. NAC 503.074 identifies certain species as aquatic invasive species:

NAC 503.074 Aquatic invasive species: Mollusks. (NRS 501.105, 501.181, 503.597) For the purposes of NRS 503.597, the following species are classified as aquatic invasive species:

1. Golden mussels.....*Limnoperna fortunei*
2. New Zealand mud snails.....*Potamopyrgus antipodarum, P. jenkinsi*
3. Quagga and zebra mussels.....All species in the genus *Dreissena*

At this time 144 nonindigenous aquatic species are tracked by USGS in Nevada with regular updates reported online on this website: http://www.invasivespeciesinfo.gov/unitedstates/nv.shtml

These include many fish, several plants, and a few invertebrate aquatic species that have become of particular concern in Nevada in recent years such as zebra mussels, quagga mussels, Asian clams, and New Zealand mud snails.

Quagga mussels, *Dreissena bugensis*, were first found at Lake Mead in 2007. Since that time, the population has exploded, now numbering in the trillions. The closely related zebra mussel, *Dreissena polymorpha*, has not been confirmed to occur in Nevada but both mussels are nuisance invasive species that are reproducing quickly and in large numbers. They are biofoulers that obstruct pipes in municipal and industrial raw-water systems, requiring millions of dollars annually to maintain. They produce microscopic larvae that float freely in the water column, and thus can pass by screens installed to exclude them. Monitoring and control of these mussels cost millions of dollars annually. As filter feeders, zebra and quagga mussels remove suspended material from the habitat in which they live. This includes the planktonic algae that are the primary base of the food web. Thus, these mussels may completely alter the ecology of water bodies in which they invade. In 2010, New Zealand mudsnails were found at a Lake Tahoe Basin inspection, and UNR research has determined that Lake Tahoe water can support quagga mussels. Proactive measures are being taken by a number of groups to prevent the spread of these species into Lake Tahoe and other high risk waters statewide.

The **Asian clam**, *Corbicula fluminea*, has been present in the Colorado River basin in Nevada for many years but is now becoming established in Lake Tahoe. Asian clams can impact Lake Tahoe's environment by:

- Releasing nitrogen and phosphorus to the lake, resulting in algal blooms.
- Negatively impacting drinking water by clogging intake pipes.
- Littering beaches with their sharp shells, negatively impacting recreation.

Asian Clam Removal Project

There is an ongoing aquatic invasive species mitigation project initiated in 2010 by the Tahoe Resource Conservation District (Tahoe RCD) to physically remove Asian clams from south shore areas of Lake Tahoe by installing two-½ acre plots of plastic 45 mil pond liner and thin rubber matting on the lake bottom along the southeast shore of the lake in Marla Bay near Lakeside Marina, to cover and terminate Asian clam populations by reducing oxygen and food availability. The project is a multi-agency collaborative effort with multiple funding sources including: UNR, University of California, Davis (UC Davis), USFWS, TRPA, CA State Parks, NDEP, Lahontan WQCB, and Lake Tahoe Water Purveyors. The forty-two 10' x 100' barriers were then removed in early November, 2011 and researchers from UC Davis and UNR will monitor the experimental plots for the next year to determine whether or not Asian clam populations are reestablishing. The goals of the project have been to understand the effects of the mats on Asian clams and the feasibility of using the treatment in other areas of the lake. In 2011, the project expanded to Emerald Bay where a small population of Asian clams has colonized at the mouth of the bay. Tahoe RCD will continue to manage and coordinate these efforts in collaboration with its partners and funders.

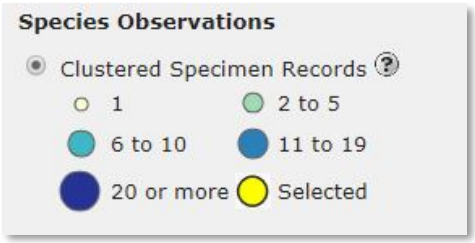
New Zealand Mudsnail, *Potamopyrgus antipodarum* is a nuisance aquatic species now reported in a few Nevada streams along the periphery of the state, (see map in Figure 3-32) with the addition most

recently in 2012 and 2013 of documentation in the Truckee River from Mayberry Park to the East McCarran bridge in Reno and on Maggie Creek, a tributary to the Humboldt River near Carlin in Elko County. It is reported in all western states, except New Mexico, and is listed as an invasive species in California. It reproduces rapidly and competes for food with native gastropods and other species and is detrimental to trout populations because of its lack of nutritional value. It is not yet a huge problem, but is being monitored in the state and may become more of a problem in the future.



Figure 3-32. A screenshot of USGS's point distribution map showing reported species observations of New Zealand mudsnails in Nevada and adjacent areas of California, Arizona, Utah, and Idaho as of 2018. Mudsnail establishments within the state have been documented on the Truckee and Humboldt Rivers and tributaries, Goose Creek/Salmon Falls drainages, and Lake Mead. The interactive map is available online, and is updated regularly by USGS:

http://nas.er.usgs.gov/taxgroup/mollusks/newzealandmudsnaildistribution.aspx



The Tahoe RCD is a part of the Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG). This group was formed to better share resources and information, standardize methods for treatment and data collection, perform coordinated education and outreach activities, obtain grants, and organize effective control efforts of aquatic invasive species affecting Lake Tahoe. Beginning in 2008, the Tahoe RCD's invasive species program has included a boat inspection effort in the Tahoe Basin to prevent the spread of quagga and zebra mussels in the area.

Currently in Lake Tahoe:

FLORA	FAUNA
Eurasian watermilfoil	Large-mouth bass
Curly leaf pondweed	Bluegill
	Bullfrogs
	Asian clam
	Quagga mussel
	Zebra mussel

Currently in Truckee River, Humboldt River, and tributaries: New Zealand mudsnail

Aquatic weed removal

A second AIS mitigation project by Tahoe RCD involved aquatic weed removal (particularly Eurasian watermilfoil, Category A noxious weed, as well as Curly leaf pondweed) begun in April and September 2010 at Elks Point Marina and summer of 2011 in Emerald Bay near the Vikingsholm swim beach and pier, the Parson's Rock area, and near Avalanche Beach. The removal effort is a collaborative effort between the Tahoe RCD, TRPA, and the California Department of Parks and Recreation. The work was accomplished by deploying over 20,000 square feet of bottom barrier and by significant diver-assisted hand removal of invasive weeds resulting in near-eradication of weeds in part of the affected area.

The Truckee Meadows Water Authority (TMWA) is continuing and expanding its boat inspection program at Lake Tahoe that began with a $231,000 from the Truckee River Fund, money collected from utility bills to pay for projects and protect the Truckee River in spring 2010. The program efforts have included monitoring lakes and reservoirs within the Truckee River system for the presence of adult or juvenile mussels. It expanded at Lake Tahoe in 2012 to six highway boat inspection stations located at Spooner, North Star, Alpine Meadows Road, Homewood Ski Resort parking lot, and Myers at the intersection of U.S. 50 and 89 and the Diamond Peak parking lot in Incline Village.

The Southern Nevada Water Authority (SNWA), in cooperation with the Lake Mead National Recreation Area, UNLV, UNR, and other agencies have developed an Interagency Monitoring Action Plan to coordinate the collection and sharing of quagga mussel data for Lake Mead. No live adult quaggas have been found at SNWA treatment facilities and improvements are being implemented to prevent the colonization of the intake structures by mussels. Although quagga larvae have been found in the raw Lake Mead water as it comes into the treatment plants, SNWA's water treatment processes have been successful in destroying all quagga before they get into the drinking water system.

3.3.12.3 Location, Severity, and Probability of Future Events

Noxious weed species distribution has a high probability to expand outward from currently known geographic locations as described above and as shown on species distribution maps throughout the state at the following link: http://www.eddmaps.org/distribution/

The severity of noxious weed infestations is continuously monitored by NDA's A, B, and C categorization of noxious weeds described in the previous section. In order to combat the spread of noxious weed infestations, the NDA continues to work with counties to enforce sections of statute for the abatement of noxious weeds. An increase in the need for regulatory enforcement is expected in

future years to address problems associated with expanding noxious weed infestations. Locations of infestations of some other insects and aquatic species are described in the previous section as well.

The NHM Planning Subcommittee agreed that plant, insect, and aquatic organism infestations will continue to occur throughout the state as recreation and commerce continue to move people and property across state lines. Cooperative efforts are necessary among state, federal, agencies and other interested regional groups to implement programs to control and mitigate the effects of infestations on all aspects of the state's environment and economy.

A final "Quagga-Zebra Mussel Action Plan for Western U.S. Waters" was submitted to the Aquatic Nuisance Species Task Force in February 2010 by the Western Regional Panel on Aquatic Nuisance Species. It details a plan for control and outlines initial costs, and charts current states' progress on control efforts including developing their own management plans for quagga and zebra mussel control. It is located online at this link:

http://anstaskforce.gov/QZAP/QZAP_FINAL_Feb2010.pdf

The Nevada Aquatic Invasive Species Management Plan was completed in September 2017 and has been submitted to the Aquatic Nuisance Species Task Force for approval. The plan is intended to present a comprehensive and realistic approach to minimizing AIS impacts to Nevada and regionally, using a multi-stakeholder approach and focusing on the species with the highest potential to have negative economic, ecological and recreational impacts. The goals of the AIS plan are to 1) prevent new introductions of AIS to Nevada, 2) limit the spread of existing AIS populations and eradicate or control existing AIS populations, and to 3) minimize harmful impacts resulting from AIS. The plan is available online at:
http://www.ndow.org/uploadedFiles/ndoworg/Content/Boat/Aquatic_Invasive_Species/Final_USE_Electronic%20AIS%20Plan_ndow-managment-plan-digital.pdf

These efforts have been strengthened since the last iteration of the plan by the passage or amendment of specific statutes and regulations including:

- NRS 488.530 identifies requirements to comply with watercraft AIS inspections and the authority of peace officers to enforce those requirements.
- NRS 488.533 provides authority to impound or quarantine infested watercraft until aquatic invasive species or aquatic plant material is completely removed.
- NRS 503.597 makes it illegal to transport any aquatic invasive species in the state and provides specific penalties for intentional introductions.
- NAC 488.520 identifies requirements to decontaminate a vessel or conveyance
- NAC 503.072 defines Injurious aquatic species
- NAC 503.074 defines aquatic invasive species

NDOW conducts early detection monitoring at high-risk waters statewide outside of the Colorado River Basin. That monitoring is focused on quagga and zebra mussels and consists of both visual (adult) surveys and plankton tows which are analyzed using both microscopy and DNA techniques to identify possible presence of mussel veligers. Most target waters are sampled multiple times each year during the active recreational boating season. Designated high-use waters have seasonal

watercraft inspection stations during the boating season to intercept and inspect incoming watercraft to prevent AIS introductions, in addition to two highway inspection stations targeting watercraft that could be transporting AIS from the Colorado River basin or other locations to central/northern Nevada waters or adjacent states.

3.3.13 Land Subsidence and Ground Failure (Low Risk)

3.3.13.1 Nature

In the southwestern United States, agricultural and urban areas that depend on aquifer groundwater pumping are prone to land subsidence. Non-recoverable land subsidence occurs when declining water table levels lead to inelastic compaction of the solid particles in the aquifer (particularly clay minerals). A lesser amount of subsidence occurs with the recoverable compression of coarse-grained sand and gravel deposits. Earth fissures commonly accompany subsidence; these are vertical tension cracks in the sediment above the water table. Figure 3-33 shows the distribution of the aquifers in the state.

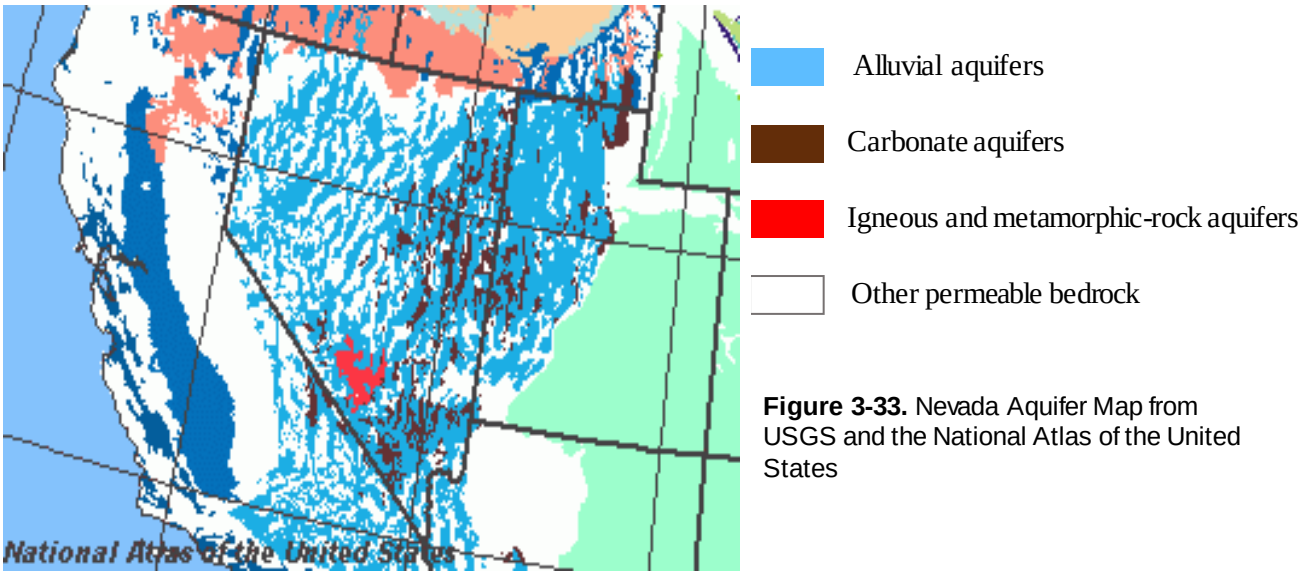


Figure 3-33. Nevada Aquifer Map from USGS and the National Atlas of the United States

Aquifers in Nevada are composed primarily of three major hydrogeologic units. One is the alluvial aquifer, which is the material that makes up the valleys between mountain ranges. Alluvial aquifers mostly consist of gravels, sands, silts, and clays. Another aquifer in Nevada is a carbonate aquifer, which is mainly made up of limestone and dolomite. These rocks comprise many mountain ranges in eastern and southern Nevada and underlie the alluvial aquifer in places. The third major aquifer type in Nevada consists of volcanic rocks and makes up many mountain ridges and underlies the alluvial aquifer in much of western and northern Nevada.

The major aquifer under Las Vegas Valley is an alluvial aquifer. Below the alluvial aquifer, at least in the western side of the valley, is the carbonate aquifer. Over-pumping (taking more water out than is naturally recharged from snow melt and rainwater) of the alluvial aquifer has caused subsidence problems in Las Vegas and Pahrump Valleys. To help mitigate this hazard, the Clark County building department has, as part of its building code, a requirement to conduct special geotechnical investigations near any earth fissures and faults to avoid building directly over these features.

The following link from NDWR contains a map of "Designated Groundwater Basins of Nevada":

http://water.nv.gov/programs/planning/stateplan/documents/fig-s3-7.pdf

3.3.13.2 History

Most subsidence problems in Nevada have developed in the Las Vegas Valley; however, this hazard is now recognized in other parts of Nevada. In a recent survey, Douglas, Nye, Storey, and Washoe Counties recognized that land subsidence is a risk. Evidence of groundwater-withdrawal-related land subsidence and local fissuring has been recognized near some of the large open-pit mining areas in Humboldt, Lander, Eureka, and Elko Counties. Sections of Interstate 80 west of Battle Mountain have been repaired because earth fissures developed in the freeway near one of the mines probably related to groundwater-withdrawal related issues.

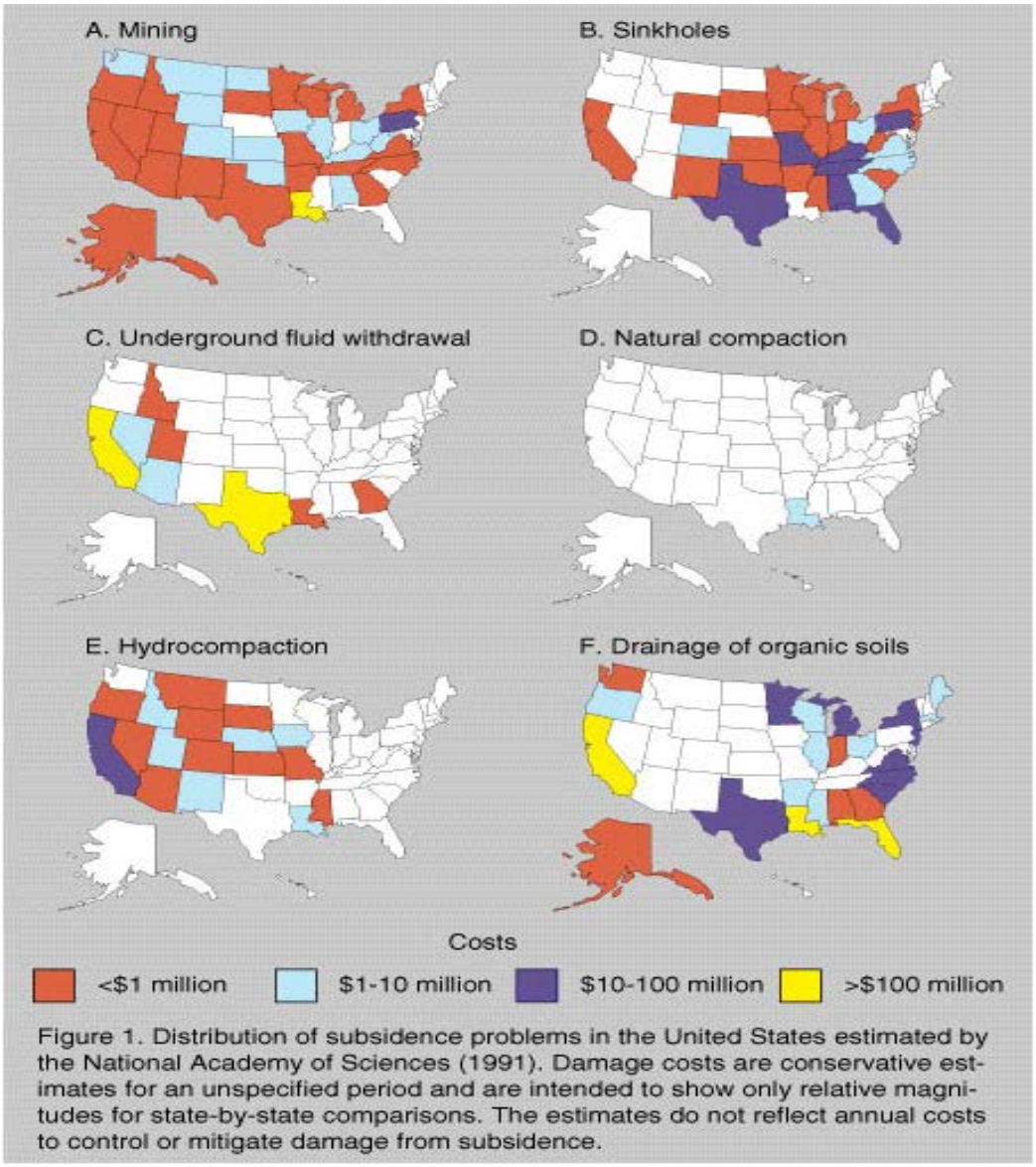


Figure 3-34. Distribution of Subsidence Problems in the U.S

Figure 3-34 shows that land subsidence can be caused by actions other than overdrafting of water. Mining, hydrocompaction, and underground fluid withdrawal (water, oil, or other fluid) can cause this hazard and result in land surface displacements and fissures. Hydrocompaction means that water absorbed on and within clay minerals is removed by withdrawal or drying, and the clays shrink. Shrinkage of clays results in less volume, so the surface will subside as the clays become more tightly compacted.

The primary problem in Storey County is one of collapse into excavations related to old mines on the Comstock Lode in Virginia City. This phenomenon is unrelated to groundwater withdrawal and is a human-caused hazard similar to sinkholes that develop in areas with natural caverns near the surface. Officials in Storey County are well aware of the mine-collapse hazard and have records of collapses and repairs to roads that have occurred in recent years. At a meeting on 25 March 2010, Storey County officials discussed the problem with representatives of the Nevada DEM, Seismo Lab, and NBMG. Maps and models of old workings on the Comstock Lode and other mined areas can be used to locate areas of potential mine collapse. Seismometers that could be located in Virginia City may be able to detect small earthquakes related to pending collapse.

3.3.13.3 Location, Severity, and Probability of Future Events

As mentioned in the history section, Clark, Douglas, Nye, Storey, and Washoe Counties have problems with this hazard.

Las Vegas Valley in Clark County has more dramatic problems which include vertical aquifer-system deformation, land subsidence, and earth fissuring that have caused millions of dollars of damage and might have altered boundaries of flood-prone areas.

Land subsidence is considered by the Subcommittee to be a "Low Risk" hazard. Unlike the rapid occurrences of fires, earthquakes, and floods, land subsidence generally occurs slowly, developing over periods of weeks, months, and years and affects localized areas.

Mine-collapse in Storey County is also considered to be "Low Risk" from the State's perspective, because it will likely only affect localized areas and because recent mining in the area has indicated that most of the stopes (large openings) along the Comstock Lode have been filled by clay and weak rock, characteristic of the wall rock of the Comstock Lode, over the years since mining ceased. Nonetheless, the mine-collapse hazard is a serious consideration for officials, businesses, and residents in Virginia City.

Due to Nevada's history of new development, and pressures on water systems related to climate change, the state will most likely see more subsidence problems. However, mitigation may be achievable through education programs; revision of building codes; artificial recharging of ground water and geotechnical investigation of the land prior to building.

3.3.14 **Landslide** (Low Risk)

3.3.14.1 Nature

A landslide is the movement of rock, soil, and/or debris downslope. Landslides occur when the force of gravity overcomes the strength of earth materials on the slope, resulting in failure. A stable slope can be made unstable by an increase in the gravitational force or a decrease in the strength of the slope (resisting force). Increases in gravitational forces may be caused by added weight to the slope including human activity or heavy rain. Decreases in the strength of supporting materials include weathering, stream

erosion, [or] other forms of removal of material from the base of a slope, and infiltration of water. Water infiltration can increase pore pressure along planes of weakness, which results in reduced friction and may lead to slope failure.

Landslides may be induced by shaking from earthquakes, heavy rainfall (especially on fire-burned slopes and vegetation-stripped areas where large amounts of runoff can occur), and volcanic activity (accompanied by earthquakes and ash and debris deposition on slopes). Debris flows — moving masses of rock fragments, soil, and mud, with more than half of the particles being larger than sand size — are considered a type of landslide in this risk assessment. Flash floods can initiate debris flows especially in areas where wildfires have burned off vegetation that previously stabilized the slope. Landslides may also occur in areas cut by perennial streams. As the stream water erodes the channel banks, the sediment and rocks are undercut and destabilized resulting in a collapse of the material above the channel. Another common type of landslide in Nevada is a rock fall. Rock falls occur when a fragment of rock detaches from the hillslope or cliff face and continues downslope, possibly dislodging other materials along the way. They are commonly triggered by heavy rainfall, earthquakes, and anthropogenic activities. Rock falls can directly injure or kill people, can damage structures, and can block transportation routes in mountainous areas.

Landslides include five modes of slope movement: falls, topples, slides, spreads, and flows. These are further subdivided by the type of geological material, such as bedrock or earth materials (the latter term implied soil or alluvial materials). Some examples of different kinds of landslides are shown in Figure 3-35. Identifying different parts of a landslide is useful when surveying an area for this hazard. Different parts of a rotational earth slide are shown in Figure 3-36.

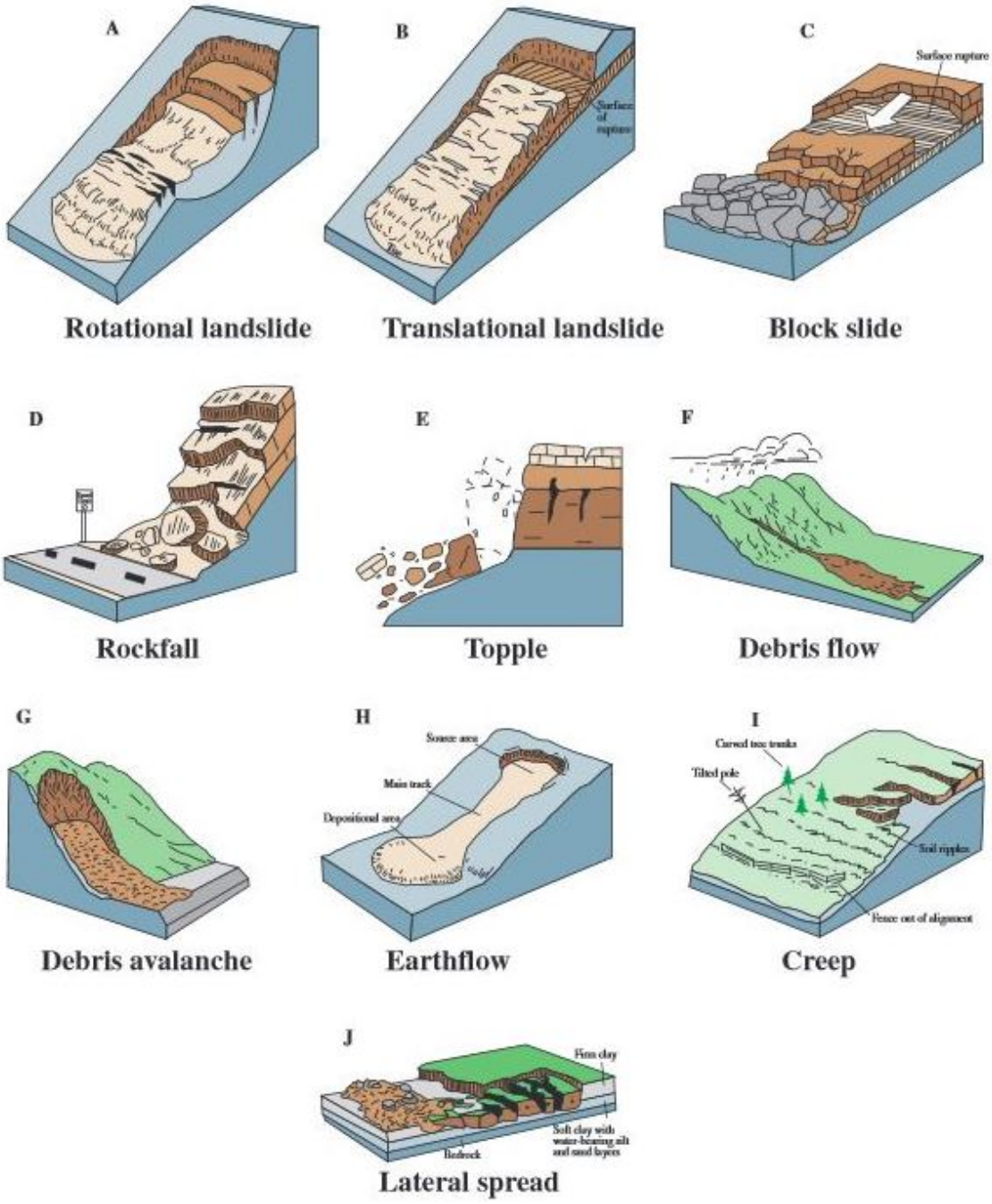


Figure 3-35. Schematic illustrations of different types of landslide

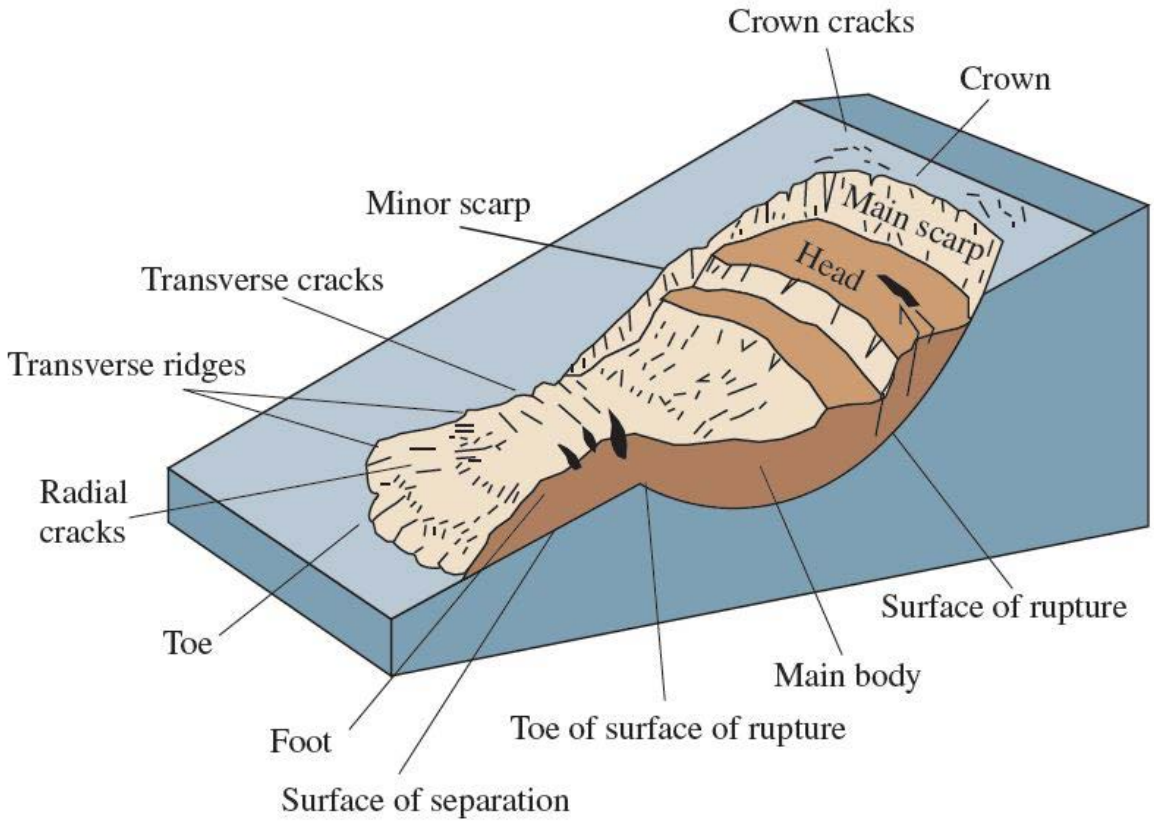


Figure 3-36. An idealized earth rotational slump with the different features of the slide identified. Hazards in the upper part of the slide include downslope movement and foundation distortion. In the lower part of the slide buildings can be impacted by the slide and damaged and/or moved.

In general, steeper slopes have greater gravitational potential and are more susceptible to landslides. Landslides in Nevada tend to be localized and usually have less damaging economic impact than hazards of a widespread nature.

3.3.14.2 History

An example of landslides caused by the undercutting of material in a perennial stream/river occurs along the Truckee River near Mogul, west of Reno. As floodwaters have eroded the channel banks, the river has undercut clay-rich sedimentary rocks, destabilizing the ground and causing the overlying material to slide repeatedly into the channel.



Figure 3-37. Photo of the Aftermath of the Slide Mountain Landslide and Ophir Creek Debris Flow in 1983.

The largest recorded event of a damaging landslide in Nevada occurred on May 30, 1983 on Slide Mountain in the Carson Range southwest of Reno (Figure 3-37). A large granodiorite slab as much as 30 meters thick, 90 meters wide, and several hundred meters long detached from the southeast face of Slide Mountain and slid downslope about 75 meters into Upper Price Lake, a small reservoir on Ophir Creek. As a result, most of the lake water was displaced and overtopped a low dam. The water then breached the dam of Lower Price Lake and sent a flood down Ophir Creek, where the rapidly moving water picked up rocky debris in the steep canyon, becoming a thick, fast-moving debris flow. The flow emerged from the canyon 4 miles downstream and spread out over the alluvial fan of Ophir Creek in Washoe Valley. The debris flow destroyed and damaged houses, caused one fatality, covered old U.S. Highway 395, and caused at least $2 million in property damage to the area. It was reported that at least two other people were caught up in the debris flow but managed to escape.

Similar landslide and debris flow events have occurred in this area in the past. These events are documented on the geologic map of the area published by NBMG in 1975 (Map 5Ag of the Washoe City Quadrangle). [Patrick Glancy, a hydrologist with the USGS has conducted extensive research on the geologic history of Ophir Creek rockslides and flooding events.] The USGS reports that similar slides can occur south of Kingsbury Grade in Douglas County and along Second Creek where populated neighborhoods of Incline Village exist today.

3.3.14.3 Location, Severity, and Probability of Future Events

Landslides tend to originate in mountainous and hilly areas with steeper slopes, but can run out on adjacent areas with lower slopes. The distance a landslide can travel depends on factors, including: momentum gained traveling downslope, and if air becomes trapped underneath the slide material resulting in a decrease of basal friction. Lateral spread is a type of landslide that does not need a steep slope to originate. The USGS defines lateral spread or flow as a landslide that commonly forms on gentle slopes and have rapid fluid-like flow movement. These are special situations where shallow levels of groundwater and uncompacted subsurface sediment are pressurized during earthquakes, and the overlying ground flows sideways. This type of lateral spread is also known as liquefaction and is discussed further in the earthquake hazard section. Lateral spreads can cause sideways movement of the ground, formation of large cracks, formation of sand blows or sand volcanoes, expulsion of subsurface water and sand (including geysering of water), and ground settlement.

A possible approach in evaluating areas of future landslide potential may include examining the slope and terrane of an area and searching for existing landslide scars and/or landslides and rock falls. [For example, landslides and landslide scars can be seen along range fronts (such as in the Kings Canyon and Ash Canyon areas in western Nevada), in drainage basins (such as Ash Canyon and the Truckee River), and in the upper parts of the Carson Range.] Landslides can be observed on hill slopes throughout Nevada, but no systematic survey has been conducted to date. Such a survey would be a useful tool for planning future development and infrastructure. In addition, climate change has resulted in warmer temperatures and higher snow levels in the western U.S. and Nevada. As a result, more precipitation is expected to fall as rain, leading to higher occurrences of ground saturation and increased runoff in areas susceptible to landslides and debris flows.

Landslide mitigation involves careful placement of structures to avoid being involved in a landslide. Potential landslide areas and runout areas can be delineated and avoided. Existing landslides can be stabilized by adding material that buttresses the base of the slide and removing material from the upper part of the slide to reduce gravitational potential. In some cases slopes are reinforced with retention structures that can work to stabilize the slope. Slopes can also be mechanically stabilized with strong root systems or geofabric-reinforced buttresses. If a landslide exists below a construction site, the slope can be stabilized and the potential for the progression of the landslide upslope can be reduced by installing straight shaft piers into ground downslope from a foundation. When considering the mitigation of a an existing landslide, it is important to identify the extent of the slide, the failure surface below the slide, and any older failure surfaces below that from older landslides. In extraordinary cases, landslides can be anchored in place using piers to reduce the chances of further movement.

In the Nevada Survey, Carson City, Douglas, Storey, and Washoe Counties reported landslides as a danger. Slide Mountain, Kingsbury Grade, and Incline Village areas are noted as being particularly vulnerable.

The chances of having a landslide are the highest in mountainous areas with steep slopes and substantially increase when triggering factors such heavy rain or earthquakes occur. Landslides are considered a “Low Risk Hazard” in Nevada primarily because Nevada is arid, and few people live in landslide prone areas. As development encroaches on areas that are higher in elevation than the valley floors, such as alluvial fans, it is likely that landslides and debris flows will become more significant hazards. Due to the limited geographic extent of this hazard, management and mitigation are best handled at the local level. Support and technical assistance to local entities are available from state agencies in response to this type of hazard.

3.3.15 Severe Storms and Extreme Snowfall (Medium/Significant Risk)

3.3.15.1 Nature



Figure 3-38. Heavy snow at NWS Reno during the series of storms December 2004 - January 2005

Severe storms can bring heavy rain or snow, high winds, extreme cold, and in rare cases ice storms.

In Nevada, the primary weather pattern for a winter storm is the jet stream slamming into California and Nevada coupled with an atmospheric river.

These storm systems can bring heavy rain or snow to Nevada (if there's no rain shadowing by the Sierra Nevada or other California mountains), flooding (if the storm is warm enough for a rain on existing snow event), or widespread high winds (if there is rain shadowing – which is common). It should be noted that high winds and windstorms can occur at any time of year and are not limited to winter weather, but rather associated with severe weather. A significant portion of the winter snowpack is generated by these Pacific atmospheric river winter storms.

The current predictability of these storms is good, with broad heads-up often possible 5-10 days in advance, with more specific details and potential impacts 1-4 days ahead. River forecasts of potential flooding can be seen out to 5 days into the future, but these are only for mainstream rivers such as the Truckee, Carson, and Humboldt. One specific aspect to these winter storms which is low predictability is the rain-snow elevation (snow level). This can impact the flood versus heavy snow potential greatly, and can result in big forecast changes even just 12-24 hours ahead of a storm.

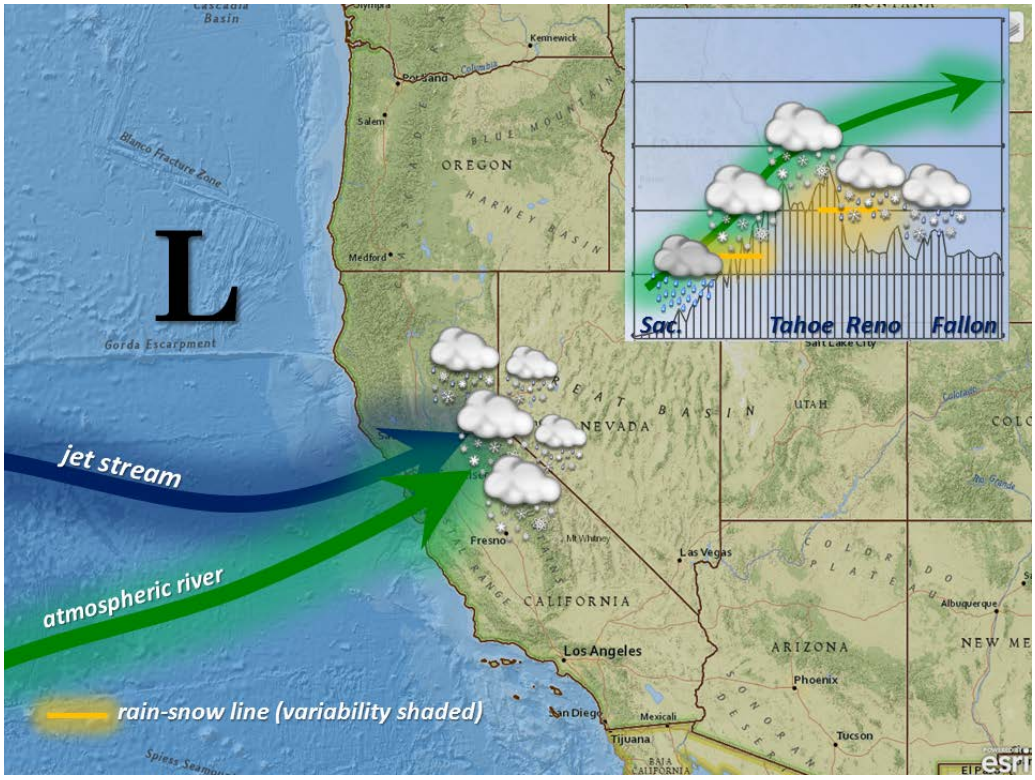


Figure 3-39. Schematic showing a classic weather pattern for heavy snows in central and northern Nevada.

Other weather patterns which are favorable to heavy snow in Nevada are 1) inside slider where a strong cold front drops in from the north producing a band of heavy snow, 2) Tonopah Low where heavy snows can be produced on the east facing aspects of mountain ranges in Nevada, and 3) lake effect snow where cold air creates localized bands of heavy snow impacting communities and highways downwind of large lakes such as Tahoe, Pyramid, and Walker in northern Nevada. The predictability of these storm types is much less than the atmospheric river events, often only 1-4 days of lead time.

3.3.15.2 History

During winter months, Nevada's higher elevations regularly experience rain and snow, sometimes freezing rain. Although less common, these conditions may also be experienced in lower elevations in the southern portion of the State.

Nevada's Basin and Range topography provides the necessary conditions for down-slope winds on the leeward (east) side of the ranges and into the valleys. North-south transportation routes can become obscured by blowing dust or snow during extreme wind conditions. Appendix K contains a Nevada Climate Office storm event summary by county with damage costs.

Table 3-29 lists some past severe storms in Nevada causing recorded deaths, injuries, economic hardship, and/or property damage.

Table 3-29. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
1889-90	Genoa area, northern NV	This winter season was known as the "White Winter" when nearly 100 inches of snow - the heaviest snowfall in northern Nevada history. An estimated 90-95% of the state's livestock died during that winter.
Winter 1937	Las Vegas area, Clark and Lincoln Counties	Although severe winter storms are generally thought to affect mainly northern Nevada, a snow storm left twelve inches of snow on Las Vegas and the Caliente Herald reported they were having the "coldest weather spell in memory for the past five days", with temperatures down to 10° above to 31° below zero, with 18 inches of snow.
February, 2004	Sierra Nevada Tahoe area	Two deaths. Severe winter storm. Gusts on the ridges were up to 110 mph. There were white-out conditions in Tahoe area. Several minor accidents were caused by the storm.
December 29, 2004 through January 10 2005:	Northern Nevada	FEMA designated 15 counties (Carson City, Churchill, Clark, Douglas, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Storey, Washoe, and White Pine) eligible for federal funding to pay part of the cost for emergency protective measures undertaken as a result of the snowstorm on December 29 through January 2. Shortly thereafter, FEMA designated these counties plus Pershing County eligible for federal funding as a result of another snowstorm on January 6-10.
January 3, 2011	Southern Nevada	A strong cold front brought very cold temperatures to the Mojave Desert over New Year's weekend, then a trailing Pacific storm brought locally heavy low elevation snow. A locally heavy snow burst produced five to seven inches of snow in Pahrump (2600').
Feb. 25, 2011	Reno-Carson City –Minden area, Northern Nevada	Up to 18 inches of snow with up to 50 mph winds caused 25 power poles to break and multiple auto accidents and two injuries and $250,000 damages. Nonessential State workers were sent home.
January 13-14, 2013	Northern Nevada	Governor Sandoval declared a state of emergency due to prolonged cold winter temperatures, allowing extended hours for propane truck driver deliveries. Subzero cold was responsible for several deaths in Elko, Reno, and South Lake Tahoe in January. Several days with lows in the single digits to as low as -14F (South Lake Tahoe airport) and highs in the upper 20s to mid-30s caused pipes to burst at four casinos in Stateline on the 13th and 14th. The burst pipes caused water damage to the 18th floor at Harrah's and flooding of casino floors and stores at Harvey's Casino.
November 21-24, 2013	Southern Nevada	Heavy snow in far northern Lincoln County stranded approximately 50 cars on Highway 93, with some drivers

Table 3-29. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
		trapped for 10-12 hours.
May 10, 2014	Southern Nevada	A strong cold front brought high winds to much of the Mojave Desert and southern Great Basin. In the Callville Bay area, damage included, 17 house trailer skirts; nine trailer awnings; several trailer roofs; flying debris damage to some vehicles, one houseboat, and a dock; a 25 foot sailboat which was flipped off a trailer; and damage to NV Energy infrastructure. At the Las Vegas Boat Harbor, one dock was pushed 20 feet and the bridge leading to it was damaged. Two other docks and private boats were also damaged. One man was presumed drowned in Lake Mead after high winds blew away his boat and caused waves in the lake.
December 11, 2014	Northern Nevada	Widespread wind gusts over 65 mph were noted on the 11th, with the highest gusts (over 80 mph) west of highway 395 in the foothills and the southwestern Carson Valley. There were an exceptionally high number of damage reports including power lines and trees downed (knocking out power to more than 10,000), fences damaged, and a semi-truck blown over on Interstate 80. In addition, winds caused more than 30 flight cancellations at the Reno-Tahoe International airport.
February 6, 2015	Northern Nevada	Widespread wind gusts of 60 to 79 mph were recorded from Minden north to the Palomino Valley. Higher gusts of 80 to 90 mph were noted in the Virginia Range and southwest of Gardnerville, with gusts over 100 mph at the Galena RAWS. Numerous roof and fences were damaged and several 4 foot diameter trees were downed on power lines in Gardnerville. Longtime residents of the area said this was the worst windstorm they had experienced in over 10 years. As many as 21,000 were without power around the area, with the worst damage to power lines in Douglas County. Finally, the high winds were blamed for the loss of power to two emergency communications repeaters critical to Lyon County. Alternate highway 95 east of Yerington was closed for a few hours due to several accidents, with high winds and very low visibility due to blowing dust reported by the Lyon County EM.
November 9-10, 2015	Northern Nevada	Widespread snow totals of 5 to 10 inches were noted in the Reno-Sparks area, highest on the north and west side of Reno (in lake effect band from Lake Tahoe). From the north valleys of Reno to Palomino Valley and Red Rock Rd near the California border lake effect snow from Pyramid Lake boosted snowfall totals to 8 to 15 inches, with the highest amounts in the Antelope and Hungry Valleys. Numerous

Table 3-29. Severe Winter Storms in Nevada		
Date	**Location**	**Deaths, Injuries, Damages**
		broken tree branches were noted due to the heavy, wet snow and over 35,000 customers were without power in Washoe County due to downed power lines (morning of 11/10).
March 6, 2016	Southern Nevada	Around the Las Vegas Valley, a tree blew down and landed on a vehicle; a rooftop air conditioner blew into power lines, breaking the power pole; a light post blew down; and a few large tree branches snapped.
March 13, 2016	Northern Nevada	Winds of 40 and 55 mph with gusts 60 to 80 mph were recorded in and just east of the foothills of the Carson Range south of Reno on the 13th. The high winds caused a big rig to overturn on highway 395 near Stead. Finally, severe turbulence aloft near the Reno-Tahoe airport caused delays and cancellations on the morning of the 13th.
January 30-31 2016	Northern Nevada	Widespread snow totals of 4 to 8 inches were reported around the Reno-Sparks area. Areas in and near the foothills west of Reno received between 8 and 10 inches of snowfall. Heavy, lake-effect snow off of Pyramid Lake caused whiteout conditions near Wadsworth, with two jackknifed big rigs causing the closure of westbound Interstate 80 in the evening. Twelve inches of snow fell at Goldfield. Near Ely - six to twelve inches of snow was reported in many valley locations and up to 18 inches in the mountains. Winds gusting over 40 mph caused drifting of snow up to 4 feet deep making travel nearly impossible. Schools and county offices were closed the next day.

Additionally, NOAA compiled the following data shown in Table 3-30 for the top 25 periods of excessive snow (15.0 inches or greater of total snowfall).

Table 3-30. Severe Winter Storms in Nevada in Decreasing Order of Snowfall	
Inclusive Dates	**Total Snowfall / Daily Maximum Amt. (Date)**
Jan. 10–14, 1911	37.9/19.7 (Jan. 12)
Dec. 1–5, 1919	33.6/11.5 (Dec. 3)
Jan. 31–Feb. 6, 1901	28.4/10.1 (Feb. 5)
Feb. 9–11, 1922	27.4/12.6 (Feb. 10)
Jan. 17–18, 1916	25.5/22.5 (Jan. 17)
Dec. 29, 2004–Jan. 1, 2005	22.2/16.4 (Dec. 30)
Feb. 16–21, 1897	22.1/10.0 (Feb. 16)
Feb. 10–12, 1959	21.9/13.2 (Feb. 10)
Feb. 16–18, 1990	21.1/18.0 (Feb. 16)
Dec. 23–29, 1941	20.0/6.5 (Dec. 27)
Jan. 15–20, 1933	19.1/10.5 (Jan. 19)
Jan. 15–16, 1913	19.0/ 10.0 (Jan. 16)

Table 3-30. Severe Winter Storms in Nevada in Decreasing Order of Snowfall	
Inclusive Dates	**Total Snowfall / Daily Maximum Amt. (Date)**
Jan. 24–27, 1956	17.8/11.0 (Jan. 25)
Feb. 23–26, 1969	17.3/8.0 (Feb. 24)
March 14–15, 1952	17.1/13.6 (March 14)
Jan. 28–30, 1937	17.0/10.1 (Jan. 30)
Jan. 22–25, 1923	16.5/9.2 (Jan. 24)
Jan. 7–8, 2005	16.4/10.5 (Jan. 8)
Nov. 8–12, 1985	16.3/15.2 (Nov. 10)
Jan. 3–Feb. 4, 1938	15.6/8.6 (Feb. 3)
March 1–3, 1902	15.5/14.4 (March 1)
Feb. 4–9, 1976	15.1/5.1 (Feb. 4)

The State Climatologist prepared a report on extreme snowfall averages in each county based on historical records. These data are available in Appendix K. A summary of the data is presented in a table showing the average number of days per year with extreme snowfall for representative sites in each county. Extreme snowfall is defined as that above the 15th percentile for that county. These data will assist each county in its preparedness and response planning for extreme snowfall events.

3.3.15.3 Location, Severity, and Probability of Future Events

Severe storms are considered to be "Medium/Significant Risk" hazards. They occur frequently and can cause significant damage to structures that have not been built to meet current building codes. Because the transportation infrastructure within the state is rather robust, weather-related events do not generally have much long-lasting effect on the transportation network. Severe weather events may cause temporary closures, but generally do not cause damage. The exception is severe flooding, that can be caused when storms bring large amounts of rain or warm rain on top of already heavy snow packs. These floods can cause significant damage to roads, railways and airports.

Power infrastructure is at risk of high wind events, however to this point widespread prolonged outages have not been observed. Outages during high wind events have been localized to city or county levels.

Because winter snow, rain, and wind storms occur each year in northern and central Nevada, most local and state jurisdictions are able to manage these types of events. Only when the storms are severe and repeated is there a possibility of these hazards causing damage and prolonged disruption. In southern Nevada while the region is accustomed to strong wind storms, it is less used to heavy snow events. These snows can cause widespread disruptions as a result. More research is necessary to determine and prioritize actions that will mitigate these hazards. The Subcommittee will assist in the development of strategies to mitigate this hazard as new data become available.

Climate Change

There are some aspects to Nevada severe storms for which we have better confidence in anticipating the impacts of climate change, while for many other aspects much is unknown.

Recent observations and simulations suggest a continued rise in the rain-snow elevation. This will result in a larger portion of winter precipitation falling as rain instead of snow. This scenario could lessen the

frequency of lower elevation heavy snow events but increase the risk of winter floods. This scenario also means less snowpack from which to rely on for summer water supply.

Simulations are mixed in terms of winter precipitation in the coming decades, with some showing a decreasing trend for the Sierra and Great Basin and others showing an increasing trend. Most projections show more of the precipitation coming in fewer, but larger atmospheric river type storms. This scenario would increase the risk of severe weather impacts – heavy snow and floods. There is, however, no reliable data on whether or not Nevada wind storms will increase or decrease in frequency and intensity in the coming decades due to climate change.

3.3.16 **Tornado** (Low Risk)

3.3.16.1 Nature

Tornadoes are one of nature's most violent storms. A tornado is defined as a rapidly rotating column of air extending from the base of a thunderstorm to the ground. In an average year, approximately 1,000 tornadoes are reported across the United States, resulting in an average of 80 deaths and over 1,500 injuries. The most violent tornadoes, with wind speeds of 250 mph or more, are capable of tremendous destruction. Damage paths can be more than 1 mile wide and 50 miles long. Tornadoes can occur anywhere in the United States, but they are most common in the Great Plains region that includes parts of Texas, Oklahoma, Kansas, and Nebraska. Tornadoes are responsible for the greatest number of wind-related deaths each year in the United States.

Tornadoes come in all shapes and sizes. In the southern states, peak tornado season is March through May; peak months in the northern states are during the summer. Tornadoes can also occur in thunderstorms that develop in warm, moist air masses in advance of eastward-moving cold fronts. These thunderstorms often produce large hail and strong winds, in addition to tornadoes. Tornadoes are extremely rare in Nevada due to the low frequency combination of an unstable air mass plus sufficient wind shear needed for tornado formation, thunderstorm cloud bases typically 5-10,000 feet off the ground which limit capability of the vortex to reach the ground, and the plethora of mountain ranges make it difficult for the circulations that spawn tornadoes to sufficiently develop.

The current predictability of tornadoes in the western United States is poor. The current state of the science and forecasting technologies results in a broad heads up of days with increased tornado potential in Nevada to 1-2 days in advance. Specific storm-scale warning lead time of severe thunderstorms with tornadoes is optimistically 15 minutes but is often zero in Nevada. A particular challenge to warning for tornadoes in Nevada is the limited low-altitude weather radar coverage in the state, so often many tornadoes go undetected and unwarned for.

3.3.16.2 History

Although tornadoes are rare in Nevada, they do occur. Based on modern data from 1991-2015, Nevada ranks 41st out of 50 states with roughly 1-2 tornado touchdowns recorded in an average year. Only Alaska, Hawaii, and several states in the northeast U.S. have lower frequencies. The majority of reported tornadoes have occurred in the central and northern parts of Nevada. It is believed there are more tornadoes that occur in Nevada per year, but they are rarely witnessed due to lack of population in rural areas.

Data from NOAA's National Centers for Environmental Information were used in this analysis. Over the last two decades, since 1995 Nevada has had 39 reported tornado events of EF0 and higher. Table

3-31 contains a list of tornadoes in Nevada that have caused injury or property damage. All were ranked at EF-0 to EF-2 on a scale of EF-0 to EF-5, using the Enhanced Fujita Scale. Typically tornadoes EF-1 and higher will result in property damage. The most recent damaging tornado hit Hawthorne in Mineral County June 5, 2015 resulting in property damage to 10-15 homes and businesses.

Table 3-31. Nevada Tornado History

Date	Location	Description /injuries/damage
May 26, 1964 2:45 p.m.	Near Yerington	A small tornado damaged outbuildings on a ranch. One man was struck by flying debris. 0 dead, 1 injured
July 16, 1973 12:23 p.m.	Six miles north of Reno	A small tornado touched down. 0 dead, 1 injured
March 30, 1992 11:45 a.m.	Extreme south edge of Las Vegas	One home was shifted and another partially unroofed. 0 dead, 0 injured.
June 24, 2004 4:00 p.m.	5 miles north of Lamoille, Elko County	0 dead, 0 injured.
June 25, 2004 4:15 p.m.	Paradise Valley, Humboldt County	Trained weather spotter reported a rope-like tornado. 0 dead, 0 injured, no damage.
June 25, 2004 4:25 p.m.	West side of the Sonoma Range, Winnemucca, Humboldt County	Trained weather spotter observed a tornado. 0 dead, 0 injured, no damage.
June 27, 2004 1:15 p.m.	Near Winnemucca, in Humboldt County:	Trained weather spotter observed tornado. 0 dead, 0 injured, no damage.
July 24, 2004 2:30 p.m.	Cold Springs, north of Reno	The weak tornado lasted less than 2 minutes. 0 dead, 0 injured, no damage.
April 27, 2005 5:30 p.m.	Near Carson-Tahoe Hospital, in Carson City.	0 dead, 0 injured, no damage.
June 9, 2006, 11:05 a.m.	About 1 mile west of the Eureka Airport, Eureka County.	A rope-like tornado was observed and photographed over open country. 0 dead, 0 injured, no damage.
July 21, 2008, 3-4:00 p.m.	Near Fallon, Churchill County.	Two EF0 tornadoes were reported by trained NWS weather spotters. 0 dead, 0 injured, no damage.
June 20, 2009, 2-3 p.m.	Near Wild Horse Reservoir, Elko County	Two EF0 tornadoes were observed, one by Nevada Highway Patrol and the other by a trained NWS weather spotter. 0 dead, 0 injured, no damage.
April 24, 2011 9:55 a.m.	Southern Humboldt County	An EF0 tornado touched down in a rural area and was photographed by several eyewitnesses. An NWS storm survey could find no visible damage. 0 dead, 0 injured, no damage.
May 21, 2014 11:40 a.m.	Elko, Elko County	A thunderstorm moving from east to west across Elko produced two EF0 tornadoes. The first tornado touched down on Manzanita Lane behind JC Penny's. The second tornado touched down on Aspen Way

Table 3-31. Nevada Tornado History		
Date	**Location**	**Description /injuries/damage**
		near the Post Office. It uprooted a large tree. The tornado then moved into the Smith's parking lot where it tore some shingles off a car wash and tossed shopping carts into the air.
June 5, 2015 2:30 p.m.	Hawthorne, Mineral County	The tornado was determined to be EF-1 for 0.3 miles on the east side of Hawthorne (near 5th street) and EF-0 elsewhere. Approximately 10 to 15 homes and businesses were severely damaged along with power lines and road signs. One 2 foot diameter tree was blown over onto a mobile home and two vehicles were severely damaged.

3.3.16.3 Location, Severity, and Probability of Future Events

Appendix K contains a summary of damage-causing storm events by county prepared by the Nevada Climate Office. There were 87 tornadoes reported in Nevada between the years 1959 and 2016. There have been no tornado-related deaths and two injuries in that period of record. While the vast majority of Nevada tornados produce no damage there has been a total of at least $1.6M in damages. Most of this was in a couple tornados that hit Clark County in 1989 and 1992. According to the data from the NOAA site, fifteen of the seventeen counties in Nevada have had one or more tornadoes since 1950. As new developments continue to be built, this hazard may become more evident.

Tornadoes are considered a "Low Risk" hazard in Nevada because few are reported each year anywhere in the state, the ones that do occur tend to be low in intensity, and they usually occur in unpopulated areas. Emergency response is likely to be handled without federal or state assistance. Structures built to modern building codes should be able to withstand the gusts of an EF0 tornado, the most likely intensity of tornado to hit Nevada.



Figure 3-40. June 9, 2006, Tornado in Diamond Valley near Eureka, NV. *Photo courtesy of Cheryl Morrison from Sheriff's office in Eureka.*

Climate Change

It is unknown how climate change will affect the frequency of Nevada tornadoes. This is due to uncertainties in the future frequency of strong thunderstorms and sufficient wind shear in the atmosphere, the two main ingredients to create tornadoes.

3.3.17 Tsunami/Seiche (Low Risk)

3.3.17.1 Nature

A tsunami (pronounced sue-ná-mee) is described by NOAA as:

A series of waves of extremely long wave length and long period generated in a body of water by an impulsive disturbance that displaces the water.

Tsunamis are primarily associated with earthquakes in oceanic and coastal regions. Landslides, volcanic eruptions, nuclear explosions, and meteorites, can also generate tsunamis. A tsunami can move hundreds of miles per hour in the open ocean and run up onto land with waves exceeding 100 feet (30 meters) in height.

From the area where the tsunami originates, waves travel outward in all directions and build in height once they approach the shore. The size of the wave is influenced by the topography of the shoreline and sea floor or lake bed which can result in different wave heights at different locations. In addition to differing wave heights, a tsunami may generate more than one wave and succeeding waves may be larger than previous ones.

A seiche (pronounced saysh) is a standing wave oscillating in a lake or semi-enclosed basin, generally initiated by wind, earthquake, or change in atmospheric pressure. Seiches rarely exceed a few meters in height with the most dramatic seiches being observed following an earthquake.

If a major earthquake or landslide occurs close to shore, the first wave in a series could reach the shoreline in a few minutes, even before a warning is issued. Areas are at greater risk if they are less than 30 feet above sea or lake level and within a mile of the shoreline. Drowning is the most common cause of death associated with a tsunami. Tsunami waves and the receding water are very destructive to structures in the run-up zone (the area where the tsunami pushes water on shore above the regular water level). Other hazards associated with a tsunami include flooding, contamination of drinking water, and fires from broken gas lines or ruptured tanks.

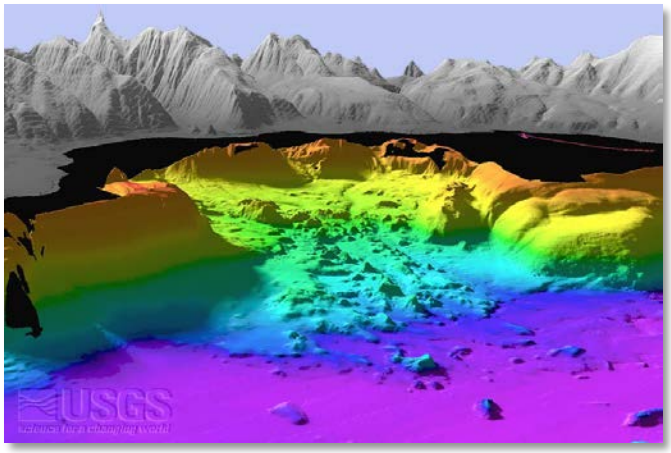


Figure 3-41. USGS Bathymetric View of Western Lake Tahoe, McKinney Bay.

Although Nevada is landlocked, tsunamis can occur in Nevada lakes that have faults that bound or cross them, or in lakes that have steep sides that could collapse, generating a landslide. This landslide would cause large amounts of water to be displaced, resulting in a tsunami. Seiches can occur in any Nevada lake, including smaller reservoirs and lakes. Lake Tahoe, Pyramid Lake, Walker Lake, Lake Mead, and

other lakes throughout the state all could be at risk of a tsunami or seiche. It is difficult to estimate a probability for this hazard. Being aware that it can occur, considering the possible impacts for important structures and facilities that are proximal to water bodies, and for people around lakes knowing how to respond can save lives and property should a tsunami or seiche occur.

3.3.17.2 History

There have been few historical instances of tsunami and seiche in the region around Nevada. In 1959, a tsunami and seiche occurred on Hebgen Lake, Montana following a M7.3 earthquake. Hebgen Lake is located in the hanging wall of the fault that generated the earthquake. The earthquake produced an initial tsunami that overtopped the Hebgen Lake Dam by approximately one foot (30 cm) of water (Myers and Hamilton, 1964). Oscillatory waves formed the resulting seiche and continued for at least 12 hours with a period of approximately 15 minutes. During this time, the dam was overtopped three to four times (Myers and Hamilton, 1964). The seiche formed as a result of the initial tsunami and lake surface working to re-establish equilibrium. A tsunami formed in Owens Lake following the 1872 Owens Valley, California earthquake (Smoot and others, 2000) and a probable seiche set up in Mono Lake, California after the 1932 M7.1 Cedar Mountain, Nevada earthquake (Reno Evening Gazette, 12/23/1932). Similar tsunami and seiche phenomenon can be expected in lakes throughout the state.

While there have been no historical occurrences of tsunamis within Nevada, University of Nevada geologists have found deposits between Sunnyside and Tahoma, California that indicate a tsunami with 30 foot (~10 meter) waves inundated the area as recently as 7,000 years ago. In 2012, a seiche was observed at Devils Hole, northwest of Pahrump, Nevada. This seiche was caused by a 7.4 magnitude earthquake in Oaxaca, Mexico. Devils hole is a collapsed cave located within the Ash Meadows National Wildlife Refuge, which provides a window into the vast aquifer below the surface. Another seiche occurred and was documented at Devils Hole on January 23, 2018. The seiche was caused by a large M7.9 earthquake 2000 miles away off the coast of Alaska. The waves from this earthquake caused the water in Devil's Hole to slosh back-and-forth. Large earthquakes, in Japan, Indonesia, Chile, and Mexico, have caused seiches in Devils Hole, with potential for waves to splash as high as two meters. For more information and videos of seiches at Devil's Hole, refer to:

- https://www.nps.gov/deva/learn/nature/devils-hole.htm
- https://www.scientificamerican.com/article/earthquake-at-devils-hole/
- https://www.youtube.com/watch?v=a6h82PIi_-0&feature=youtu.be

These two instances show the potential threat of tsunamis and seiches as a result of earthquake and landslide activity within Nevada.

A 2014 study by Santa Clara University, USGS, and UNR has shown that a tsunami or seiche induced by an earthquake and landslide occurred at Lake Tahoe between 12,000 and 21,000 years ago. This landslide—known as the McKinney Bay landslide—displaced approximately 12 km^3 of sediment and generated waves possibly up to 330 feet (100 meters) high. This landslide and resulting tsunami are also believed to have lowered the lake level by ~33 feet (10 meters). Although an incident such as this is incredibly rare, this research shows that under the right conditions, a tsunami/seiche is possible in the Lake Tahoe Basin.

A 2006 study showed evidence of a tsunami triggered by an earthquake and massive underwater landslide that deposited ridges of glacial boulders and smaller volcanic rocks on the "Tahoe City Shelf,"

a triangular region fifty feet below the western shore of the lake and twelve miles from the "McKinney Bay slide" (Figure 3-42).

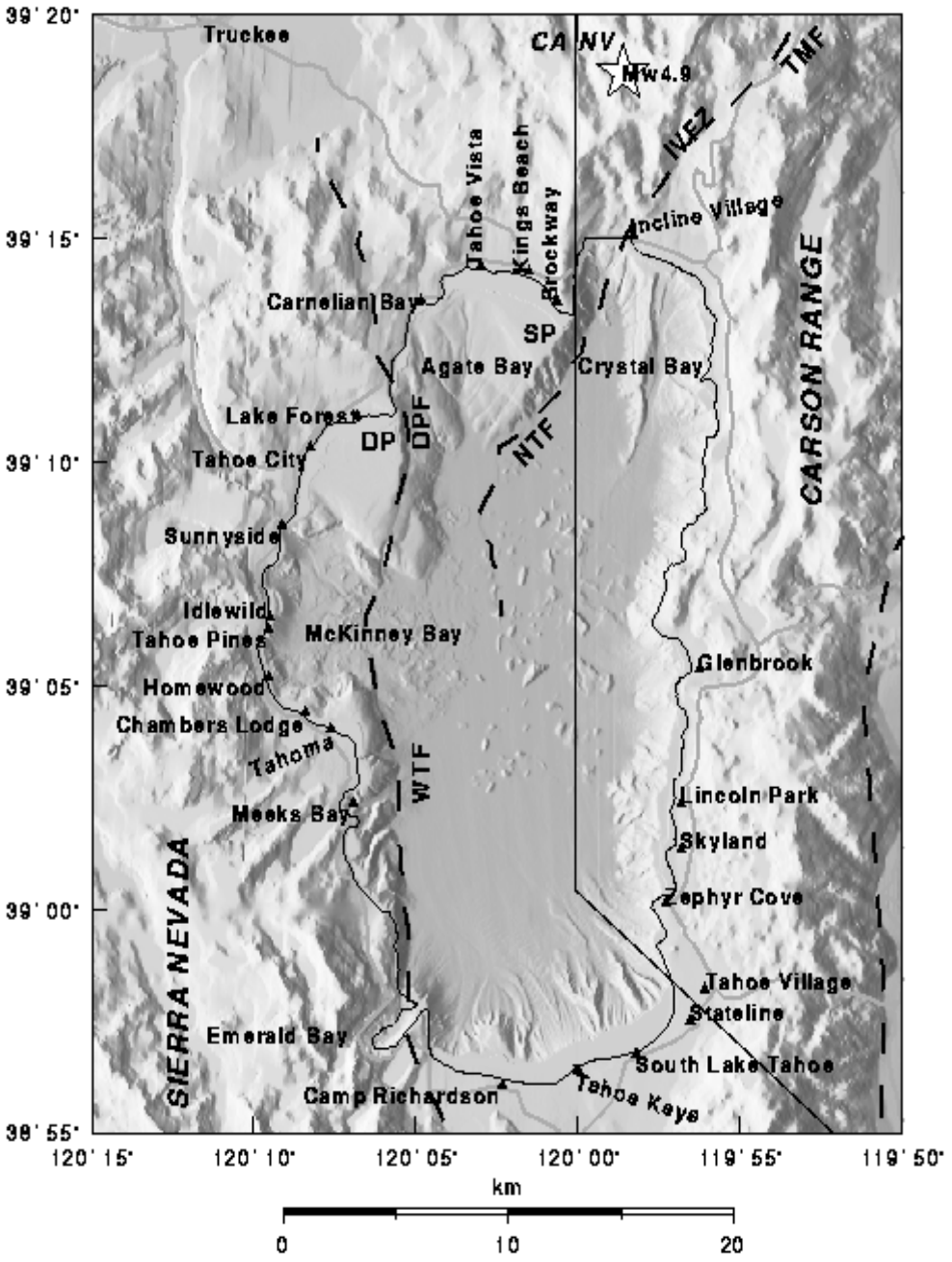


Figure 3-42. Lake Tahoe Fault Map.

Relief map of Lake Tahoe showing faults and debris on the floor of the lake resulting from landslides and debris flows spreading out from McKinney Bay across the floor of the lake. (SP= Stateline Point, NTF=North Tahoe fault line, IVFZ=Incline Village fault zone, TMF=Truckee Meadows fault, WTF=West Tahoe fault, DPF=Dollar Point fault). Source: The Potential Hazard from Tsunami and Seiche Waves Generated by Future Large Earthquakes within the Lake Tahoe Basin, California-Nevada, 1999-2000; Gene A. Ichinose, Kenji Satake, John G. Anderson, Rich A. Schweickert, and Mary M. Lahren; Seismo Lab; University of Nevada; (University of Nevada 2000 study)

3.3.17.3 Location, Severity, and Probability of Future Events

While tsunamis and seiches can occur in any lake in Nevada, Lake Tahoe displays the largest risk for these types of events. Faults beneath the surface of Lake Tahoe contribute to the tsunami hazard within the basin. These faults are dip-slip faults (faults that exhibit vertical displacement where one side moves down relative to the other). Movement along these faults could cause displacement in the water column above the fault rupture; if the displacement is large enough, a damaging tsunami could be generated. A large, rapid landslide, either underwater within the lake or into the lake from the surrounding topography, could also generate a tsunami. It is possible a landslide such as this could be triggered by an earthquake.

In 1999, researchers at the University of Nevada conducted a study to determine if a magnitude 7 earthquake could generate a tsunami or seiche that would pose a hazard to shoreline communities of the Lake Tahoe Basin. They concluded from their scenarios that such a quake would likely generate a wave as small as 10 feet (~3 meters) and as large as 30 feet (~10 meters) in amplitude that would threaten shoreline communities. The two faults underneath the lake are capable of producing M7.1 earthquakes. An earthquake of this size could result in a displacement of the lake floor and water column of up to 13 feet (4 meters).

Wave heights of potential Lake Tahoe tsunamis have been modeled by Ichinose and others (2000) and are shown in Figure 3-43. Two scenarios are shown: a rupture on the North Tahoe-Incline Village fault (A – black triangles), and a rupture on the West Tahoe-Dollar Point fault zone (B – gray dots). In these model runs, wave heights of 15 to 23 feet (~4.6 to 7 meters) were generated along the lake shore in Carson City, but to the south, wave heights as high as 30 feet (~9 meters) were generated. These are reasonable wave heights to consider when developing ideas for the tsunami/seiche hazard along the Lake Tahoe shoreline.

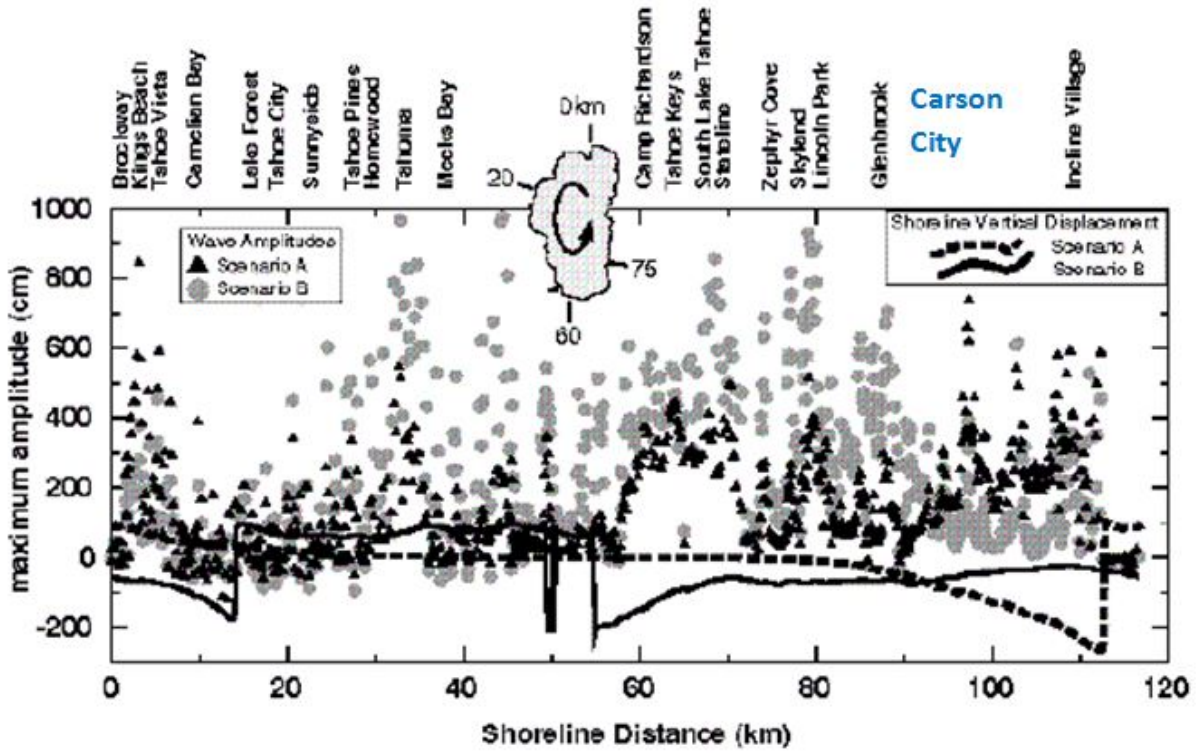


Figure 3-43. Potential tsunami wave heights around Lake Tahoe; the locations are indicated along the top of the figure with the area within the Carson City County labeled as "Carson City". From Ichinosa and others (2000).

Strike-slip faults (faults in which one side moves horizontally relative to the other side) are also found in Nevada. Motion generated along strike-slip faults is not likely to create significant vertical displacements in the water column. Although strike-slip faults are found near or underneath Pyramid Lake and Lake Mead, geological evidence at this time does not indicate the presence of active normal (dip-slip) faults capable of producing tsunamis in these or other large lakes in Nevada (other than Lake Tahoe). Strike-slip earthquakes can induce seiches, however, as occurred in the 1932 Cedar Mountain earthquake. While there is good bathymetric evidence of a major landslide that spread large blocks from McKinney Bay across the floor of Lake Tahoe (Figures 3-41 and 3-42), it appears that similarly large landslides have not occurred at the other large lakes in Nevada.

Tsunamis are considered a low-risk hazard in Nevada primarily because the earthquakes that would likely cause sizeable tsunamis on Nevada lakes, either directly by fault displacement or indirectly by a large landslide, occur only once every few thousand years. There are no significant impacts on this hazard related to climate change.

If a tsunami does occur, most of the near-shore portions of communities surrounding lakes in Nevada would be at risk. There would be little or no warning, other than perhaps feeling the ground shake from the earthquake before the first wave of water hits. As is the case along the Pacific Northwest coast, the most effective tsunami-hazard mitigation may be training people to run to high ground as soon as possible after feeling strong shaking from an earthquake.

It must be noted that a tsunami/seiche is a limited exposure event that would affect a finite population, specifically impacting shoreline residents and visitors to lakes within the state. With that being said, the

resulting property damage value could be extensive. The risk of tsunamis and seiches exist in and are incorporated into the hazard mitigation plans of Washoe, Carson City, and Douglas Counties.

3.3.18 **Volcano** (Low Risk)

3.3.18.1 Nature

Volcanoes are created when internal forces in the earth cause heated, melted rock (magma) to rise to the surface. First collecting in magma chambers, some of the magma pushes upward through cracks and eventually vents to the Earth's surface. As the magma reaches the surface, it can erupt violently due to escaping gases (e.g., Mount St. Helens in 1980, Figure 3-44), it can erupt less spectacularly as a lava flow (e.g., Hawaii), or it can expand slowly as a lava dome (similar to the filling of the crater of Mount St. Helens in recent years).

Volcanoes have varied shapes and sizes, but are divided based on the type of material that reaches the surface and the type of eruption that ensues.



Figure 3-44. Mount St. Helens 1980 Eruption. *USGS Photograph by Austin Post*

1. *Composite or Stratovolcanoes*

Composite volcanoes (stratovolcanoes) develop from repeated explosive and non-explosive eruptions of tephra (airborne lava fragments that can range in size from tiny particles of ash to house-sized boulders) and lava that build up layer by layer. These volcanoes are the largest and form symmetrical cones with steep sides. Mount Shasta, Mount Rainier, and Mount St. Helens are examples of stratovolcanoes.

2. *Shield Volcanoes*

Shield volcanoes form from "gentle" or non-explosive eruptions of flowing lava. The lava spreads out and builds up volcanoes with broad, gently sloping sides. They are named for their low-profile shape that resembles a warrior's shield. Currently, active volcanoes of this type are found in the Hawaiian Islands.

3. *Cinder Cones*

Cinder cones build up from lava that is blown violently into the air and breaks into fragments. As the lava pieces fall back to the ground, they cool and harden into cinders (lava fragments about ½ -inch in diameter) that pile up around the volcano's vent at the angle of repose. Cinder cones are the smallest volcanoes and are cone-shaped. Cinder cones are found in many areas of the western U.S., including Nevada.

4. *Phreatic Eruptions*

Phreatic eruptions occur when rising magma contacts ground or surface water. The extreme temperature of the magma (anywhere from 1110°F to 2140 °F (600-1170 °C)) causes near-instantaneous boiling of groundwater resulting in an explosion of steam, water, ash, rock, and volcanic bombs. A less intense geothermal event may result in a mud volcano. This kind of activity is also described as steam-blast

eruptions. Phreatic eruptions typically include steam and rock fragments and seldom erupt lava. The temperature of the fragments can range from cold to hundreds of degrees Fahrenheit. If molten material is included, the term phreato-magmatic may be used. These eruptions occasionally create broad, low-relief craters called maars. Phreatic explosions can be accompanied by carbon dioxide or hydrogen sulfide gas emissions. The former can asphyxiate at sufficient concentration; the latter is a broad spectrum poison. A 1979 phreatic eruption on the island of Java killed 149 people, most of whom were overcome by poisonous gases.

5. *Calderas*

Calderas are large volcanoes that produce violent eruptions of ignimbrites – hot ash that wipes out areas tens to thousands of square miles in size. Although many calderas existed in Nevada tens of millions of years ago, none are active today. However, the Long Valley Caldera near Mammoth Lakes, California, deposited ash in much of western Nevada when it erupted approximately 760,000 years ago. Similarly, Mount Mazama, a stratovolcano in Oregon, deposited ash in Nevada approximately 7,700 years ago, when it erupted to create Crater Lake, a relatively small caldera.

3.3.18.2 History

Nevada Volcanic History and Hazards

Nevada has a long history of volcanism. In western Nevada, the most recent episode was between 2.6 to 1 million years ago (Henry and Cousens, 2013). At about 1.36 million years ago, two lava flows erupted out of a volcanic cone at McCellan Peak and "flowed ~6 km [3.6 mi] into what is now suburbs of Carson City and across U.S. Highway 50" (Henry and Cousens, 2013). It has been a long time since these eruptions, but still renewed activity is not out of the question.

Volcanic activity from surrounding states, particularly California and Oregon, has created ash clouds that have drifted over Nevada, as evidenced by numerous young ash beds in western Nevada. Small eruptions from the Mono Craters area near Lee Vining and Mono Lake in eastern California have sent ash into Nevada as recently as about 260 years ago; an eruption from these volcanoes presents the most likely current volcanic hazard for Nevada. Other volcanoes that have erupted in recent history and could deposit ash in Nevada include Lassen Peak, Mount Shasta, the Long Valley Caldera in California, and volcanoes in the Cascade Mountains in Oregon. Ash from the 1915 eruption of Lassen Peak traveled at least 200 miles northeast to Winnemucca. The eruption of Mount St. Helens in 1980 deposited up to several centimeters of ash several hundred kilometers away from the volcano. The biggest threat to Nevada from eruptions in California and Oregon is damage to flying aircraft.

A massive eruption from the Long Valley Caldera near Mammoth Lakes, California about 760,000 years ago devastated a considerable area in Owens Valley when thick, hot flows of ash were deposited as far south as Bishop. Air-fall ash from these eruptions did collect as thick piles of ash in parts of Nevada, and some of the ash may have been hot enough or thick enough to locally devastate the landscape. Scientists would expect to see strong indications from seismographs before another eruption of this magnitude. The USGS continues to monitor the area around Mammoth Lakes, and will issue warnings prior to any subsurface changes that could precede a major eruption.

Seismic and geodetic data at the north end of Lake Tahoe have been interpreted by researchers at UNR (K.D. Smith and others, 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada-California: Science, v. 305, p. 1277-1280). These data indicate active magma at a depth of approximately 19 miles (30 kilometers). There does not appear to be a near-term threat of volcanic

eruption from this area, in part because the last documented eruption in the area was approximately one million years ago.

Soda Lake and Little Soda Lake near Fallon in Churchill County are maars, volcanoes that form by explosions when magma rises near the surface of the earth and boils the groundwater. Phreatic eruptions such as these pose a risk of asphyxiation from the volcanic gases released. Soda Lake and Little Soda Lake are probably the youngest volcanoes within the borders of the State. They have not erupted in recorded history, although sediment deposited during the last high stand of glacial Lake Lahontan is overlain by volcanic sediments indicating that they are younger than 13,000 years old. On the basis of preliminary helium isotopic studies (Thure Cerling, University of Utah, personal communication, 1997), the eruption at Soda Lake may be younger than 1,500 years before present. Somewhat similar phreatic events, but without magma, have occurred at the Steamboat geothermal area just south of Reno. The youngest volcanic rocks exposed at the Earth's surface in the Steamboat area are approximately one million years old.

Other relatively young volcanoes occur in the Crater Flat–Lunar Crater zone, Nye County, which includes basaltic volcanoes ranging in age from about 38,000 to 1 million years old (Smith, E.I. Keenan, D.L., Plank, T. 2002, Episodic volcanism and hot mantle: implications for volcanic hazard studies at the proposed nuclear waste repository at Yucca Mountain, Nevada: GSA Today, v.12, no.4, p. 4-10); in Clayton Valley, near Silver Peak in Esmeralda County; near Winnemucca in Humboldt County; and near Reno in Storey County. Most of these are basaltic volcanoes, which typically form small cinder cones and small lava flows. There are also some one million-year-old rhyolitic lava flows in the Reno area near Steamboat Hot Springs.

Although geothermal power plants in many parts of the world are associated with active volcanoes, the 15 geothermal power plants in northern Nevada do not appear to be associated with magma. With the possible exception of the Steamboat geothermal system at the south end of Reno, the geothermal areas in Nevada appear to derive their heat from deep circulation of groundwater rather than direct connections with magma or cooling igneous rock. A hazard that is recognized in the Steamboat area is violent eruption of steam, mud, and rock from geysers. As indicated on the geologic map of the Mt. Rose NE Quadrangle (NBMG Map 4Bg), such eruptions have occurred during the Quaternary Period near the Mount Rose Highway (Nevada Route 431), west of the intersection with U.S. Highway 395, and could occur again there or in other parts of the Steamboat area. The hazard from such eruptions is a local feature that would not be likely to require federal assistance.

3.3.18.3 Location, Severity, and Probability of Future Events

There is clearly some potential for ash from the Mono Craters, Inyo Craters, and Mammoth Mountain to affect airplanes, air quality, and highway driving in Nevada, particularly in near-downwind areas of Esmeralda, Mineral, and Nye Counties. In the event of an eruption in this region, planes flying between Reno and Las Vegas would have to be re-routed west of the Sierra Nevada. Similarly, there is some potential for ash from Cascade volcanoes in northern California (Lassen Peak and Mount Shasta areas) and Oregon to affect airplanes, air quality, and highway driving in northern Nevada, particularly Washoe, Humboldt, Pershing, and Elko Counties. Air travel between Reno and Portland and Reno and Seattle would be re-routed in the event of an eruption in this area. Geologic evidence of past eruptions from these volcanoes, recognized as ash deposits of particular ages and distinct chemical compositions, is abundant in Nevada. Volcanic gases associated with phreatic eruptions could pose a localized threat of asphyxiation to humans in poorly ventilated spaces in the immediate vicinity of these vents. At

Mammoth Mountain, several CO_2 related deaths occurred when a skier and rescuers became trapped in a snow pocket that was filled with CO_2 gas. The emission of CO_2 gas in this area is associated with volcanic unrest in between more dramatic eruption cycles. Elevated CO_2 levels in the soil were first observed by the USGS in 1989 after a swarm of small earthquakes occurred beneath Mammoth Mountain. It is noted that the ski resorts in that region are located in close proximity to volcanoes.

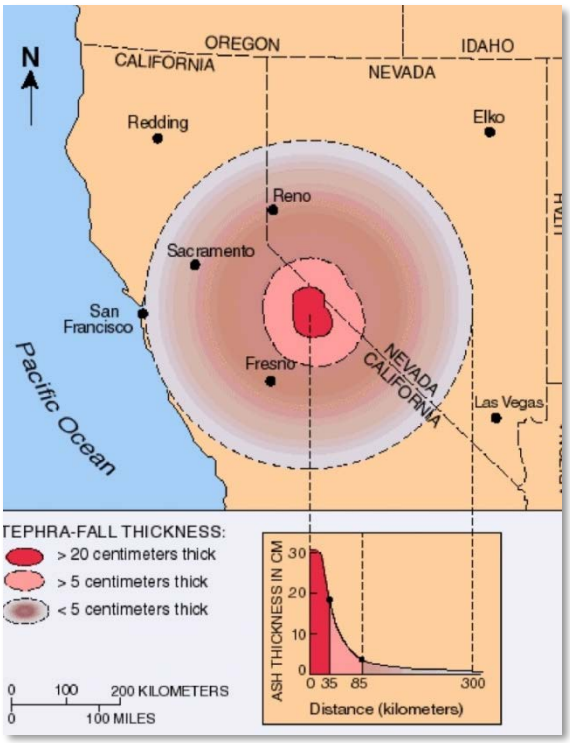


Figure 3-45. Map showing the region that could be affected by tephra accumulations on the ground following an eruption in the Long Valley – Mono Lake area. Thickness and distribution of tephra is dependent upon wind speed and direction during the eruption. From USGS Volcano Hazards Program: "Potential Tephra Fall Hazards for Small to Moderate-Sized Eruptions in the Long Valley – Mono Lake Area, California".

Volcanic eruptions may also trigger a "volcanic blast" or an atmospheric shock wave that creates a pressurized burst of moving air which travels away from the eruption center. Shock waves from eruptions may flatten trees (e.g. Mount Saint Helens) and break windows in buildings. Effects of these shock waves are more destructive near the eruption center.

It is likely that seismic instruments will detect any imminent eruption in time to warn people to avoid the hazard. Our ability to monitor small tremors associated with magma at depth is limited by the currently small number of seismographs that are operated in Nevada. The Seismo Lab and the USGS have joint responsibilities for earthquake monitoring and warnings.

Volcanic risk is low, but can change to high in a matter of months to a year as a volcano becomes active. The probability is low but the consequences can be locally severe. Mitigation actions are limited to public awareness and evacuation procedures at the local level. There are no significant impacts expected to the volcanic hazard in Nevada resulting from climate change.

Examples of response plans for volcanic eruptions include (and are referenced in Section 7):

1. Mount St. Helens – Mount Adams Volcanic Region Coordination Plan (2014): https://www.mil.wa.gov/uploads/pdf/PLANS/mount-st.-helens---mount-adams-volcanic-region-coordination-plan-october-2014.pdf
2. Mount Rainier Volcanic Hazards Plan (2008): http://www.co.pierce.wa.us/DocumentCenter/View/3499
3. Mt. Hood Coordination Plan (2013): http://www.oregon.gov/OEM/Documents/Mount_Hood_Volcano_Coordination_Plan.pdf
4. Central Cascades Volcano Coordination Plan (2007): http://www.oregon.gov/OEM/Documents/Central_Cascades_Coordination_Plan.pdf

3.3.19 **Wildfire** (High Risk)



Figure 3-46. Wildland Urban Interface Fire outside of Pioche, NV

3.3.19.1 Nature

A wildfire is a type of fire that spreads by consumption of vegetation. It often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles around. Wildfires can be caused by human activities such as arson or campfires or by natural events such as lightning. Wildfires are not confined to forests but can easily ignite in other areas with adequate vegetation or fuel volumes and continuity such as sagebrush or cheatgrass. Additionally, wildfires can be classified non WUI or WUI fires based on their juxtaposition to structures and communities. WUI wildfires can then be further classified into urban fires, interface or intermix fires based on the density of structures and amounts of fire fuel between the structures.

Nevada is susceptible to weather that may range from prolonged periods of drought to periods that are marked by above average precipitation. These weather fluctuations result in millions of acres of dead or dying vegetation, which rapidly dry out under normal summer weather conditions. The dry, hot conditions and windy weather patterns characteristic of Nevada's summers combine with vegetation conditions that fuel fast-moving, high-intensity wildland fires. Nevada also experiences off-season wildfires in drier fall and winter conditions when adequate herbaceous fuels loads exist and are not covered by snow. These can easily be as devastating to communities in the WUI as wildfires occurring in the traditional wildfire season.

Although wildfires are generally considered to be a damaging event, the Great Basin and Sierra pine forest types are ecosystems that have evolved with fire being an essential process to achieve diversity, health, and stability in ecosystem components and values such as vegetation, soils, water quality, water quantity, and wildlife habitat. Given the fire suppression policy of the last century and the increased presence of invasive annual grasses, Nevada's ecosystems now have a mixture of too much wildfire in some ecosystems, like the sagebrush rangelands and too little in others, like the Sierra pine, pinyon-juniper and mountain brush ecosystems. Any wildfire on State or private lands is suppressed fully as fast as possible due to the desire to avoid loss of life and damage to property and values on those lands.

The following three factors contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas:

- **Topography:** Topography is the configuration of the earth's surface, including its relief and the position of its natural and man-made features. Topography has a direct bearing on fire behavior. As slope increases, the rate of wildfire spread increases. A slope's aspect correlates with the amount of moisture, quantity and type of vegetation. South-facing slopes are also subject to more solar radiation, making them drier, thereby intensifying wildfire behavior. However, a ridge-top may stop a wildfire from spreading, since fire spreads more slowly or may be unable to spread downhill.

- **Fuel:** Fuel characteristics determine the potential fire intensity, and influence the rate of spread. The type and condition of vegetation play a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or burn with greater intensity. Dense or overgrown vegetation increase the amount of combustible material available to fuel the fire (referred to as the "fuel load"). The ratio of living to dead plant matter is also important. The risk of fire is increased significantly in ecosystems with woody fuels during periods of prolonged drought, as the moisture content of both living and dead plant matter decreases. Ecosystems dominated or co-dominated by herbaceous vegetation are often times more flammable and can create larger wildfires in years following above normal amounts of precipitation because the plants grow greater amounts of biomass that dries out during the summer wildfire season. The fuel's continuity, both horizontally and vertically, is also an important factor.

- **Weather:** The most variable factor affecting wildfire behavior is weather. Temperature, humidity, wind, and lightning can affect both the ignition and spread of fire. Extreme weather, such as high temperatures, low humidity, and strong winds can lead to extreme wildfire activity. By contrast, cooling, higher humidity, and calm atmospheric conditions often reduce wildfire occurrence and rates of spread, thereby making containment easier. Wind has the greatest impact on fire behavior of any of the weather factors. The passage of a warm front will usually bring a wind direction shift of 45 to 90 degrees. The passage of a cold front will shift wind direction from less than 45 degrees to as much as 180 degrees. Great Basin valley heating causes downslope winds in Nevada mountain ranges. As wind flows downslope in the atmosphere it is compressed, becoming warmer and dryer. This causes the fuels to dry out. As the temperature increases, wind speed may reach 50 to 70 miles per hour. Thunderstorms are another common extreme weather condition in Nevada. A thunderstorm's effect may extend 25 to 30 miles from the actual storm. A downburst is caused by the collapse of a thunderstorm, causing cool air to

be released in a downward direction. When this occurs, it adversely affects fire behavior and fire suppression efforts by causing a highly unpredictable wind event.

The frequency and severity of wildfires also depend on other hazards, such as lightning, drought, and infestations of diseases or insects in vegetation. If not promptly controlled, a wildfire may grow into an emergency or disaster. Fires that break out immediately following earthquakes can be particularly devastating, because the earthquake may have impaired the ability of first responders to reach or combat an urban or urban interface fire. Lack of access and suppression tools such as water are common place in post-quake fire response scenarios. Even small fires can threaten or destroy lives, resources, and improved properties.

In addition to affecting people, wildfires may severely affect wildlife, livestock, and pets. Such events may require emergency watering/feeding, evacuation, and shelter. Evacuating animals can complicate the general evacuation procedures, logistics, and compliance of the public due to financial and emotional connections with their animals. This complication has the potential to put responders and the public at increased risk for injury and death. It is not uncommon for NDOW to extend hunting seasons and tags for animal harvest following large wildfires in key habitats to mitigate large winter starvation-related die offs of wildlife in fire affected areas.

The indirect effects of wildfires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, intense fires can harm the soil, waterways, wildlife, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life for years. Exposed soils erode quickly and increase siltation of rivers and streams, increasing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris-flow hazards. All of these results can cause communities to lose their municipal water sources as well as damage water conveyance and control structures ineffective. When these structures become non-functional, common outcomes can include road washouts, houses flooded, as well as loss of irrigation water for crops and livestock watering. Local economies are often based on agricultural production, which can be eliminated for the short-term on federal lands that are used by private livestock ranching operations as a source of livestock feed for most of the year. Additionally, there is a large economy in Nevada that is dependent upon outdoor recreation such as hiking, hunting, camping, fishing and other activities that can be detrimentally affected by the lasting effects of a wildfire.

3.3.19.2 History

Wildfires and human-caused fires have been the primary landscape shaping events for thousands of years in Nevada. Some ecosystems, such as the Eastern Sierra pine forests and valley bottom wetlands were managed actively by Native Americans through the application of fire to the landscape. In areas not regularly burned by Native Americans, such as salt desert scrub and sagebrush rangelands, wildfires burned in areas where natural ignitions and wildfire fuel buildup coincided. In some ecosystems, this occurred as frequently as every 25 years at the same site to greater than 400 years. Ecosystems in Nevada evolved with wildfire as a part of those systems. Based on a century of full fire suppression, most of our forested and woodland types have an over-abundance of woody fuels that fuel larger and more intense wildfires of the last two decades. Sagebrush rangelands followed this trend as well, though many of them have now been converted to annual grasslands that burn many more times frequently than they did traditionally in history. The presence and expansion of invasive annual grasses has caused fire return intervals to decrease to three to five years in many locations across Nevada.

In Nevada, particularly in the northern half of the state, wildfires are a common yearly event. Nevada's traditional fire season starts in May and ends in October, but wildfires can occur at any time of the year depending on fire and weather conditions. NDF recently conducted a GIS analysis on Nevada wildfire occurrences over a 14 year period (2000 thru 2013). Results of the analysis indicate that over the 2000-2013 time period, Nevada wildfires are trending towards more distribution throughout the seasons, occurring more frequently in non-summer months. For the time period 2000-2003 in the West Region, 86% of wildfires occurred in summer months, with 14% occurrence for all other seasons combined. Over the 2004-2008 time period, 79% of wildfires occurred in summer, with 21% occurring in all other seasons combined. Finally, the 2009-2013 period saw summer wildfire occurrence drop to 67%, with 33% occurring in all other seasons combined. North and South Regions showed very similar results to the Western Region. For the three regions combined, six wildfires occurred over the winter months over 2000-2003, with 17 winter wildfires over the 2004-2008 period, and 27 winter wildfires over 2009-2013.

Nevada's fire regime is outside the range of historical variation which means that wildland fires have become larger, more destructive, and more frequent, especially starting in the mid-1980s. Since 1985 there have been nine fire years exceeding 500,000 acres burned in Nevada.

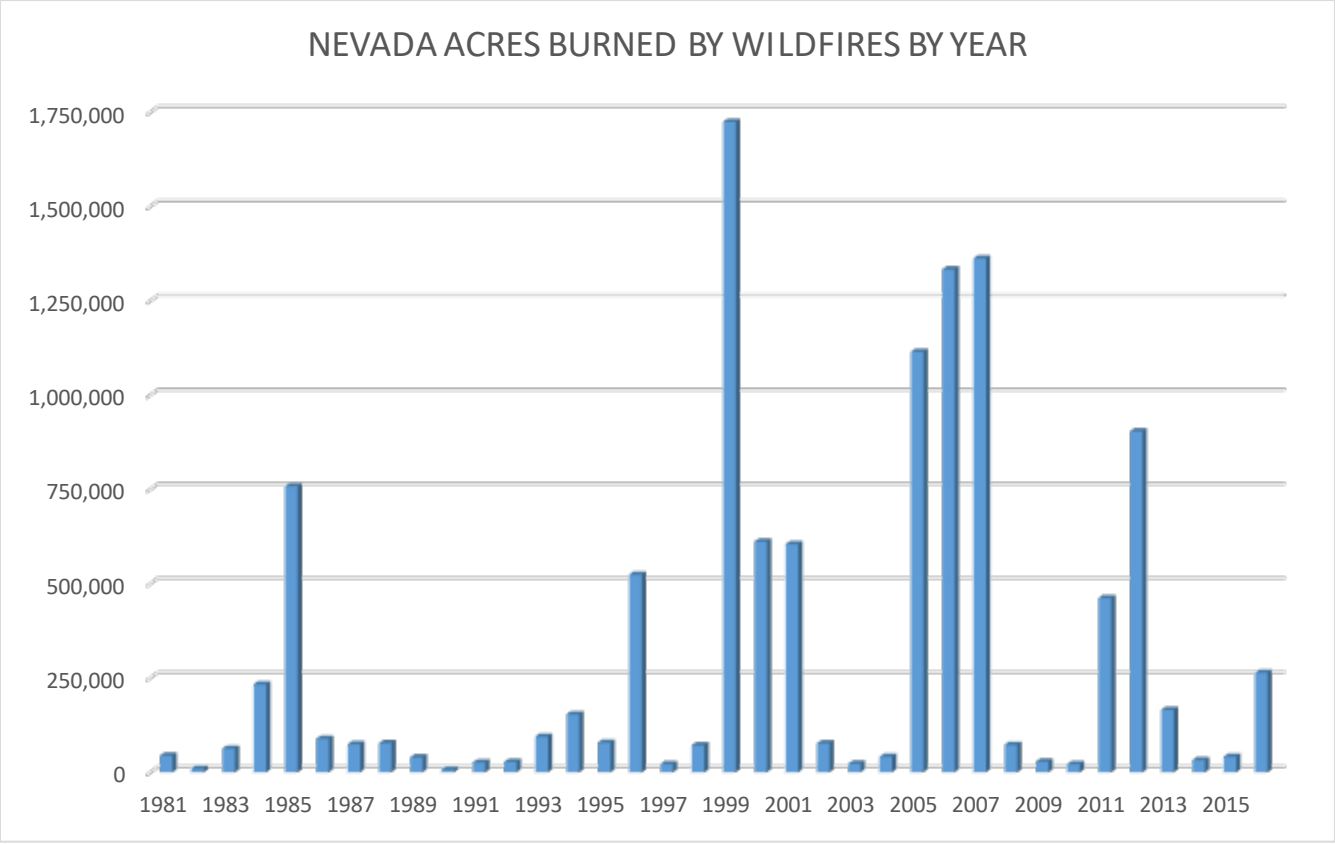


Figure 3-47. Historical Nevada acres burned by wildfires, by year.

The trend of having large wildfire years has continued since the mid-1980s with regular cycles of a few lesser fire years in between larger years, singly or aggregated sequentially in small groups. Much of this variation can be explained by the cyclic nature of our precipitation and the response of vegetation growth and conversion to wildfire fuels as they dry in the summer. Wildfire fuels can build to levels two to six times the annual average depending on the precipitation timing and amount each year. Controlling fires is easiest when they are small, which requires

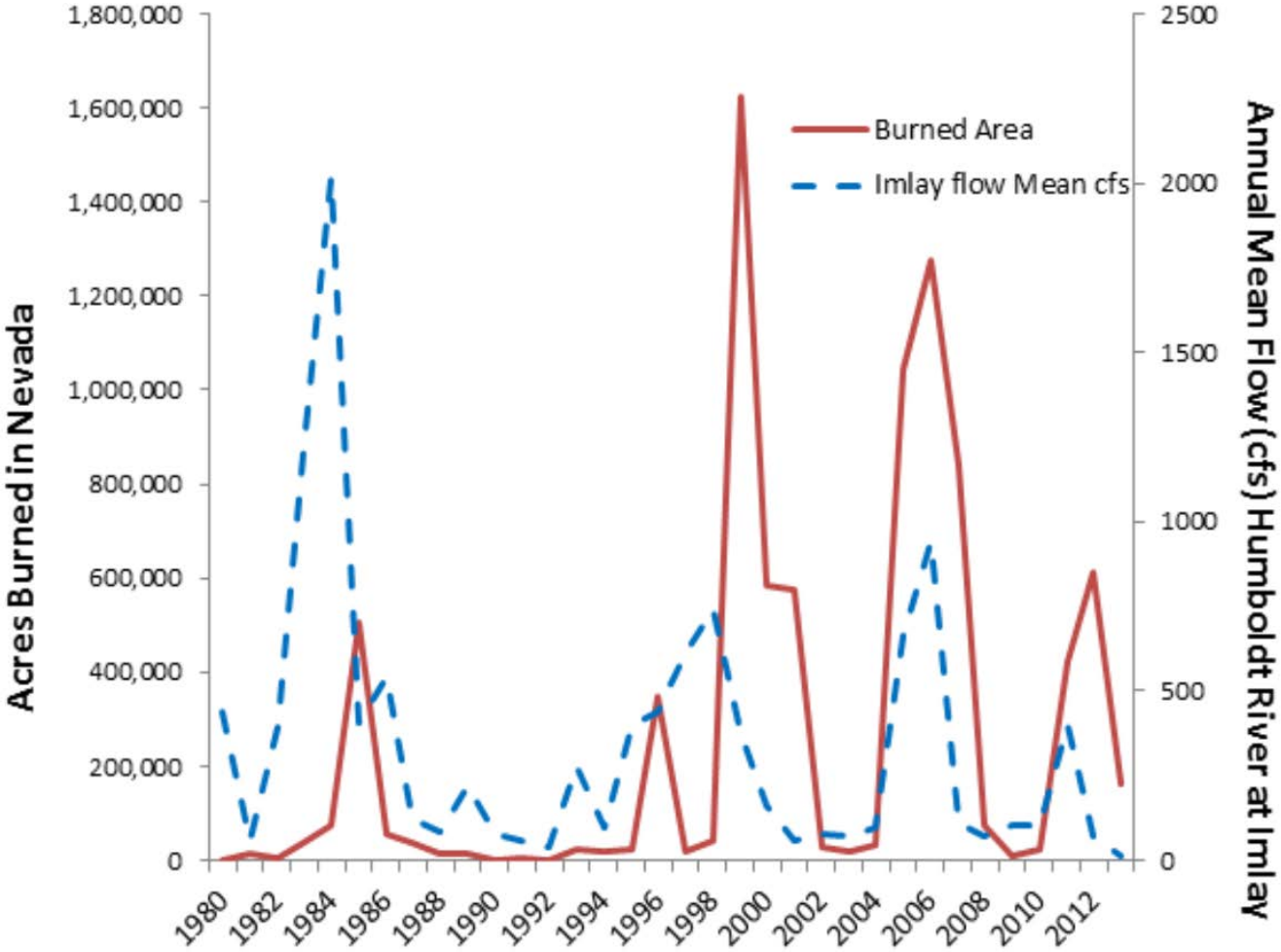


Figure 3-48. Nevada fire seasons are cyclic and highly correlated with precipitation and runoff levels (Swanson 2015).

Based on a twenty year average from 1996 to 2015, over 450,000 acres of land burn per year, which is the same acreage that is in Douglas County. These fires have devastated ranches, watersheds, homes, businesses, human lives and wildlife habitat. Additionally, large fires destroy native plant communities

that are replaced by invasive species, such as cheatgrass and red brome. In many cases these invasive species are more fire prone than native species and fuel larger, more intense fires.

In recent years this fire-invasive species-fire cycle is accelerating and posing serious threats to the health of some Nevada ecosystems. The spread of these invasive annual plants perpetuates the cycle of destructive fires and the loss of native plant communities.

The 1999 fire season was the worst fire season on record in terms of acres burned (1.87M) in the State of Nevada. The 2001 fire season was the worst on record in terms of the number of starts (1,277). These fires threatened not only homes, but plant and animal species. Historically, human-caused fires tend to account for 40 to 50% of the ignitions, while natural causes account for 50 to 60%. The total number of fires in Nevada appears to be trending down over time. Although more than 95% fires are suppressed and controlled during initial attack (first 24 hours following report), the five or less percent that escape initial attack control account for most of the damage and acres consumed. Additionally, damage incurred does not always correlate with the size of the fire. For instance, many of the large fires in northeastern Nevada are within critical wildlife habitats, though much smaller fires on the Sierra front can destroy many homes, take lives, and impair community watersheds.

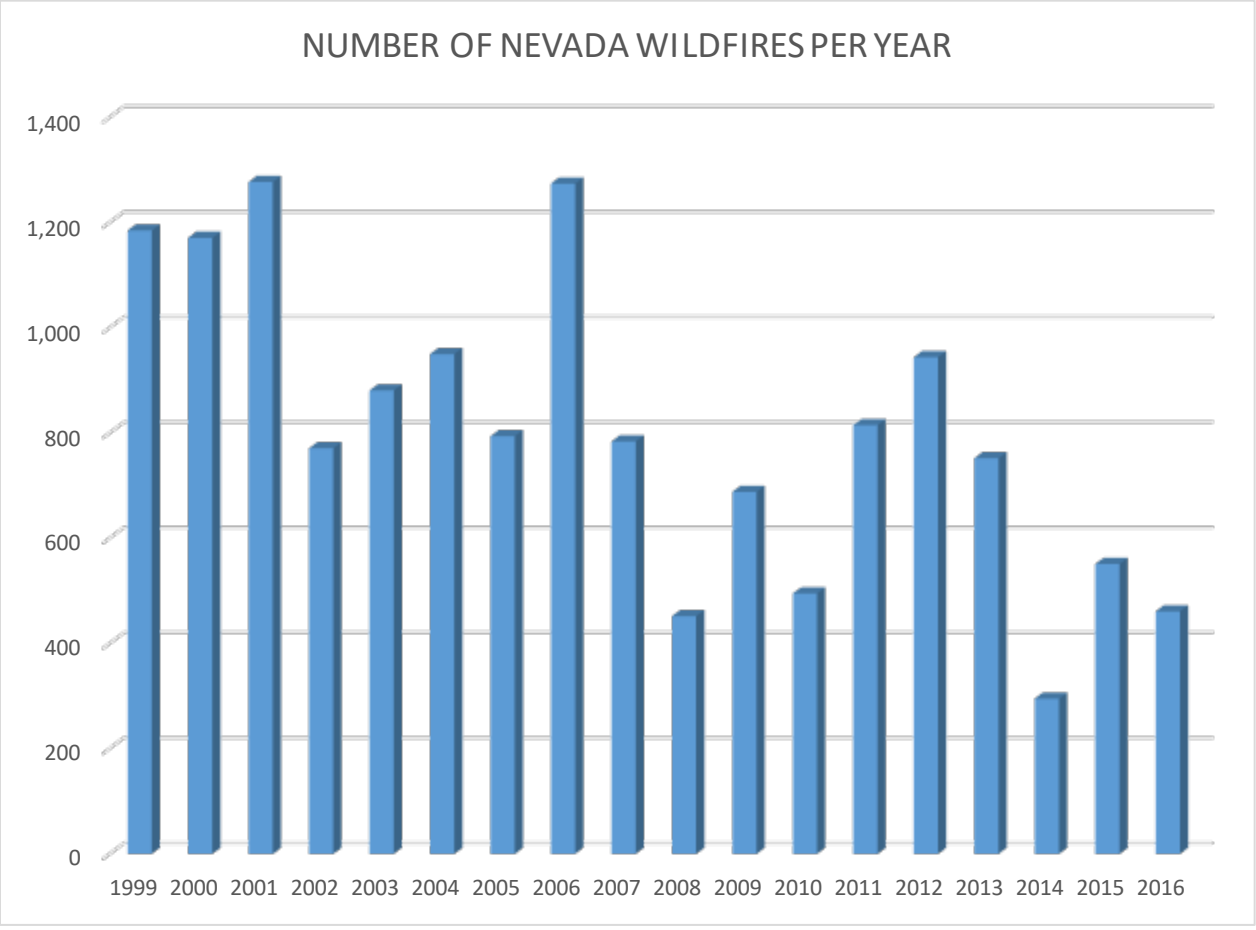


Figure 3-49. Number of Wildfires in Nevada by year (http://gacc.nifc.gov/gbcc/intell.php).

Table 3-32 presents a brief history of some of the most destructive Nevada wildfires.

Table 3-32. Destructive Wildfire History

Place	Date	Acres	Description
Kings Canyon	1926	Unknown	5 firefighters fatally burned over
Long Point	1934	Unknown	1 firefighter fatality from falling snag.
Humboldt County	1939	Unknown	5 firefighters fatally burned over
Eureka County	1973	Unknown	2 firefighters killed in air tanker crash
Carson City	1976	Unknown	3 firefighters killed in helicopter crash
White Pine County	1980	Unknown	4 firefighters killed in an aircraft crash
Unknown	1983	Unknown	1 firefighter fatally burned over
Churchill County	2000	Unknown	1 firefighter killed in a helicopter crash
Elko County	2000	Unknown	1 firefighter killed in a helicopter crash
Elko County	2005	6,000+	Chance Fire. The fire, which started August 28, consumed more than 6,000 acres and resulted in the voluntary evacuation of approximately 200 residents. The fire burned near the communities of Ryndon, Osino and Elburz in Elko County.
Elko County	2006	78,300	Suzie Fire. This fire burned more than 78,300 acres about five miles from Elko. This fire threatened rangeland, homes, and highways. A five-member strike team from California, composed of personnel and engines from fire departments in Sacramento, Placer and Nevada counties was involved in fighting this fire.
Humboldt	2006	102400	Oregon Fire. This fire burned more than 160 square miles of Nevada rangeland near the Oregon border. Also, this fire on the Oregon side threatened the major transmission lines that carry power between California and the Pacific Northwest.
Washoe County, Carson City	2006	8,000	Linehan Fire Complex. This fire burned about 8,000 acres, threatening homes in Carson City. One federal Type I incident response team moved in to battle the 8,000-acre Sierra-Tahoe complex of fires in western Nevada near Reno and Carson City.
Washoe County	2006	6000	The Verdi Fire burned 6,000 acres west of Reno, Nevada threatening the Somersett home subdivisions. It significantly depleted the winter forage food for the deer in this area.

Table 3-32. Destructive Wildfire History			
Place	**Date**	**Acres**	**Description**
Elko County	2006	3,000+	The Mud Fire on the outskirts of Elko burned more than 3,000 acres. It threatened 300 homes and forced mandatory evacuations of about 1,000 persons. It was a human–caused fire that threatened businesses and a number of state and Federal facilities. A Fire Management Assistance Grant (FMAG) was approved August 23, 2006.
Washoe County	2006	300	The Pine Haven Fire. This fire was caused by power lines and windy conditions. Firefighters held the blaze to approximately 300 acres with wildland fire engines, structure fire engines, water tenders, several hand crews and other equipment. Although the fire briefly threatened homes near Caughlin Ranch near Reno, no structures were damaged or lost during the fire.
Washoe County	2007	2,710	The Hawkens Fire was caused by construction crews working in the Caughlin Ranch subdivision near Reno. The fire threatened numerous homes and structures.
Elko County	2007	71,340	The Red House Complex of multiple fires in Elko County burned 71,340 acres total.
Humboldt County	2007	18,806	The Kelly Creek fire threatened several rural ranches in the Humboldt County area.
Elko County	2007	61,070	The West Basin Fire threatened several local ranches in the area.
Elko County	2007	19,959	The Eccles Fire threatened several ranches and structures.
Elko County	2007	648,154	The Murphy Complex, the Wine Cup Complex, and the Highway 93 Complex fires together burned 648,154 acres. Resources in the surrounding area and around the state were at maximum drawdown.
Nye County	2008	6,198	The Elkhorn fire
Washoe County	2008	3,042	The Gooseberry fire threatened several outbuildings.
Washoe County	2008	Unknown	3 firefighters killed in air tanker crash
Elko County	2008	40,937	The East Slide Rock Ridge fire threatened the town of Jarbidge.
Washoe County	2009	10,549	The Red Rock Fire and threatened several subdivisions in the Red Rock community.
Churchill County	2009	10,670	The Hoyt fire burned 10,670 acres. There was one pilot fatality in this fire.
Washoe County	2010	5,298	Rock Creek
Pershing County	2010	3,852	Seven Troughs
Elko County	2010	2,681	Bailey fire
Eureka County	2010	1,300	Grass Valley fire

Table 3-32. Destructive Wildfire History			
Place	**Date**	**Acres**	**Description**
Elko County	2011	4,780	Salmon fire
Douglas County	2011	3,895	Ray May fire
Washoe County	2011	2,377	Great Stone fire
Lincoln County	2011	1,721	Jumbo fire
Lander County	2011	1,041	Ellison fire
Lincoln County	2011	12,087	Vigo fire
Pershing County	2011	1,091	Willow Canyon fire
Elko County	2011	1,496	Wells fire
Lyon County	2011	1,062	Burbank fire
Humboldt County	2011	38,055	Hot Springs fire
Elko County	2011	116,875	Indian Creek fire
Elko County	2011	42,190	Izzenhood fire
Elko County	2011	51,390	Chukar Canyon fire
Humboldt County	2011	24,000	Eden Valley fire
Humboldt County	2011	18,468	China Garden fire
Humboldt County	2011	5,125	Tom Basin fire
Elko County	2011	2,363	Signboard Pass fire
Lander County	2011	2,000	Fire Creek fire
Humboldt County	2011	11,624	Big Antelope fire
Washoe County	2011	1,935	Caughlin fire, one fatality and 29 residences destroyed; November 18th
Washoe County	2012	3,177	Washoe Drive fire, one fatality, 34 residences destroyed; Jan 18th
Clark County	2012	1,086	White Rock fire
Lincoln County	2012	4,123	Pahroc fire burned
Lander County	2012	6,007	Antelope Complex
Churchill County	2012	17,200	Wall fire
Douglas County	2012	7,152	TRE fire
Douglas County	2012	1,070	Preacher fire
Lincoln County	2012	6,355	White Rock fire; two fatalities in Tanker 11 crash
Lyon County	2012	3,871	Weeks fire
White Pine County	2012	12,047	North Schell fire
Pershing County	2012	1,010	Mine fire
White Pine County	2012	4,000	Pinto fire
Lincoln County	2012	1,815	Boyd fire
Humboldt County	2012	2,478	Buffalo fire
White Pine County	2012	4,600	Range fire
White Pine	2012	7,238	Egan fire
Elko County	2012	13,149	20 mile fire
Elko County	2012	1,435	Palisades fire
Douglas County	2012	1,193	Springs fire

Table 3-32. Destructive Wildfire History			
Place	**Date**	**Acres**	**Description**
Pershing County	2012	1,600	Jupiter fire
Elko County	2012	4,597	Chimney fire
Lincoln County	2012	7,300	Gregerson fire
Lincoln County	2012	6,057	Basin fire
Lincoln County	2012	23,680	Dell fire
Elko County	2012	43,271	Willow fire
Humboldt County	2012	460,850	Holloway fire
Elko County	2012	1,200	Lutz fire
Eureka County	2012	12,091	Frazier fire
Humboldt County	2012	1,500	Slumbering fire
Humboldt County	2012	43,271	Eleven fire
Eureka County	2012	1,035	Four Tanks fire
Lander County	2012	31,652	Gilbert fire
Elko County	2012	6,000	Homer fire
Elko County	2012	7,590	Lime fire
Elko County	2012	12,500	Browns Gulch fire
Lincoln County	2012	4,246	Kane fire
Elko County	2012	2,680	Greenhorn fire
Lander County	2012	7,402	Cain fire
Humboldt County	2012	25,000	Long Canyon
Elko County	2012	6,738	Stud fire
Lander County	2012	2,532	Indian Creek fire
Humboldt County	2012	12,469	Hanson fire
Elko County	2012	16,797	Mustang fire
Humboldt County	2012	6,000	Buckskin fire
Humboldt County	2012	5,500	Coyote Point fire
Douglas County	2012	3,454	Carter Springs fire
Humboldt County	2013	36372	Crescent Dunes
Elko County	2013	2901	Wieland
Elko County	2013	2777	Smith Ranch
Elko County	2013	3888	Cattle Guard
Elko County	2013	16184	Red Cow
Elko County	2013	3031	Waterpipe
Nye County	2013	4028	Willow Creek
Lander County	2013	1093	Ferguson
Lander County	2013	1998	Goat Peak
Lincoln County	2013	4886	Black
Lincoln County	2013	6714	Eightmile
Lincoln County	2013	2783	Gregerson
White Pine County	2013	1100	North Creek
White Pine County	2013	1051	Snow Creek

Table 3-32. Destructive Wildfire History			
Place	**Date**	**Acres**	**Description**
Nye County	2013	1292	White Pine
Clark County	2013	27865	Carpenter 1
Lincoln County	2013	1216	DOD 4
Washoe County	2013	5369	Red Rock
Lyon County	2013	24140	Bison
Nye County	2013	4219	Chestnut
Humboldt County	2014	1983	Denio Basin
Lincoln County	2014	11279	Middle Ridge
White Pine County	2014	2168	Sampson
White Pine County	2014	9235	Lages
Nye County	2014	1383	Cottonwood
Washoe County	2014	Unknown	1 firefighter killed
Elko County	2015	4986	Annie
Eureka County	2015	2231	Boulder
Churchill County	2015	4013	Cold Springs
White Pine County	2015	7112	Diamond
White Pine County	2016		Strawberry fire; 1 firefighter killed from a falling snag

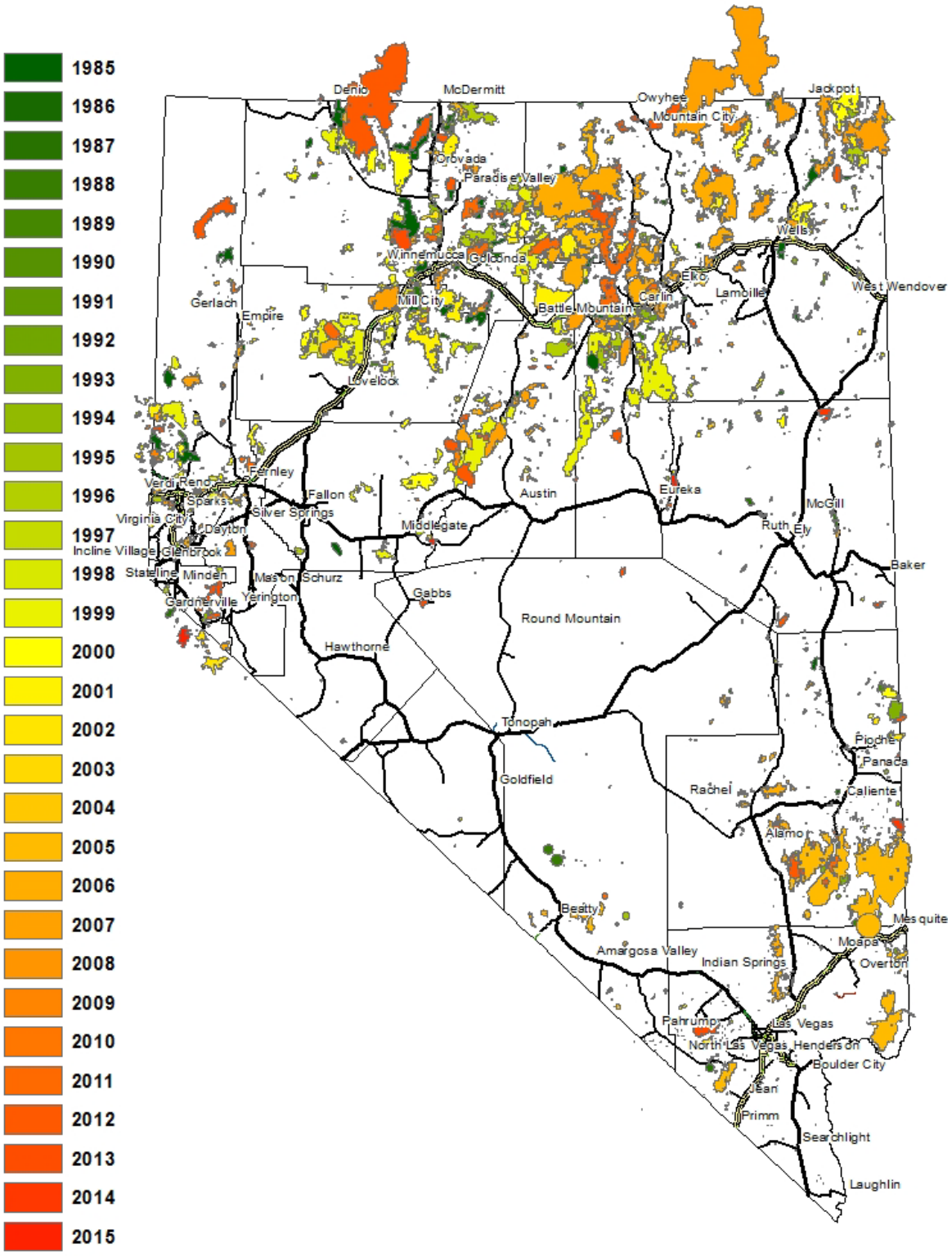


Figure 3-50. Locations of large Nevada wildfires over the last 30 years

3.3.19.3 Location, Severity, and Probability of Future Events

Nearly the entire State of Nevada is at risk to wildfires due to fuel-loading, ignition risk, weather, and topography. No specific area, other than playas, lakes, and parking lots, of the State are immune to this risk. Based on reported locations, wildfires are clustered largely near human population centers, though that is also where the best detection methods and suppression resources are located. This phenomena results in increased reported starts and also increased successful suppression. Human related starts are increased in these areas which includes recreation areas, highways, and power line rights-of-way. As populations continue to grow in the state, so will the number of fires in these and other areas.

Based on historical data and current trends (including climate change), scale, severity and probability for large wildfires are increasing in all parts of the state. For example, during early July of 2016, the Hot Pot fire was burning at a rate of roughly 3 acres burned every second, 166 acres every minute and 10,000 acres every hour — for a total of 56,000 acres in one continuous run. This kind of fire behavior is becoming normal for many different fuels types and regions in Nevada.

While fire service agencies, cooperators, and the public take many actions to mitigate risks associate with wildfire, there is no actions that can change the natural conditions that make wildfire possible in Nevada. What most mitigation impacts seek to achieve is decreasing the amount of damage caused by wildfires. Some mitigation actions on wildlands include creating natural landscapes that are resilient to wildfire, meaning that they can regenerate and survive wildfires and not become totally destroyed in the process. Other actions also seek to protect developed areas, by creating fire-adapted-communities, which are communities that can survive wildfires without becoming destroyed and with the limited amount of suppression response that can be expected with existing suppression resources. Increasing the amount and the effectiveness of suppression resources is also a damage mitigating action. The only mitigation action that seeks to reduce the number of fires is prevention education which attempts to teach the public how to avoid accidental wildfire starts.

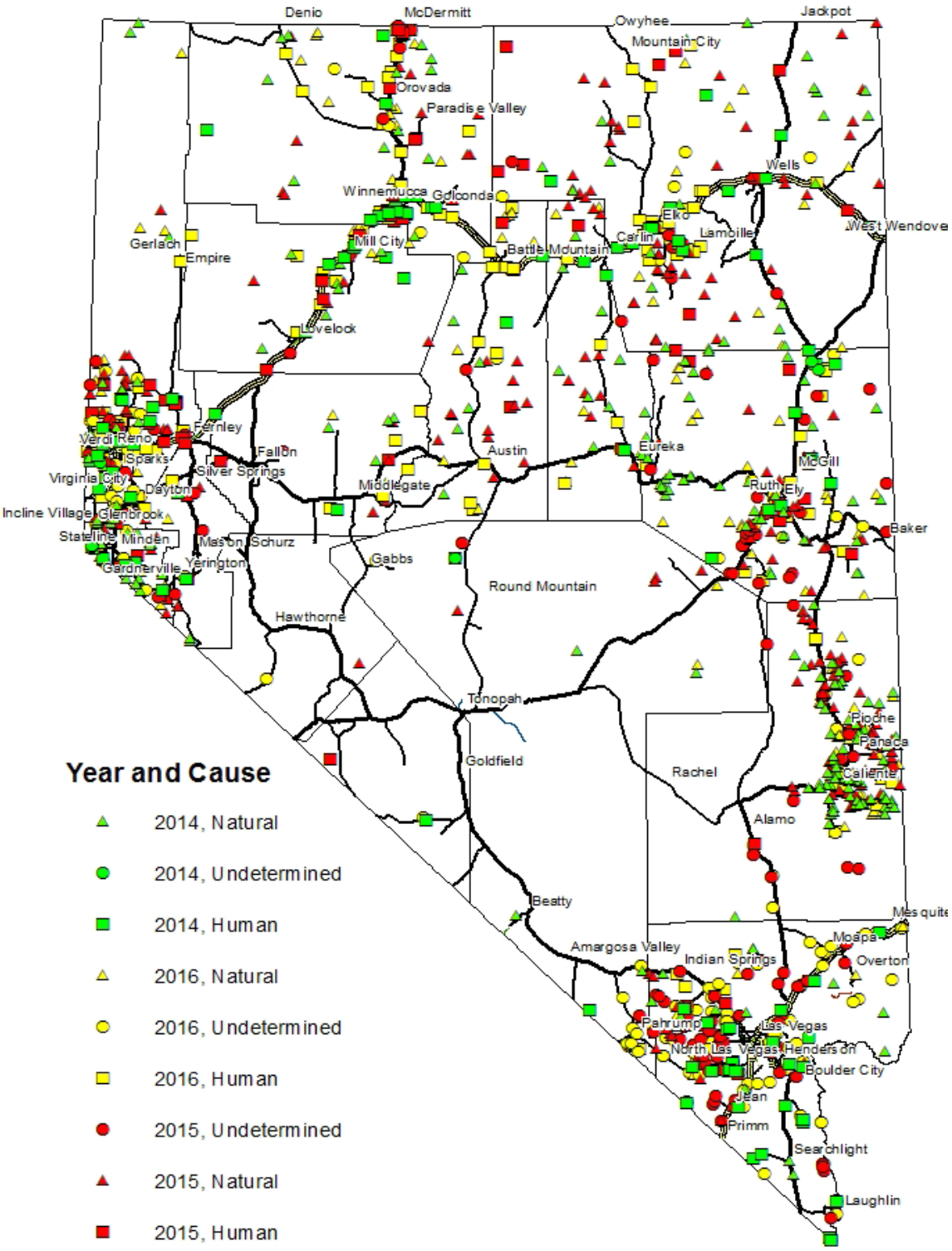


Figure 3-51. Wildfire locations and causes for 2015-2016.

The State of Nevada Division of Forestry cooperates with other federal (BLM, USFS, BIA), State (UNR-UNCE) and county-based fire protection districts to provide wild-land urban interface fire planning, mitigation, and response. NDF's mission is to provide professional natural resource and fire services to Nevada's citizens to enhance and protect forest, rangeland, and watershed values; conserve endangered plants and other native flora; provide effective collaborative fire protection and emergency management; assist in the creation of fire adapted communities; and maintain a robust statewide wildland fire/emergency response system.

In a collaborative effort, government agencies at all levels, tribes, communities, volunteers, and a variety of other participants have reduced the threats posed by wildland fire since adoption of the Western Governor Association's A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - *10-Year Strategy, Implementation Plan*.

The revision of the *10-Year Strategy* in December of 2006 gives direction for a collaborative framework that crosses agency jurisdictions and program boundaries. It strongly emphasizes the following:

- Information sharing and monitoring of accomplishments and forest conditions to improve transparency
- Long-term commitment to maintaining the essential resources for project implementation
- Landscape-level approach to the restoration of fire adapted ecosystems
- Use of fire as a management tool (wildland fire use, prescribed fire)
- Improve collaboration on all levels consistent with the *10-Year Strategy*, the *Implementation Plan*, and individual agency goals and objectives.

The severity of wildfires in the State of Nevada has been determined by NHMPC using a hazard ranking system and vulnerability rating explained in section 3.2.1 and 3.2.2. The rating for wildfires in Nevada is a "High Risk" hazard. Wildfire is being addressed by a variety of strategies and projects in the State.

Nevada's Extreme Wildfire Hazard Communities. A key element of the **Healthy Forests Initiative** announced by the White House in 2002 is the implementation of core components of the ***National Fire Plan Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-year Comprehensive Strategy***. Federal agencies and western state governors adopted the Plan in the spring of 2002 in collaboration with county commissioners, state foresters, and tribal officials. The Plan calls for more active forest and rangeland management to reduce the threat of wildfire in the wildland urban interface.

The Healthy Forest Restoration Act (H.R. 1904) was signed into law in December of 2003. The act creates provisions for expanding the activities outlined in the National Fire Plan. During this year, the Nevada Fire Safe Council received National Fire Plan funding through the BLM to conduct a Community Risk/Hazard Assessment in at-risk communities across Nevada. The communities to be assessed were among those named in the 2001 Federal Register list of Communities-at-Risk within the vicinity of Federal lands (66 FR 160). The list identified Nevada communities adjacent to Federal lands that are most vulnerable to wildfire threat in Nevada.

During 2004, field teams comprised of fire behavior specialists, foresters, rangeland fuels specialists, and field technicians visited over 250 communities in Nevada's seventeen counties to assess both the

risk of ignition and the potential fire behavior hazard. Using procedures accepted by Nevada's wildland fire agencies, these specialists focused their analysis on the wildland urban interface areas where homes and wildlands meet. This effort was known as the Nevada Community Wildfire Risk/Hazard Assessment Project. The reports generated by the Nevada Community Wildfire Risk/Hazard Assessment Project for each of the 17 counties in Nevada, as well as two reports for Lake Tahoe communities and a Fire-Safe plan for Virginia City Highlands may all be viewed on the website below:

http://www.rci-nv.com/home/rci-reports/

Upon completion of the Community Wildfire Protection Plans (CWPP), the plans were approved by County Commissioners, local fire chiefs, and the State Forester. These plans serve as the basis for risk assessment ratings and development of wildfire mitigation strategies for the assessed communities.

Specific goals of the Nevada Community Risk/Hazard Assessment Project in developing the CWPPs are the following:

- Reduce the threat of wildland fire to the communities.
- Raise the level of public awareness about ignition risk factors and fire-safe practices in the wildland urban interface.
- Improve local coordination for suppression activities.
- Identify and pursue firefighting resource needs (equipment and infrastructure).
- Describe proposed risk and hazard mitigation projects in enough detail to aid communities in applying for future implementation funds.

Source: Nevada Community Wildfire Risk / Hazard Assessment Project, Resource Concepts, Inc., 1.0 Introduction

The Community Risk/Hazard Assessments were conducted systematically. The assessment teams observed and recorded the factors that significantly influence the risk of wildfire ignition along the WUI, and inventoried features that can influence hazardous conditions in the event of a wildfire. Interviews with local fire agency and emergency response personnel were completed to assess the availability of suppression resources and identify opportunities for increased community preparedness. A description of the existing fuel hazard and fire behavior potential was discussed and presented with photos for each community.

Four primary factors that affect potential fire hazard were assessed to arrive at the community hazard assessment score:

1. Community design
2. Structure survivability
3. Availability of fire suppression resources
4. Physical conditions such as the vegetative fuel load and topography

An ignition risk rating of low, moderate, or high was assigned to each community. The rating was based upon historical ignition patterns, interviews with local fire personnel, field visits to each community, and professional judgment based on experience with wildland fire ignitions in the Great Basin.

The results of each community assessment were formatted to facilitate ease of reference and reproduction for individual communities. Each community was mapped and recommendations to improve fire safety were described and summarized in table form. Summary sheets highlighting important aspects of Defensible Space and Homeowner Responsibilities are formatted for widespread distribution. These tools will aid local, state and federal agencies in strategic planning, raising public awareness, and seeking funding for future risk and hazard reduction projects. Mitigating the risks and hazards identified by these assessments is crucial not only to the long term goals of the National Fire Plan, but also to the short and long-term viability of Nevada's communities, natural resources, infrastructures, and watersheds. All Nevada counties have signed and approved their plans. There are additional assessments of wildfire risk that have been completed to address the rest of the state outside the communities. There is also a Western States Wildfire Risk Assessment that was completed in December 2012 that can be found here: http://forestry.nv.gov/fire-program/wildfire-risk-assessment-protection/.

The initial CWPP assessment covered communities at risk as defined in the 2001 Federal Register in the interface, intermix and occluded conditions. To date, several communities and subdivisions within communities-at-risk have updated their CWPPs to reflect current fuels management work that has been completed. These assessments simply represent a snapshot in time of the conditions in the identified communities. However, wildland fire conditions continue to change and new and existing communities impact the wildland environment causing a need for ongoing collaborative review and update of the original assessments as well as a need for creation of new assessments. Grants are being provided for many ongoing mitigation efforts such as fuels reduction programs and awareness, education and outreach programs that are ongoing in many communities of extreme risk as shown in the updated version of Table 3-33 below.

The preparation of CWPPs for each county in the State is a part of the State of Nevada Division of Forestry's fire planning, mitigation, and response. The University of Nevada Cooperative Extension (UNCE) reviewed these CWPPs and prepared a report, *Course of Study Reports for Nevada's Extreme Wildfire Hazard Communities*, outlining the risk factors that identify communities with wildfire risks. The risk factors used to rate the State of Nevada's communities are the following:

1. Contributing factors
    a. History of lightning strikes
    b. Camping activities
    c. High level of visitors/recreational activities
    d. Understory provides receptive fuel bed for ignition
    e. Thick brush/trees provide receptive fuel bed for ignition
    f. Improperly maintained power line corridors
    g. High fuel loads
    h. High winds
2. Community design
    a. Wildland-urban interface condition
    b. Number of homes
    c. Ingress/egress
    d. Width of road

   e. Accessibility
   f. Secondary roads
   g. Visible street signs
   h. Visible address
   i. Utilities-ignition risk
3. Construction materials
   a. Non-combustible roof
   b. Non-combustible siding
   c. Unenclosed structures
4. Defensible space
   a. Lot size
   b. Defensible space
5. Fire behavior
   a. Fuels
   b. Fire behavior
   c. Slope
   d. Aspect
6. Suppression capability
   a. Available water source
   b. Fire protection
   c. Primary fire protection service
   d. Supporting fire protection service
   e. Additional support
7. Additional Factors
   a. Existing Fire Safe Council Chapter

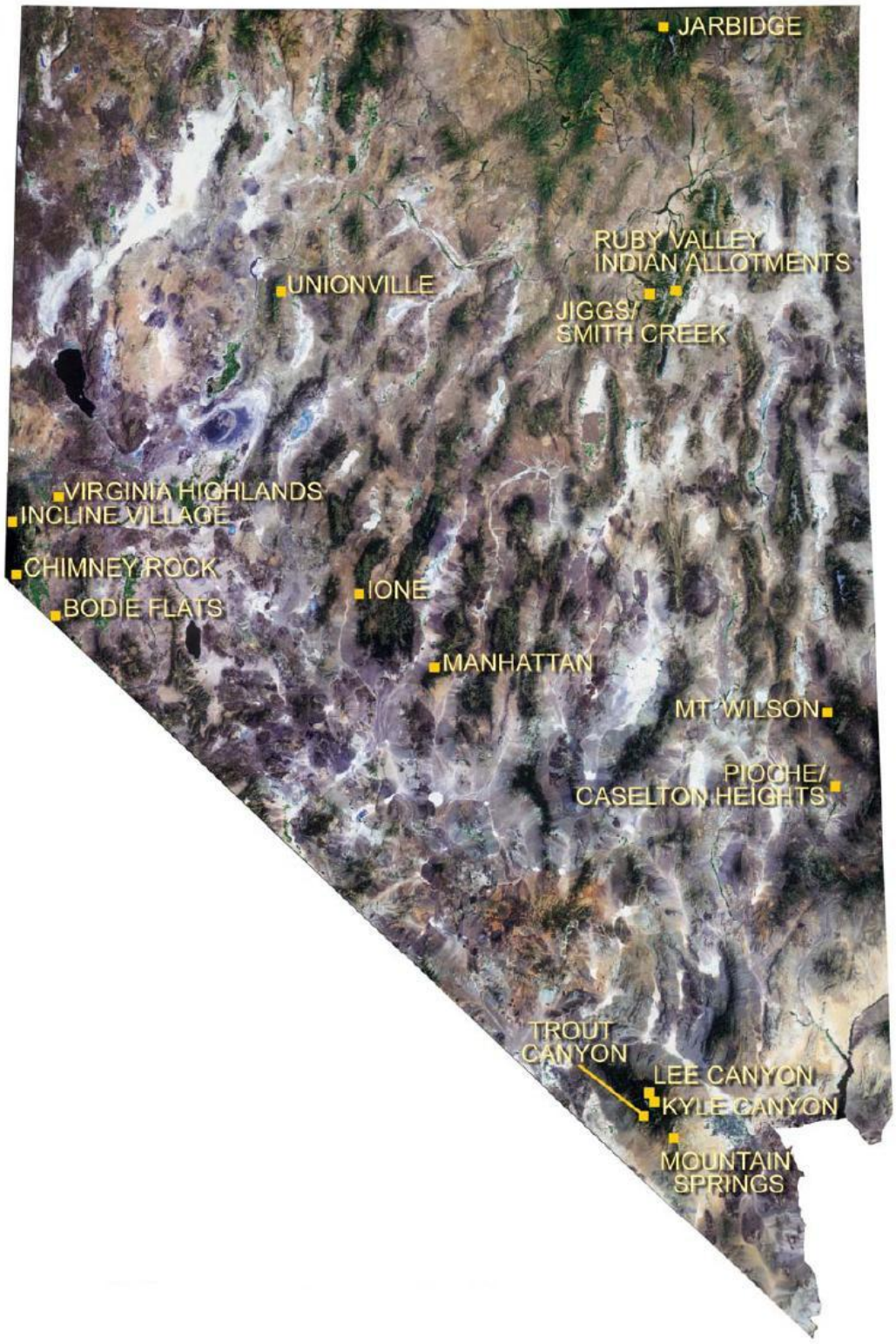


Figure 3-52. Map Showing Communities with Extreme Wildfire Risk

Table 3-33 below lists all the communities that were rated using the information provided by the CWPPs, grouped by county, and the hazard rating for each community, as well as a column to indicate ongoing or completed fuels reduction programs and/or public awareness and education projects in each community in the past 5 years.

Table 3-33. Wildfire Hazard Ratings for Nevada Communities by County	Wildfire mitigation programs completed in 2011-2015 period: 1. Fuels reduction projects 2. Education, awareness, outreach programs	
County/Community	**Hazard rating**	**Type**
Carson City		
Clear Creek	Extreme	1,2
Carson Colony-Voltaire Canyon	High	1,2
Edmonds-Prison Hill	High	1,2
Kings Canyon-Upper	High	1,2
Lakeview	High	1,2
Mexican Dam	High	1,2
North Carson	High	1,2
Pinion Hills	High	1,2
Ash Canyon-WNCC	Moderate	1,2
C-Hill	Moderate	1,2
Stewart-South Carson	Moderate	1,2
Timberline	Moderate	1,2
Kings Canyon-Lower	Low	1,2
Churchill		
Eastgate	High	
Cold Springs	Moderate	
Middlegate	Moderate	
Fallon	Low	
Fallon Naval Air Station	Low	1
Fallon Outskirts	Low	1
Clark		
Kyle Canyon Summer Home Area	Extreme	1,2
Lee Canyon Summer Home Area	Extreme	1,2
Mountain Springs	Extreme	1,2
Trout Canyon (not geocoded)	Extreme	1,2
Cold Creek (not geocoded)	High	1,2
Nelson	High	
Torino Ranch (not geocoded)	High	2
Cactus Springs	Moderate	
Goodsprings	Moderate	
Moapa Valley	Moderate	1,2
Sandy Valley	Moderate	2
Searchlight	Moderate	
Arden	Low	
Blue Diamond	Low	1,2
Boulder City	Low	
Bunkerville	Low	1,2
Cal-Nev-Ari	Low	
Cottonwood Cove (not geocoded)	Low	
Glendale	Low	1
Henderson	Low	1,2
Indian Springs	Low	
Las Vegas	Low	2
Laughlin	Low	1,2
Logandale	Low	1,2
Mesquite	Low	1,2
North Las Vegas	Low	
Overton	Low	1,2
Palm Garden Estates (not geocoded)	Low	

Primm	Low	
Sloan	Low	
Douglas		
Bodie Flats (not geocoded)	Extreme	
Chimney Rock (not geocoded)	Extreme	1,2
China Springs (not geocoded)	High	1,2
Double Springs (historical)/Spring Valley	High	1,2
Elk Point/Zephyr Heights/Round Hill	High	1,2
Fish Springs (not geocoded)	High	
Genoa	High	1,2
Glenbrook	High	1,2
Holbrook Junction	High	2
Kingsbury	High	1,2
Job's Peak Ranch (not geocoded)	High	2
Logan Shoals (not geocoded)	High	1,2
North Foothill Road Corridor (not geocoded)	High	2
Pine Nut Creek (not geocoded)	High	
Sheridan	High	2
Skyland/Cave Rock	High	1,2
Topaz Ranch Estates	High	1,2
Alpine View (not geocoded)	Moderate	2
Dresslerville	Moderate	
Indian Hills/Jacks Valley	Moderate	1,2
Johnson Lane	Moderate	
Ruhenstroth (not geocoded)	Moderate	
Stateline	Moderate	1,2
Topaz Lake	Moderate	
East Valley (not geocoded)	Low	
Gardnerville	Low	
Gardnerville Ranchos	Low	
Minden	Low	
Elko		
Jarbidge	Extreme	1,2
Jiggs/Smith Creek	Extreme	1,2
Ruby Valley Indian Reservation	Extreme	
Adobe Heights (not geocoded)	High	
Adobe Ranchos (not geocoded)	High	
Contact	High	
Deeth/Starr Valley	High	1,2
Lamoille	High	1,2
Lee/South Fork Indian Reservation	High	
Lucky Nugget I & II (not geocoded)	High	1,2
Midas	High	1,2
Mountain City	High	
Osino	High	1,2
Ruby Lake Estates	High	
Ten Mile (not geocoded)	High	
Tuscarora	High	1,2
Carlin	Moderate	
Currie	Moderate	
Elburz	Moderate	
Elko	Moderate	
Gold Creek- moderate	Moderate	
Hidden Valley/Coal Mine (not geocoded)	Moderate	
Humboldt Ranchettes (not geocoded)	Moderate	
North Fork	Moderate	
Oasis	Moderate	
Owyhee	Moderate	1,2
Pilot Valley (not	Moderate	

geocoded)		
Ruby Valley	Moderate	
Ruby Lake National Wildlife Refuge & Hatchery	Moderate	
Ryndon	Moderate	
Spring Creek	Moderate	1,2
Wild Horse Estates- (not geocoded)	Moderate	
Jackpot	Low	
Montello	Low	
Wells	Low	2
West Wendover	Low	2
Charleston	Rural	
Clover Valley	Rural	
Independence Valley (not geocoded)	Rural	
Goose Creek- rural (not geocoded)	Rural	
Esmeralda		
Gold Point	Moderate	
Goldfield	Moderate	
Lida	Moderate	1
Silver Peak	Moderate	
Dyer/Fish Lake Valley	Low	2
Eureka		
Eureka	High	1,2
Beowawe	Moderate	
Crescent Valley	Low	2
Dunphy	Low	
Shoshone		
Diamond Valley	Moderate	1,2
Humboldt		
McDermitt	High	
Denio	Moderate	
Golconda	Moderate	
Paradise Valley	Moderate	1,2

Valmy	Moderate	
Winnemucca	Moderate	
Denio Junction	Low	
Paradise Hill/Paradise Ranchos	Low	2
Quinn River Crossing	Rural	1,2
Lander		
Austin	High	1
Kingston	High	
Battle Mountain	Low	
Hilltop	Low	
Grass Valley	Rural	
Battle Mountain Colony	Low	
Lincoln		
Pioche/Caselton Heights	Extreme	1,2
Ursine/Eagle Valley	High	1,2
Alamo	Moderate	2
Caliente	Moderate	2
Panaca	Moderate	2
Rachel	Moderate	2
Ash Springs	Rural	2
Hiko	Rural	2
Mount Wilson	Extreme	1,2
Lyon		
Silver City	High	
Dayton	Moderate	1,2
Mark Twain Estates	Moderate	1,2
Mason Valley	Moderate	1
Mound House (historical)	Moderate	1,2
Smith Valley	Moderate	1
Wabuska	Moderate	
Weed Heights	Moderate	
Weeks (historical)/Fort Churchill	Moderate	1,2

Fernley	Low	
Silver Springs	Low	
Stagecoach	Low	1,2
Yerington	Low	
Mineral		
Marietta	High	
Luning	Moderate	
Mina	Moderate	
Schurz	Moderate	
Walker Lake	Moderate	
Hawthorne	Low	
Nye		
Ione	Extreme	2
Manhattan	Extreme	1,2
Belmont	High	1,2
Amargosa Valley	Moderate	
Beatty	Moderate	
Carvers	Moderate	
Gabbs	Moderate	
Hadley/Round Mountain	Low	
Pahrump	Low	1,2
Tonopah	Low	
Pershing		
Unionville	Extreme	1,2
Humboldt	High	
Imlay	Moderate	
Lovelock	Moderate	
Mill City	Moderate	
Oreana	Moderate	
Rye Patch	Moderate	1,2
Storey		
Virginia City Highlands	Extreme	1,2
Gold Hill	High	1,2
Virginia City	High	1,2
Lockwood	Moderate	

Washoe		
Crystal Bay	Extreme	1,2
Incline Village	Extreme	1,2
Antelope Valley (not geocoded)	High	
Rancho Haven (not geocoded)	High	
Red Rock (not geocoded)	High	2
Warm Springs Valley (not geocoded)	High	
Anderson Acres (not geocoded)	Moderate	
Cold Springs	Moderate	
Galena (not geocoded)	Moderate	1,2
Gerlach	Moderate	
Golden Valley	Moderate	
Lemmon Valley	Moderate	
Mogul/I-80 Corridor West	Moderate	
Nixon	Moderate	
Palomino Valley (not geocoded)	Moderate	
Pleasant Valley	Moderate	
Reno	Moderate	1,2
Reno Northwest	Moderate	
Reno Southeast	Moderate	1,2
Silver Knolls (not geocoded)	Moderate	
Spanish Springs	Moderate	
Steamboat	Moderate	
Sun Valley	Moderate	
Sutcliffe	Moderate	
Verdi	Moderate	1
Washoe City	Moderate	1,2
Washoe Valley East	Moderate	1,2
Empire	Low	
Reno Southwest	Low	1,2
Reno-Stead	Low	
Sparks	Low	

Wadsworth	Low	
White Pine		
Cherry Creek	High	
Baker	Moderate	1,2
Ely	Moderate	1,2
Lund	Moderate	
McGill	Moderate	
Pleasant Valley (historical)	Moderate	
Preston	Moderate	1
Ruth	Moderate	1
Shoshone	Rural	
Strawberry (historical)	Rural	
Total number of communities		**230**
Total number of extreme wildfire hazard communities		**17**
Total number of high wildfire hazard communities		**55**
Total number of moderate wildfire hazard communities		**98**
Total number of low wildfire hazard communities		**51**
Rural communities assed (not rated)		**9**

Principals of Nevada's "Living With Fire" program (administered by the UNCE) did a study of Nevada's Extreme- and High-Risk communities to determine the possible effectiveness of education and increased awareness programs in reducing wildfire risk in those communities as already identified by the CWPP program. This identified not only those extreme- and high-risk communities that would most likely benefit from targeted education and increased awareness programs, but also prioritized the communities where grant resources would likely have the most positive effects in reducing wildfire risks. This laid the groundwork for ongoing statewide multiagency wildfire education and awareness programs that are now being implemented in several of the extreme/high-risk communities, supported by both state and federal grants.

The Nevada Fire Safe Council was a coalition of concerned citizens who shared a common interest in reducing the loss of lives, property, and valuable natural resources to wildfire. They worked with affiliated communities to identify and administer grant funding from federal, state, local, and private sources to reduce the risk of catastrophic loss due to wildfire. While the functions this group were essential, such as rallying community members, educating them with Living With Fire materials, facilitating local CWPP planning, and implementing community protection fuel reduction projects, it did not prove to be a sustainable model. The organization failed to maintain reasonable and effective grant funding management mechanisms, and was ordered by the USOIG to cease and desist operations due to commingling of funds. Once the corporate organization was removed, the 124 local chapters and 5,000+ dues paying members of the organization slowly ceased operations. Around 2013, some of the founding members of the Nevada Fire Safe Council started a program at the Living With Fire program called the Nevada Network of Fire Adapted Communities. This organization was created to salvage community efforts and coordination across the communities in Nevada to keep pursuing wildfire mitigation with the Fire Safe Council. This model was known to have limited capability with the University system, so NDF advanced a proposal to adopt the program and operate it into the future. The proposal has been largely supported and is scheduled to be implemented with a full transfer of the program by July of 2017. Partners hope to reconstitute the success of the Fire Safe Council while adjusting the approach to avoid the failure points experienced in the past. The goal of the program is to support the creation of fire adapted communities for all of the communities-at-risk in Nevada. The program will be following the model set forth by the National Fire Adapted Communities Coalition (https://fireadapted.org/), which includes ensuring that communities have the following components in place:

- Programs that educate and provide awareness of fire risks and threats to communities and homeowners
- Programs that incentivize proactivity on the part of the landowners to mitigate risks on their lands
- Fuel reduction projects planned and implemented where needed
- Management of ecosystems for fire-resilience surrounding communities
- Safety zones established within communities for use during wildfire events
- Building codes and ordinances that mitigate risks of ignition of structures in the WUI
- Model defensible space standards for all structures in the WUI and technical inspections and advice for residents from local resources

- Wildfire prevention education activities, events and programs implemented
- Communities creating and updating CWPPs regularly for their community
- Cooperative firefighting agreements between jurisdictions that have resources in the area
- Residents have prepared for wildfire by following codes, standards and ordinances for building construction and defensible space
- Residents have a system in place to be ready for wildfire events and way to stay informed of the latest details if a fire threatens their community
- Residents are ready to evacuate and follow their personal wildfire action plan when they are ordered to evacuate

In central Nevada, Eureka County and the community of Crescent Valley have worked to minimize wildfire risk earning national recognition by being designated Firewise Communities under a program administered by the National Fire Protection Association.

In September 2007, the UNCE coordinated the first Nevada WUI Fire Summit and is held annually. The purpose conference is to bring state, local and federal agencies together to provide information to communities rated as extreme risks for wildfire hazard and to promote awareness that would stimulate the communities' desire to mitigate wildfire risk through a grassroots approach. Since 2007, the Nevada WUI Fire Summit has continued to convene fire service personnel, county managers, and other emergency managers annually for those Nevada communities ranked as "extreme", "high" and "moderate" for wildfire hazard to discuss how to lower their hazard ratings and to promote action at the local level. As part of the "Living With Fire" program, this event is made possible with funding from the BLM, the Nevada Fire Safe Council, Sierra Front Wildfire Cooperators, and NDF in cooperation with the USFS. Major goals of the annual summit are to decrease the wildfire-hazard rating of Nevada's at-risk communities and create fire-adapted communities capable of surviving wildfire with little or no firefighter assistance, getting community members informed and engaged, recognizing that wildfire survival takes a community, and that we all have a role to play in it.

In recent years, there has been an important shift from protecting communities from wildfire at all costs to preparing them to withstand wildfire. This is largely driven by the fact that not all structures can depend on fire suppression personal and apparatus to respond during a wildfire event, as well as the fact that many homes have survived wildfires without direct action from firefighters if preparedness and mitigation actions were implemented prior to the fire. Education of all community stakeholders in wildfire preparedness is one of the most critical and effective initial steps to saving structures from wildfires. There is a role not only for firefighters but also for homeowners, landscapers, construction workers, and politicians as well as for proactive housing developers who can make decisions when designing and building new communities capable of withstanding wildfire by creating defensible space, providing adequate road access for resident evacuation and fire engines, using ignition-resistant building materials, installing water sources for fighting fires, and situating homes so fire racing up steep slopes would be less likely to ignite them. Upon these realizations and the need to be more effective, the National Cohesive Strategy was initiated in 2009 and was adopted in Nevada in 2015. The Strategy addresses four main challenges relating to wildfire:

- Managing vegetation and fuels;
- Protecting homes, communities, and other values at risk;
- Managing human-caused ignitions;
- Effectively and efficiently responding to wildfire.

The strategy to address these challenges includes three goals:

- Restore and maintain resilient landscapes;
- Create fire-adapted-communities; and
- Ensure safe and effective wildfire response

When this strategy was adopted, state, local and federal resources agreed that this was a good pathway and are in the process of creating action plans to reach each of the three goals in Nevada.

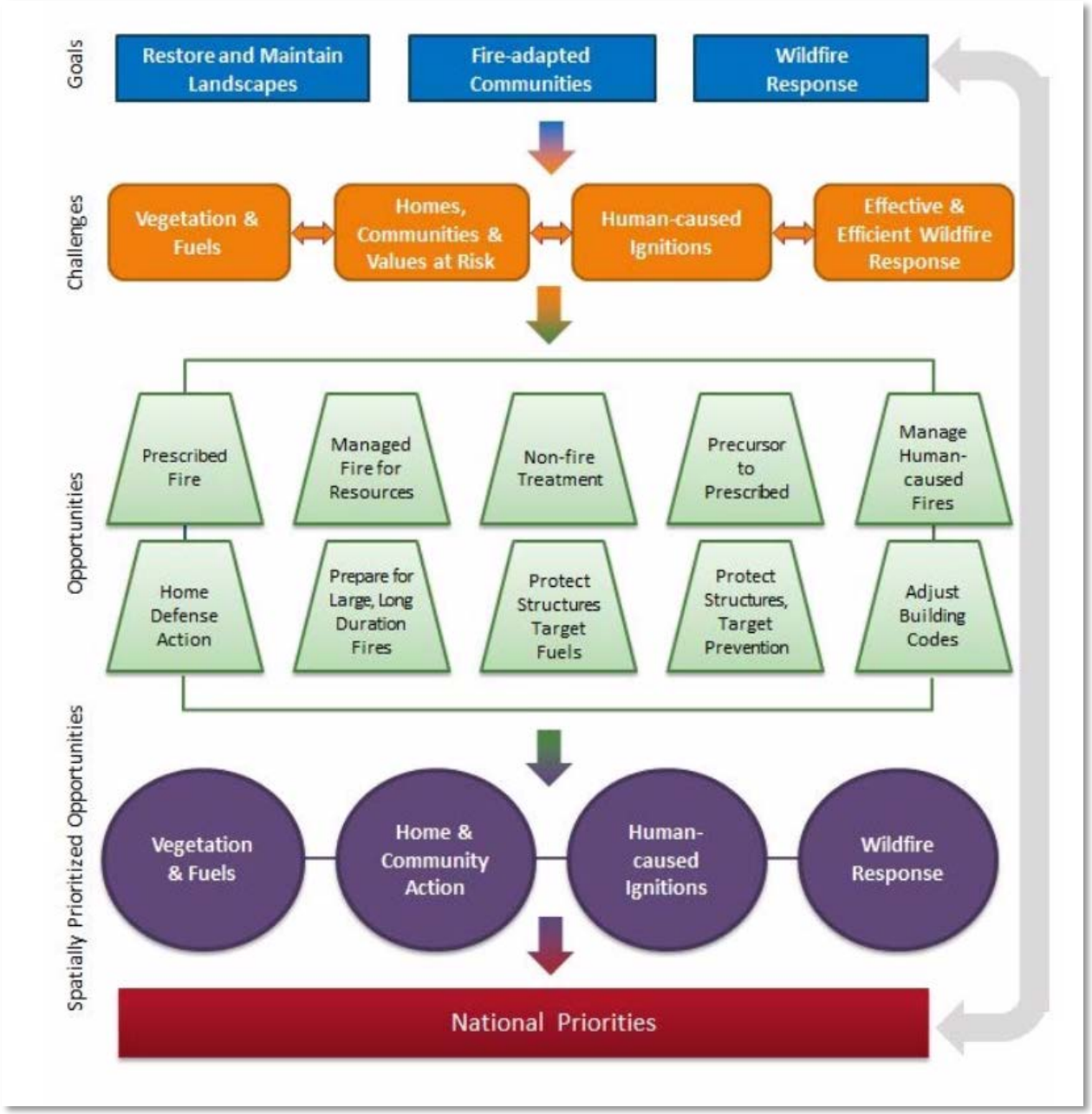


Figure 3-53. Illustration of the basic relationship between national goals, challenges, options, spatially prioritized opportunities, and national priorities. (https://www.forestsandrangelands.gov/strategy/thestrategy.shtml)

Wildland fire suppression in Nevada is a partnership between Federal, tribal, state and local fire services. Historically, some counties have 473 fire districts whereby NDF provided wildland fire and all-risk emergency support on behalf of the county through professional and volunteer fire personnel and resources. Fire suppression in Nevada has evolved since the passage of the FY 2012-13 State budget, which disallowed the 473 districts and created NDF's Wildland Fire Protection Program. Through this change, County Fire Protection Districts assumed responsibility for all of the all-risk emergency management in their jurisdictions as well as the administration of local volunteer fire departments. The program allows member counties access to the State wildfire suppression fund to cover costs of large and expensive fires. In addition, NDF works to add wildland fire suppression capacity and capability is in the best interest of state and local governments. The program focuses response capabilities where historical fire occurrences and "values at risk" intersect. The program provides suppression resources historically difficult to fill, develops more Type 3 Incident Commanders and associated staff, and provides technical assistance with FEMA's FMAG program, as well as fuel reduction projects, cost share agreements and training. The program is voluntary. Counties pay an annual assessment to help fund the program based on wildland fire risk. Participation allows the State to provide financial assistance with wildland fire costs, use NDF resources on other emergencies that threaten human life and property, increase availability of suppression forces for all, enhance fuels reduction projects and improve restoration of burned areas. Other benefits include incident management assistance, wildfire prevention programs, public education and training. The Wildland Fire Protection Program provides the State of Nevada and participating jurisdictions enhanced capability:

- Before a wildfire occurs through fuels management projects (e.g. green strips, thinning, reductions, defensible space, and community infrastructure) and fire prevention activities (e.g. public education, compliance with rules, regulations and restrictions);
- During a wildfire through increased suppression resources and coordination, Incident Management capability, technical expertise for FMAGs and cost share agreements and logistics;
- After the wildfire with Burned Area Rehabilitation and Restoration.

Nevada currently has approximately 77 fire departments with around 276 fire stations that house more than 800 firefighters. There are nearly 250 fire engines, 90 water tenders, and 130 brush trucks in the state to respond to wildland fires at any given time. There are around 4,000 calls for wildfires per year between all fire districts in the state. The State and Federal fire services in Nevada interoperate using the Master Cooperative Wildland Fire Management and Stafford Act Response Agreement that is signed annually. The purpose of this agreement is to improve efficiency by facilitating the coordination and exchange of personnel, equipment, supplies, services, and funds among the Agencies to this Agreement. The state and the federal agencies may jointly conduct mutual interest projects within their authority to maintain or improve fire protection capability of the agencies. These projects may be in such activities as suppression, preparedness, fuels management, training, prevention, public affairs, and other beneficial efforts. Such projects will be documented in operating plans, agreements, or other appropriate written documents. Documentation will include the objectives, role of each agency, and each Agency's share of costs. The state and local districts work cooperatively through auto, mutual, and cooperative aid agreements to ensure collaborative suppression can occur efficiently and effectively between jurisdictions.

Based on trends in wildfires, budget increases are being outpaced by expenditures for most fire service organizations. Some of these organizations have mitigation budgets and programs, but most do not, which means that fuel reduction, mitigation education and defensible space inspections are not occurring for most of the residences in the wildland urban interface. To put the status of community protection alone into perspective, NDF treats around 4,000 acres per year for fuel reduction, yet the total need of treatments for community fuel breaks around the state is approximately double what NDF and other local fire districts are funded to achieve. This is the most active portion of mitigation besides suppression activities, so others are getting even less support and therefore progress toward mitigating wildfire hazards and losses.

As mentioned in previous sections, there are indirect and latent impacts of wildfires that cost Nevada from a financial and resource value perspective. There can be short term risks to life and property from debris flows, compromised water quality, and fugitive dust. The methods of rehabilitation to mitigate post-wildfire emergency events are intensive, and therefore have significant costs, which are largely unfunded. For example, the waterfall fire in 2004 was projected to have rehabilitation costs that exceeded $6,000,000, while the suppression costs exceeded $10,000,000. Additionally, there are other resource objectives such as wildlife habitat restoration and prevention of invasion by fire-prone vegetation types such as annual grasses. These activities are largely handled by federal partners and NDOW, though budgets dictate that only the highest priority acreage receives rehabilitation treatment. The general trend is that there is still a net increase in negative fire impacts and net loss of native vegetation communities.

Due to Nevada's geography and environment, wildland fires will continue to occur, and if trends continue, it can be expected that larger, more intense, and less seasonally predictable wildfires can be expected. Increased public awareness, risk management, and control of new land development at the local level are necessary to mitigate this risk.

Table 3-34. Wildfire Mitigation Goals and Strategic Actions

5.A	Protect existing assets, as well as future development, from the effects of wildfire.	Completed: NDF has created the WFPP which gives member fire protection districts access to emergency suppression funds for large and expensive fire suppression. Not Completed: Local jurisdictions need to adopt defensible space standards/inspections/enforcement programs, standards of coverage, CWPPs, and WUI building codes.
5.B	Identify and recommend changes to State NRS, NAC and communities' ordinances and regulations.	Not completed
5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention.	Not completed
5.D	Provide public education and outreach to educate homeowners in the WUI	Completed: Partners in Nevada created the Living With Fire program and continue to support it and

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
	about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance.	utilize it to educate residents on fire risks/hazards. Not Completed: Long-term stable funded source needed for the organization to ensure sustainability through time.
5.E	In highly motivated communities, focus on activities by individual participation in and maintenance of projects (personal responsibility).	Partially Completed: NDF and some local fire protection districts are achieving this, but mostly through a defensible space standards and enforcement program.
5.F	Educate and train State and communities in current standards and regulations for proper practices in defensible space and firefighting.	Partially Completed: Since the demise of the Nevada Fire Safe Council, and outside of the Living Fire Program, there is no formal organization dedicated to this statewide. NDF is adopting the NNFAC and will provide this function in the future.
5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	Completed: All agencies adhere to NFPA PPE standards. Volunteer firefighters are the most challenging group to ensure adherence.
5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment and training.	Partially Completed: NDF offers the VFA grant periodically that achieves this, though the funds are decreasing over time. Local fire districts should consider applying for the FEMA-AFG annually to assist.
5.I	Participate in research and development of interoperability for emergency response communications.	Completed: All fire services in Nevada communicate regularly to each other to ensure that dispatch centers, radio frequencies, contact information and other communications issues are tested and resolved prior to every fire season.
5.J	Coordinate the development of a comprehensive, collaborative program for mutual aid/mobilization of State, local, and Federal fire resources.	Partially Complete: Many mutual aid agreements exist between local fire services. The Master Agreement between Federal and State agencies allows for these functions. As the Nevada Cohesive Strategy gets developed more, these agreements and processes will be developed further to enhance collaboration.
5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related.	Partially Completed: All cooperators were invited to attend the Nevada Cohesive Strategy Summit in Reno in 2015 where engagement at all levels lead to the adoption of the strategy and commitment of creating action plans for Nevada to address each

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
		tenet. Additionally, the annual Master Agreement allows for greater integration of fire and fuels operations.
5.L	Continue to improve fire prevention programs statewide through partnerships with Fire Prevention Association of Nevada, State Fire Marshal's Office, UNCE, and any other cooperators.	Partially Completed: A national fire prevention team was activated in northern Nevada in 2016 and they assembled some media materials as well as revived the nevadafireinfo.org website for outreach purposes. The Great Basin MEP group is meeting regularly, proving prevention trainings, as well as collaborating with prevention media materials. UNCE is not interested in traditional fire prevention roles, just mitigation. A statewide prevention team formulated of all of the prevention personnel at all levels to organize around a single set of messages and approaches may increase prevention effectiveness in the State.
5.M	Assist communities in fuels-reduction projects for areas with extreme or high ratings in updating Community Wildfire Protection Plan (CWPP) assessments.	Partially Completed: The Nevada Network of Fire Adapted Communities provides CWPP updating templates. State, federal and local organizations provide fuels reduction to extreme and high risk communities as financial and personnel resources are available. The NNFAC adoption by NDF is aimed at increasing the volume and effectiveness of both of these tasks.
5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property.	Completed: This occurs annually and results in approximately 4,000 acres of treatments implemented per year, though all of the treatments are federal grant funded. Federal grants are competitive and allocations are decreasing, so there is not enough financial support to complete all necessary projects.
5.O	Provide assistance to counties for priority setting and CWPP updating.	Partially Completed: System exists through NNFAC, though the organization has limited manpower, so the program does not have statewide reach. NDFs adoption of NNFAC is aimed at increasing the volume and effectiveness of this task.
5.P	Provide a statewide evaluation process for monitoring community progress, prioritization and participation in CWPP.	Not Completed:

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
5.Q	Provide and maintain a statewide process for documenting fuels projects progress, completion, success and maintenance.	Partially Completed: NDF has contracted out to create a web portal that will be used to track community-at-risk/CWPP boundaries and fuels reduction projects. When completed, this task will be an ongoing facet of the webportal.
5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities.	Partially Completed: As the Cohesive Strategy matures in Nevada, cooperation on multijurisdictional projects will increase to greater than current levels. Integration of resource health and fire mitigation programs will also increase, although current levels are the highest they have ever been. Examples include Secretarial Order 3336, Federal Fire and Invasives Assessment Team reports, Integrated Rangeland Fire Management Strategy.
5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.).	Completed: NDF has enacted this internal policy and all projects now have an associated planning documents that is entered into the federal SMART program.
5.T	Provide training for employees and project managers on SHPO and cultural resource identification, reporting methods and clearances.	Partially Complete: A course was coordinated to training and educate new employees in 2016. Agency turnover will dictate that a course is taught every 2 to 4 years.
5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites.	Partially Complete: This is performed for all areas that are identified for fuel reduction treatments.
5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects.	Partially Complete: NDF and other agencies are actively engaged in planning and implementing long-term sustainable projects, though there is a lack of funding to do it at landscapes scales in multiple locations across the state to impact the general wildfire trends.
5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	Not Complete: All agencies and stakeholders are earnestly working toward achieving this task, though the gaps in science and funding have not allowed the rates of prevention of invasion and conversion from invasives back to natives and

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
		desirables to exceed the rates of invasion and impact, therefore there is a net increase in negative impacts from invasions in the sagebrush rangelands and pinyon-juniper woodlands. Invasive
5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions.	Partially Complete: Due to sage grouse concerns, use of prescribed fire in sagebrush rangelands has largely been curtailed. Mechanical and hand treatments are not yet prevalent enough to make a significant impact in conservation and restoration of native sagebrush communities. Pinyon-juniper woodlands and Sierra forest types are being burned and treated at small scales compared to the size of need.
5.Z	Provide native and accepted introduced seed species through the Nevada State seed bank program.	Partially Complete: This is an ongoing task that occurs through the seedbank and nursery programs. These programs are in need of strategic plans and marketing to increase awareness and usage among stakeholders. NDOW and BLM have also cooperated to increase the functionality of the Great Basin seed warehouse in Ely. The NRCS has an established Native Plant Materials Center in Fallon. There is a group of stakeholders meeting to collaborate in providing these kinds of solutions.
5.AA	Provide training for local cooperators for treatment practices and skill acquisition.	Not Complete:
5.AB	Encourage collaboration at all levels with state, federal and local cooperators.	Partially Complete: The Nevada Cohesive Strategy adoption in 2015 and subcommittee work to complete action plans in 2016 represents the largest step forward on this task in many years. As the plans and processes to integrate resources mature, Nevada will have one of the most vertically and horizontally integrated sets of stakeholders in the country.

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports and public education and outreach to provide the best land management practices available for collaborative land rehabilitation.	Complete: NDF is generally the lead for State level agencies on BAER projects and does accomplish the task. Many of those efforts are completed in conjunction with County and Federal stakeholders. Collaborative land rehabilitation practices are being made available through coordinated meetings, field assessments, and rehabilitation recommendations to affected property owners. These tasks are ongoing based on the occurrence of large wildfires.
5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices.	Complete: This task is usually completed as part of the BAER process where it is deemed to be necessary.
5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State seed bank programs.	Complete: The nursery and seedbank programs are providing rehabilitation plant materials to the extent that they are feasible to produce, keep on hand, and purchase where stakeholders have budgets to support purchases.
5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation.	Complete:
5.AG	Provide public education and outreach to communities affected by wildfire.	Complete:
5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments.	Complete: Communities with these ratings are generally considered to be the highest priority for support in the form of education, awareness, and fuel reduction projects.
5.AI	Assist with the development of and the participation in a comprehensive program by which current CWPP or equivalent assessments are updated as projects are completed, ratings change or new at-risk communities arise.	Not Complete: NDF plans to adopt the Nevada Network of Fire Adapted Communities and track all CWPPs in the state. Ratings changes will likely take a partnership with local fire districts that are willing to perform defensible space inspections, enforcement and WUI construction codes.
5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents.	Partially Complete: Stronger advocacy is needed at the local level in many local fire districts and communities to distribute the information. The adoption of NNFAC by NDF and growth over future years should assist with the community outreach.

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
5.AK	Encourage community involvement in project completion, participation, and maintenance.	Partially Complete: NDF and some local fire districts are performing this task on limited scope in the state. Broader scale support mechanisms are needed since the collapse of the Nevada Fire Safe Council.
5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection district or fire department) according to NRS 472.040.	Partially Complete; NDF provides a variety of services through membership in the WFPP (474 Districts) and in conjunction with the Community Assessments, but also supports all jurisdictions with technical support via its programs. Through budgeting procedures and NRS changes, 473 Districts are no longer supported by the state of Nevada. Rangeland Fire Protection Associations have also been created through NRS changes and NDF is actively supporting their creation.
5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by US Forest Service.	Complete:
5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding and other catastrophic natural event.	Complete:
5.AO	Provide technical assistance in the formation of end users of woody biomass to produce heat and/or power (i.e. Fuels in Schools program) and provide ongoing outreach and education as to the societal benefits associated with utilization of biomass in the State of Nevada.	Completed: This task is completed as grant funding is awarded to NDF and other stakeholders to complete such tasks.
5.AP	Participate in the Nevada State Biomass Working Group, southern Nevada Woody Biomass Collaboration Group, and other state, local, and national biomass committees.	Partially Complete: There is no state level funding to support the biomass program at NDF, so the biomass coordinator position is solely dedicated to working on specific grant projects that may include utilization of biomass from specific fuel reduction projects, end user coordination, new biomass products development and demonstration project implementation.

Table 3-34. Wildfire Mitigation Goals and Strategic Actions		
5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness.	Complete:
5.AP	Keep apprised of all federal, state, and local regulations.	Complete:
5.AQ	Participate in interagency project planning, implementation and monitoring.	Partially Complete: This is occurring more in some areas of the state than others based on stakeholder relationships, interagency cooperative culture and project types. It could be better achieved by all stakeholders on a broader scale across the state.
5.AR	Protect the envelope of buildings from wildfire.	Partially Complete: Following the economic recession of 2008, many local and state fire protection resources were cut, reducing the ability of the fire services to adhere to the standards of coverage. The fire services are slowly regaining employees and returning to pre-2008 coverage levels. Additionally, only a small portion of communities are implementing and maintaining fire-adapted community practices, so most are vulnerable to damage from wildfire.

3.4 RANKING OF HAZARDS BY COUNTIES AND TRIBES

The Nevada Hazard Mitigation Planning Committee reviewed local, county, and tribal hazard mitigation plans, and their hazard ratings are compiled together as Table 3-35 and 3-36 below (L=low hazard, M=moderate hazard, H=high hazard, N=none).

Table 3-35. Rankings of Hazards by County

Local hazards identified by counties	Carson City	Churchill	Clark	Douglas	Elko	Esmerald	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Pershing	Storey	Washoe	White Pine
Avalanche	L	N	L	N	L	N	L	L	L	N	N	L	N	L	L	M	L
Civil disorder			M							M			L			M	
Drought	M	L	H	H	M	H	M	M	M	M	M	L	H	M	L	M	M
Earthquake	H	H	H	H	H	M	H	H	M	H	M	M	M	M	M	H	M
Epidemic	H	L	H	L	L	L	M	M	M	H	L	M	L	L	L	M	M
Expansive soil	N	N		N	N	N	L	L	L		N	N		L	N	N	L
Flood (includes flash flood, dam, & canal wall failure, mudslide)	H	H	H	H	M	M	M	M	M	H	M	H	M	M	H	H	M
Hail and thunderstorm	M	M	H	H	M	L	M	M	M	N	L	M	L	L	M	M	H
Hazardous materials	M	M	H		H	M	H	H	M	H	M	M	M	L	L	M	H
Heat, extreme		M	M	H	N	N	M	H	M	N	L	N	N	L	N	M	H
Infestation		L	L	N			L	M	L	N	L	L	L	L	N	N	M
Land subsidence/ground failure		N	M	N	N	L	M	L	L	N	L	N	L	L	M	N	L
Landslide	L		L		L	N	M	L	L	N	L	L	L	L		N	L
Large venue fires			H														
Mining hazards						N	L						M		M		M
Nuclear waste/radiological			N							H	M					M	
Terrorism/WMD	H	H	N		N	M	M	H	M	M	L	M	M	L	L	L	M
Tornado		M	L	N		L	M	M	M	N	L	M	N	L	N	M	L
Tsunami/Seiche	M	N		L	N	N		L	L		N	N		L	N		
Utility loss/energy emergency	M		L				M						M			L	M
Volcano	M	L	L	L	N	N	L	L	L	N	H	L	N	N	N	L	L
Wildfire	H	M	H	H	H	L	H	H	H	H	M	M	H	H	H	H	H
Windstorm	M	M	H	H	L	L	M	M	M	M	M	M	M	L	M	M	H
Winter storm/Severe (includes extreme snowfall)	M	M	H	H	M	L	M	M	M	N	M	M	M	L	M	M	H

Table 3-36. Rankings of Hazards by Tribes

Local hazards identified by tribes	Confederated Tribes of the Goshute Reservation (NV and UT)	Duckwater Shoshone Tribe of the Duckwater Reservation	Ely Shoshone Tribe of Nevada	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Fort Mojave Indian Tribe (AZ, CA, NV)	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Lovelock Paiute Tribe of the Lovelock Indian Colony	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Pyramid Lake Paiute of the Pyramid Lake Reservation	Reno-Sparks Indian Colony	Shoshone- Paiute Tribes of the Duck Valley Reservation	Summit Lake Paiute Tribe of Nevada	Te-Moak Tribe of Western Shoshone Indians of Nevada: Battle Mountain Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: Elko Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: South Fork Band	Te-Moak Tribe of the Western Shoshone Indians of Nevada: Wells Band	Walker River Paiute Tribe of the Walker River Reservation	Washoe Tribe (NV and CA)	Winnemucca Indian Colony of Nevada	Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch	Yomba Shoshone Tribe of the Yomba Reservation
Avalanche		N							N	L	L	N			N			L	N			
Civil Disorder		L								L	L	N							L			
Drought		M			H			M	L	L	L	N			H			M	H			
Earthquake		L						H	H	H	H	L			H			M	M			
Epidemic		L			M			L	L			L			H			L	L			
Expansive Soil									N	N	N	N			N			N	N			
Flood		L			H			H	L	H	H	H			L			H	M			
Hail and thunder-storm		M							M	L	L	N			M			H	M			
Hazardous materials		L			H			M	M	M	M	L			H			L	M			
Heat, extreme		N			H				N			L			N			N	N			
Infestation		L						L	L	N	N	N			N			L	N			
Land subsidence/ ground failure		L						L	N	N	N	N			N			N	N			
Landslide		L								L	L	L			L			L	M			
Large venue fires												N							N			

Table 3-36. Rankings of Hazards by Tribes

Local hazards identified by tribes	Confederated Tribes of the Goshute Reservation (NV and UT)	Duckwater Shoshone Tribe of the Duckwater Reservation	Ely Shoshone Tribe of Nevada	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Fort Mojave Indian Tribe (AZ, CA, NV)	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Lovelock Paiute Tribe of the Lovelock Indian Colony	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Pyramid Lake Paiute of the Pyramid Lake Reservation	Reno-Sparks Indian Colony	Shoshone- Paiute Tribes of the Duck Valley Reservation	Summit Lake Paiute Tribe of Nevada	Te-Moak Tribe of Western Shoshone Indians of Nevada: Battle Mountain Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: Elko Band	Te-Moak Tribe of Western Shoshone Indians of Nevada: South Fork Band	Te-Moak Tribe of the Western Shoshone Indians of Nevada: Wells Band	Walker River Paiute Tribe of the Walker River Reservation	Washoe Tribe (NV and CA)	Winnemucca Indian Colony of Nevada	Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch	Yomba Shoshone Tribe of the Yomba Reservation
Mining hazards		L										N							N			
Nuclear waste/ radiological										H	L	N							N			
Terrorism/ WMD		L						L	H	H	L	L			M			L	N			
Tornado		N							M	L	L	L			M			H	N			
Tsunami/ Seiche									N	N	N	N			N			N	N			
Utility loss/ energy emergency		H			M			H		H	L	L			N				N			
Volcano		N							L	L	H	N			N			L	N			
Wildfire		H			H			M	M	H	H	H			H			M	H			
Windstorm		M			H				M	M	L	M			H			H	L			
Winter storm/ severe		M							M	M	L	H			H			H	M			

3.5 VULNERABILITY ASSESSMENT

The next step of risk assessment is the vulnerability assessment. This section includes assessing vulnerability by jurisdiction and assessing vulnerability of State facilities.

3.5.1 Overview

This vulnerability assessment includes only the hazards rated by the Subcommittee as "High": Earthquake, Flood (including Dam Failure), and Wildfire. The vulnerability assessment data compiled are derived from local hazard mitigation plans (LHMPs) (both approved and in development), UNR's HAZUS runs and assessments as well as other sources listed under the individual hazards below.

ELEMENT	REQUIREMENTS
S6. Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)] ***Intent:*** *To understand potential impacts of future hazard events on jurisdictions throughout the state as the basis for identifying and prioritizing mitigation actions*	a. The risk assessment must provide a current summary of the most vulnerable jurisdictions based on the state, local, and tribal, as applicable, risk assessments. Vulnerability must be analyzed in terms of: 1. Jurisdictions most threatened by the identified hazards (based on hazard location, extent, and probability). 2. Jurisdictions most susceptible to damage and loss from hazard events related to populations and assets (such as, structures, infrastructure, critical facilities, and systems). These populations and assets may be located in the identified hazard areas or affected by the probability of future hazard events. b. The risk assessment must include a summary of the potential losses to the identified vulnerable structures based on estimates in the local risk assessments as well as the state risk assessment. c. *If the state is interested in an increased Federal cost share under the FMA program, the risk assessment must address repetitive loss (RL) and SRL properties.* [16] *(See RL1 in Section 3.8 Repetitive Loss Strategy.)* ***Special Consideration:*** An overview or summary provides the results of the analysis and does not need to include the details from each local plan. An example is a list of key issues or problem statements that clearly describes the greatest vulnerabilities and compares losses across the state, allowing the state to determine mitigation priorities.

[14] 44 CFR §201.4(c)(2)(iii): "An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas."

[15] Adapted from 44 CFR §9.4 Definitions (critical action) and National Flood Insurance Program Community Rating System Coordinator's Manual (2013); definition and examples do not supersede any regulatory definitions.

[16] For the current RL and SRL property definitions consistent with the changes in the BW-12, refer to the HMA Guidance (Part VIII. Additional Program Guidance: C. Flood Mitigation Assistance Program).

3.5.2 Analysis of State and Local Risk Assessment

The risk analysis was completed exclusively for the natural hazards rated as "High" by the NHM Planning Subcommittee: earthquake, flood, and wildfire.

Earthquake (High Risk)

Earthquake-related information was derived from the Seismo Lab, NBMG, and USGS.

NBMG used the most current version available of FEMA's loss-estimation computer model, HAZUS-MH, to estimate such factors as total economic loss, numbers of buildings receiving extensive to complete damage, number of people needing public shelter and hospital care, and number of fatalities from earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0. Thirty-eight communities that include all the major population centers in each of Nevada's 17 counties were modeled. The epicenters of the earthquakes were chosen at the fault position that is closest to each community. A depth of 10 kilometers (6 miles) was used for each scenario. Magnitudes ranging from 5.0 to 7.0 were chosen to illustrate the variation that magnitude has on losses.

The resulting estimates were compiled into tables summarizing losses for each community and the state, including over 400 separate HAZUS summary reports. The individual HAZUS summary reports include the following data for each community and the state.

- General description of the region
- Building and lifeline inventory
- Building inventory
- Critical facility inventory
- Transportation and utility lifeline inventory
- Earthquake scenario parameters
- Direct earthquake damage
- Buildings damage
- Critical facilities damage
- Transportation and utility lifeline damage
- Induced earthquake damage
- Fire following earthquake
- Debris generation

The complete report is available as NBMG Open-File Report 14-5, Updated Estimated Losses from Earthquakes near Nevada Communities, in Appendix L and online at:
http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm

Summary HAZUS earthquake loss values for selected Nevada communities are contained in Tables 3-44 and 3-43 found in Section 3.7.1 below.

In 2011, NBMG completed a study entitled "Comparison of Loss-Estimation Modeling Using HAZUS with Ground-Motion Input from ShakeMap versus Default Values" (NBMG OFR 11-1) that corroborated the validity of HAZUS values within an order of magnitude except at the lowest earthquake magnitudes studied. Results are available online at:

http://pubs.nbmg.unr.edu/Loss-estimation-modeling-HAZUS-p/of2011-01.htm

The study concludes that loss estimates from HAZUS using ShakeMap ground motions are higher than those calculated by HAZUS, probably due mainly to the use of different fragility functions. However,

the two calculations still yield results that are mostly well within an order of magnitude of one another. ShakeMap provides more accurate information about ground shaking than that derived from HAZUS, because in a real earthquake, ShakeMap incorporates actual measurements of ground motion.

Earthquake loss estimates from magnitude 6 event, such as the 2008 Wells, Nevada earthquake, generally range from tens of millions of dollars to a few billion dollars, making earthquakes one of the highest consequence events that can occur in the state. Earthquakes near communities can have much larger magnitudes than this, as high as 6.8 to 7.4, which would have much higher, more widespread multi-community impacts. A steady reduction in earthquake risk through mitigation is needed to reduce these potential losses.

Flood (High Risk)

To assess risks and vulnerability due to flooding, NBMG used the most current version available of FEMA's loss-estimation model, HAZUS-MH for reaches of the Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker Rivers. In all cases, the HAZUS runs used floods with average 100-year return periods.

The HAZUS modeling program integrates many factors contributing to the frequency and severity of flooding that include:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- Changes in landscape resulting from wild fires (loss of moisture-trapping vegetation and increased sediment available for runoff)
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

These factors were evaluated using:

- Hydrologic analysis to determine the probability that a discharge of a certain size will occur, and
- (2) Hydraulic analysis to determine the characteristics and depth of the flood that results from that discharge.

The complete report with all data generated by these HAZUS runs is contained in NBMG Open-File Report 13-3 entitled "Updated Assessment of Risks and Vulnerability to Flood Hazards in Nevada"

This report is referenced in Section 7 and is available as an online document at the following link:

http://www.nbmg.unr.edu/dox/of103/_docs/of_13-3.pdf

Tables 3-46 and 3-47 found in Section 3.7.2 below summarize the HAZUS flood assessment and losses.

The NHMPC recognizes the need to assess non-riverine flood risks in Nevada, including: failure of irrigation canals & ditches, flash flooding on developed alluvial fans, and flooding in closed basins. Recently, alluvial fan flooding has not been a major issue in the southern Nevada Las Vegas area. Alluvial fan flooding in the Las Vegas area is handled by large detention basins and outfall channels managed by the Clark County RFCD. Due to flooding events in northern Nevada in 2017, NHMPC recognizes that flooding in closed basins and sub-basins is another non-riverine flood risk that needs to be assessed. Committee members are currently working on other funded hazard mitigation activities and promoting local activities that implement strategies to mitigate these hazards.

Wildfire (High Risk)

To assess wildfire vulnerability, the Subcommittee used approved LHMPs, the most current version of the CWPPs and assessed valuations of real property for each county. NDF provided the Nevada Natural Resources and Fire Information Portal, accessible online at: https://nevadaresourcesandwildfireinfo.com/ which is available to all public, partners and cooperators. Under this assessment, GIS wildfire hazard mitigation maps were produced for seventeen counties that show the assessed valuation of property and land value affected by wildfire risk. Appendix J contains these maps. The map data will be made available to planning groups via MyPlan, on request from the SHMO, and at local technical assistance meetings. A summary of County Assessors' property values and number of state owned buildings by county are provided in Appendix J as Tables A and B, respectively. Parcel data was not available for Esmeralda County. Once available, similar analyses will be conducted.

Since the last plan update, NDF continued to collaborate with the Western States Foresters and Western Forestry Leadership Coalition (including federal agencies such as the BLM and USFS) to update a statewide risk assessment for areas of the state that had not been previously assessed. NDF also collaborates within individual communities whom are updating their individual CWPPs to reflect current conditions.

NDF utilized GIS databases from the BLM and a GIS analysis to report and document the increasing scale of wildfire across the state. An additional analysis using a database from the USFS's Electronic Geospatial Portal was performed to report and document the continued fire starts from both human and natural ignition sources across the state. These databases were also used to document the increase of wildfires occurring outside of the traditional fire season (May-Oct.) in Nevada.

An analysis performed by UNR dispelled the notion that large fire years are only related to drought, and displayed a high correlation between wetter years and the greatest amount of acreage annually burned in the state. NDF also continued to collect and analyze safety messages that contained fire behavior warnings to detect well-documented experiences of extreme fire behavior.

3.5.3 State's Vulnerability Based on Local, County, and Tribal Assessments as well as State Assessments

The updated plan includes a description of vulnerability to each of the high-rated hazards based on estimates provided in local risk assessments as well as the State risk assessments (see each Hazard description section above). The State will continue to work with the local, county, and tribal entities to convey the most up-to-date information from risk or vulnerability assessments, such as the HAZUS

results presented in sections 3.7.1 for earthquakes, 3.7.2 for floods, and the NDF analysis presented in section 3.7.3 for wildfire. Results of all vulnerability assessment studies will be shared with local communities throughout the state, and communities and counties will share their results and data with the state as they become available through the MyPlan web application, providing a two-way exchange that benefits all in hazard mitigation strategy development.

3.5.4 State's Vulnerability in Terms of Jurisdictions Most Threatened and Vulnerable.

Local jurisdictions' vulnerabilities to the three highest-ranked hazards are found in the sections listed below:

- Earthquake — Section 3.7.1, Tables 3-44 and 3-45
- Flood — Section 3.7.2, Tables 3-46 and 3-47
- Wildfire — Section 3.7.3, Tables 3-48 and 3-49

Table 3-37. Projected Losses and Threat Rankings by County for each Major Hazard

	EQ Risk	EQ Cost (millions)	EQ Threat	FL Risk	Flood Cost (millions)	FL Threat	WF Risk	Wildfire Cost (millions)	WF Threat
Carson City	5	$2,293.2	3	5	$297.0	4	5	$100	
Churchill	5	$243		5	$183.6		1	$1.1	
Clark[1]	5	$100,118	1	5	$3,178	2	5	$95.4	
Douglas	5	$565.1		5	$2,511.5	3	1	$8,400	1
Elko	4	$773.4	5	3	$85.5		5	$604.1	
Esmeralda	3	$6.5		3	$6.5		1	$6.5	
Eureka	5	$17.6		5	$106.6		5	$39.7	
Humboldt	5	$179		3	$19		5	$1,002	3
Lander	3	$24		3	$68		5	$45	
Lincoln Co	5	$27.2		5	$49.2		5	$252.9	5
Lyon	3	$2,587	4	5	$23.3		5	$47.0	
Mineral	5	$65.9		3	$216		3	$2.2	
Nye Co	5	$7.9		3	$249.2	5	3	$17.4	
Pershing	3	$9		3	$9		5	$78	
Storey	5	$209.2[2]		5	$32.5		5	$677.8[3]	4
Washoe	5	$8,560	2	5	$4,003	1	5	$6,841	2
White Pine	3	$146.2		3	$8.3		5	$5	

Source: Data was extracted from State-approved LHMPs and plans under development through February 2018. Projected losses include: nonresidential and residential buildings, and critical facilities.

[1] Plan in process
[2] Includes severe and strong shaking
[3] Includes low, moderate, high, and severe hazard areas

Table 3-37 above, Threat Ranking by County, was developed using approved LHMPs. It shows projected losses in millions of dollars from each of the major hazards, Earthquake, Flood, and Wildfire, for all counties. The "Threat" column for each hazard shows the top five counties ranked by economic loss for each of the major hazards, earthquake, flood and wildfire along with the stated vulnerability rating for each of those three hazards. This ranking is considered during the NHMPC grant application prioritization process.

3.5.5 Results of Changes in Development

Table 3-38 shows the cumulative change in population in Nevada counties from 2010 to 2017. The greatest total increase by population is found in Clark and Washoe counties; however, Esmeralda and Lander counties have the greatest growth by percentage. An overall slowdown in rapid growth across the state (except for mining communities) presents a challenge as many communities suffer from smaller budgets and therefore smaller staffs to enforce existing codes and regulations. As demonstrated in Table 8-4, Section 8.6.4, more Nevada communities have adopted the latest versions of international building and fire codes, however, enforcement of codes and regulations becomes cumbersome with reductions in staffing.

Table 3-38. Population Change in Nevada by County 2010-2017

	Population Estimates		Change, 2010 to 2017	
	April 1, 2010 Estimates Base	**July 1, 2017 Estimates Base**	**Difference**	**Percent**
Nevada Total	*2,700,552*	*2,930,654*	*230,102*	*8.5*
Counties				
Churchill	24,877	26,048	1,171	4.7
Clark	1,951,269	2,126,099	174,830	9.0
Douglas	46,997	48,171	1,174	2.5
Elko	48,818	55,294	6,476	13.3
Esmeralda	783	1,044	261	33.3
Eureka	1,987	1,930	-57	-2.9
Humboldt	16,529	18,159	1,630	9.9
Lander	5,775	6,778	1,003	17.4
Lincoln	5,345	5,099	-246	-4.6
Lyon	51,980	55,404	3,424	6.6
Mineral	4,772	4,404	-368	-7.7
Nye	43,946	46,004	2,058	4.7
Pershing	6,753	6,830	77	1.1
Storey	4,010	4,009	-1	-0.02
Washoe	421,407	459,142	37,735	9.0
White Pine	10,030	10,295	265	2.6
Carson City	55,274	55,945	671	1.2

Source: Nevada State Demographer's website http://www.nvdemography.org/data-and-publications/march-2015-projections/

Increases in population place more people at risk from the high-risk hazards of earthquake, wildfire, and flood, including dam failure. These risks are particularly dangerous to communities when:

- Building along faults and locations prone to extreme shaking during an earthquake.
- Developing residential locations within areas prone to wildfire without the required defensible space, water storage, or building materials.
- Developing residential neighborhoods on alluvial fans that are vulnerable to flash-flooding in arid environments.
- Potential flood and dam failure concerns are ignored as dams are built along the creeks, rivers and waterways.

Other challenges to land use planning are as follows:

- Enforcement – lack of staffing in rural counties due to the county's economic, administrative and technical capabilities.
- State laws are not effective unless counties and cities adopt and enforce them at the local level.
- Federal ownership of land - over 85% of the land in Nevada is managed by the federal government. New development on privately owned property is often flanked on several sides by federally owned land making the mitigation of hazards problematic, especially for wildfire and flood hazards.

Possible solutions to avoid risks posed by hazards are:

1. Provide incentives to communities for added enforcement of existing codes.
2. Create stricter requirements for development.
3. Enhance land-use-planning capabilities.
4. Initiate water reclamation projects.
5. Restrict water-saving features to new homes;
6. Provide incentives for new and existing homeowners to mitigate the risk to their homes from possible hazards.
7. Increase hazard mapping and study programs for all hazards but especially on alluvial fans and areas adjacent to canals and ditches.
8. Increase public awareness for all hazards.

3.6 ASSESSING VULNERABILITY OF STATE FACILITIES

The requirements for assessing vulnerability of State facilities, as stipulated in the DMA 2000 and the regulations implementing the act are described below.

ELEMENT	REQUIREMENTS
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)] ***Intent:*** *To understand the probability of hazard events in the future as the basis for anticipated impacts of hazard risks statewide.*	a. The risk assessment must provide a summary of the probability of future hazard events that includes projected changes in occurrences for each natural hazard in terms of location, extent, intensity, frequency, and/or duration. b. Probability must include considerations of changing future conditions, including the effects of long-term changes in weather patterns and climate on the identified hazards. ***Probability*** means the likelihood of the hazard occurring and may be defined in terms of general descriptors (for example, unlikely, likely, highly likely), historical frequencies, statistical probabilities (for example: 1% chance of occurrence in any given year), and/or hazard probability maps. If using general descriptors, then the plan must provide a definition. For example, "highly likely" could be defined as equals near 100% chance of occurrence next year or happens every year.

[13] 44 CFR §201.4(c)(2)(ii): "An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable

3.6.1 Types of State-Owned or -Operated Critical Facilities in Hazard Areas

Definition of a Critical Facility

Critical facilities in the state are defined as those that will impact the delivery of vital services to Nevadans; or whose damage would put special populations at risk; or which could cause greater damage to other sectors of the community. Critical facilities is defined in *Emergency Management: Principles and Practice for Local Government* (1991) Drabek and Hoetmer (Editors) as "sites, structures and institutions that, if affected by an emergency, may enlarge the scope of impact by exacerbating the problem; reducing a department's ability to respond; or presenting a secondary problem greater than the primary one".

The State recognizes that some privately owned critical facilities are essential to Nevada's economy and livelihood such as casinos. A major disaster would have a strong negative impact on these private assets as well as on state facilities.

At the completion of this update in 2018, there were a total of 3,195 facilities on the 2017 listing of buildings owned by the state. SPWD has determined that 1,762 of these state-owned buildings should be considered critical and are listed in Table 3-39. To view the complete list, please see SPWD's website: http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings.

Table 3-39 below summarizes the state's critical facilities and infrastructure, and their replacement value updated for 2018. Please note that there is only one bridge listed – the recent bridge constructed by SPWD in Caliente, Nevada. This list does not include NDOT bridges or roads that may be considered critical, however it does include NDOT buildings.

Table 3-39. State Critical Facilities and Infrastructure		
State Departments	**Number of Buildings**	**Facility Replacement Value**
Administrative	72	$440,641,925
Conservation and Natural Resources	68	$43,160,500
Military	101	$218,881,250
Nevada System of Higher Education	614	$4,003,703,750
Veteran Services	3	$21,686,000
Department of Wildlife	3	$5,304,000
Department of Agriculture	9	$16,802,250
Attorney General	5	$15,847,750
Department of Corrections	266	$864,758,250
Department of Education	3	$7,523,000
Health and Human Services	145	$259,082,250
Legislative	5	$96,732,000
Department of Motor Vehicles	21	$76,396,000
Department of Public Safety	6	$25,082,000
Supreme Court	1	$29,725,000
Department of Transportation	440	$340,856,750
Bridge	1	$3,000,000
Water Well*	15	$650,000
Total	**1,778**	**$6,469,832,675**

* Water well data will be updated in the next iteration of the plan, as data becomes available. These wells are owned by NDOT. In the Tonopah sub-district, there are 3 public wells maintained by NDOT.

3.6.2 Estimating Potential Losses by Jurisdiction

The requirements for estimating potential losses by jurisdiction, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S6. Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)] ***Intent:*** *To understand potential impacts of future hazard events on jurisdictions throughout the state as the basis for identifying and prioritizing mitigation actions*	a. The risk assessment must provide a current summary of the most vulnerable jurisdictions based on the state, local, and tribal, as applicable, risk assessments. Vulnerability must be analyzed in terms of: 1. Jurisdictions most threatened by the identified hazards (based on hazard location, extent, and probability). 2. Jurisdictions most susceptible to damage and loss from hazard events related to populations and assets (such as, structures, infrastructure, critical facilities, and systems). These populations and assets may be located in the identified hazard areas or affected by the probability of future hazard events. b. The risk assessment must include a summary of the potential losses to the identified vulnerable structures based on estimates in the local risk assessments as well as the state risk assessment. c. *If the state is interested in an increased Federal cost share under the FMA program, the risk assessment must address repetitive loss (RL) and SRL properties.* [16] *(See RL1 in Section 3.8 Repetitive Loss Strategy.)* ***Special Consideration:*** An overview or summary provides the results of the analysis and does not need to include the details from each local plan. An example is a list of key issues or problem statements that clearly describes the greatest vulnerabilities and compares losses across the state, allowing the state to determine mitigation priorities.

[14] 44 CFR §201.4(c)(2)(iii): "An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas."

[15] Adapted from 44 CFR §9.4 Definitions (critical action) and National Flood Insurance Program Community Rating System Coordinator's Manual (2013); definition and examples do not supersede any regulatory definitions.

[16] For the current RL and SRL property definitions consistent with the changes in the BW-12, refer to the HMA Guidance (Part VIII. Additional Program Guidance: C. Flood Mitigation Assistance Program).

As part of the current update to this plan, the most recent version of HAZUS was run for a series of earthquake and flood scenarios. An earthquake that has happened in the geological past was chosen on a fault near each county seat. Results and vulnerability analyses for earthquake are discussed and tabulated in Section 3.7.1 below.

For floods, HAZUS was run for 100-year floods on the major rivers within the state (Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker). Results and vulnerability analyses for flood are discussed and tabulated in Section 3.7.2 below. For potential failures of major dams on the Truckee

(and its tributaries in California), Carson, and Humboldt Rivers, the 100-year flood values serve as a proxy for potential losses. HAZUS scenarios for failures of the two dams on the Colorado River in Nevada (Hoover and Davis) have not been analyzed; Hoover Dam is discussed in Section 3.3.8.3.

For wildfire vulnerability, NDF provided an analysis of potential wildfire losses in areas of mapped as moderate to high-risk for wildfire compared to the assessed value of improved and unimproved land provided by the county assessors' offices. These data are displayed in Table 3-47 and 3-48 in the wildfire vulnerability subsection 3. 7.3.

3.6.3 Estimating Potential Losses of State Facilities

The requirements for estimating potential losses of State facilities, as stipulated in the DMA 2000 and its implementing regulations, are described below. NDWR estimates that the dam failure losses will be similar to flood losses. Therefore, we do not present separate data for dam failure, but include it as a type of flooding. Potential losses to State building facilities were estimated for the three highest-ranking natural hazards: earthquake, wildfire, and flood. These loss estimations are presented in the following subsections.

ELEMENT	REQUIREMENTS
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)] ***Intent:*** *To understand the probability of hazard events in the future as the basis for anticipated impacts of hazard risks statewide.*	a. The risk assessment must provide a summary of the probability of future hazard events that includes projected changes in occurrences for each natural hazard in terms of location, extent, intensity, frequency, and/or duration. b. Probability must include considerations of changing future conditions, including the effects of long-term changes in weather patterns and climate on the identified hazards. ***Probability*** means the likelihood of the hazard occurring and may be defined in terms of general descriptors (for example, unlikely, likely, highly likely), historical frequencies, statistical probabilities (for example: 1% chance of occurrence in any given year), and/or hazard probability maps. If using general descriptors, then the plan must provide a definition. For example, "highly likely" could be defined as equals near 100% chance of occurrence next year or happens every year.

ELEMENT	REQUIREMENTS
S5. Does the risk assessment address the vulnerability of state assets located in hazard areas and estimate the potential dollar losses to these assets? [44 CFR §§201.4(c)(2)(ii)[13] and 201.4(c)(2)(iii)[14]] ***Intent:*** *To understand vulnerability of assets critical for state resilience as a basis for identifying and prioritizing mitigation actions.*	a. The risk assessment must include an analysis of the potential impacts of hazard events to state assets and a summary of the assets most vulnerable to the identified hazards. These assets may be located in the identified hazard areas or affected by the probability of future hazard events. b. The risk assessment must estimate potential dollar losses to state assets located in identified hazard areas. Vulnerability and potential losses are not a list or inventory of state facilities but the summary of the potential impacts to those assets from the identified hazards. Factors affecting vulnerability may include asset use and function as well as construction type, age, or intended use. ***State assets*** may include state-owned or operated buildings, infrastructure, and critical facilities. ***Critical facilities***[15] means structures that the state determines must continue to operate before, during, and after an emergency and/or hazard event and/or are vital to health and safety. Examples of critical facilities may include, but are not limited to: • Emergency operations centers, police and fire stations, and storage facilities (including data storage). • Structures that house occupants with restricted mobility or access and/or functional needs, such as hospitals, institutions, and shelters. • Utility generating, transmission, and storage facilities and related infrastructure, such as power and/or water treatment plants. • Transportation facilities, such as ports, airports, roads, railroads, bridges, and/or tunnels.

[13] 44 CFR §201.4(c)(2)(ii): "An overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable.

3.6.3.1 Earthquake Loss Estimation for State Facilities

The earthquake vulnerability analysis for state buildings was updated for this iteration in the following manner: SPWD and NBMG coordinated the geocoding of additional State facilities and infrastructure to include in the HAZUS runs and developed GIS layers enhancing this analysis. However, this led to the discovery of additional rural buildings without a physical address that will need to be geocoded in the future.

Losses were calculated using the updated *"Nevada State Owned Building List"* received from SPWD, which provided an updated average replacement value of $250 for all state buildings that was used (as compared to the replacement value of $275 per square foot used in the 2013 iteration of the plan).

1. The sum of the square footage for all State Buildings equals 27,644,320 sq. ft.
2. The sum of the square footage for Critical State Buildings equals approximately 24,863,565 sq. ft.
3. The replacement value for all State Buildings totals $6,205,750,375.
4. The replacement value for Critical State Buildings is approximately **$6,215,891,250**

NBMG ran a probabilistic HAZUS run for Nevada annualized over a 100-yr period. A HAZUS run using the out-of-the box default data, which does not include many State or local government structures, produced an annualized loss rate of 0.03 percent. This came to $**86,174,400** per year when calculated against the total dollar value of the existing building stock for Nevada as identified in HAZUS.

Using this loss rate and the replacement values for all State Buildings and Critical State Facilities listed above, the annualized loss is expected to be approximately $2,074,824 for all State Buildings and $1,864,767 for Critical State Buildings.

Simply using the replacement values listed above and the ratio of the Capital Stock Loss ($6,306,320,000) to the Statewide total building replacement cost ($287,248,000,000) in a single likely earthquake in the Reno-Carson City area (magnitude 7.1 on the Carson Range frontal fault system) from a recent HAZUS run by NBMG, the estimated losses to all State buildings would be approximately $152 million and the estimated losses to all Critical State Buildings would be approximately $136 million.

Similarly, using the replacement values listed above and the ratio of the Capital Stock Loss ($17,551,400,000) to the Statewide Total Building Replacement Cost ($287,248,000,000)in a single likely earthquake in the Las Vegas area,(magnitude 6.9 on the Frenchman Mountain Fault) from a recent HAZUS run by NBMG, the estimated losses to all State Buildings would be approximately $432 million, and the estimated losses to Critical State Buildings would be approximately $380 million.

3.6.3.2 Loss Estimation for Flood for State Facilities

The State Division of Risk Management provided a listing of critical state facilities found in SFHAs along with the insured value for the buildings.

The State Flood Insurance Program Manager, based on historical data, concluded that there would be a building loss of approximately 30% for buildings located within the 100-year flood zone. The losses calculated include contents of each facility as provided by the Division of Risk Management. Using this loss percentage, the estimated losses for State-owned critical facilities during a 100-year flood are summarized in Table 3-40 below.

Table 3-40. Flood Vulnerability of Critical State-Owned Buildings, Statewide

Hazard Rating	**Building Inventory Affected** *Number of Buildings*	*Value in ($ Million)*
Extreme		
High[1]	49	68.5
Medium[2]	531	2,160
Total Losses in ($) Millions	**2,228.5**	

Source: NV Risk Management (provided flood zone data) and SPWD (provided a list critical facilities). Data does not include Nevada System of Higher Education (NSHE) buildings. Due to staff and time constraints, only a fraction of state-owned buildings has been mapped.

[1] Includes critical buildings listed in the following flood zones: A, AE, AH, AO

[2] Includes critical buildings listed in the following flood zones: C, X, X500, X500L

3.6.3.3 Loss Estimation for Wildland/Urban Interface Fires for State Facilities

For buildings in the listing provided by SPWD without a replacement value, the members of the NHM Planning Subcommittee agreed to use the previous cost of $250 sq. ft. for replacement cost of a structure. For all facilities, the State Fire Program Manager confirmed the loss of the entire structure when faced with wildland fire whether in extreme, high or medium risk location, the value of contents was calculated by adding 50 percent to its total cost. This is considered an average cost to include cleaning of smoke damage, loss of function, equipment, and supplies. The formula is:

$$\text{Loss} = (\text{Area X } \$250) + ((\text{Area X } \$250) \text{ X } .50)$$

for facilities with no current replacement value. Otherwise, the value provided by the SPWD was used with a 50 percent value for contents added. NDF used the Westwide Wildfire Risk Assessment GIS data to overlay the known wildland fire risk categories associated with current locations of state facilities. The loss estimation due to wildfire for critical state facilities is shown in Table 3-41. The maps created for this vulnerability assessment are found in Appendix J.

Table 3-41. Wildfire (WUI) Vulnerability of Critical State-Owned Buildings, Statewide

Hazard Rating	**Building Inventory Affected**	
	Number of Buildings	*Value in ($ Million)*
Extreme	465	316.7
High	200	110.7
Medium	195	38.8
Total Losses in ($) Millions	**466.2**	

Source: NDF provided data & SPWD provided a list of critical facilities

3.6.3.4 Vulnerability of State Communication Facilities due to Earthquake, Flood, and Wildfire

In Nevada, communication facilities are managed by NDOT and the Enterprise IT Services (EITS). Because the management lies outside of SPWD, and was received at a later time, this information was not included in the HAZUS or wildfire vulnerability assessments. Table 3-42 below shows the vulnerability for state-owned communications facilities based on the information provided by EITS Manager for the State Microwave Group. The location of these facilities will be integrated into the HAZUS data base and the wildfire GIS module for inclusion in the overall analysis next iteration of this plan. The analysis consists of applying the number of facilities at risk of each hazard by the replacement value, estimated at $500,000 each, with an increase of 50 percent of the value for contents. For example, all 110 facilities are at risk of earthquake, presuming complete damage, 110 X $500,000 = $5,500,000. With a 50 percent increase for contents: $5,500,000+2,750,000 =$8.250 million. EITS estimates that 20 percent and 60 percent of the communication facilities are at risk of flood and wildland fire, respectively.

Table 3-42. Vulnerability for State-owned Communication Facilities, Statewide						
	Communications Facilities Inventory Affected					
Hazard Rating	**Earthquake**		**Flood**		**Wildfire**	
	Number	$ Mill	Number	$ Mill	Number	$ Mill
Extreme	110	82.5				
High					66	49.5
Medium			22	16.5		
Total Losses in ($) Millions	**148.5**					

Source: Enterprise IT Services. This table will be updated in the next iteration of the plan.

3.7 VULNERABILITY ASSESSMENT AND ANALYSIS OF POTENTIAL LOSSES

3.7.1 Earthquake

The following information is taken from NBMG Open-File Report 14-5, *Updated Estimated Losses from Earthquakes near Nevada Communities*, 2014, by Irene M. Seelye, Gary L. Johnson, Craig M. dePolo, James E. Faulds, and Jonathan G. Price, which is available in Appendix L and online at this link: *http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm*

Figure 3-54 below shows the location of the thirty-eight Nevada communities chosen for the scenarios for this report. It estimates losses from earthquakes that could occur near the communities, which include all county seats and major population centers. The online report includes links to detailed loss estimation scenarios for each community for each of the given earthquake values. The report uses the FEMA's loss-estimation computer model, HAZUS-MH, to estimate such factors as:

- total economic loss
- numbers of buildings receiving extensive to complete damage
- number of people needing public shelter and hospital care
- number of fatalities

from earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0.

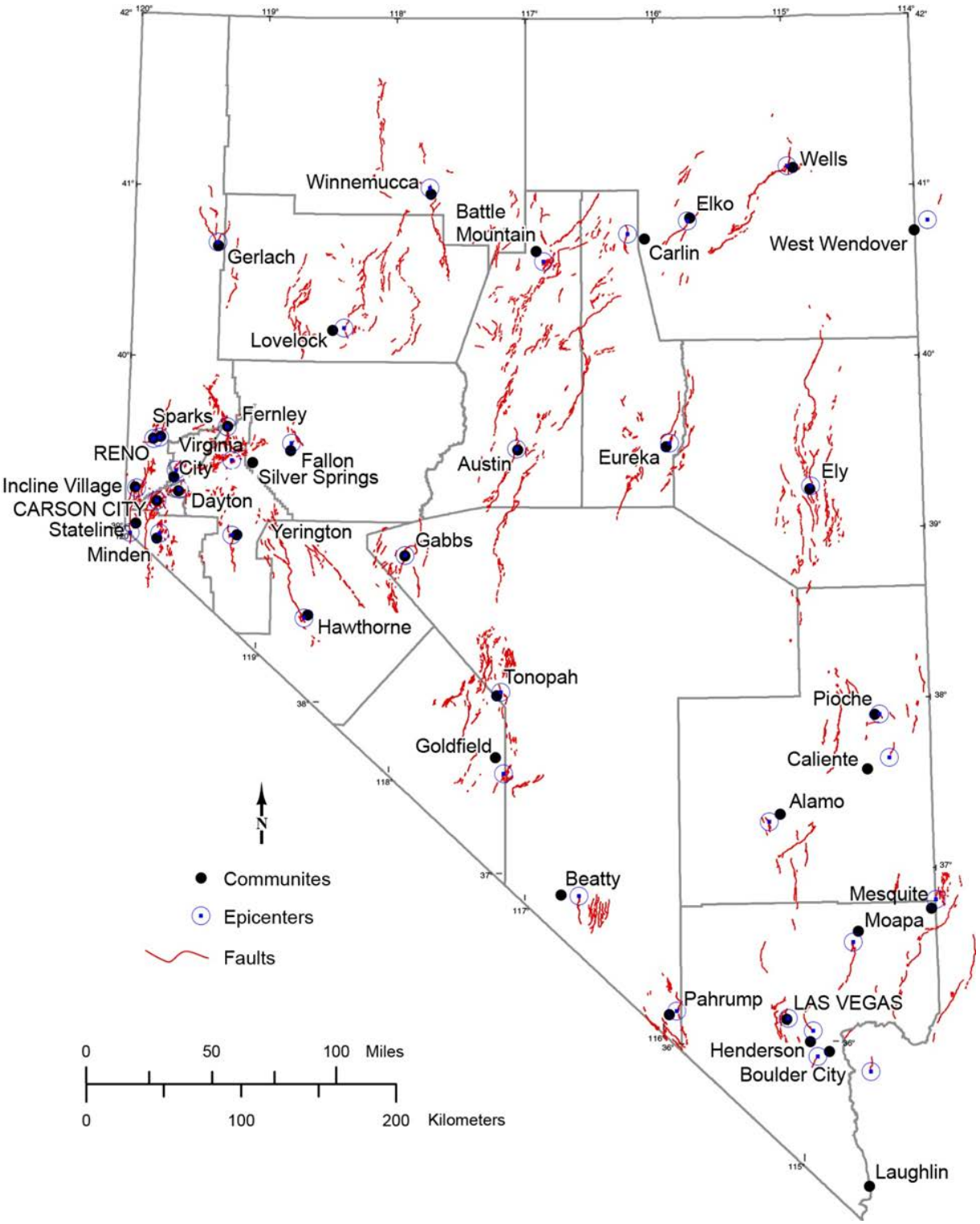


Figure 3-54. Locations of the 38 Communities in Nevada for which HAZUS earthquake scenarios have been developed. *Note: The faults chosen for the earthquake scenarios are also shown with red lines. The epicenters of the earthquakes shown with thin blue circles were chosen at the fault position that is closest to the community.*

Table 3-43. Probabilities of Earthquakes of Various Magnitudes Occurring within 50 years within 50 kilometers (31 miles) of 38 Major Communities in Nevada							
County	**County seat *or other community***	**% Probability of occurrence of magnitude greater than or equal to:**					**Rank by Probability**
		5.0	5.5	6.0	6.5	7.0	
Carson City	Carson City	>90	~80	70	50-55	12-15	2
Churchill	Fallon	80-90	~60	35	20-25	6-8	14
Clark	Las Vegas	40-50	~30	12	4-5	<0.5	28
	Boulder City	50-60	~30	12	4-5	<0.5	23
	Henderson	50-60	~30	12	4-5	<0.5	23
	Laughlin	10-20	~5	2-3	0.5-1	<0.5	38
	Mesquite	20-30	~15	4-6	2	<0.5	35
	Moapa	40-50	~25	10	4-5	<0.5	30
Douglas	Minden	>90	~80	67	50-60	10-12	6
	Stateline	>90	~80	60-70	40-50	10	9
Elko	Elko	30-40	~25	10-15	6-8	0.5-1	31
	Carlin	40-50	~30	10-15	6-8	0.5-1	27
	Wells	30-40	~20	9	6	0.5-1	32
	West Wendover	20	~10	4	1-2	<0.5	37
Esmeralda	Goldfield	80-90	~55	20-30	5-10	<1	15
Eureka	Eureka	40-50	~30	10-15	4-6	<0.5	28
Humboldt	Winnemucca	50-60	~35	15-20	5-10	1-1.5	22
Lander	Battle Mountain	60-70	~40	18	10	1.5	20
	Austin	60-70	~40	20	10-15	2-3	19
Lincoln	Pioche	30-40	~20	6-10	2-3	<0.5	33
	Alamo	70-80	~50	20-25	6-8	<0.5	17
	Caliente	50-60	~35	10-15	4	<0.5	23
Lyon	Yerington	>90	~75	60	40-45	12	8
	Dayton	>90	~80	70-75	50-55	15-18	1
	Fernley	90	~70	48	35	8	12
	Silver Springs	>90	~70	50-60	30-40	10-12	11
Mineral	Hawthorne	>90	~75	61	30-40	10-12	10
Nye	Tonopah	70-80	~50	20-30	5-10	<1	17
	Beatty	70-80	~55	30-40	20-30	10-12	16
	Gabbs	90	~65	40-50	20-25	6-8	13
	Pahrump	30-40	~25	5-10	3	<1	33
Pershing	Lovelock	50-60	~35	10-20	10	1-2	21
Storey	Virginia City	>90	~80	70	50	12-15	3
Washoe	Reno	>90	~80	67	50	12-15	4
	Gerlach	40	~25	10-15	6-10	2-3	26
	Incline Village	>90	~80	60-70	40-50	10-12	7
	Sparks	>90	~80	67	50	12-15	4
White Pine	Ely	20-30	~15	4-6	1.5-2	<0.5	35

Source: Data taken from maps produced by USGS

The probability of occurrence of each of these earthquake magnitudes for the listed communities is also tabulated using USGS's probabilistic seismic hazard analysis and is shown in Table 3-43 above.

What these Magnitudes Mean

Although it is nearly impossible to specifically predict what an earthquake of a given size might do to a community, the earthquake sizes presented relate to different general levels of damage. Generally, the greater the magnitude, the stronger the shaking will be and the longer the shaking will last.

Magnitude 5 earthquakes are distinctly felt by almost everybody and can cause rockslides and nonstructural damage, such as heavy, unsecured objects falling off shelves. If a magnitude 5 earthquake is shallow and directly under a community, significant damage can occur.

Magnitude 6 earthquakes can significant nonstructural damage, damage to weak buildings, and content damage, especially in basins and along ridge tops.

Magnitude 6.5 earthquakes can create surface offsets and can cause significant damage.

Magnitude 7 earthquakes cause widespread structural, nonstructural, and content damage to multiple communities and require a significant "recovery period" for communities to restore themselves, and can have surface ruptures 10s of miles long.

It is noteworthy that the earthquake that struck Wells, Nevada on 21 February 2008 was a magnitude 6.0 event. The probability of such an earthquake striking the Las Vegas urban area is comparable to the probability for Wells, and the probability of such an earthquake striking the Reno-Sparks-Carson City urban corridor is considerably higher.

A shaking potential map for the entire state of Nevada is shown in Figure 3-55. Individual county shaking potential maps are presented in Appendix F.

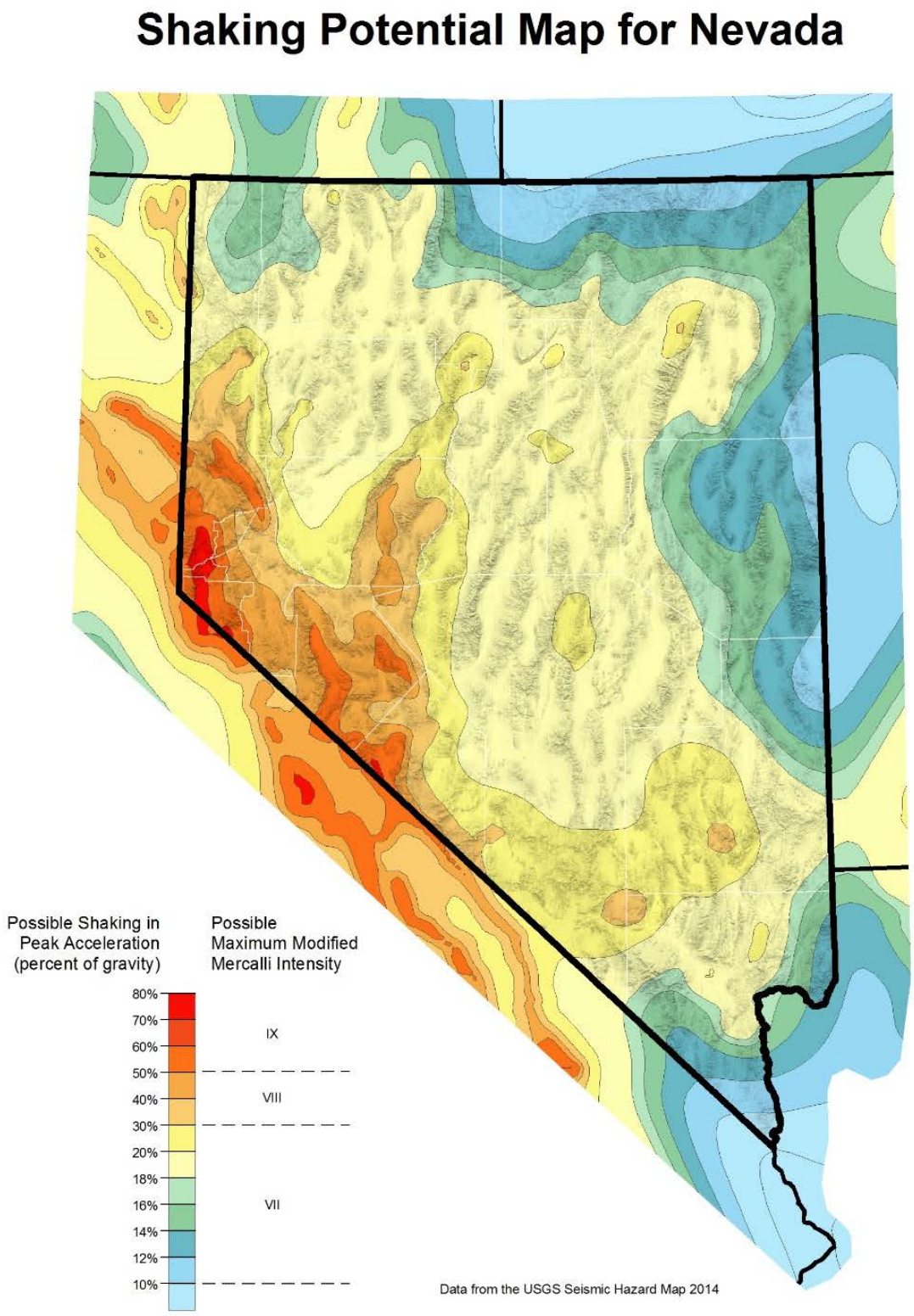


Figure 3-55. Shaking Potential Map for Nevada, *Source: Nevada Bureau of Mines and Geology*

HAZUS damage estimates for individual communities for each scenario magnitude earthquake are presented in Table 3-44 below or may be accessed online at this link:

http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm

Table 3-44. HAZUS Summary Estimates for Total Economic Losses

County	County seat (bolded) *or other community (italicized)*	Total Economic Loss	% Probability of occurrence *(from Table 3-43)*	Rank by Loss
Carson City	**Carson City**	$250,000,000	70	6
Churchill	**Fallon**	$53,000,000	35	14
Clark	**Las Vegas**	$3,100,000,000	12	1
	Boulder City	$590,000,000	12	5
	Henderson	$1,000,000,000	12	2
	Laughlin	$44,000,000	2–3	16
	Mesquite	$62,000,000	4–6	13
	Moapa	$33,000,000	10	17
Douglas	Minden	$140,000,000	67	10
	Stateline	$160,000,000	60–70	7
Elko	**Elko**	$92,000,000	10–15	12
	Carlin	$7,500,000	10–15	31
	Wells	$17,000,000	9	22
	West Wendover	$6,000,000	4	34
Esmeralda	**Goldfield**	$5,000,000	20–30	36
Eureka	**Eureka**	$16,000,000	10–15	24
Humboldt	**Winnemucca**	$18,000,000	15–20	20
Lander	**Battle Mountain**	$8,600,000	18	30
	Austin	$15,000,000	20	25
Lincoln	**Pioche**	$7,000,000	6–10	32
	Alamo	$5,100,000	20–25	35
	Caliente	$6,000,000	10–15	33
Lyon	**Yerington**	$13,000,000	60	28
	Dayton	$110,000,000	70–75	11
	Fernley	$44,000,000	48	15
	Silver Springs	$29,000,000	50–60	19
Mineral	**Hawthorne**	$14,000,000	61	26
Nye	**Tonopah**	$9,000,000	20–30	29
	Beatty	$4,600,000	30–40	37
	Gabbs	$4,300,000	40–50	38
	Pahrump	$30,000,000	5–10	18
Pershing	**Lovelock**	$13,000,000	10–20	27
Storey	**Virginia City**	$140,000,000	70	9
Washoe	**Reno**	$970,000,000	67	3

Table 3-44. HAZUS Summary Estimates for Total Economic Losses				
County	**County seat (bolded)** *or other community (italicized)*	**Total Economic Loss**	**% Probability of occurrence** *(from Table 3-43)*	**Rank by Loss**
	Gerlach	$16,000,000	10–15	23
	Incline Village	$140,000,000	60–70	8
	Sparks	$920,000,000	67	4
White Pine	**Ely**	$17,000,000	4–6	21

Note: Figures are derived from a magnitude 6.0 earthquake on a fault close to each of the scenario communities and probability of a magnitude 6 or greater earthquake occurring within 50 years within 50 kilometers (31 miles) of each community. Source: NBMG OFR 14-5; 2014, Updated Estimated Losses from Earthquakes near Nevada Communities, 2014, by Irene M. Seelye, Gary L. Johnson, Craig M. dePolo, James E. Faulds, and Jonathan G. Price

Table 3-44 indicates that damage from major earthquakes could range from hundreds of thousands of dollars in sparsely populated rural counties to billions of dollars in urban areas. Tens of thousands of buildings could suffer extensive or complete damage. Fatalities could reach into the hundreds. Thousands of people may need public shelter. Importantly, many earthquakes are likely to cause significant, simultaneous damage in multiple counties. In particular, a major earthquake anywhere in the Reno-Carson City urban corridor is likely to cause significant damage in not only Carson City but also in adjacent Douglas, Storey, and southern Washoe Counties.

Table 3-45 ranks the top ten Nevada communities by potential economic losses due to the scenario earthquake. Not surprisingly, the counties with the largest populations are generally the ones with the most at risk.

Table 3-45. HAZUS Top Ten Nevada Communities for Highest Potential Economic Loss from Earthquake				
County	**County seat (bolded)** ***or other community***	**Total economic loss**	**% Probability** ***(see Table 3-43)***	**Rank by Loss**
Clark	Las Vegas	$3,100,000,000	12	1
Clark	*Henderson*	$1,000,000,000	12	2
Washoe	Reno	$970,000,000	67	3
Washoe	*Sparks*	$920,000,000	67	4
Clark	*Boulder City*	$590,000,000	12	5
Carson City	Carson City	$250,000,000	70	6
Douglas	*Stateline*	$160,000,000	60-70	7
Washoe	*Incline Village*	$140,000,000	60-70	8
Storey	Virginia City	$140,000,000	70	9
Douglas	Minden	$140,000,000	67	10

Source: HAZUS, NBMG, UNR

HAZUS program runs also demonstrate that essential facilities will be severely stressed following major earthquakes. The HAZUS program predicts that hospitals in the epicenter areas will have insufficient beds to accommodate the number of injured people, which means that plans should be improved for transporting injured people to hospitals in other unaffected jurisdictions. Fire stations, police stations, and schools will most likely be operating at reduced capacity due to earthquake damage, and there may be significant damage to utilities and transportation systems.

HAZUS is a modeling tool only. Given the uncertainties in actual ground-shaking and potential damage during earthquakes, HAZUS damage estimates are likely to differ from actual losses by a factor of between two and ten. Nonetheless, HAZUS provides a reasonable, widely accepted methodology for estimating vulnerabilities and ranking areas by relative risk.

From a geological perspective, it is obvious that all areas of Nevada will experience major earthquakes at some time in the future. Thus, all communities are justified in preparing for a serious earthquake scenario regardless of the probability of occurrence of an earthquake of that magnitude, particularly in the consideration of using earthquake-resistant building standards in the design and planning of critical facilities.

3.7.2 Flood

Flooding is considered to be a "High Risk" hazard in much of Nevada. Floods can potentially affect many areas developed for businesses and homes. Floods can affect multiple jurisdictions, as was the case in January of 1997, when Carson City, Douglas, Lyon, Storey, and Washoe Counties were impacted by floods on the Carson, Walker, and Truckee Rivers. Based on the frequency of flooding in the past, the probability of future, damaging floods in Nevada is high.

Emerging tools and techniques will help in the process of identifying the structures with the highest flooding vulnerability. GIS data of Nevada's Critical Facility structures have been compiled and can be used with the new digital flood hazard data to query detailed information. Current and future flood hazard mapping as part of FEMA's Risk MAP program will include a non-regulatory flood risk product data set called "Areas of Mitigation Interest." Features of this data set identifies conditions in a watershed that may contribute to the severity and associated losses of a flood hazard: stream flow pinch points, the conditions included in this spatial data set are areas experiencing development or land use change, locations of past claims areas with a history of flood claims, key emergency routes overtopped during frequent flooding events, areas of significant erosion or mitigation success, and areas that have structures that are contributing to flooding (undersized culverts, bridges and dams). With a general idea of potential mitigation projects, the task of ranking the proposed projects can be facilitated with the use of a refined HAZUS analysis (updated terrain data, hydrologic and hydraulic analyses, and updated building stock/population data).

To assess risks and vulnerability associated with riverine flooding, NBMG has run the most recent version of FEMA's loss-estimation model, HAZUS-MH for reaches of the Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker Rivers. The results using HAZUS-MR4 are summarized in Tables 3-46 and 3-47. In most cases, the HAZUS runs used floods with average 100-year return periods.

Although failures of dams can cause floods, no specific HAZUS runs were made to simulate dam failures. Nonetheless, the inundation caused by a flood with a 100-year return period can be used to approximate the damage that could occur from some dam failures, particularly along the Truckee River (with the Stampede, Boca, and Prosser Reservoirs along tributaries in California, upstream from Reno),

Carson River (with Lahontan Reservoir upstream from Fallon), and Humboldt River (with Rye Patch Reservoir upstream from Lovelock).

Tables 3-46 and 3-47 indicate that damage from floods could range from hundreds of thousands of dollars in sparsely populated rural areas to hundreds of millions of dollars in large urban areas. Hundreds of buildings could suffer complete destruction. Thousands of people may need public shelter. Hundreds of thousands of tons of debris may need to be cleared.

One way of assessing vulnerability is in terms of total building-related economic losses, summed for the counties affected by a 100-year flood. Using this measure, flood vulnerabilities are ranked as follows:

- Highest loss: Truckee River: $1.51 billion
- 2nd highest: Humboldt River: $304 million
- 3rd highest: Colorado River: $255 million
- 4th highest: Muddy River: $166 million
- 5th highest: Carson River: $77 million
- 6th highest: Walker River: $12 million
- 7th highest: Virgin River: $4 million

Clearly, Nevada's northern counties, Washoe County in particular, are more at risk than its southern ones for floods along major rivers. Clark County is, however, very vulnerable to damage from flash flooding on alluvial fans along ephemeral streams, particularly in Las Vegas Valley. This vulnerability is difficult to quantify without further extensive geologic mapping in areas where residential, industrial, and commercial development is extending over alluvial fan surfaces.

Table 3-46. Summary of HAZUS Loss-Estimation Output for 100-year Floods on Major Rivers in Nevada

River	County	Cities	Building-Related Economic Loss ($ million)	Number of People Needing Public Shelter	Buildings with at least moderate damage
Carson					
	Douglas	Gardnerville, Minden	17.04	163	32
	Carson City	Carson City	7.18	285	0
	Lyon	Dayton, Silver Springs	16.42	194	35
	Churchill	Fallon	36.72	601	82
Carson Total			77.36	1,243	149
Colorado					
	Clark	Laughlin, Bullhead City, Riviera[1]	255.53	319	237
Colorado Total			255.53	319	237
Humboldt					
	Elko	Elko, Carlin	128.27	2,191	378
	Eureka	Palisade, Beowawe	n/a	0	n/a
	Lander	Battle Mountain	1.04	11	0

Table 3-46. Summary of HAZUS Loss-Estimation Output for 100-year Floods on Major Rivers in Nevada

River	County	Cities	Building-Related Economic Loss ($ million)	Number of People Needing Public Shelter	Buildings with at least moderate damage
	Humboldt	Winnemucca	71.78	445	153
	Pershing	Lovelock (protected by Rye Patch Reservoir)	103.44	1,476	576
Humboldt Total			304.52	4,123	1,107
Muddy					
	Lincoln	Ursine, Panaca, Caliente	3.20	37	16
	Clark	Moapa, Glendale, Logandale, Overton	163.52	3,411	675
Muddy Total			166.72	3,448	691
Truckee					
	Washoe	Verdi, Reno, Sparks, Wadsworth, Nixon	1,465.58	8,210	994
	Lyon		0	n/a	n/a
	Storey	Lockwood	44.04	725	167
Truckee Total			1,509.32	8,935	1,162
Virgin					
	Clark	Mesquite, Bunkerville	4.77	113	23
Virgin Total			4.77	113	23
Walker					
	Lyon	Wellington-Smith, Yerington	11.90	218	30
	Douglas		.009	0	0
	Mineral	Schurz, Hawthorne (protected by Walker L.)	.54	3	30
Walker Total			12.45	221	60

[1] HAZUS runs were completed for 100-year floods on the major rivers within the state (Carson, Colorado, Humboldt, Muddy, Truckee, Virgin, and Walker), which is why Las Vegas was not included.

Table 3-47. Vulnerability of buildings in each county to HAZUS-MR4 100-floods on selected rivers in Nevada, ranked both by economic loss and loss by a percentage of exposure.

River & County	Building Exposure ($ million)	Building-Related Economic Loss ($ million)	Loss as % of exposure (%)	Rank by Economic Loss	Rank by Loss as % Exposure
Carson River				5	3
Douglas County	6,211.40	17.04	0.27%		
Carson City	6,221.25	7.18	0.12%		
Lyon County	4,366.62	16.42	0.38%		
Churchill County	2,279.68	36.72	1.6%		
Total	*19,078.94*	*77.36*	*0.4%*		
Colorado River				3	4
Clark County only	205,217.64	255.53	0.12%		
Humboldt River				2	1
Elko County	4,833.40	128.27	2.65%		
Eureka County	231.48	n/a	0%		
Lander County	509.08	1.04	0%		
Humboldt County	1,497.98	71.78	4.79%		
Pershing County	493.92	103.44	20.94%		
Total	*7,565.85*	*304.52*	*4.02%*		
Muddy River				4	6
Lincoln County	487.36	3.20	0.66%		
Clark County	205,217.64	163.52	0.08%		
Total	*205,705*	*166.72*	*0.08%*		
Truckee River				1	2
Washoe County	49,451.79	1,465.58	2.96%		
Lyon County	4,366.62	n/a	0%		
Storey County	411.07	44.04	10.71%		
Total	*54,229.47*	*1,509.61*	*2.78%*		
Virgin River				7	7
Clark County only	205,217.64	4.78	0.001%		
Total	*96,719*		*0.001%*		
Walker River				6	5
Lyon County	4,366.65	11.90	.27%		
Douglas County	6,211.40	.009	0.001%		
Mineral County	506.60	.54	0.11%		
Total	*11,084.60*	*12.45*	*0.11%*		

Table 3-46 summarizes vulnerability (or risk) from floods using two methods of ranking flood vulnerability:

(1) by building-related economic loss and

(2) by economic loss as a percentage of building exposure.

The county's building exposure, one of the factors within the HAZUS program, is a measure of the economic wealth of the county and a proxy for the ability of the county to recover from a disaster. Ranked by loss as a percentage of exposure, the most vulnerable rivers are:

- Highest vulnerability: Humboldt River
- 2nd highest: Truckee River
- 3rd highest: Carson River
- 4th highest: Colorado River
- 5th highest: Walker River
- 6th highest: Muddy River
- 7th highest: Virgin River

The complete HAZUS flood report with all data generated by these HAZUS runs will be contained in Nevada Bureau of Mines and Geology Open-File Report 18-1 entitled "Updated Assessment of Risks and Vulnerability to Flood Hazards in Nevada." This report is available as an online document at

http://data.nbmg.unr.edu/public/freedownloads/of/of2018-01.zip

Appendix H contains maps showing the extent of flooding for the 100-year flood event along each of the following river systems: the Carson, Colorado, East Humboldt, West Humboldt, Truckee, Walker, Virgin, and Muddy as well as a location map showing the location of these rivers within the state of Nevada. Colored contour areas represent the peak floodwater depth, an indicator of flooding intensity, scaled depending on the river and the area flooded.

The HAZUS runs have been done along major rivers within the State. However, as population in Nevada grows and development continues to expand outward from the currently populated areas, additional buildings will likely become prone to flooding in and along what are normally dry alluvial fans, washes, or ephemeral streams, particularly around the periphery of Las Vegas Valley. Flooding in these areas is typically caused by intense rainfall over relatively short periods of time. The Clark County RFCD has an aggressive program to reduce these hazards within their jurisdiction in an attempt to mitigate flood hazards along dry washes, in canyons, and on alluvial fans.

3.7.3 Wildfire

For wildfire vulnerability, NDF provided a GIS analysis of maximum potential wildfire losses in areas mapped as medium to extreme risk for wildfire overlain by the assessed values of improved and unimproved property obtained from the county assessors' offices to generate a total potential maximum exposure of property loss for each county. These data are displayed in Table 3-48 below. Wildfire Risk Maps and a summary of county assessors' property value lists from which the GIS data analysis was generated are located in Appendix J. For a few counties, no assessor's data were available to complete the analysis at this time (Esmeralda).

Table 3-48. Wildfire Vulnerability in Moderate to High-Risk Areas *Summary of County Assessors' Property Values used in GIS Wildfire Index Category Analysis*			
County	**Land Value**	**Value of Improvements**	**Total Assessed Parcel Value**
Carson City	$352,307,825	$496,563,110	$848,870,935
Churchill	$94,640,965	$240,412,110	$335,053,075
Clark	$7,612,696,132	$6,609,037,887	$14,221,734,019
Douglas	$634,986,237	$600,744,669	$1,235,730,906
Elko	$206,971,674	$656,123,644	$863,095,318
Esmeralda	No Parcel Data Available		$0
Eureka	$22,123,567	$75,583,195	$97,706,762
Humboldt	$90,049,690	$392,280,429	$482,330,119
Lander	$69,419,831	$50,088,060	$119,507,891
Lincoln	$509,160,677	$83,064,143	$592,224,820
Lyon	$276,298,041	$881,114,952	$1,157,412,993
Mineral	$93,951,988	$17,298,489	$111,250,477
Nye	$1,848,901,684	$738,729,977	$2,587,631,661
Pershing	$119,014,035	$62,031,267	$181,045,302
Storey	$99,804,495	$185,393,811	$285,198,306
Washoe	$2,535,594,078	$4,458,283,022	$6,993,877,100
White Pine	$565,302,005	$112,735,982	$678,037,987
TOTAL			**$30,790,707,671**

Table 3-49 below presents an assessment of wildfire vulnerability and potential losses of due to wildfire on tribal lands and two Nevada counties not covered in Table 3-48 above. Data source was the 2013 NHMP Table 3-49, which derived the data from the LHMPs. To assist the communities still lacking any wildfire vulnerability assessment for the current iteration of this plan (Esmeralda), the state will request funding to work with NDF and the local county assessors to gather building stock value and number data resulting in a GIS-based vulnerability analysis that will be available to those communities via the MyPlan website.

Table 3-49. Wildfire Vulnerability Assessment of Nevada Counties and Tribal Lands not included in Table 3-48

County/Tribal Hazard Mitigation Plan	Hazard Rating	Population affected	Building Inventory Affected				No. of Critical Facilities affected		Total by Rating	Total Losses $ x1000
			Residential		Non-Residential					
			Number	($x1000)	Number	($ x1000)	Number	($x1000)		
Esmeralda County[1]	Extreme								0	
	High								0	
	Moderate	971	629	32,554	10	1,391	35	6,500	40,445	40,445
Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	Extreme								0	
	High	1,268	449	39,695	8	1,287	131		40,982	
	Moderate								0	40,982
Te-Moak Tribe of Western Shoshone Indians of Nevada - Elko Band	Extreme								0	
	High								0	
	Moderate	729	267	30,884	15	44,797	6	4,565	80,246	80,246
Reno-Sparks Indian Colony	Extreme									
	High									*
	Moderate	919			2	183				
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Extreme									
	High	Not available	6	128	2	324				*
	Moderate	Not available	6	128	2	324				
Washoe Tribe (Nevada and California)	Extreme								0	
	High	3,833			Not available	15,007	57	20,332	35,339	35,339
	Moderate								0	

[1] All people, critical facilities and structures are equally vulnerable to this hazard. * Included in Washoe County figures

This Section describes the State's mitigation goals that guide the selection of mitigation activities. It also describes how the previous goals were assessed and whether or not they were revised. It includes a discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities. It includes an evaluation of State laws, regulations, policies, and programs related to hazard mitigation. It evaluates the State's policies related to development in hazard-prone areas and discusses State funding capabilities for hazard mitigation projects. This section includes a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.

The NHM Planning Subcommittee's strategy is to support and encourage the lead agencies and their efforts to achieve their mitigation goals and objectives to the maximum extent possible. This Plan stresses its support of all mitigation efforts as resources become available.

For the 2018 iteration of this plan, the NHM Planning Subcommittee made the following revisions (no significant changes were made to Tables 4-1, 4-2, 4-11, and 4-12):

- *Table 4-3 of hazard management policies, programs, and capabilities was updated with new web links.*
- *Tables 4-4, 4-5, 4-6 and Figures 4-1, 4-2, 4-3 relating to hazard mitigation grant funding were revised to reflect additional program management capability and funding received since the last plan iteration.*
- *Table 4-7 of State Model Codes was updated to reflect changes in revised statutes since the last plan iteration.*
- *Table 4-8 Local Capabilities General Analysis was updated to reflect changes in local and plan status and changes to capabilities since the last plan iteration, and approved tribal plans were added.*
- *New Social, Technical, Administrative, Political, Legal, Economic, Environmental (STAPLEE) prioritization of Strategic Actions was done by the NHM Planning Subcommittee and used to update Table 4-10, Strategic Action Plan Matrix.*

The requirements for mitigation strategy are described below:

ELEMENT	REQUIREMENTS
S8. Does the mitigation strategy include goals to reduce long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)[18]] ***Intent:*** *To guide development and implementation of hazard mitigation actions. Goals are statements of the vision for the future.*	a. The plan must identify hazard mitigation goals representing what the state seeks to accomplish through mitigation plan implementation. b. The goals must be consistent with the hazards and vulnerabilities identified in the risk assessment. c. The goals must address reducing the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities. d. *If the state is interested in an increased Federal cost share under the FMA program, the plan must include goals to address RL and SRL properties. (See RL2 in Section 3.8 Repetitive Loss Strategy.)* ***Goals*** are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.

[18] *44 CFR §201.4(c)(3)(i): "A description of State goals to guide the selection of activities to mitigate and reduce potential losses."*

4.1 HAZARD MITIGATION GOALS

The requirements for hazard mitigation goals, as stipulated in the DMA 2000 and its implementing regulations, are described below

ELEMENT	REQUIREMENTS
S8. Does the mitigation strategy include goals to reduce long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)[18]] ***Intent:*** *To guide development and implementation of hazard mitigation actions. Goals are statements of the vision for the future.*	a. The plan must identify hazard mitigation goals representing what the state seeks to accomplish through mitigation plan implementation. b. The goals must be consistent with the hazards and vulnerabilities identified in the risk assessment. c. The goals must address reducing the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities. d. *If the state is interested in an increased Federal cost share under the FMA program, the plan must include goals to address RL and SRL properties. (See RL2 in Section 3.8 Repetitive Loss Strategy.)* ***Goals*** are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)[17]] ***Intent:*** *To ensure that the mitigation strategy addresses the risk and vulnerabilities to existing and potential development, and takes into consideration possible future conditions that can impact statewide vulnerability.*	The plan must provide a summary of the changes in development that have occurred or are projected to occur in hazard prone areas based on the state, local, and tribal, as applicable, risk assessments, specifically: a. Changes in land use and the built environment; b. Changes in population demographics that may affect vulnerability to hazard events; and c. Changes to the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities. ***Changes in development*** means recent development, potential and projected land use and development, or conditions that may affect risk and vulnerability to the state and jurisdictions within the state, such as changes in population demographics.

[18] 44 CFR §201.4(c)(3)(i): "A description of State goals to guide the selection of activities to mitigate and reduce potential losses."

[17] 44 CFR §201.4(d): "Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years."

4.1.1 Hazard Mitigation Goal Assessment Overview

The NHM Planning Subcommittee members were asked to review and assess the 2013 goals for the 2018 Enhanced Plan based on the revised hazard rankings that resulted from the Subcommittee's hazard categorization and assessment work presented earlier in Section 3 that identified earthquake, flood, and wildfire as the High Risk hazards in the state. Specific feedback was requested from those Subcommittee members from the lead agencies for each of the major profiled high-risk hazards – earthquake, flood, and wildfire. The five previous 2013 goals were found to still be valid for 2018 without modifications. These goals and the lead agencies that assessed them are shown in Table 4-1. The lead agency for each goal is the state agency with regulatory responsibility to address a particular proposed action, or which is capable and willing to organize resources, find appropriate funding, oversee implementation, monitor and evaluate the goal's activities. Agencies that may be able to assist in the implementation of a particular proposed action item by providing added resources to the lead agency are also listed. The intent of these goals is to guide NHMPC in the selection of mitigation activities at the state level as well as the local jurisdiction level in accomplishing these goals.

Table 4-1. 2018 Goals and Lead Agencies

2018 Goals	2018 Lead Agencies
Goal 1: *Reduce the loss of life and injuries.*	*Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee*
Goal 2: *Improve local hazard mitigation plans -technical assistance.*	*Nevada Division of Emergency Management and Nevada Hazard Mitigation Planning Committee*
Goal 3: *Reduce the possibility of damage and losses due to earthquakes.*	*Nevada Bureau of Mines and Geology), Nevada Seismology Laboratory, Nevada Earthquake Safety Council, Nevada Division of Emergency Management, Nevada Hazard Mitigation Planning Committee*
Goal 4: *Reduce the possibility of damage and losses due to flooding.*	*Nevada Division of Water Resources), Nevada Hazard Mitigation Planning Committee*
Goal 5: *Reduce the possibility of damage and losses due to wildfire.*	*Nevada Division of Forestry*

4.1.2 Mitigation Goals and Strategic Actions

The NHM Planning Subcommittee members and specifically the lead agencies for each of the 2018 profiled High-Risk hazards were asked to review and assess all 2013 strategic actions for the 2018 Enhanced Plan. No significant changes were made to Table 4-2 in this iteration of the plan. The intent of the Strategic Actions is to guide NHMPC in the selection of mitigation activities at the state level as well as the local jurisdiction level to accomplish the goals. Since these goals and actions were developed through the contribution of state and local agencies, they are a guide to the mitigation activities that are needed in Nevada. Each action provides a framework for the NHMPC members to advise, review, and direct resources of the state to projects that will address hazard mitigation. NDWR staff, including the State Floodplain Manager and the Dam Safety Officer, developed the flood action items. NDF provided the Wildland Fire actions. NBMG working with NESC and the Seismo Lab developed the Earthquake actions.

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 1 Reduce the loss of life and injuries *Nevada DEM and NHMPC*	1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability and measures to protect life safety and health.	
Goal 1	1.B	Provide current information and workshops about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies.	
Goal 1	1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new development and redevelopment practices.	
Goal 1	1.D	Promote the modification of structures to meet life safety standards.	
Goal 1	1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy.	
Goal 1	1.F	Encourage local governments, special districts and tribal organizations to develop, adopt, implement maintain and update hazard mitigation plans.	The words “maintain and update” were added because a majority of local plans are developed or in progress and will require only maintenance and updating from now on
Goal 1	1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning for multiple hazards, including earthquakes and wildfires.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 2 Improve Local Hazard Mitigation Plans Technical Assistance *Nevada DEM and NHMPC*	2.A	~~Promote local hazard evaluation and mitigation planning and assist in developing local hazard mitigation plans~~ Provide technical assistance, guidance, resources and tools to local governments and tribal entities to promote hazard evaluation and to develop and update hazard mitigation plans.	Combined 2a and 2b The majority of local plans are developed or area in progress and will require only updating from now on; while most tribes still require plan development.
Goal 2	~~2.B~~	~~Provide technical assistance, guidance, resources and tools to local governments for all aspects of local hazard mitigation planning~~	Combined 2a and 2b The majority of local plans are developed or in progress and will require only updating from now on; while most tribes still require plan development.
Goal 2	2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program.	
Goal 2	2.C	~~Develop~~ Maintain a tracking system for local and state government mitigation plans and projects.	Deleted word "Develop" and added "Maintain" because plan is already developed; and requires only maintenance
Goal 2	2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 2	2.E	~~Develop~~ Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations about how local governments can incorporate these in support of the state's mitigation program efforts.	Deleted word "Develop" and added "Maintain" because NHMPC is this system that has been implemented and requires only maintenance
Goal 2	2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	
Goal 2	2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	
Goal 2	2.H	Promote coordination among state agencies, local governments and tribal organizations of regional hazard mitigation activities	
Goal 2	2.I	Identify, enhance and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	
Goal 3 Reduce damage and losses from earthquakes *NBMG, Nevada Seismology Laboratory, NESC, Nevada DEM, NHMPC*	3.A	Protect existing assets, as well as future development, from the effects of earthquakes by providing setback criteria for building and development.	Goal 3 was modified to better integrate the strategic actions of the NESC 2013 Strategic Plan. Strategic Action 3A was modified to match strategies of NESC.

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 3	~~3.B~~	~~Mitigate shaking hazards in communities' and State critical facilities so that they are seismically resistant and operational following a strong earthquake.~~	Deleted. Integrated into 3F and G
Goal 3	3.B	Hold workshops on strategies, benefits, risk-reduction opportunities, and challenges associated with the inventory of seismically susceptible buildings.	
Goal 3	3.C	Assist communities and State to retrofit, change occupancy to decrease risk, or demolish susceptible buildings and structures.	
Goal 3	3.D	Create planning for "special consideration zones" for Nevada communities.	
Goal 3	3.E	Create microzonation of earthquake hazards in Nevada.	
Goal 3	~~3.G~~	~~Improve the threshold of detection and accuracy of location for earthquakes throughout Nevada~~	Deleted. Covered by #3S and 3Y
Goal 3	3.F	Encourage seismic retrofit of deficient essential structures and infrastructure of community and State critical facilities (economic and lifeline-utilities) to structurally and seismically withstand the effects of earthquakes.	modified to match strategies of NESC
Goal 3	3.G	Encourage seismic retrofit of public safety and critical facilities (both community and State) (such as 911 communications, hospitals, fire, law enforcement and ambulance facilities, etc.)	Added to match strategies of NESC
Goal 3	3.H	Develop lesson plans or activities for teachers to increase awareness about Nevada's earthquake hazard that tie into the existing science curriculum and align with the science standards for the state.	Added to match strategies of NESC.
Goal 3	3.I	Increase media involvement by networking with partners from all media types such as print, radio, TV, and social media.	Added to match strategies of NESC.
Goal 3	3.J	Provide Applied Technology Council (ATC) training and develop formalization of the process.	Added to match strategies of NESC.
Goal 3	3.K	Expand earthquake awareness in educational sites such as regional science fairs, and speakers.	Added to match strategies of NESC.

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 3	3.L	Develop earthquake hazard information programs targeting public safety, emergency managers, local government executives, and business and industry.	Added to match strategies of NESC.
Goal 3	3.M	Promote the Great Nevada Shakeout and earthquake drills throughout the state.	Added to match strategies of NESC.
Goal 3	3.N	Promote training of volunteer community emergency response teams (CERT) about earthquake risks and possible mitigation activities.	Added to match strategies of NESC.
Goal 3	3.O	Promote training of hospital staff about earthquake risks and possible mitigation activities.	Added to match strategies of NESC.
Goal 3	3.P	Improve integration of the emergency management system at all levels of the community bringing forth the "whole community" approach.	Added to match strategies of NESC.
Goal 3	3.Q	Provide publications and workshops to promote the exchange of technical information relating to earthquakes among professionals, managers and the citizens of Nevada.	Added to match strategies of NESC.
Goal 3	3.R	Promote a post-earthquake technical clearinghouse through planning and established practices.	Added to match strategies of NESC.
Goal 3	3.S	Give planning and special consideration to developing a "Fault Map of Nevada" and identifying all active faults and seismic sources near major urban areas in Nevada.	Added to match strategies of NESC.
Goal 3	3.T	Establish a "lifelines and transportation" workgroup.	Added to match strategies of NESC.
Goal 3	3.U	Enhance implementation of nonstructural remediation.	Added to match strategies of NESC.
Goal 3	3.V	Create earthquake planning scenarios (Las Vegas and rural areas).	Added to match strategies of NESC.
Goal 3	3.W	Determine potential fault rupture characteristics and maximum earthquakes.	Added to match strategies of NESC.

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 3	3.X	Continue to inventory and field-verify unreinforced masonry buildings in Nevada and make this data publicly available to planners and emergency response staff in communities statewide.	Added to match strategies of NESC.
Goal 3	3.Y	Promote coordination among private and public entities to improve statewide earthquake monitoring capabilities.	Added to match strategies of NESC.
Goal 3	3.Z	Identify potential funding sources for earthquake mitigation strategic actions not only at the Federal and State levels but also from private funding and community partnerships.	Added to match strategies of NESC.
Goal 3	3.AA	Develop a set of model codes and regulations that would be presented after a major earthquake occurs in Nevada.	Added to match strategies of NESC.
Goal 3	3.AB.	Develop an Earthquake Early Warning System for Nevada.	
Goal 4 Reduce damage and losses from floods *NDWR, NHMPC*	4.A	Protect existing assets, as well as future development, from the effects of flooding.	
Goal 4	4.B	Identify and prioritize areas in the State where existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas.	
Goal 4	4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments.	
Goal 4	4.D	Retrofit State buildings to meet NFIP standards.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 4	4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.	Added SRL structures
Goal 4	4.F	Assist communities and State with programs dealing with repetitive loss structures and severe repetitive loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	Added SRL structures and broadened possible mitigation strategies to deal with them.
Goal 4	4.G	Upgrade State-owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State-owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services.	
Goal 4	4.H	Protect existing assets as well as future development from the effects of dam failure	
Goal 4	4.I	Inventory existing dams and add to the inventory as dams are discovered or constructed.	
Goal 4	4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	
Goal 4	4.K	Install early warning weather stations in watersheds with dams above populated areas.	
Goal 4	4.L	Assist communities and State in structural mitigation measures, updates, repairs and maintenance to dams, ditches, and canals.	Added the words “maintenance, ditches, and canals” to incorporate mitigation activities for canals and ditches.
Goal 4	4.M	Encourage local ordinances and regulations to reduce encroachment into flood-prone zones resulting from dam impoundment or high (non-failure) releases.	
Goal 4	4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 4	4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood hazards.	
Goal 4	4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency.	
Goal 5 Reduce the possibility of damage and losses due to wildfire. *NDF*	5.A	Protect existing assets, as well as future development, from the effects of wildfire.	
Goal 5	5.B	Identify and recommend changes to State NRS, NAC and communities' ordinances and regulations.	
Goal 5	5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention.	
Goal 5	5.D	Provide public education and outreach to educate homeowners in the WUI about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance.	
Goal 5	5.E	In highly motivated communities, focus on activities by individual participation in and maintenance of projects (personal responsibility).	
Goal 5	5.F	Educate and train State and communities in current standards and regulations for proper practices in defensible space and firefighting.	
Goal 5	5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment and training.	
Goal 5	5.I	Participate in research and development of interoperability for emergency response communications.	
Goal 5	5.J	Coordinate the development of a comprehensive, collaborative program for mutual aid/mobilization of state and local government fire resources.	
Goal 5	5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related.	
Goal 5	5.L	Continue to improve fire prevention programs statewide through partnerships with Fire Prevention Association of Nevada, State Fire Marshal's Office, University of Nevada Cooperative Extension, and any other cooperators.	
Goal 5	5.M	Assist communities in fuels-reduction projects for areas with extreme or high ratings in updating CWPP assessments.	
Goal 5	5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property.	
Goal 5	5.O	Provide assistance to counties for priority setting and CWPP updating.	
Goal 5	5.P	Provide a statewide evaluation process for monitoring community progress, prioritization and participation in CWPP.	
Goal 5	5.Q	Provide and maintain a statewide process for documenting fuels projects progress, completion, success and maintenance.	
Goal 5	5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.).	
Goal 5	5.T	Provide training for employees and project managers on SHPO and cultural resource identification, reporting methods and clearances.	
Goal 5	5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites.	
Goal 5	5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects.	
Goal 5	5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	
Goal 5	5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions.	
Goal 5	5.Z	Provide native and accepted introduced seed species through the Nevada State seed bank program.	
Goal 5	5.AA	Provide training for local cooperators for treatment practices and skill acquisition.	
Goal 5	5.AB	Encourage collaboration at all levels with state, federal and local cooperators.	
Goal 5	5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports and public education and outreach to provide the best land management practices available for collaborative land rehabilitation.	
Goal 5	5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices.	
Goal 5	5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State seed bank programs.	

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	**#**	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation.	
Goal 5	5.AG	Provide public education and outreach to communities affected by wildfire.	
Goal 5	5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments.	
Goal 5	5.AI	Assist with the development of and the participation in a comprehensive program by which current CWPP or equivalent assessments are updated as projects are completed, ratings change or new at-risk communities arise.	
Goal 5	5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents.	
Goal 5	5.AK	Encourage community involvement in project completion, participation, and maintenance.	
Goal 5	5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection district or fire department) according to NRS 472.040.	
Goal 5	5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by USFS.	
Goal 5	5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding and other catastrophic natural event.	
Goal 5	~~5.AO~~	~~Provide technical assistance in the formation of end users of woody biomass to produce heat and/or power (i.e. Fuels in Schools program) and provide ongoing outreach and education as to the societal benefits associated with utilization of biomass in the State of Nevada.~~	Action no longer valid due to federal funding cutbacks.
Goal 5	~~5.AP~~	~~Participate in the Nevada State Biomass Working Group, southern Nevada Woody Biomass Collaboration Group, and other state, local, and national biomass committees.~~	Program closed by Dept. of Corrections; Action deleted

Table 4-2. Mitigation Goals and Strategic Actions			
Goal/Lead Agency	#	**Strategic Action**	**Changes and reason for (a) modification, or (b) deletion**
Goal 5	5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness.	
Goal 5	5.AP	Keep apprised of all federal, state, and local regulations.	
Goal 5	5.AQ	Participate in interagency project planning, implementation and monitoring.	
Goal 5	5.AR	Protect the envelope of buildings from wildfire.	

The implementation strategy for the Strategic Actions shown in Table 4-2 above is found in Section 4.4, Table 4-10, Strategic Action Plan Matrix. This table includes the lead department/division, potential funding sources, implementation timelines, and economic justification.

4.2 STATE CAPABILITY ASSESSMENT

The requirements for State capability assessment, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S12. Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment? [44 CFR §201.4(c)(3)(ii) [22]] ***Intent:*** *To identify and build the state's capabilities to reduce risk and increase resilience.*	The plan must describe existing state pre- and post- disaster hazard management policies, programs, and capabilities to mitigate the hazards in the state, including: a. An evaluation of state laws, regulations, policies, and programs related to hazard mitigation, as well as to development in hazard-prone areas, to include the state's administration of the: 1. National Flood Insurance Program (NFIP) and Community Rating System (CRS); and 2. Risk Mapping, Assessment, and Planning (Risk MAP) program. b. A discussion of state funding capabilities for hazard mitigation projects, including: 1. A general description of how the state has used its own funds for hazard mitigation projects; and 2. A general discussion of how the state has used FEMA mitigation programs and funding sources, including but not limited to: a. HMGP, PDM, and FMA; and b. PA C-G. c. A general summary of: 1. Obstacles and challenges; and 2. Changes since the previous plan approval.

[22] 44 CFR §201.4(c)(3)(ii): "A discussion of the State's pre and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities."

4.2.1 Pre- and Post- Disaster Hazard Management Capability

Table 4-3 below presents the state's capability to mitigate the hazards described in Section 3 and demonstrates pre-and post-disaster hazard management policies, programs, and capabilities. It also presents the state's funding capabilities for hazard mitigation projects - whether it can support, facilitate, or fund such projects. Support implies that the state manages federally funded programs. The state may also facilitate mitigation programs by providing technical assistance to local, tribal, and other entities. The last column provides details of each listed program or agency and its policies and capabilities to mitigate hazards in the state. In the 2018 iteration of the plan, there were no new programs added to Table 4-3.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
U. S. Housing and Urban Development (HUD)	All Hazards	Community Development Block Grants (CDBG)	√	√	√	√		Grants to develop viable communities, principally for low and moderate income persons. CDBG funds available through Disaster Recovery Initiative. Contingent upon Presidential Disaster declaration https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs
HUD	All Hazards	Disaster Recovery Assistance		√	√	√		Disaster relief and recovery assistance in the form of special mortgage financing for rehabilitation of impacted homes. https://www.hud.gov/hudprograms/disaster-recovery
HUD	All Hazards	HUD Sustainable Communities	√		√	√		This program supports multi-jurisdictional regional efforts that integrate housing, economic development, transportation, water infrastructure and environmental planning, and assists regional entities and consortia of local governments with integrated decision-making.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
		Planning Grant Program						https://www.hud.gov/program_offices/economic_development/sustainable_communities_regional_planning_grants
HUD	All Hazards	HOME Investment Partnerships Program	√	√	√	√		HOME provides formula grants to States and localities that communities use, often in partnership with local nonprofit groups, to fund a wide range of activities that build, buy, and/or rehabilitate affordable housing for rent or home ownership or provide direct rental assistance to low-income people. The construction is up to standard hazard-resistant building codes. https://www.hud.gov/program_offices/comm_planning/affordablehousing/programs/home/
USDA	All Hazards	Smith-Lever Special Needs Funding	√		√	√		Grants to State Extension Services at 1862 Land-Grant Institutions to support education-based approaches to addressing emergency preparedness and disasters. https://nifa.usda.gov/funding-opportunity/smith-lever-special-needs-competitive-grants-program
USDA	All Hazards	Community	√		√	√		This program provides an incentive for commercial lending tool develop essential community facilities,

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
		Facilities Guaranteed Loan Program						such as fire stations, police stations, and other public buildings. https://www.rd.usda.gov/programs-services/community-facilities-guaranteed-loan-program
USDA	All Hazards	Community Facilities Direct Loans Community Facilities Direct Grants	√		√	√		This program provides direct loans for essential community facilities. https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program
USDA	All Hazards	Community Facilities Direct Grants	√		√	√		This program provides grants to develop essential community facilities. https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
USDA Farm Service Agency	All Hazards	Farm Service Agency (FSA) Disaster Assistance Programs		√	√	√		This program provides emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland and livestock damaged by natural disasters. https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/index?utm_source=landing&utm_medium=spotlight&utm_content=spot3&utm_campaign=fsadisasters
U.S. Department of Health & Human Services	All Hazards	Disaster Assistance for State Units on Aging (SUAs)		√	√	√		This program provides disaster relief funds to those SUAs and tribal organizations who are currently receiving a grant under Title VI of the Older Americans Act. https://www.acl.gov/grants/disaster-assistance-state-units-aging-suas-and-tribal-organizations-national-disasters
U.S. Economic Development Administration (EDA)	All Hazards	Economic Development Administration Investment	√	√	√	√		These programs provide grants that support public works, economic adjustment assistance, and planning. Certain funds are allocated for locations recently hit by major disasters. https://www.eda.gov/programs/eda-programs/

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
		Programs						
U.S. Small Business Administration	All Hazards	Small Business Administration Loan Program		√	√	√		This program provides low-interest, fixed rate loans to small businesses for the purpose of implementing mitigation measures. Also available for disaster-damaged property. http://www.sba.gov/services/financialassistance/index.html
USDA/APHIS/ Veterinary Services	All Hazards	Animal Disaster Program	√	√		√		This program plans and facilitates sheltering of animals during emergency or disaster incidents.
FEMA	All Hazard	Hazard Mitigation Grant Program (HMGP)		√	√	√		This program provides grants to implement long-term hazard mitigation measures after a major disaster declaration. https://www.fema.gov/hazard-mitigation-grant-program
FEMA	All Hazard	Pre-Disaster Mitigation Grant Program (PDM)	√		√	√		This program provides funds for hazard mitigation planning

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								and implementation of mitigation projects prior to a disaster event. https://www.fema.gov/pre-disaster-mitigation-grant-program
FEMA	All Hazard	Hazard Mitigation Funding Under Section 406 (Stafford Act)		√	√	√	√	This FEMA program provides funds for the repair of disaster-damaged facilities that directly reduce the potential of future, similar damages to the repaired facility by subsequent disaster events.
FEMA	All Hazard	Emergency Management Performance Grant	√		√	√	√	This program assists in the development, maintenance and improvement of state, tribal and local emergency management capabilities
Nevada DEM	All Hazard	Disaster Relief Fund		√	√	√	√	This fund provides required matching funds for federal grants for local governments.
Nevada DEM	All Hazard	Emergency Assistance Account		√	√	√	√	This account provides required matching funds for federal grants local governments.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
US Department of Commerce, Economic Development Administration	All Hazard	Disaster Mitigation Planning and Technical Assistance	√		√	√		This provides technical and planning assistance grants for capacity building and mitigation project activities focusing on creating disaster resistant jobs and workplaces.
USDA NRCS	All Hazard	Watershed Program	√		√	√		Through the Watershed Programs NRCS provides technical and financial assistance to States, local governments and Tribes (project sponsors) to plan and implement authorized watershed project plans for the purpose of: watershed protection, flood mitigation, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation, water management, sediment control, fish and wildlife enhancement, wetlands and wetland function creation and restoration, groundwater recharge, easements, wetland and, floodplain conservation, hydropower, watershed dam rehabilitation. http://www.nrcs.usda.gov/programs/watershed/index.html
USDA NRCS	All Hazards	Emergency Watershed		√	√	√		The EWP Program assists sponsors, landowners, and operators in implementing emergency recovery measures

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
		Protection Program						for runoff retardation and erosion prevention to relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed. http://www.nrcs.usda.gov/programs/ewp/
National Science Foundation (NSF)	All Hazards	Decision, Risk, and Management Sciences Program (DRMS)	√		√	√		This program provides grants for small-scale, exploratory, high-risk research having a severe urgency with regard to natural or anthropogenic disasters and similar unanticipated events. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES
DHS, FEMA, NDCNR BCA, Nevada DEM	All Hazards	Homeland Security Grant Programs	√		√	√	√	These programs provide funding to assist state, tribal, and local governments to maintain and improve plans, facilities and equipment. They also fund disaster preparedness exercises and training for emergency services.
NBMG	All Hazards	GIS and HAZUS support	√	√	√	√		NBMG provides expertise in HAZUS loss estimation modeling to support mitigation planning efforts and disaster training.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
NSF	All Hazards	Hazard Reduction Program			√	√	√	NSF provides funding for research and related educational activities on hazards.
US Department of Health and Human Services (USDHHS) (partners with Nevada Department of Health and Human Services (NDHHS) and State Health Division (SHD))	All Hazards	Emergency Management/ Mitigation Training	√		√	√		This program provides training in disaster mitigation, preparedness, and planning for Public Healthcare http://www.cdc.gov/about/business/funding.htm
USACE, USDA-FSA	Drought	Drought Assistance	√	√	√	√		NDA coordinates requests for disaster declarations related to drought. The state's Disaster Assistance Account funding may become available for drought declaration assistance.
DCNR, Division of Water Planning	Drought	Nevada Drought Plan	√		√	√		This document establishes a system for determining drought severity and establishes an administrative coordinating system among agencies to help mitigate

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
								drought impacts. It also establishes a process for obtaining federal assistance if required.
NDWR, Colorado River Water Commission	Drought		√		√	√		Coordination of water distribution for the Colorado River basin among all interested parties.
USDA FSA	Drought	Emergency Conservation Program (ECP)		√	√	√		This program provides emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures in periods of severe drought. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=ecp
USDA FSA	Drought	Emergency haying and grazing		√	?	?		Emergency haying and grazing of CRP acreage may be authorized to provide relief to livestock producers in areas affected by a severe drought. Emergency authorization is provided by either a national FSA office authorization or by a state FSA committee determination utilizing the U.S. Drought Monitor.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								http://www.fsa.usda.gov/Internet/FSA_File/haying_and_grazing_july2012.pdf
Southern Nevada Water Authority, Truckee Meadows Water Authority	Drought	Several water conservation and drought mitigation programs	√		√	√	√	Local government and state agencies and consortia have authority to place restrictions on water use and to implement programs for drought mitigation. TMWA offers information on water conservation at https://tmwa.com/our-environment/water-conservation/ SNWA offers incentive programs and information to encourage water conservation. https://www.snwa.com/
EPA	Drought and Flood	Clean Water Act Section 319 Grants	√		√	√	√	This program provides grants to state agencies to implement non-point source programs, including support for nonstructural watershed resource restoration activities. https://www.epa.gov/nps/319-grant-program-states-and-territories

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
EPA Bureau of Water Quality Planning (BWQP) may have a grant from EPA to fund this type of program/project in NV)	Drought and Flood	Clean Water Act Section 319 Grants	√		√	√	√	This program provides grants to state agencies to implement non-point source programs, including support for nonstructural watershed resource restoration activities.
National Institute of Science and Technology (NIST); FEMA; USDHHS; Department of Interior, USGS; NSF (Partnering with UNR-NBMG, Seismo Lab, UNLV)	Earthquake	National Earthquake Hazard Reduction program (NEHRP) in Earth Sciences	√		√	√		NEHRP Provides grants for seismic mapping for U.S. HAZUS loss-estimation modeling, fault-hazard identification, liquefaction-hazard identification, landslide-hazard identification, probabilistic seismic hazard analysis, ground-shaking microzonation, basin-effect analysis, earthquake process research. http://www.nehrp.gov/contracts/solicitations.htm
CDC, USD	Epidemic	Programs for prevention of epidemic disease	√	√	√	√		CDC Provides funding for preparation for and prevention and control of diseases. http://emergency.cdc.gov/

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
USDA/Animal and Plant Health Inspection Service/ Veterinary Services (Partners with NDA)	Epidemic	Animal diseases	√		√	√		USDA conducts tests for State/Federal program of animal diseases, livestock issues related to food safety, and those animal diseases transmissible to man. https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/!ut/p/z1/04_iUlDg4tKPAFJABpSA0fpReYllmemJJZn5eYk5-hH6kVFm8T7-Js6GTsEGQNrVycDRNcjc19XV08ggyEjfSz8Kv4KC7EBFANjvecc!/
EPA (NDEP has a grant from EPA to manage a Safe Drinking Water Revolving Loan Fund)	Epidemic	Safe Drinking Water Revolving Loan.	√		√	√		This program provides funds to communities, tribes, individuals and others to finance infrastructure improvements to drinking water systems with an emphasis on providing funds to small and disadvantaged communities and to programs that encourage pollution prevention as a tool for ensuring safe drinking water. https://www.epa.gov/drinkingwatersrf
USDHHS	Epidemic	The Hospital Preparedness Program (HPP)	√	√	√	√		This program enhances the ability of hospitals and health care systems to prepare for and respond to bioterrorism and other public health emergencies. https://www.phe.gov/Preparedness/planning/hpp/Pages/d

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								efault.aspx
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	NFIP	√	√	√	√		This program enables property owners to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. https://www.fema.gov/national-flood-insurance-program
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	Flood Mitigation Assistance	√		√	√		This program provides funding to implement measures to reduce or eliminate the long term risk of flood damage. https://www.fema.gov/flood-mitigation-assistance-grant-program
FEMA (Partners with NDWR, Tribes, local and individuals)	Flood	Repetitive Flood Claims	√		√	√		This program provides funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP). https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
EPA (Partners with NDWR, Tribes, local and individuals)	Flood	Wetlands Program Development Grants	√		√	√		This program provides funds for projects that promote research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction and elimination of water pollution. https://www.epa.gov/wetlands/wetland-program-development-grants
USACE (Partners with Tribes, NDWR, CWSD, Truckee River Flood Project (TRFP), Tribes)	Flood	Planning Assistance to States	√		√	√		This program provides funding for the development of plans to conserve water resources, dam safety, flood damage reduction, and flood plain management. https://planning.erdc.dren.mil/toolbox/library/FactSheets/PAS_FS_June2017.pdf
USACE (Partners with Tribes, TRFP, NDWR, Clark County Flood Control Project)	Flood	Flood Plain Management Services	√		√	√		This program provides technical support for effective flood plain management. http://www.nae.usace.army.mil/Missions/Public-Services/Flood-Plain-Management-Services/
USACE (Partners with	Flood	USACE Environmental						This program provides guidance for implementing environmental programs as ecosystem restoration and

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
Tribes, locals, NDWR)		Laboratory						reuse of dredged materials. http://www.erdc.usace.army.mil/Locations/EL.aspx
USDA	Flood	Emergency Watershed Protection Support Services		√	√	√		This program provides funds for implementing emergency measures in watersheds in order to relieve imminent hazards to life and property created by a natural disaster. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/
USDA	Flood	Watershed and Flood Prevention Operations	√		√	√		This program provides funding for soil conservation, development, utilization and disposal of water, and conservation as well as the proper use and conservation of land. https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/
USACE, EPA	Flood	Aquatic Ecosystem Restoration	√		√	√		The purpose of the program is the development of aquatic ecosystem restoration and protection projects that improve the quality of the environment, are in the public interest, and are cost effective.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
								http://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/Section-206/
EPA (Partners with DCNR, BWQP)	Flood	Wetlands Protection and Development	√		√		√	This Federal grant program supports State, Tribal, and local efforts to protect wetlands by providing funds to enhance existing programs or develop new programs. http://www.epa.gov/owow/wetlands/initiative/#financial
EPA (Partners with DCNR, BSDW, Dept. of State Lands)	Flood	Source Water Protection	√		√	√		This program provides funding to states, local and tribes for activities to protect drinking water. http://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Programs
FEMA	Flood	National Dam Safety Program	√		√	√		This program provides financial assistance to the states for strengthening their dam safety programs. https://www.fema.gov/national-dam-safety-program
FEMA (Partners with NDWR, Tribes,	Flood	Community Assistance Program - State	√		√	√		This program provides funding to States to provide technical assistance to communities in the NFIP and to evaluate community performance in implementing NFIP

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
local communities)		Support Services Element						floodplain management activities https://www.fema.gov/community-assistance-program-state-support-services-element
U.S. Department of Energy Partners with Nevada DEM, Desert Research Institute, and NDHHS	Hazardous Materials	DOE's Radiological Assistance Program (RAP)	√		√	√		RAP provides resources (trained personnel and equipment) to evaluate, assess, advise, isotopically identify, search for, and assist in the mitigation of actual or perceived nuclear or radiological hazards. The RAP is implemented on a regional basis, with coordination between the emergency response elements of state, local, and federal agencies. https://nnsa.energy.gov/aboutus/ourprograms/emergencyoperationscounterterrorism/respondingtoemergencies/firstresponders-0
U.S. DOT's Pipeline and Hazardous Materials Administration (Partners with SERC, tribes and local emergency	Hazardous Materials	Hazardous Materials Emergency Preparedness (HMEP) Grant Program	√		√	√		The HMEP program provides financial and technical assistance as well as national direction and guidance to enhance State, Territorial, Tribal, and local hazardous materials emergency planning and training. https://www.phmsa.dot.gov/grants/hazmat/hazardous-materials-grants-program

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
planning committees)								
SERC Partners with local emergency planning committees and state agencies	Hazardous Materials	Superfund Amendment and Reauthorization Act (SARA) Title III	√		√	√	√	Filing fees for reports submitted pursuant to SARA, Title III provide funding for planning, training and equipment activities in emergency preparedness, prevention, mitigation and response capabilities associated with hazardous chemicals. Eligible applicants include LEPCs and state agencies. Funding is available to public officials, fire and police personnel, medical personnel, first responders and tribal personnel through the LEPCs. http://serc.nv.gov/
EPA Partners with Tribes	Hazardous Materials	Hazardous Waste Management grant program	√		√	√		This program supports projects designed to develop and implement hazardous waste management programs that improve the applicant's ability to properly identify, manage, or dispose of hazardous waste. All hazardous waste management activities that address the RCRA Subtitle C "cradle to grave" approach are eligible. https://www.epa.gov/grants/fy-2017-hazardous-waste-management-grant-program-tribes

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities

Funding Agency (Federal, State, Local, Private)	Hazard	Program	Type of Hazard Management Capability		State Involvement			Description of Program, Policy, Regulation; links
			Pre-Disaster	Post-Disaster	Support	Facilitate	Funds	
NDEP	Hazardous Materials	Nevada Brownfields Program		√	√	√	√	The Nevada Brownfields Program currently operates a $2 million dollar revolving loan fund intended to help property owners or developers cover the costs associated with the cleanup of sites with environmental contamination. https://ndep.nv.gov/environmental-cleanup/brownfields
NDEP	Hazardous Materials	Nevada Brownfields Revolving Loan Fund Program		√	√	√	√	The Nevada Brownfields Program currently operates a $900,000 dollar revolving loan fund to help property owners or developers cover the costs associated with the cleanup of sites that are hindered for redevelopment due to environmental contamination and have no viable responsible party. https://ndep.nv.gov/environmental-cleanup/brownfields/funding/revolving-loan-fund
NDEP	Hazardous Materials	Nevada 128(a) Brownfields Program		√	√	√	√	The Nevada 128(a) Brownfields Program provides funding to municipalities and non-profit organizations when there are no viable responsible parties for the assessment and characterization of sites that are abandoned or under developed due to the perception of contamination.

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
								https://ndep.nv.gov/environmental-cleanup/brownfields
EPA	Hazardous Materials	104(k) Brownfields Program		√	√			EPA provides a wide-range of funding opportunities to municipalities and non-profit organizations that may be used to mitigate potential hazards on eligible Brownfields sites. EPA Region IX also may provide Targeted Site Assessment services with their federal monies for Brownfields projects in the State of Nevada http://www.epa.gov/brownfields/
NDEP	Hazardous Materials	Nevada Petroleum Fund		√				This fund provides reimbursement to the qualified storage tank owner/operators for corrective action costs associated with cleaning up petroleum product releases. https://ndep.nv.gov/environmental-cleanup/petroleum-fund

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
NDEP	Hazardous Materials	Nevada Voluntary Cleanup Program		√				This program provides relief from liability to owners who undertake cleanups of contaminated properties under the oversight of the NDEP. https://ndep.nv.gov/environmental-cleanup/brownfields/voluntary-clean-up-program-vcp/voluntary-cleanup-brownfields
USDA FSA	Multiple: drought, infestation, flood	Noninsured Crop Disaster Assistance Program (NAP)		√	√	√	?	Provides financial assistance to producers of non-insurable crops when low yields, loss of inventory or prevented planting occur due to a natural disaster. http://www.fsa.usda.gov/Internet/FSA_File/nap_august_2011.pdf

Table 4-3. Pre- and Post-Disaster Hazard Management Policies, Programs, and Capabilities								
Funding Agency (Federal, State, Local, Private)	**Hazard**	**Program**	**Type of Hazard Management Capability**		**State Involvement**			**Description of Program, Policy, Regulation; links**
			Pre-Disaster	**Post-Disaster**	**Support**	**Facilitate**	**Funds**	
USDA FSA	Multiple: drought, infestation, flood	Supplemental Revenue Assistance Payments (SURE) Program		√	√	√	?	is authorized by the 2008 Farm Bill to provide assistance to producers suffering crop losses due to natural disasters. SURE is available for crop losses due to natural disasters occurring through Sept. 30, 2011. http://www.fsa.usda.gov/Internet/FSA_File/sure_2011.pdf

4.2.2 Policies Related to Development in Hazard-Prone Areas

The State of Nevada has not established a statewide land use plan, although the state provides guidance to the counties and local communities in legislating policies related to development in hazard-prone areas. However, it is the responsibility of the counties to adopt and enforce building code policies within their jurisdictions. Nevada Revised Statutes require each county to have and maintain a Master Plan that regulates development in hazard-prone areas. In addition, organizations, such as the UNCE, and regulating state agencies, such as NDWR, provide a wide array of technical assistance, funding, and support to Nevada communities in the mitigation of hazards.

Nonetheless, one challenge is the current social and political climates, which are not conducive to providing the necessary foundation for the State to promote a uniform statewide "smart growth" policy. NHMPC attempts to promote "smart growth" in its grant-awarding procedures by considering the subapplicant's existing building codes and regulations when prioritizing proposals for mitigation funding. The State's Notice of Intent requires information about the proposed activity's concurrence with the subapplicant's adopted building codes which is provided to NHMPC members with the proposal. Please see a copy of the Notice of Intent in Appendix I and in Section 8.2., Figure 8-2, for the prioritization criteria.

4.2.3 State Funding Capabilities

Nevada has two sources of funding created by the Legislature to assist with hazard management and mitigation.

1. The Emergency Assistance Account (EAA) provides support to state agencies and local jurisdictions during declared emergencies on the state or local level. In order to receive moneys from the EAA, the applicant must declare an emergency or disaster, have a preliminary damage assessment, and disclose financial records within thirty days or forty-five days depending on jurisdiction type. See Appendix E for a copy of the Nevada Administrative Code 414.105 through 414.140 with detailed information on procedures to obtain funding from this State source.
2. The Disaster Relief Account is a special account intended to stabilize the operation of the state government after a disaster. The Interim Finance Committee administers the account. This account is used to match Federal funding for declared disasters. See NRS 353.2735 for details.

4.2.4 Hazard Management Capabilities Changes

With the loss of long-time temporary staff since the 2013 plan, Nevada DEM has been challenged by the inability to replace temporary staff in the short-term. The collaborative approach to mitigation has enabled Nevada's mitigation capability to multiply, since the process involves coordination among government entities at all levels, including tribal nations. The following paragraphs provide a summary of mitigation activities accomplished since the approval of the last plan.

FEMA's unification of the hazard mitigation programs provided an excellent platform for Nevada DEM and NDWR to join forces in the management of the five programs in Nevada. During the update of this plan, the State Flood Plain Manager and the SHMO have worked together to promote

all five programs and provide additional technical assistance to local and tribal government resulting in added number of and improved quality of applications. This resulted in increased funding for the state. In 2012, NDWR ceded the management of the three flood programs to Nevada DEM while maintaining a close working relationship for Unified Hazard Mitigation Assistance Programs (HMA) programs. This remains in effect with this plan update.

Since the approval of the previous 2013 plan, more counties and State agencies have become involved in the planning process. This has promoted networking which has led to a greater awareness of existing mitigation programs. This has resulted in better mitigation planning and related activities in the State. In 2004, five counties and three cities had approved plans. Since the previous state plan was approved in 2013, all counties have maintained a FEMA-approved plan (with the exception of Clark County, which has a completed plan awaiting approval by FEMA). The following counties are in the process of updating plans: Eureka-White Pine (regional plan), Douglas, Washoe, Pershing, Humboldt, and Lander (regional plan), and Nye. The State has promoted the cost effectiveness as well as other benefits of a regional planning approach. Washoe and Clark Counties updated their plans with multi-jurisdictional and regional plans to include incorporated cities, school districts, and tribal nations. Nye County updated their 2013 plan to include the Duckwater Shoshone Tribe of the Duckwater Reservation as an additional jurisdiction. Churchill County included the City of Fallon and the Paiute-Shoshone Tribe of the Fallon Reservation and Colony in its multi-jurisdictional plan. Mineral County included Walker River Paiute Tribe of the Walker River Reservation in their 2016 update. Elko County included the following cities in their 2014 update: Wells, West Wendover, Carlin, and Elko. Lincoln County included the City of Caliente in their 2016 update. Additionally, White Pine and Eureka as well as Pershing, Humboldt and Lander counties are regional areas with low populations but similar topography and hazards, that have joined together to develop regional multi-jurisdictional plans. This has allowed the state to better manage the planning process including training and support with limited state resources.

The SHMO and the NHMPC are increasing public awareness by convening the NHMPC quarterly committee meetings at locations around the state where the local community stakeholders are invited to participate. This process has been challenging due to the two 2017 presidentially declared disasters in northwest Nevada, which have placed more demands on a limited mitigation staff. At these meetings, local community leaders are invited to give presentations on the area's demographics, government, geography, economic, and social profile. Local emergency managers provide specifics on the area's hazards and capabilities or needs and the area Flood Plain Manager presents local flood hazard information and capabilities if known. The State Geologist or representative presents information regarding the HAZUS-MH runs on earthquakes and the SHMO provides information on the Pre Disaster Mitigation (PDM) and Hazard Mitigation Grant Program (HMGP) grants. NBMG provides MyPlan information and data access details. This provides to the community increased awareness of the programs and funding opportunities and provides the NHMPC information to help with their evaluation of applications. The SHMO continues working closely with fiscal staff to increase efficiency in distributing funds to subgrantees and to improve capability for obtaining the cost share requirements. The SHMO continues to take advantage of the administrative funds allocated by HMA programs.

The table below provides information on the number of PDM applications submitted each year. The SHMO and NHMPC continue to provide technical assistance during the application drafting process. The SHMO annually provides a Grant Application Workshop and a BCA Workshop in both northern and southern Nevada.

Table 4-4. HMA Grant Applications

Year	Type	# Submitted	# Approved
PDM 2007	Planning	3	3
	Project	1	1
PDM 2008	Planning	1	1
	Project	4	1
PDM 2009	Planning	1	0
	Project	4	2
PDM 2010	Planning	4	4
	Project	7	4
PDM 2011	Planning	4	1
	Project	3	1
FMA 2011	Planning	0	0
	Project	1	1
PDM 2012	Planning	2	2
	Project	3	1
PDM 2013 – Accepted by NHMPC but not submitted to FEMA because PDM 2013 remains unfunded.	Planning	1	0
	Project	2	0
PDM 2014	Planning	4	4
	Project	1	1
PDM 2015	Planning	1	1
	Project	1	1
PDM 2016	Planning	1	1
	Project	2	2
PDM 2017	Planning	4	4
	Project		

The table and figures below provide HMA funding by year in Nevada, including management costs where applicable. The increased local awareness combined with the technical assistance are demonstrated by the increased funding each year. Also evident is the state's reliance on pre-disaster funding sources for the implementation of mitigation plans.

Table 4-5. Mitigation Funding 2001-2018

Year	Funding by Program			Five-Year Total		
	PDM ($)*	HMGP ($)	FMA ($)	PDM ($)	HMGP ($)	FMA ($)
2001						
2002	297,271	0				
2003	198,125	0		198,125	0	
2004 – SHMP Approved Oct		523,113				
2005	60,064	392,541				
2006	29,115	413,679		89,178	1,329,333	
2007 – Update Approved Oct	561,347					
2008	573,173	489,792				
2009	1,067,996			2,202,515	489,792	
2010	3,515,777					
2011	905,822		1,930,138			
2012	2,598,569			7,020,168	0	1,930,138
2013	355,650.00					
2014	2,255,125	583,609				
2015	400,000					
2016	1,379,989					
2017	407,635.61	4,866,012.26		4,798,399.61	5,449,621.26	
Sub-Total	14,250,008.61	7,268,746.26	1,930,138	14,308,385.61	7,268,746.00	1,930,138.00
Total	**$23,448,892.87**			**$23,507,269.61**		

*Funding amounts reflect selected projects. Funding is conditioned on NEPA review. Flood Mitigation Assistance (FMA)

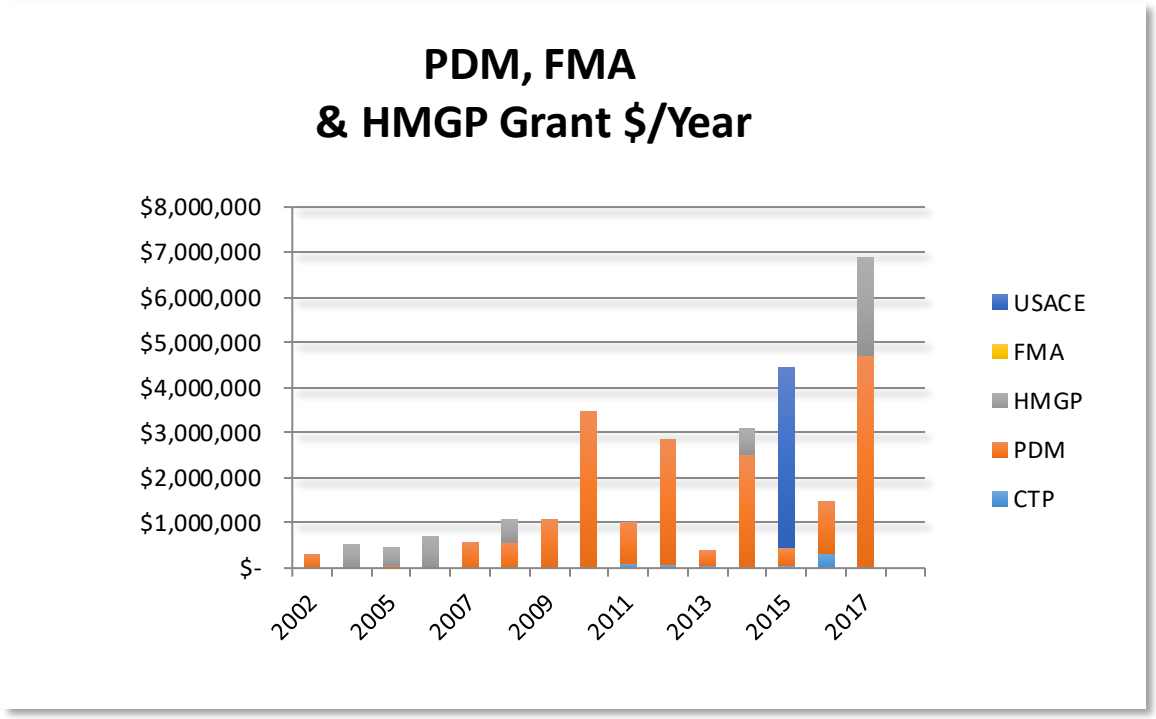


Figure 4-1. PDM, FMA and HMGP Grant Dollars of Funding per Year

The table and figure below provide the PDM, FMA, and HMGP funding by type of mitigation activity and project. Earthquake, flood and wildfire are Nevada's most destructive hazards.

Table 4-6. PDM & HMGP Funding by Hazard Type

Hazard or Grant Type	Amount
Earthquake	$ 888,262.00
Flood	$ 17,994,126.55
Wildfire	$ 1,547,138.50
Public Awareness	$ 36,310.00
Local Planning	$ 1,580,152.71
NHMPC & State Plan	$ 1,558,602.95
Management	$ 1,442,152.88
Total	$ 25,046,745.60

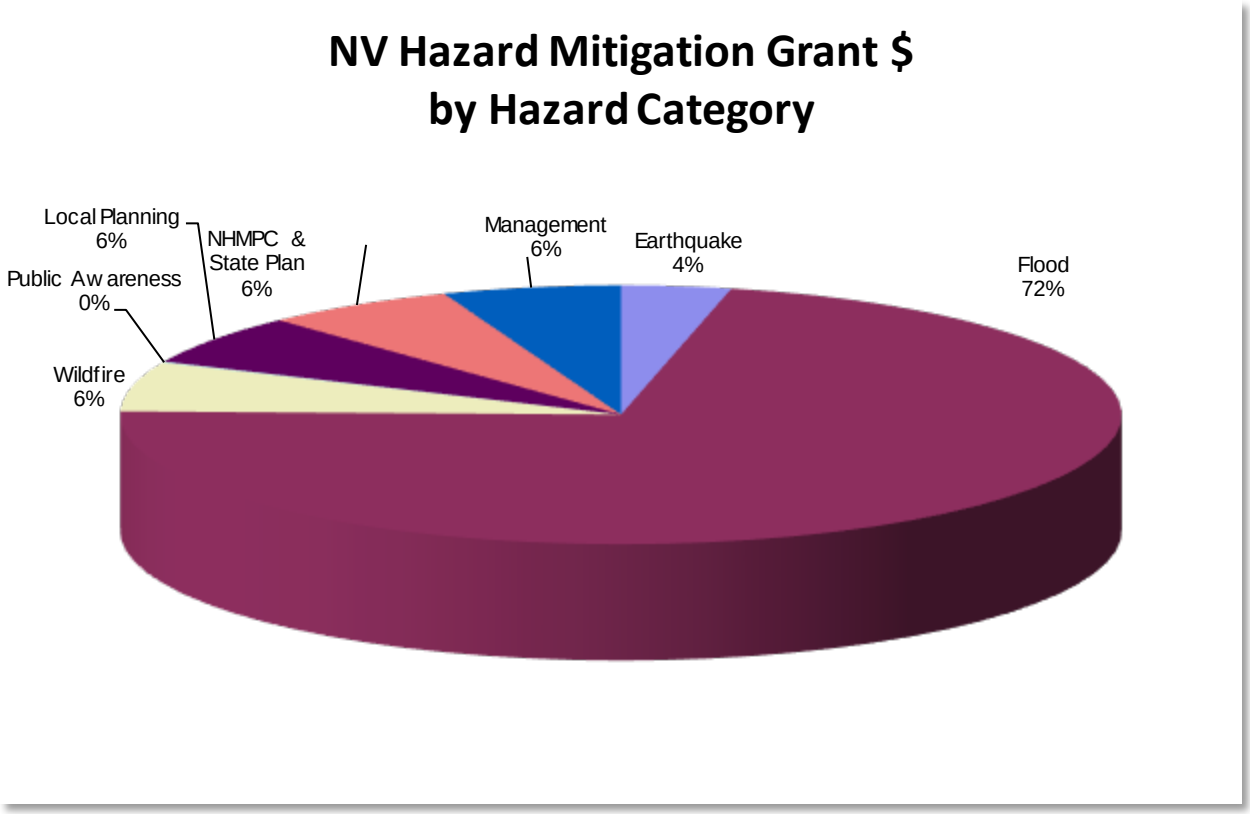


Figure 4-2. PDM, FMA & HMGP Funding by Activity Type

Figure 4-3 below depicts HMA funding by county. Tracking county funding allows the State to provide training and public awareness to counties that are not applying.

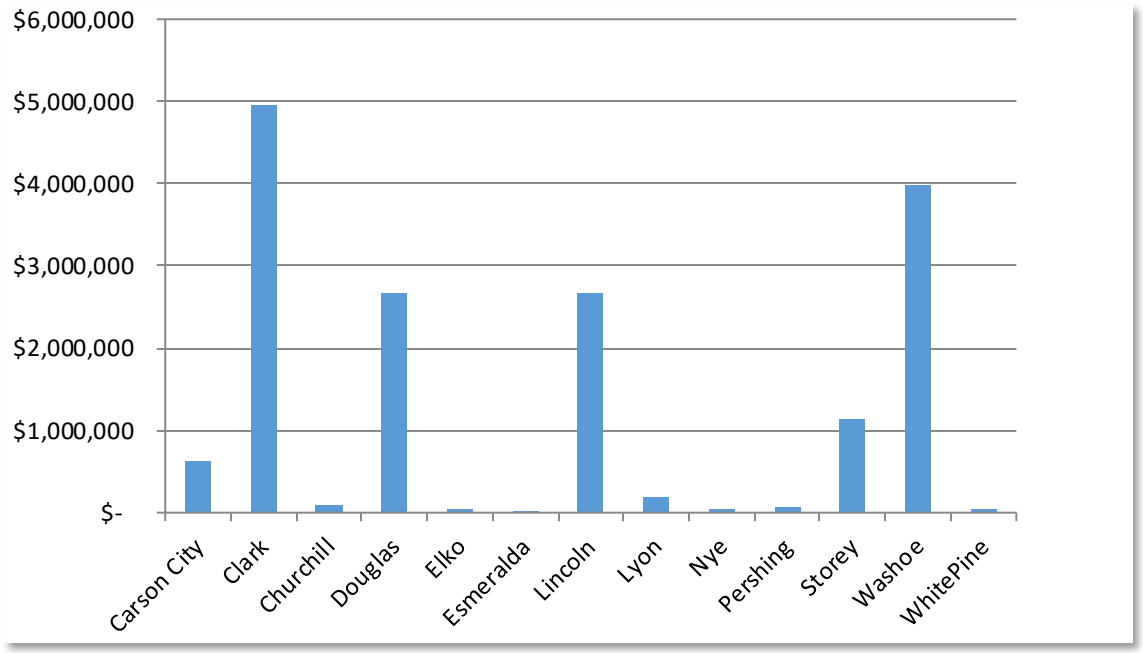


Figure 4-3. Bar Graph of HMA Funding by County

Currently, the Division of Risk Management and SPWD works closely with Nevada DEM, Public Works, and Buildings and Grounds to complete mitigation activities and projects affecting State buildings. This change has an added capability to the State's hazard management programs.

NBMG first ran HAZUS "Loss-Estimation Modeling" earthquake scenarios for each county in Nevada in 2007 and created an updated report with similar data for 38 communities across the state in 2014.That series of models also incorporates ShakeMap data provided by the Seismo Lab. The results are summarized in this report, available in detail in the NBMG publication Open-file 14-5, and is linked up online within the MyHazards and MyPlan websites.

There is continued commitment of the Nevada DEM, NDWR, and NHMPC to a comprehensive mitigation program as evidenced by the development of this Plan, the commitment to local mitigation planning, statewide promotion of mitigation, interdepartmental coordination, and the continuation of training workshops, technical assistance and outreach efforts. Examples of these ongoing efforts are listed below.

1. Nevada DEM and NDWR coordinate regular training sessions on the five HMA programs to assist local governments with grant administration, hazard mitigation planning and related duties.
2. Nevada DEM administers pass-through of HMA grant funds to counties and municipalities to develop DMA 2000-compliant hazard mitigation plans.
3. Nevada DEM coordinates the NHM Planning Subcommittee, which is directly responsible for assisting in the development and updating of this plan.
4. NHMPC and NDWR evaluate and prioritize hazard mitigation grant proposals.
5. NHMPC and NDWR provide advice to Nevada DEM in mitigation planning activities statewide.
6. NHMPC and NDWR improve the level of coordination across state agency programs that share objectives that complement the goals of this plan.
7. Nevada DEM continues to develop the mitigation program's GIS capability with support from UNR, NBMG's existing system.
8. NBMG partnering with Nevada DEM provides and enhances risk and vulnerability assessment data for local and tribal governments.
9. Nevada DEM coordinates local annual Tabletop Exercises (TTX) for Hazard Mitigation plan maintenance statewide.
10. Nevada DEM supports THIRA activities at the state and local level.
11. NDWR manages and coordinates the Silver Jackets team program.

4.3 LOCAL CAPABILITY ASSESSMENT

The requirements for local capability assessment, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S13. Does the plan generally describe and analyze the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)] ***Intent:*** *To ensure the state understands the local and tribal, as applicable, jurisdictions' capabilities to accomplish hazard mitigation, particularly as capability varies across jurisdictions.*	a. The plan must provide a general summary of current local and tribal, as applicable, policies, programs, and capabilities of jurisdictions to accomplish hazard mitigation. b. The plan must describe the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities, including: 1. Challenges to implementing local and tribal, as applicable, mitigation policies, programs, and capabilities. 2. Opportunities for implementing mitigation actions through local and tribal, as applicable, capabilities. c. *If the state is interested in an increased Federal share under the FMA program, the plan must include RL and SRL properties in the analysis of effectiveness. (See RL5 in Section 3.8 Repetitive Loss Strategy.)*

4.3.1 Local Capability Description

The NHMPC has been actively working with local governments to identify the most effective strategic actions for hazard mitigation planning. Nevada has a history of being strong on property rights, but support is growing for policies that will help with hazard mitigation. NHMPC identifies those local governments with policies currently in place that include strong hazard mitigation programs and offers them as positive examples to other Nevada communities and local governments in developing their own effective hazard mitigation plans and ordinances. The State provides guidance to these communities, and supports pass-through funds available to communities interested in adopting hazard mitigation actions.

The existing State model codes are shown in Table 4-7 below and Table 8-4 in Section 8. Adoption of these codes by local jurisdictions is encouraged and will make local mitigation more effective. As stated above, the NHMPC takes into consideration the adoption of building codes by the community applying for hazard mitigation funding when prioritizing proposals.

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
Building and Fire Codes	The State has adopted a building code and local governments are required to adopt and enforce this code with the exception of Clark County. (see NRS 477.030 (12)). **NRS 278.580 –** Building codes: Adoption; fees for permits; applicability to State and Nevada System of Higher Education; authorization of use of materials and technologies that conserve resources in construction and use of solar or wind energy; adoption of seismic provisions and standards **NRS 461.170 –** Division required to adopt by regulation nationally recognized codes and standards for construction, reconstruction and alteration. **NRS 477.030 (1)–**Requires the State Fire Marshal to adopt minimum fire and building codes to ensure fire safety, except as otherwise provided. **NRS 477.030 (12)-** Except as otherwise provided in this subsection, any regulations of the State Fire Marshal concerning matters relating to building codes, including, without limitation, matters relating to the construction, maintenance or safety of buildings, structures and property in this State. Exemptions are provided to a county whose population is 700,000 or more (Clark County, only) and have adopted a code at least as stringent as the *International Fire Code* and the *International Building Code*, published by the International Code Council. **NRS 514.040(3) –** Apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State. **NRS 623 –** Architects, Interior Designers and Residential Designers.	The adoption and enforcement of building and fire codes relates the design and construction of structures to standards established for withstanding wildfires, earthquakes, flooding, dam failure, and high winds.
Zoning	Laws and ordinances regulate development by dividing the community into zones and by setting development criteria for each zone. **NRS 278.147 –** Facilities for use, manufacture, processing, transfer or storage of explosives or certain other substances: Conditional use permit required;	Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use,

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
	application for and issuance of conditional use permit. **NRS 278.160 –** Elements of the master plan (planning and zoning). **NRS 278.580—** Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction **NRS 410.095 through 410.210 –** Regulation and restriction of outdoor junkyards.	or agriculture. Zoning can also be used to control construction by dedicating areas for cluster development or planned unit development. The State currently works with local governments on implementing these last two policies.
Land Use Planning	Comprehensive land use planning provides a mechanism to prevent development in hazardous areas or allows development in a manner that minimizes damage from hazards. Land use planning gives local governments "the big picture" of what is happening in their jurisdiction. **NRS 278.02521 –** Legislative intent (protecting environmentally sensitive areas and maintaining the economic viability of rural lands). **NRS 278.160 –** Elements of master plan (planning and zoning). **NRS 278.580—**Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction. **NRS 321.640 through 321,770 –** State planning of use of land. **NRS 324 –** Lands under Carey Act (regulates use of water and reclamation of water projects). **NRS 376A –** Taxes for development of open space land. **NRS 472 –** State Forester Fire Warden (management of vegetation, cooperative agreements, rangeland fire protection associations, elimination of fire hazards, etc.). **NRS 528 –** Forest practice and reforestation. **NRS 534 –** Underground water and wells	Local governments can use land use planning to identify those areas subject to damage from hazards and work to keep inappropriate development out of those areas. Land use planning can also be used for more regional approach when local governments work together.
Subdivision Regulations	Sets construction and location standards for subdivision layout and infrastructure. **NRS 445D –** Environmental covenants (Uniform Act).	Contains standards for such things as storm water management and erosion control

Table 4-7. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
Capital Improvements Planning	Identifies where major public expenditures will be made over the next 5 to 10 years.	Capital Improvement Plans can secure hazard-prone areas for low risk uses, identify roads or utilities that need strengthening, replacement, or realignment, and can prescribe standards for the design and construction of new facilities.

4.3.2 Local Capabilities General Analysis

At this time all 17 Nevada counties have FEMA-approved mitigation plans. The Subcommittee will integrate the capabilities from local jurisdictions as soon as their completed plans are approved by FEMA. The NHMPC Task Force derived this information from the local jurisdictions' hazard mitigation plans. The following table provides a general summary analysis of the effectiveness of the local capabilities of the completed plans.

Table 4-8. Local and Tribal Capabilities General Analysis				
County	**Effectiveness**			**Comments**
	Legal Regulatory	**Administrative Technical**	**Fiscal**	
Carson City	Excellent	Excellent	Excellent	Plan was approved. Carson City continues to adopt and enforce the most current building codes. They remain strong in their desire to incorporate mitigation projects as well as training and public awareness campaigns.
Churchill	Excellent	Very Good	Very Good	Plan approved. Actively working to implement flood mitigation activities and accomplished quite a bit of flood mitigation during the 2017 January and February flood events.

Table 4-8. Local and Tribal Capabilities General Analysis				
Clark	Excellent	Excellent	Excellent	Plan going through update process. They have excellent mitigation actions in flood awareness and prevention. Currently, they are researching earthquake mitigation actions, but already have regulations dealing with faults and fissures. One community is rated extreme for wildfire risk. The County, State, and Federal agencies implement mitigation activities for wildfire. The most current building codes are in place
Douglas	Very Good	Very Good	Very Good	Plan is approved. Douglas continues with legal, regulatory, and fiscal and administrative capability. Coordination and partnerships have improved in the hazard management field.
Duckwater Shoshone Tribe of the Duckwater Reservation	Very Good	Good	Good	Plan is approved under the Nye County plan.
Elko	Very Good	Very Good	Very Good	Plan is approved. Elko County has the foundation in place to enhance current hazard mitigation strategy. Implementing local mitigation activities.
Esmeralda	Good	Good	Good	Plan approved. Coordination among its agencies improved through the planning process.
Eureka	Good	Good	Good	Plan approved. Currently working on an update in conjunction with White Pine County.
Humboldt	Good	Good	Good	Plan approved as a tri-county regional plan with Pershing and Lander Counties.
Lander	Good	Good	Good	Plan approved as a tri-county regional plan with Humboldt and Pershing Counties.

Table 4-8. Local and Tribal Capabilities General Analysis				
Lincoln	Very Good	Very Good	Very Good	Plan approved. Coordination among its agencies improved through the planning process and implementing a strategy.
Lyon	Good	Good	Good	Plan approved. Currently working on their plan update. The county remains part of a superfund site and this limits some of the flood mitigation available for the county.
Mineral	Very Good	Good	Very Good	Plan approved. The county also did a lot of flood mitigation with the 2017 flood events.
Nye	Good	Good	Good	Plan approved. Nye Co. has the ability to adopt regulations. Additional staff and funding for mitigation purposes would help the growing population. The county will have a turnover in staff with their emergency manager in 2018.
Pershing	Good	Good	Good	Plan approved as a regional tri-county plan with Humboldt and Lander counties. As a rural county, Pershing is limited in staff to increase mitigation efforts.
Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Good	Very Good	Good	Developed an approved plan in conjunction with Washoe County.
Reno-Sparks Indian Colony	Good	Good	Very Good	Developed an approved plan in conjunction with Washoe County.
Shoshone-Paiute Tribes of the Duck Valley Reservation	Good	Good	Good	Plan continues in the update process.
Storey	Very Good	Very Good	Very Good	Plan approved. Storey County has successfully applied for HMA funding and has a current HMGP project pending,

Table 4-8. Local and Tribal Capabilities General Analysis				
Te-Moak Tribe of Western Shoshone Indians of Nevada – Elko Band	Very Good	Very Good	Very Good	Plan remains in update process. They have been challenged by staff turnover.
Washoe	Excellent	Excellent	Excellent	Washoe Co. completed a regional hazard mitigation plan to include tribes, and communities have applied for funding to implement strategy.
Washoe Tribe (Nevada and California)	Excellent	Excellent	Excellent	Plan is currently in the update process. The tribe has been challenged by turnover in staff working on the plan update. They will work to accomplish their update along with state technical assistance.
White Pine	Good	Good	Good	Plan approved as a regional plan with Eureka County.

The NHM Planning Subcommittee will continue to track and analyze the local jurisdictions' capabilities as approved plans enter the update process (all county plans are approved or are in the process of updating their approved plans).

4.4 MITIGATION ACTIONS

The requirements for mitigation actions, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S9. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(3)(iii)[19] and (iv)[20]] ***Intent:*** *To establish specific hazard mitigation actions that will be implemented to reduce the vulnerabilities identified in the risk assessment. This is the heart of the mitigation plan, and is essential to leading statewide mitigation programs to reduce risk.*	a. The plan must identify actions based on the current risk assessment to reduce the vulnerability of jurisdictions within the state as well as the vulnerability of state- owned or operated buildings, infrastructure, and critical facilities. b. The plan must describe the process used by the state to evaluate and prioritize actions that are cost effective, environmentally sound, and technically feasible. c. The plan must describe how each action contributes to the hazard mitigation goals. d. The plan must describe how the local and tribal, as applicable, mitigation strategies are linked with the state mitigation strategy. e. *If the state is interested in an increased Federal cost share under the FMA program, the plan must address RL and SRL properties in the risk assessment.* (*See RL3 in Section 3.8 Repetitive Loss Strategy.*)
S11. Was the plan updated to reflect progress in statewide mitigation efforts and changes in priorities? [44 CFR §201.4(d)] ***Intent****: To evaluate progress in implementing the mitigation strategy and to ensure the plan reflects current conditions, including financial, legal, and political realities and post-disaster conditions.*	a. The plan must describe the status of hazard mitigation actions in the previous plan by identifying those that have been completed or not completed. For those actions not completed, the plan must provide a narrative describing the status (for example, is the action relevant or will it be included in the plan update). b. The prioritization of mitigation actions and activities must be updated based on the updated analysis of risks, capabilities, and progress.

[19] 44 CFR §201.4(c)(3)(iii): "An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified."

[20] 44 CFR §201.4(c)(3)(iv): "Identification of current and potential sources of Federal, State, local, or private funding to

This is the process by which the Subcommittee identified, evaluated and prioritized cost-effective, environmentally sound, and technically feasible mitigation strategy actions

4.4.1 Identification of Cost-Effective, Environmentally Sound, and Technically Feasible Mitigation Actions

To identify strategic actions, we first reviewed the 2013 mitigation strategic actions and projects and requested input from Subcommittee members on any needed additions deletions or changes to the list or any that had been accomplished. Completed mitigation activities are listed in Appendix O.

4.4.2 Evaluation and Prioritization of Strategic Actions and Activities

The standard FEMA-approved STAPLEE process was used as a starting point for the Subcommittee to focus prioritization of action items in the strategic plan. Table 4-9 presents the evaluation criteria of the STAPLEE process as used in development of mitigation strategy.

Table 4-9. STAPLEE Evaluation Criteria for Ranking Mitigation Strategic Action Items

Evaluation Category	Discussion topics	Considerations
Social	Is there public support for the overall mitigation strategy and specific mitigation actions?	Community acceptance; any adverse effects on population
Technical	Is the mitigation action technically feasible and is it a whole or partial solution?	Technical feasibility; long-term solutions; secondary impacts
Administrative	Does the community have the personnel and administrative capabilities necessary to implement the action or will outside help be necessary?	Staffing; funding allocation; maintenance/operations
Political	What do the community and its members feel about issues related to the environment, economic development, safety, and emergency management aspects of the action?	Political support; local champion; public support
Legal	Does the community have the legal authority to implement the action, or must the community pass new regulations?	Local, state, and federal authority; potential legal challenges
Economic	Can the action be funded with current or future internal and external sources? Do the costs seem reasonable for the size of the project, and is enough information available to complete a FEMA Benefit-Cost Analysis?	Benefit/cost of action; contributes to other economic goals; outside funding required; FEMA Benefit-Cost Analysis
Environmental	What is the impact on the environment? Does the action promote a desirable, sustainable and environmentally healthy community for the public?	Effect on local flora and fauna; consistent with community environmental goals; consistent with local, state, and federal laws.

To achieve this, the Subcommittee members were given a spreadsheet containing the action items as rows and the items defining STAPLEE as columns. The members ranked the actions using numbers 1 to 5 with 1 being the lowest rating and 5 the highest rating for each specific action and item. The numbers were added and ranked based on a summation of all points received from members providing input. These results for all of the participating members are shown as a column under the Subcommittee Respondents heading.

A review of the results of the STAPLEE prioritization shows that the 102 strategic action items received scores of between 233 and 326 points each from Subcommittee members; The top 25% scoring 305 and above were ranked as "High" priority strategic action items. The second quartile (scoring 290 to 304) were ranked as "Medium" priority strategic action items and the lower half receiving less than 289 points in the STAPLEE rating process were ranked as "Low" priority strategic action items.

The resulting prioritization of strategic actions effectively constitutes the Mitigation Strategy for the State and is listed below in Table 4-10, Strategic Action Plan Matrix. This listing details not only the ranking of strategic action items, but also the lead agencies for each item, possible funding sources for their highest priority actions, implementation timeline and economic justification. The Subcommittee strongly supports any mitigation action for earthquake, flood, and wildfire — those hazards that are rated "High" and that affect all Nevada communities.

Although this prioritization presents a general framework for mitigation strategy at the state level, it should not be regarded as a rigid set of guidelines dictating all mitigation activity. Actual mitigation efforts across the state are more often directed by the efforts of the local communities and groups who submit innovative, feasible, fundable grant projects with local matching funds for activities of importance to them at the community level. These projects are deserving of state support whenever possible.

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
Action Number	**Strategic Action Item Description**	**Lead Agency Department/ Division**	**Potential Funding Sources**	**Imple-mentation Timeline**	**Economic Justification**	**Prioritization**
5.D	Provide public education and outreach to educate homeowners in the WUI about proper defensible space practices and landscaping for fire resistance and encourage community involvement in project completion, participation, and maintenance	NDF	HMA, Emergency Management Performance Grant (EMPG), Fire Management Assistance Grant (FMAG), USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.A	Protect existing assets, as well as future development, from the effects of wildfire	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AR	Protect the envelop of buildings from wildfire	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.M	Assist communities in fuels reduction projects for areas with extreme or high ratings in CWPP assessments	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.F	Educate and train State and communities in current standards and regulations for	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS,UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and	**HIGH**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	proper practices in defensible space and firefighting				reduce loss of life and injury	
5.AO	Comply with all federal regulations in the funding stream to ensure compliance and future competitiveness	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
4.B	Identify and prioritize areas in the State where existing flood hazard mapping is inadequate due to planned and existing significant development and conduct flood hazard mapping in those areas	NDWR, NDEM	Repetitive Flood Claims (RFC), SRL, PDM, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
4.G	Upgrade State owned or operated infrastructure (e.g. servicing roads, culverts, bridges, channels, and structures) related to State owned or operated critical facilities to protect critical facilities from flood damages or disruption of essential services	NDWR, NDEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AG	Provide public education and outreach to communities affected by wildfire	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.L	Continue to improve fire prevention programs statewide through partnerships with Fire	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and	**HIGH**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	Prevention Association of Nevada, State Fire Marshal's Office, University of Nevada, Reno Cooperative Extension, and any other cooperators.				reduce loss of life and injury	
5.G	Ensure proper personal protective equipment, apparatus, equipment and training for career staff and seasonal wildland firefighters.	NDF	FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
4.A	Protect existing assets, as well as future development, from the effects of flooding	NDWR, NDEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.H	Assist volunteer fire departments in attaining funds for proper personal protective equipment, apparatus, equipment and training	NDF	FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.K	Encourage collaboration on all levels among state, federal and local cooperators, both fire- and resource-related	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
2.H	Promote coordination among state agencies, local governments and tribal organizations of regional hazard mitigation activities	Nevada DEM, NESC, NBMG	HMA, EMPG, FEMA,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
3.AB	Earthquake Early Warning System for Nevada	Seismo Lab	USGS, FEMA, Earthquake	Near future	Reduce injuries and losses from	**HIGH**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
			Hazard Program (EHP)		earthquakes by forewarning people, agencies, and industry that imminent shaking is about to occur allowing safety, economic, and operational measures to be taken	
5.AF	Provide training, expertise, and supplies/equipment in a collaborative manner to assist in rehabilitation	NDF	USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AB	Encourage collaboration at all levels with state, federal and local cooperators	NDF	USDA, BLM, USFS, Living With Fire Program	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AJ	Assist in the formulation and dissemination of current information such as Living with Fire documents	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
3.X	Continue to inventory and field-verify unreinforced masonry buildings in Nevada and make this data publicly available to planners and emergency response staff in communities statewide.	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
5.J	Coordinate the development of a comprehensive, collaborative program for mutual aid/mobilization of state and local government fire resources	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
4.J	Inventory and inspect existing dams for structural and hydraulic adequacy and implement operational constraints, if warranted.	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AP	Keep apprised of all federal, state, and local regulations	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
5.AQ	Participate in interagency project planning, implementation and monitoring	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
3.M	Promote the Great Nevada Shakeout and earthquake drills throughout the state.	NESC, Seismo Lab, NBMG	HMA, NEHRP	ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
4.P	Develop Emergency Action Plans to ensure swift coordinated response in the event of an emergency	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
4.I	Inventory existing dams and add to the inventory as dams are discovered or constructed.	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
2.F	Continue to build operational links between hazard mitigation, disaster preparedness and recovery programs with public and private sectors	Nevada DEM, DWR,	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**HIGH**
2.A	Provide technical assistance, guidance, resources and tools to local governments and tribal entities to promote hazard mitigation planning	Nevada DEM, DWR	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
4.H	Protect existing assets as well as future development from the effects of dam failure	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AN	Assist in the planning for and removal of biomass waste on fuels reduction and forest health projects, as well as following wildland fires, flooding and other catastrophic natural event.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AC	Assist communities and State in Burned Area Emergency Rehabilitation, and complete fire damage reclamation reports	NDF	USDA, BLM, USFS, NRCS, USACE, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and	**MEDIUM**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	and public education and outreach to provide the best land management practices available for collaborative land rehabilitation				reduce loss of life and injury	
5.AL	Assist, encourage and provide guidance to communities in the development of the appropriate fire service organization for their community (i.e. a legally constituted fire protection district or fire department) according to NRS 472.040	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
4.K	Install early warning weather stations in watersheds with dams above populated areas	NDWR, Nevada DEM	NWS, NOAA, USGS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
3.G	Encourage seismic retrofit of public safety and critical facilities (both community and State) (such as 911 communications, hospitals, fire, law enforcement and ambulance facilities, etc.)	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, NDF, Local Fire Department	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AH	Focus fuels projects in communities with extreme or high ratings in CWPP assessments	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
5.C	Assist local communities in enacting local ordinances for mitigation and fire prevention	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.N	Provide funding and service forestry technical assistance through the State Fire Assistance and Hazardous Fuels Reduction programs to reduce fuels on state and private property	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
3.N	Promote training of volunteer CERT about earthquake risks and possible mitigation activities.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
2.B	Provide specialized training and exercises to state agency staff and local governments concerning local hazard mitigation planning and the local hazard mitigation plan program	Nevada DEM, NDWR	HMA, EMPG, CDBG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AK	Encourage community involvement in project completion, participation, and maintenance.	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.E	In highly motivated communities, focus on activities by individual	NDF	HMA, EMPG, FMAG, USDA,	Ongoing	Reduce economic impact of hazards on infrastructure and	**MEDIUM**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	participation in and maintenance of projects (personal responsibility)		BLM, USFS,UNCE		reduce loss of life and injury	
5.AD	Assess damage to critical watershed and threats to communities' domestic water supplies and mitigate those threats through erosion control practices	NDF	USDA, BLM, USFS, NRCS, USACE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
4.L	Assist communities and State in structural mitigation measures, updates, and repairs to dams	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
3.F	Encourage seismic retrofit of deficient essential structures and infrastructure of community and State critical facilities (economic and lifeline-utilities) to structurally and seismically withstand the effects of earthquakes.	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.Y	Use mechanical and hand treatments as well as prescribed fire to assist in attaining desired forest and rangeland conditions	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
1.D	Promote the modification of structures to meet life safety standards	Nevada DEM, NDWR	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
4.N	Identify hazards of flooding from man-made structures, such as irrigation ditches and canals, and integrate these into local zoning ordinances	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
3.S	Give planning and special consideration to developing a "Fault Map of Nevada" and identifying all active faults and seismic sources near major urban areas in Nevada.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.U	Work closely with the Tribal communities, local landowners, and the SHPO to obtain clearances and to mark sensitive sites	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.V	Provide assistance to communities and State in planning and implementing long-term sustainable landscape projects	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
4.O	Develop laws and regulations that ensure reasonable standards of design and construction to reduce flood hazards	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AI	Assist with the development of and participation in a comprehensive program by which current CWPP or equivalent assessments are updated as projects are	NDF	USDA, BLM, USFS, NRCS, UNCE, Living With Fire Program, FEMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	completed, ratings change or new at-risk communities arise.					
5.Z	Provide native and accepted introduced seed species through the Nevada State Seedbank program	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
5.AM	Assist in acquiring funding for local firefighters for training and equipment through the State Fire Assistance, and Volunteer Fire Assistance when funded by US Forest Service.	NDF	USDA, BLM, USFS, NRCS, UNCE, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
4.H	Protect existing assets as well as future development from the effects of dam failure	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**MEDIUM**
1.A	Improve awareness of the locations, potential impacts and links among hazards, vulnerability and measures to protect life safety and health	Nevada DEM, NDWR	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency Response Commission, Local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
1.G	Develop a hazard communication system that can be used to rapidly detect and provide early warning for multiple hazards, including earthquakes and wildfires	Nevada DEM, NDWR	HMA, EMPG, BLM, NDF, USFS, SERC, Local Fees	12-18 Months	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
3.Z	Identify potential funding sources for earthquake mitigation strategic actions not only at the Federal and State levels but also from private funding and community partnerships.	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.L	Develop earthquake hazard information programs targeting public safety, emergency managers, local government executives, and business and industry.	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, NDF, Local FD	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
1.E	Improve communication, collaboration and integration among stakeholders and promote hazard mitigation as an integrated public policy	Nevada DEM, NDWR	HMGP, EMPG, USGS, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
4.D	Retrofit State buildings to meet NFIP standards	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE, NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.P	Improve integration of the emergency management system at all levels of the community bringing forth the "whole community" approach.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
1.C	Encourage the incorporation of mitigation measures into repairs, major alterations, new	Nevada DEM, NDWR	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency	Ongoing	Reduce economic impact of hazards on infrastructure and	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	development and redevelopment practices		Response Commission, Local fees		reduce loss of life and injury	
5.B	Identify and recommend changes to State NRS, NAC and communities ordinances and regulations	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.O	Provide assistance to counties for priority setting and CWPP updating	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
1.F	Encourage local governments, special districts and tribal organizations to develop, adopt and implement, maintain and update hazard mitigation plans	Nevada DEM, NDWR	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
2.G	Promote understanding by the general public of the benefits of hazard mitigation in reducing casualty and property losses and ensuring continuity of businesses, institutional and government functions	Nevada DEM, NDWR	HMA, EMPG, NHERP, NSF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
1.B	Provide current information about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application procedures to State and local agencies	Nevada DEM, NDWR	HMA, EMPG, DHS grant, USFS, FMAG, BLM, Emergency Response Commission, Local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
4.E	Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and severe repetitive loss structures.	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
4.M	Encourage local ordinances and regulations to reduce encroachment into flood prone zones resulting from dam impoundment or high (non-failure) releases.	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, NRCS, USDA	Ongoing	Reduce the impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.Q	Provide publications and workshops to promote the exchange of technical information relating to earthquakes among professionals, managers and the citizens of Nevada.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
2.C	Maintain a tracking system for local and state government mitigation plans and projects	Nevada DEM, NDWR	HMA, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
2.I	Identify, enhance and integrate public education efforts by state and local agencies that have programs directed to hazard mitigation	Nevada DEM, NDWR	HMA, EMPG, FMA, RFC, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
4.C	Conduct flood hazard mapping in piedmont and alluvial fan environments	NDWR, Nevada DEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE,NRCS, USDA, USGS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.B	Hold workshop on strategies, benefits, risk-reduction opportunities, and challenges associated with the inventory of seismically susceptible buildings	Nevada DEM, NDWR	HMA, EMPG, FMA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.W	Restore native and adapted vegetation and work to prevent areas being impacted by non-native or undesirable species conversions through collaborative efforts.	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.A	Protect existing assets, as well as future development, from the effects of earthquakes by providing setback criteria for building and development	Nevada DEM, NDWR	HMA, EMPG, FMA, RFC	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.P	Provide a statewide evaluation process for monitoring community progress, prioritization and participation in CWPP	NDF	locals?	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.K	Expand earthquake awareness in educational sites such as regional science fairs, and speakers	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, NDF, UNR Coop Extension	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
3.I	Increase media involvement by networking with partners from all media types such as print, radio, TV, and social media.	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.AE	Supply resources for rehabilitation efforts through the State Tree Nurseries in Las Vegas and Washoe Valley, and the Nevada State Seedbank programs.	NDF	NDF	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.Y	Promote coordination among private and public entities to improve statewide earthquake monitoring capabilities.	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.E	Create microzonation of earthquake hazards in Nevada	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
4.F	Assist communities and State with programs dealing with Repetitive Loss and Severe Repetitive Loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies.	NDWR, NDEM	RFC, SRL, PDM, HMGP, FMA, EMPG, USACE,NRCS, USDA	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.O	Promote training of hospital staff about earthquake risks and possible mitigation activities.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
					reduce loss of life and injury	
2.D	Provide training to local governments and state agency staff to clarify mitigation measures from response and recovery and preparedness measures	Nevada DEM, NDWR	HMGP, EMPG, Interoperable Communications, USGS, USFS, BLM, FEMA, BOR	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.R	Focus projects in areas to attain desired forest conditions and coordinate with forest health program activities	NDF	USDA, BLM, USFS, locals	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.V	Create earthquake planning scenarios (Las Vegas and rural areas).	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.W	Determine potential fault rupture characteristics and maximum earthquakes.	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.C	Assist communities and State to retrofit, change occupancy to decrease risk, or demolish susceptible buildings and structures	Nevada DEM, NDWR	HMA, EMPG, USGS, Interoperable communications, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
2.E	Maintain a system to allow state agencies with hazard mitigation programs and plans to make recommendations	Nevada DEM, NDWR	HMA, EMPG, Local fees, SERC	Ongoing	Reduce economic impact of hazards on infrastructure and	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	about how local governments can incorporate these in support of the state's mitigation program efforts				reduce loss of life and injury	
5.I	Participate in research and development of interoperability for emergency response communications	NDF	HMA, EMPG, FMAG, USDA, BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.H	Develop lesson plans or activities for teachers to increase awareness about Nevada's earthquake hazard that tie into the existing science curriculum and align with the science standards for the state.	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, SHPO,	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.S	Ensure that all projects have an approved fuels/forest health/stewardship plan that includes all aspects of service forestry (State Historic Preservation Officer (SHPO) (threatened and endangered species, prescriptions, actions, etc.)	NDF	USDA, BLM, USFS, locals	ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.AA	Develop a set of model codes and regulations that would be presented after a major earthquake occurs in Nevada.	NESC, Seismo Lab, NBMG	HMA, NEHRP, EMPG	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.Q	Provide and maintain a statewide process for	NDF	locals?	Ongoing	Reduce economic impact of hazards on	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	documenting fuels projects progress, completion, success and maintenance				infrastructure and reduce loss of life and injury	
3.U	Enhance implementation of nonstructural remediation.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.AA	Provide training for local cooperators for treatment practices and skill acquisition	NDF	USDA, BLM, USFS, locals, private	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.T	Establish a "lifelines and transportation" workgroup.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.R	Promote a post-earthquake technical clearinghouse through planning and established practices.	NESC, Seismo Lab, NBMG	HMA, NEHRP	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
3.J	Provide Applied Technology Council (ATC) training and develop formalization of the process	NESC, Seismo Lab, NBMG	HMA, EMPG, USFS, BLM, UNCE	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**
5.T	Provide training for employees and project managers on SHPO and cultural resource	NDF	BLM, USFS	Ongoing	Reduce economic impact of hazards on infrastructure and	**LOW**

Table 4-10. Strategic Action Plan Matrix; 2018 NHMP Prioritization of Strategic Actions						
	identification, reporting methods and clearances				reduce loss of life and injury	
3.D	Create planning for "special consideration zones" for Nevada communities	Nevada DEM, DWR	HMA, EMPG, USGS, FMA, FEMA, local fees	Ongoing	Reduce economic impact of hazards on infrastructure and reduce loss of life and injury	**LOW**

The Subcommittee will continue to evaluate all the listed strategic action items during its quarterly meetings for validity and revise the related plan sections accordingly. Any significant revisions will be submitted to FEMA as they occur.

The action items provided by each of the lead agencies participating in the NHM Planning Subcommittee meetings fall into one of the following broad mitigation strategy categories.

Prevention: These strategic activities are especially effective in areas where development has not occurred or capital improvements have not been substantial. For example:

- Planning and zoning
- Hazard mapping
- Building codes
- Studies, data collection and analysis
- Open space preservation
- Floodplain regulations
- Storm water management

Property Protection: Examples of activities for property protection are listed below. These actions enable structures to better withstand hazard events or remove structures from hazardous locations.

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection and/or hardening
- Retrofitting
- Insurance

Natural Resource Protection: These activities reduce the impact of hazards by preserving or restoring the natural function of environmental systems. These measures serve the dual purpose of protecting lives and property while enhancing environmental goals. These activities are usually carried out by parks, recreation or conservation organizations.

- Floodplain protection
- Fire resistant landscaping
- Fuel breaks
- Watershed protection

Structural Projects: These projects modify the physical environment of the structures to lessen the impacts of a hazard.

- Levees/dikes/floodwalls
- Reservoirs
- Diversion, detention, retention dams

Emergency Services: These activities are generally not considered as mitigation techniques, but they minimize the impact of a hazard on people and property.

- Warning system
- Evacuation planning and management

Public Information and Awareness: These activities are used to advise residents, business owners, visitors and government officials about hazards, hazardous areas, and mitigation techniques used to protect life and property.

- Outreach and education
- Training
- Public service announcement

4.4.3. Actions in Local Plans & State Mitigation Strategy

The NHMPC's quarterly meetings are now being conducted at a different county each quarter. A list of the local planning area goals and actions, when available, is provided to the NHMPC members prior to the meeting, providing them with background on mitigation strategy identified by the locals. It also provides input for NHMPC to reflect these local mitigation strategies in the state goals and objectives.

Although local agencies are independent in their development of mitigation goals and actions, the state provides a plan format as a recommended guide. The plan format provides a sample list of mitigation goals and objectives that mirror the state strategy. The final local actions are reviewed by NHM Planning Subcommittee members and NHMPC as each local plan is submitted. This dual process of similar goals and actions provide familiarity and supports the development of concurrent action items for both state and local plans.

Some tribal entities have chosen to develop mitigation plans as governmental entities at the State level and their planning process did not include a review by the State of Nevada. They received their funding directly from FEMA. Nevada provides technical assistance to tribal entities only when requested. When the information on goals and actions is available Nevada DEM will distribute it to the NHMPC members.

4.5 FUNDING SOURCES

The requirements for funding sources, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S10. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR §201.4(c)(3)(iv)] ***Intent:*** *For the responsible entity to take action to complete activities and projects as funding opportunities to implement them arise.*	a. Each mitigation action or project must include the identification of current and/or potential sources of Federal, state, local, tribal, as applicable, or private funding for implementation. b. At a minimum, the plan must identify FEMA mitigation funding sources, including, if applicable, but not limited to HMGP, PDM, FMA, and PA C-G.[21] c. *If the state is interested in an increased Federal cost share under the FMA program, the plan must address identify current and potential sources of funding with respect to RL and SRL properties. (See RL4 in Section 3.8 Repetitive Loss Strategy.)*

[21] Stafford Act, §406(e) Repair, Restoration, and Replacement of Damaged Facilities and 44 CFR §206.226 Restoration of damaged facilities. FEMA Recovery Policy 9526.1 "Hazard Mitigation Funding Under Section 406 (Stafford Act)", dated March 30, 2010.

4.5.1 Current Funding Sources

Since 2010, the State of Nevada has used the funding sources shown in the table below for mitigation activities. Local jurisdictions supply matching funds and at times fully support mitigation activities without assistance from Federal or State resources. The rural counties have less economic, administrative, and technical capability to manage and support mitigation activities. The more populous counties, Clark, Carson City, Douglas, Washoe and to a limited extent, Elko have programs that support mitigation activities, such as paid fire departments, flood control districts and the ability to enforce land-use regulations. For additional sources of funding currently available for mitigation activities, see Table 4-3 in Section 4.2.1. This table will be updated as the Subcommittee finds new funding sources to implement mitigation activities.

Table 4-11. Current Funding Sources for Strategic Mitigation Actions	
Description	**Comments**
Clark County Flood Control District	Develops flood control projects countywide
FEMA	For pre-disaster and post-disaster mitigation and emergency funding, HMGP, PDM, FMA, RFC, FMAG
National Weather Service	Early warning public announcements
Nevada Division of Forestry	Administers funding from FEMA, BLM, and U.S. Forest Service for wildfire emergency and mitigation funding, except for HMGP and PDM
Nevada Earthquake Safety Council	Allocates FEMA money for earthquake mitigation efforts
Nevada State Emergency Response Commission (SERC)	Administers state and federal money for pre-disaster funding in mitigation efforts for Hazardous Materials
Nevada Mining Association, Newmont Gold, Barrick Mines, and other individual mining companies.	Donations, public awareness, and/or mitigating their structures for hazard safety
Private individuals	Provide labor and matching costs for mitigation activities.
Southern Nevada Water Authority	Provides incentives to preserve water
Truckee Meadows Water Authority	Regulates the use of water in the Truckee Meadows
Truckee River Flood Management Authority	Responsible for implementing the "Living River" project that eliminates flood risk throughout the Truckee River.
U. S. Army Corps of Engineers (ACE)	Mitigation and emergency funding for any navigable river, stream, or waterway
U. S. Bureau of Land Management	Funding for plans and projects for wildfire and urban-wildfire interface
U. S. Forest Service	Provides emergency and mitigation funding for wildfire
U. S. Geological Survey	UNR and UNLV have participated in the external grants program of the USGS portion of the National Earthquake Hazard Reduction program.
U. S. HUD Community Development Block Grants (CDBG)	State-administered Small Cities CDBG grants program to smaller units of local government for community development activities. Annually, each State develops funding priorities and criteria for selecting projects to address a wide range of community development needs including hazard mitigation
United We Stand	Special License Plate that funds first responder training and equipment.
Volunteer Fire Departments (local and paid)	Local fundraisers and local jurisdictions; general fund

4.5.2 Potential Funding Sources

In addition to federal agencies already providing hazard mitigation funding (see Table 4-3, Section 4.2.1), Table 4-12 lists several potential funding sources in the private sector for mitigation activities. This table will be updated as the Subcommittee discovers new potential funding sources for implementing strategic mitigation activities.

Table 4-12. Potential Funding Sources for Strategic Mitigation Activities

Private Sources	Comments
Casinos	Donations, public awareness, and/or mitigating their structures for hazard safety
Construction (New Development) Companies, Contractors	Donations, public awareness, and/or mitigating their structures for hazard safety
Federal Emergency Management Agency	Through the PDM and the HMGP funded local jurisdiction hazard mitigation plans, FMA, Community Assistance Program, National Dam Safety Program, NFIP and flood modernization programs, etc.
Housing and Urban Development	CDBG
Intermountain Farmers Association, Nevada Cattlemen's Association, etc.	Public awareness and/or mitigating their structures for hazard safety
Local communities/districts	Fire districts, school districts, general improvement districts, county and city governing authorities have all provided in-kind or cash matching sources for all the activities accomplished through federal sources.
Local media	Offering free public safety announcements
National Science Foundation	Earthquake risk reduction
Private Insurance Companies Farmers Insurance, AIG, Allstate, etc.	Public awareness, incentives for mitigation activities, and mitigation training.
U. S. Army Corps of Engineers	Design and construction of local flood control projects, riverbank protection, floodplain management, etc.
U. S. Department of Agriculture	Waterway protection from erosion: Environmental Quality Incentives Program (EQIP), Agricultural Management Assistance (AMA), Conservation Stewardship Program (CSP), Conservation Reserve Program (CRP)
U. S. Department of Agriculture	Invasive species protection programs: EQIP, Grassland Reserve Program (GRP), Wetlands Reserve Program (WRP), CSP, CRP
U. S. Department of Agriculture	Wildfire protection programs: EQIP, GRP, WRP, CSP, AMA
U. S. Department of Agriculture	Animal disease, rural development, flood control projects, etc.
U. S. Department of Agriculture	Severe wind damage protection: EQIP, CSP
U. S. Department of Energy	Stream gauging, flood monitoring, disaster mitigation planning and technical assistance, disaster resistance jobs and workplaces, etc.
U. S. Department of Health and Human Services	Medical emergency management and mitigation, training and preparedness, etc.
U. S. Environmental Protection Agency	Wetlands protection, emergency watershed protection, Clean Water Act, etc.

Table 4-12. Potential Funding Sources for Strategic Mitigation Activities	
Private Sources	**Comments**
U. S. Bureau of Land Management	Funded CWPPs and WUIs
U. S. Geological Survey	Earthquake hazard reduction, mapping, etc.

4.6 REPETITIVE LOSS AND SEVERE REPETITIVE LOSS

This Section addresses the State's strategy for mitigation of repetitive loss properties including Severe Repetitive Loss properties.

ELEMENT	REQUIREMENTS
RL. Did the state develop a Repetitive Loss Strategy? [44 CFR §201.4(c)(3)(v)] ***Intent:*** *Describe how the state intends to reduce the number of repetitive loss properties (which must include severe repetitive loss properties).*	1. RL1. Did Element S6 (risk assessment) address RL and SRL properties? [44 CFR §§201.4(c)(2)(ii), 201.4(c)(2)(iii), and 201.4(c)(3)(v)] 2. RL2. Did Element S8 (mitigation goals) address RL and SRL properties? [44 CFR §§201.4(c)(3)(i) and 201.4(c)(3)(v)] 3. RL3. Did Element S9 (mitigation actions) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iii) and 201.4(c)(3)(v)] 4. RL4. Did Element S10 (funding sources) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iv) and 201.4(c)(3)(v)] 5. RL5. Did Element S13 (local and tribal [as applicable] capabilities) address RL and SRL properties? [44 CFR §§201.4(c)(3)(ii) and 201.4(c)(3)(v)] 6. RL6. Did Element S15 (prioritizing funding) address RL and SRL properties? [44 CFR §§201.4(c)(4)(iii) and 201.4(c)(3)(v)] ***Special Consideration:*** Descriptions of the various programs and initiatives to meet this requirement do not need to be repeated in a separate section. However, if the documentation to meet this requirement is not a separate section, the Plan Review Tool (refer to Appendix B: State Mitigation Plan Review Tool) should identify where in the plan the descriptions are found.

Legislative changes made in the Biggert-Waters Flood Insurance Reform Act of 2012 define a **Severe Repetitive Loss** (SRL) property as a **structure** that:

a. Is covered under a contract for flood insurance made available under the NFIP and
b. Has incurred flood-related damage
    i. For which four or more separate claims made available under flood insurance coverage with the amount of each such claim exceeding $5,000, and the cumulative amount of such claims payments exceeding $20,000; or

ii. For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

A **Repetitive Loss** (RL) property is a structure covered by a contract for flood insurance made available under the NFIP that:

a. Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event; and
b. At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance.

Existing NFIP data for the State of Nevada indicate that there is currently one SRL and two RL properties in the State that fulfills the criteria defined above.

The NHM Planning Subcommittee will continue to monitor data from the NFIP to identify any SRL properties in the State. The goal is to address any repetitive flood structure to avoid it becoming an SRL. Should the State develop any additional SRL properties in the future, the following strategy will be followed to mitigate such SRL occurrences.

4.6.1 Goals that Support Mitigation Activities for Repetitive Loss Properties

State mitigation goals that support the selection of mitigation activities for RL properties are Goal 1 – Reduce the loss of life and injuries, and Goal 4 – Reduce the possibility of damage and losses due to flooding. See Section 4.1.2 for more detail on goals and actions.

4.6.2 Repetitive Loss and State & Local HM Policies, Programs & Capabilities

Section 4.2.1, Table 4-3 provides Nevada's policies, programs and capabilities for flood hazards. Additionally, NDWR manages floodplain managers. NDWR works with local communities to address NFIP issues and flood mapping. This provides communities with guidance and assistance in hazard mitigation projects.

4.6.3 Repetitive Loss Properties in Risk Assessment

Table 3-17 in Section 3.3.7.3.2 provides a summary of RL and SRL properties due to flood for each community in Nevada. Section 3.3.7.3.3 provides a description of partnerships and stakeholders with whom Nevada cooperates to reduce repetitive losses from floods.

4.6.4 Mitigation Actions for Repetitive Loss and Severe Repetitive Loss Properties

Section 4.1.2., Table 4-2, Goal 4, Action item 4.E and 4.F provide actions effective in mitigating and reducing the flood hazard in repetitive loss and severe repetitive loss properties in Nevada. Specifically:

Action item 4.E: "Assist communities and State with programs to elevate, dry-flood proof or wet-flood proof identified structures to obtain NFIP compliance and/or mitigate repetitive loss structures and Severe Repetitive Loss structures, "and

4.F "Action 4.F: " Assist communities and State with programs dealing with Repetitive Loss and Severe Repetitive Loss structures; these programs may involve acquisition and demolition; relocation; elevation or other mitigation strategies." The STAPLEE process was used to prioritize actions.

4.6.5 Specific Actions Implemented to Mitigate Repetitive Loss Properties

See Section 3.3.7.3.3 and Appendix O for examples of actions implemented in Nevada to mitigate repetitive loss properties. In addition, TRFMA is using 2017 HMGP funds on a home elevation project of two repetitive loss structures. Through Nevada DEM, TRFMA utilized PDM 2015 and PDM 2016 grants to demolish structures along the Truckee River, which is still in progress as of February 2018.

The TRFMA is utilizing PDM 2016 and HMGP funds to elevate flood-prone residences in the Hidden Valley area of Washoe County, making the properties more resistant to flood damage.

In a separate area within the Carson River SFHA, residences located in flood-prone areas were elevated.

Nevada has applied for FMA funding but has not yet been selected for further review.

4.6.6 Funding for Repetitive Loss Properties

Sections 4.5.1 and 4.5.2 identify current and potential sources of Federal, State, local, and private funding to implement mitigation activities for repetitive loss properties.

This section provides a description of the State of Nevada's support in the development and maintenance of local mitigation plans. *Major accomplishments in this section since the last iteration of the NHMP include the following:*

- *16 counties have FEMA-approved HM plans (at the time of writing, the Clark County plan is awaiting FEMA approval).*
- *Six tribal entities have updated plans, and three are in the process of updating.*
- *The State has developed and successfully implemented a "Tabletop Exercise" for updating of local plans*
- *Successfully developed and used the MyPlan website for the exchange of hazard mitigation data with local and tribal entities*
- *Integrated LHMP data into the current Enhanced State Plan*

5.1 LOCAL FUNDING AND TECHNICAL ASSISTANCE

The requirements for local funding and technical assistance for the development of local mitigation plans, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENTS	REQUIREMENTS
S13. Does the plan generally describe and analyze the effectiveness of local and tribal, as applicable, mitigation policies, programs and capabilities? [44 CFR §201.4(c)(3)(ii)] ***Intent:*** *To ensure the state understands the local and tribal, as applicable, jurisdictions' capabilities to accomplish hazard mitigation, particularly as capability varies across jurisdictions.*	a. The plan must provide a general summary of current local and tribal, as applicable, policies, programs, and capabilities of jurisdictions to accomplish hazard mitigation. b. The plan must describe the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities, including: 1. Challenges to implementing local and tribal, as applicable, mitigation policies, programs, and capabilities. 2. Opportunities for implementing mitigation actions through local and tribal, as applicable, capabilities. c. *If the state is interested in an increased Federal share under the FMA program, the plan must include RL and SRL properties in the analysis of effectiveness. (See RL5 in Section 3.8 Repetitive Loss Strategy.)*

ELEMENTS	REQUIREMENTS
S14. Does the plan describe the process to support the development of approvable local and tribal, as applicable, mitigation plans? [44 CFR §§201.3(c)(5)[23] and 201.4(c)(4)(i)[24]] ***Intent:*** *To direct state resources toward effective local and tribal, as applicable, mitigation planning.*	a. The plan must describe how the state supports developing or updating FEMA-approvable local and tribal, as applicable, mitigation plans, including the process used to provide: 1. Training; 2. Technical assistance; and 3. Funding *[NOTE: criteria for prioritizing funding for planning and project awards are addressed in S15].* b. The plan must provide a summary of the: 1. FEMA-approved local and tribal, as applicable, mitigation plan coverage; 2. Barriers to developing or updating, adopting, and implementing FEMA-approved local and tribal, as applicable, mitigation plans; and 3. Approach to remove barriers in order to advance local and tribal, as applicable, mitigation planning.

[23] 44 CFR §201.3(c)(5): "Provide technical assistance and training to local governments to assist them in applying for HMGP planning grants, and in developing local mitigation plans."
[24] 44 CFR §201.4(c)(4)(i): "A description of the State process to support, through funding and technical assistance, the development of local mitigation plans."

5.1.1 Development of Local Mitigation Plans

The primary goal of the NHMPC is to ensure that every community in Nevada develops a hazard mitigation plan and maintains it in a current, updated status. The NHMPC believes that the planning process is the first step in awareness of the risk and vulnerability posed by the hazards and provides the communities with a method to "do something about the risk." This goal includes the updating of existing plans and enhancing the data available for locals to use in the update process. The State provides technical assistance in the development of local mitigation plans in all communities including those with SRL properties. Through 2018, every plan needing an update has acquired funding through the application process, and, where needed, communities have joined to develop regional plans. Since the previous state plan was approved in 2013, all counties have maintained a FEMA-approved HMP, with the exception of Clark County, which has a completed plan awaiting approval by FEMA. Funding received for planning during PDM 2013 has allowed Washoe County to update their plan. Carson City, Churchill, and Lincoln County plan updates were approved in PDM 2014. Clark County (PDM 2015) and Lyon County (PDM 2016) plans are both in progress. Eureka and White Pine Counties are updating their plan jointly with assistance from the State, while Elko County is updating their plan on their own with state assistance. Applicants for PDM 2017 include Nye, Douglas, Washoe, and the combined Pershing, Humboldt, and Lander counties. Nevada has also developed plans to cover tribal entities. Six of the 26 tribal entities have approved plans, while an additional three tribes are in the process of updating their plans.

Planning funds have been "shared" by more than one community in several instances. For example, Humboldt, Lander and Pershing counties have developed a regional plan under the approved PDM 2011 funding, and White Pine and Eureka counties developed a joint regional plan under a PDM 2010 Grant, and are in the process of updating the plan with State help. This leveraging of grant monies to develop

regional plans is a very cost-effective way for rural communities to work together to become covered by a mitigation plan.

The status of hazard mitigation plans and updates for all 17 counties and tribes is shown pictorially in Figure 5-1:

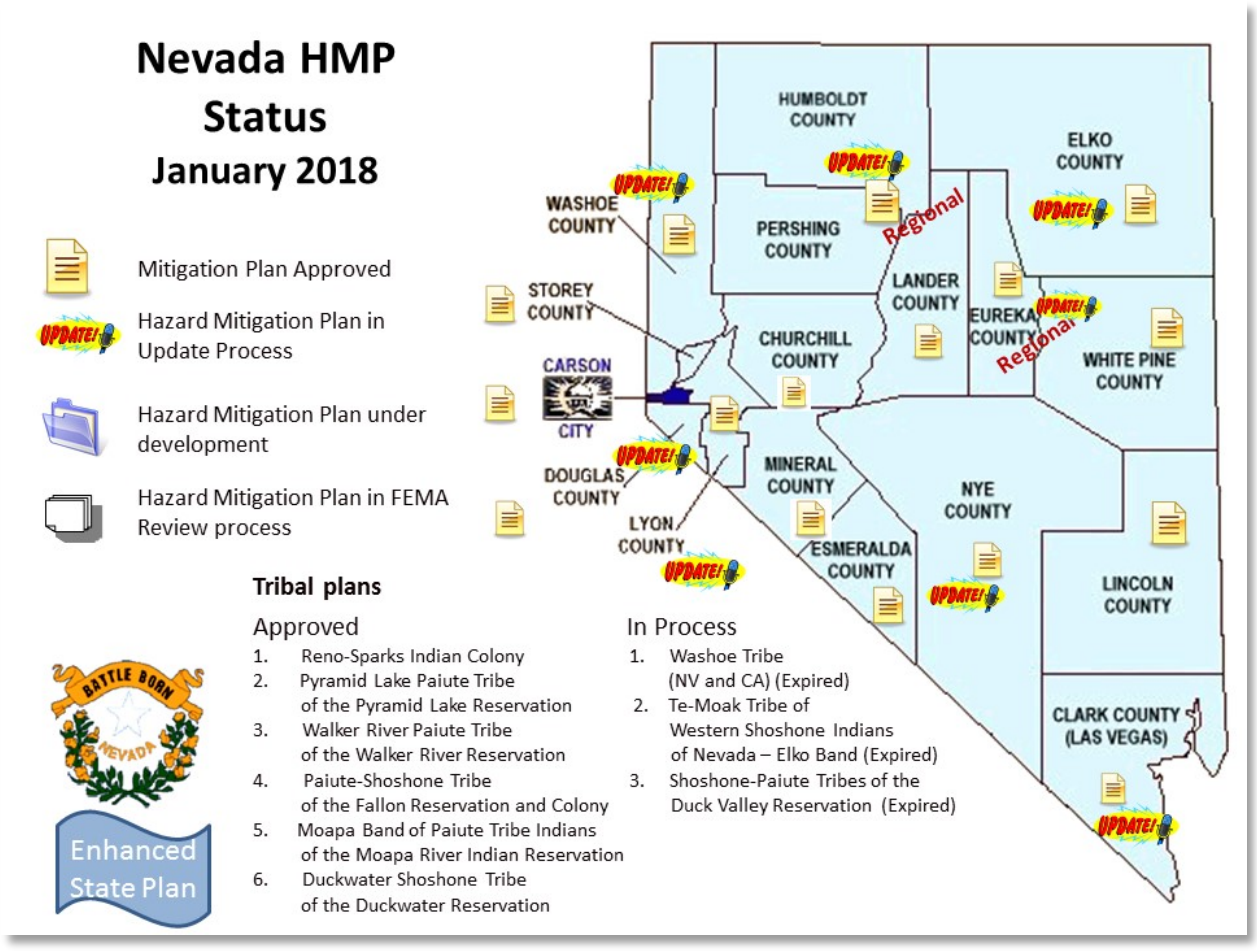


Figure 5-1. Map of Counties and LHMP Status

Since the last NHMP was approved:

- Clark County is updating their plan under a PDM 2015 planning grant.
- Churchill and Lincoln County plans were approved in 2017 under a PDM 20 2014 planning grant. These planning efforts were helped by NHMPC traveling to rural counties to conduct the quarterly meeting.
- The White Pine County and Eureka County multi-jurisdictional plan was approved in 2014. It is in the process of updating with State assistance.
- The Pershing, Humboldt, and Lander Tri-County HMP was approved in 2015. They have applied for a PDM 2017 planning grant, as an update is due in 2020. These planning efforts

were helped by NHMPC traveling to rural counties to conduct the quarterly meeting.

- All counties have a FEMA approved HM plan (Clark County awaiting approval).

The following counties are in the process of updating plans: Eureka-White Pine, Douglas, Washoe, Pershing, Humboldt, and Lander (regional plan), and Nye.

A TTX was held with Carson City in April 2014 and another was completed with Washoe County in August 2014. Additional TTX sessions were held in Nye County (February 2015), Douglas County (May 2015), Lyon County (July 2015), White Pine (September 2015), and Elko and Storey counties during April 2016. Two TTX were conducted in Clark County in February 2014 and in February 2016.

A TTX is scheduled with Carson City, Douglas, Pershing-Humboldt-Lander, Eureka-White Pine, and Washoe counties in 2018.

Nevada's SHMO and NHMPC are currently working to assist the tribal nations in developing hazard mitigation programs. Since the last iteration of the NHMP, hazard plans have been approved for the Reno-Sparks Indian Colony, the Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation, the Walker River Paiute Tribe of the Walker River Reservation, the Paiute-Shoshone Tribe of the Fallon Reservation and Colony, the Moapa Band of the Paiute Indians of the Moapa River Indian Reservation, and the Duckwater Shoshone Tribe of the Duckwater Reservation. These were completed singly or in conjunction with other community plans. Plans for Duck Valley Shoshone-Paiute tribe and Washoe tribe of Nevada and California, and Elko Band are in progress. With the assistance of the State Tribal Liaison, mitigation staff continues to meet with tribal emergency managers to discuss development and/or update of mitigation plans. As with any community, awareness and the readiness of the community is the first step in beginning the planning process. FEMA visited and/or made contact with all tribes in 2017 during presidential disasters, through the open Joint Field Office (JFO).

Nevada's Local Hazard Mitigation Planning Process

With the elimination of pre-disaster hazard mitigation funding, Nevada DEM is limited to providing technical support for local planning efforts. These efforts are supported by Cooperating Technical Partners (CTP) and Management Cost funds. The SHMO does outreach through visits to the targeted communities and personal meetings with emergency managers, planners, public works directors and county commissioners of all Nevada communities to build awareness about the hazard mitigation plan requirements and process. Once the local jurisdiction has established resources and committed to the planning process, the SHMO assists in obtaining funds for the development and/or updating of the plan. Technical support from the state continues throughout the application process and plan development and/or update. Under the HMA program, Nevada DEM works together with the help and guidance of NDWR staff in administering and processing all five hazard mitigation grant programs to ensure that Nevada's subgrantees follow the same process when applying for funding under the HMA and both agencies provide outreach together.

Nevada's established methodology for technical support for the development and maintenance of local plans is as follows:

- SHMO and staff attend local planning meetings in rural venues to ascertain their needs and capabilities, and to develop local points of contact.

- SHMO and staff act as liaison with consultants and local entities to ensure information is provided promptly and accurately.
- Nevada DEM provides risk assessment data and access to experts in the all hazard fields specific to the local jurisdictions. It also provides risk assessment data on flood, wildfire and earthquake hazards through the MyPlan website. (MyPlan is a FEMA-funded GIS-based website developed by NBMG to assist local planning professionals with hazard data necessary to address the risk and vulnerability assessment information required for hazard mitigation planning in their communities. For additional details see Section 8.6.2).

For plan maintenance, Nevada DEM staff developed a TTX to facilitate annual evaluation of approved local hazard mitigation plans. Nevada DEM staff demonstrates this exercise at established LEPC meetings where there is already a broad cross-section of community leaders in attendance without requiring an additional meeting. SERC requires that the LEPC meetings include representatives from local law enforcement, fire departments, hospitals, elected officials, and the private sector.

The primary benefit of the TTX has been to educate individuals not involved in the original planning process about hazard mitigation actions for the community. Recent TTX have made counties aware of the importance of the plan update and many counties will address the update process at quarterly meetings. Where it has been implemented, this exercise has also proved its usefulness in generating requests from the participating local individuals about hazard mitigation activities. As one example, Lincoln County requested information on seismic retrofits of mobile homes as a result of the TTX. As another example, as a result of the TTX, Storey County decided to ground-truth URM data presented at the exercise. Table Top Exercises have been completed in Douglas County, Storey County, Esmeralda County, and Carson City. Four additional TTX will be completed in the coming year.

The TTX is compliant with the Homeland Security Exercise and Evaluation Program (HSEEP) and FEMA Region IX is considering it as a Best Management Practices example for other states to follow.

Other challenges observed during this plan update process include high staff turnover at Nevada DEM, disaster declarations during the plan update process, a need for greater prioritization, and a lack of continuity throughout the update period. These challenges have been noted and will be addressed in the future.

Tables 5-1 and 5-2 below show details of the current status of hazard plan development and updates in the local jurisdictions, tribal communities, and the state, as well as the dates FEMA approved their plans.

Table 5-1. Current Status of Local Hazard Plan Development and Updates

State of Nevada - Division of Emergency Management
County Hazard Mitigation Plan Status as of: 2-April-2018

	County/City	Type of Plan	Date Approved	Update Due	Comments
1	Carson City	Single	11-Aug-2016	10-Aug-2021	
2	Churchill	Multi	27-Apr-2017	26-Apr-2022	

Table 5-1. Current Status of Local Hazard Plan Development and Updates

State of Nevada - Division of Emergency Management
County Hazard Mitigation Plan Status as of: 2-April-2018

	County/City	Type of Plan	Date Approved	Update Due	Comments
3	Clark County[3]	Multi	29-Nov-2012	29-Nov-2017	In review - PDM 2015 Grant
4	Douglas County	Single	4-Feb-2014	4-Feb-2019	Applied for PDM 2017 Grant
5	Elko County	Multi	11-Aug-2014	11-Aug-2019	Updating on their own with State help
6	Esmeralda County	Single	14-Sep-2016	14-Sep-2021	
7	Eureka County[1]	Multi	22-Sep-2014	22-Sep-2019	Updating with State help
8	Humboldt County[2]	Multi	14-May-2015	14-May-2020	Applied for PDM 2017 Grant
9	Lander County[2]	Multi	14-May-2015	14-May-2020	
10	Lincoln County	Multi	11-Aug-2016	11-Aug-2021	
11	Lyon County	Multi	18-Sept-2013	18-Sept-2018	Updating PDM 2016 Grant
12	Mineral County	Multi	16-May-2017	15-May-2022	
13	Nye County	Multi	3-Dec-2013	3-Dec-2018	Applied for PDM 2017 Grant
14	Pershing County[2]	Multi	14-May-2015	14-May-2020	
15	Storey County	Single	14-May-2015	14-May-2020	
16	Washoe County	Multi	9-May-2016	8-May-2021	Applied for PDM 2017 Grant
	Reno, City of	Multi	9-May-2016	8-May-2021	
	Sparks, City of	Multi	9-May-2016	8-May-2021	
17	White Pine County[1]	Multi	22-Sep-2014	22-Sep-2019	

[1] Eureka and White Pine Counties have a multi-jurisdictional HMP
[2] Humboldt, Lander and Pershing Counties have a Tri-County HMP
[3] Dates listed are for the expired plan, updated plan is in review.

Table 5-2. Current Status of Nevada Tribal Hazard Plan Development and Updates

	Tribal	Type of Plan	Date Approved	Update Due	Comments
1	Duckwater Shoshone Tribe of the Duckwater Reservation	Standard	3-Dec-2013	3-Dec-2018	Regional with Nye County
2	Ely Shoshone Tribe of Nevada	Standard	-	-	Plan in progress
3	Paiute-Shoshone Tribe of the Fallon Reservation and Colony	Standard	27-Apr-2017	26-Apr-2022	Regional with Churchill Co.
4	Fort Mojave Indian Tribe (AZ, CA, NV)	Standard	12-Aug-2016	12-Aug-2021	Regional with Mohave Co. AZ
5	Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation (NV and OR)	Standard	-	-	Plan in progress
6	Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony	Standard	-	-	Annex to Clark County Plan. Will be submitted soon
7	Lovelock Paiute Tribe of the Lovelock Indian Colony	-	-	-	
8	Moapa Band of Paiute Indians of the Moapa River Indian Reservation	Standard	29-Nov-2012	29-Nov-2017	Annex to Clark County Plan – in review
9	Pyramid Lake Paiute Tribe of the Pyramid Lake Reservation	Standard	9-May-2016	9-May-2021	Regional with Washoe Co.
10	Reno-Sparks Indian Colony	Standard	9-May-2016	9-May-2021	Regional with Washoe Co.
11	Shoshone-Paiute Tribes of the Duck Valley Reservation	Standard	24-Jan-2012	24-Jan-2017	Working on update
12	Summit Lake Paiute Tribe of Nevada	-	-	-	-
13	Te-Moak Tribe of the Western Shoshone Indians of Nevada (Four constituent bands:)				
	Battle Mountain Band	Standard	-	-	Plan in progress
	Elko Band	Standard	18-Jan-2011	18-Jan-2016	Working on update
	South Fork Band	Standard	-	-	Plan in progress
	Wells Band	-	-	-	-
14	Walker River Paiute Tribe of the Walker River Reservation	Standard	16-May-2017	15-May-2022	Plan approved with Mineral County plan
15	Washoe Tribe (Nevada and California)	Standard	3-Jun-2009	3-Jun-2014	Working on update and awaiting revisions

Table 5-2. Current Status of Nevada Tribal Hazard Plan Development and Updates					
	Tribal	**Type of Plan**	**Date Approved**	**Update Due**	**Comments**
	Carson Colony	-	-	-	-
	Dresslerville Colony	-	-	-	-
	Stewart Community	-	-	-	-
16	Winnemucca Indian Colony of Nevada	-	-	-	-
17	Yerington Paiute Tribe of the Yerington Colony and Campbell Ranch	-	-	-	-
18	Yomba Shoshone Tribe of the Yomba Reservation	-	-	-	Submitted plan, in review by FEMA

5.1.1.1 Identification and Notification of Potential Subgrantees (206.437(b)(4)(i))

Potential subgrantees for pre-disaster mitigation funding are identified and notified via the TTX sessions, workshops, social media, Flood Mitigation (FM) technical assistance sessions, NHMPC member networking, as well as widely distributed e-mail notices and hard-copy paper flyers.

First, there is a well-established email communication tree network that connects the main "trunk" SHMO with all subsidiary branches of the emergency management network throughout Nevada that reaches all levels of emergency management personnel in state, county, local, and tribal governments. This e-mail network is used to communicate with, identify, and notify potential subgrantees of pre-disaster mitigation funding opportunities. Through this network the initial notification is sent to the following main branches of the emergency management system and all subsidiary networks throughout the state:

- State Floodplain Manager
- Emergency Managers
- NHMPC
- NESC
- Tribal Liaison
- Nevada Association of Counties
- Public Works Directors for local communities
- Homeland Security Distribution list
- Governor's office email list of State agencies
- Current and past subgrantee list
- Community Emergency Response Teams (CERT)
- Local Emergency Planning Committees
- Nevada Grants Office

In addition to the mass e-mail notification, a paper flyer, found in Appendix P, is updated annually that describes the HMA programs, eligible activities, and a calendar with scheduled deadlines for the current grant cycle. This flyer is distributed to potential subgrantees through the Nevada DEM staff, the floodplain manager, and at the NHMPC meetings statewide. The flyer directs potential subgrantees to the NHMPC website for details on the application process.

In addition, the NHMPC website, the Floodplain Management Website, and the Nevada DEM website are updated with current application procedures and notices of intent and relevant forms.

Below is the State Administrative Plan's section pertaining to identification and notification of potential subgrantees for the post-disaster funding, HMGP. It includes the application process for PDM and HMGP as well as the application prioritization criteria used by NHMPC for all hazard mitigation requests under HMA. This process is also used to prioritize FMA and RFC proposals managed by NDWR.

The State's Multi-Hazard Enhanced Plan will be used as the basis for initiating the HMGP. Among projects to be funded, those that do not require extensive environmental and historical reviews may be expedited.

The State may use up to seven percent of the total amount allocated to the HMGP for planning activities. Five percent of the total amount of the HMGP may be used to fund activities difficult to evaluate for cost effectiveness and eligibility. The activities to be submitted under the five percent set aside initiative shall be identified and selected at the discretion of the Governor's Authorized Representative (GAR). Guidelines for the Five Percent Initiative activities are in the Fiscal Year 2015 Hazard Mitigation Assistance Unified Guidance (FY 15 HMA Guidance).

A. IDENTIFICATION OF POTENTIAL SUBAPPLICANTS

Upon receipt of a presidential disaster declaration, the SHMO will coordinate with the Hazard Mitigation Branch Chief (HMBC) to determine a preliminary list of subapplicants. Using the most current disaster assessment information available, the SHMO will develop a list of potential subrecipients. The SHMO will consider the use of pre-identified mitigation strategies (un-funded PDM Grant Applications and potential HMGP projects found in the State and/or Local Multi Hazard Mitigation Plan). Potential projects may also be identified during the preliminary damage assessment or post-disaster hazard mitigation team process. The SHMO will forward all applications to NHMPC for review of eligibility and prioritization recommendations. The list of potential subrecipients will continue to expand as recovery efforts get underway.

B. NOTIFICATION OF POTENTIAL SUBAPPLICANTS

1. Potential subapplicants may be notified through a standard briefing process.
2. Identified potential subapplicants will be notified of the HMGP by letter. In addition, telephone calls, the publication of notices, other media announcements may be used when appropriate, and HMGP information will be posted on the NV DEM web site.
3. NV DEM will work to identify and notify appropriate PNPs and any other potential applicant that may be eligible for participation. Generally, NV DEM will rely on local governments to identify appropriate PNPs.

C. SUBAPPLICANT ELIGIBILITY

The following entities are eligible to apply for the HMGP:

1. State agencies
2. Local governments
3. PNPs which meet the criteria of 44 CFR
4. Indian tribes or authorized tribal organizations (may apply directly to FEMA)

D. SUBAPPLICATION WORKSHOPS

1. NV DEM and FEMA will announce, advertise, and conduct HMGP Workshops, as needed, in areas convenient to potential subapplicants. At these Workshops information will be provided describing the HMGP, the mitigation priorities for the current disaster and the subapplication process.
2. NV DEM will provide HMGP program guidance.
3. The materials provided to qualified subapplicants at the Applicant Workshops will include information concerning the following:
    a. General program overview
    b. Eligibility
    c. The application process
    d. The selection process
    e. Types of activities
    f. Project management
    g. Environmental requirements
    h. Local planning requirements
    i. Cost effectiveness (Benefit Cost Analysis)
    j. Cost share requirements
    k. Financial control and grant management
    l. Technical assistance
    m. Contact for additional information

E. SUBAPPLICATION PROCESS

The State recognizes its responsibility to submit complete subgrant applications in a timely manner.

1. State Responsibilities
    a. The State will provide technical assistance to subapplicants.
    b. The State will provide a list of state funding priorities and program guidelines to subapplicants, including details of eligibility determination and key deadlines.
    c. The State will provide assistance to subapplicants in developing and completing subapplications.
    d. The SHMO and NV DEM HMGP staff will have primary responsibility for ensuring that all subapplications are properly completed prior to submission to FEMA.
2. Subapplicants Responsibilities
    a. The subapplication must be properly completed and submitted by the announced deadlines.
3. FEMA Responsibilities
    a. FEMA will perform programmatic and environmental review of proposed activities.

F. TYPES OF ACTIVITIES

The activities funded under HMGP are derived from the full range of measures identified in the State of Nevada Enhanced Multi-Hazard Mitigation Plan, consistent with the state legislation or mandates, and reflecting state-of-the-art knowledge and practices. Virtually

all types of hazard mitigation projects are eligible provided they meet basic project eligibility requirements (see section H below). See FEMA FY 15 HMA Guidance for eligibility.

https://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf

HMGP funds may be used in combination with other funding sources when appropriate to develop a comprehensive mitigation solution. This includes assistance for any part of an activity for which benefits have not been provided by another local, state, or federal funding source. The 44CFR section 206.434 (g) states, "Section 404 funds may be packaged or used in combination with other Federal, State, local, or private funding sources when appropriate to develop a comprehensive mitigation solution, though section 404 funds cannot be used as a match for other Federal funds."

G. ACTIVITY PRIORITIZATION

As cited in the 2013 Nevada Enhanced Multi-Hazard Mitigation Plan, Section Eight, Enhanced Plan Criteria Achievements Program, the NHMPC, which includes the SHMO, will be the review, ranking and selection panel for the HMGP. Each application will be reviewed for eligibility. It is the function of the NHMPC to review, prioritize and select projects for submission to FEMA for approval and funding. The SHMO will submit prioritized projects to the GAR for his/her review and final approval.

H. ACTIVITY ELIGIBILITY

The State is responsible as recipient for ensuring that the subgrant applicants and proposed activities meet basic eligibility requirements. Specifically, NV DEM will:

1. Ensure applicant and activity eligibility as defined in 44 CFR Section 206.434.
2. Ensure that all proposed activities are consistent with current codes, standards, state and local hazard mitigation plans, and permit requirements, if applicable.
3. Ensure that all costs included in the individual activity budgets (including those to be funded by non-federal funds) are eligible costs for funding under the HMGP.
4. Verify availability and eligibility of non-federal share of funding.
5. Provide FEMA a list of names and addresses of potential acquisition and elevation projects for Duplication of Benefits (DOB) searches to ensure that HMGP funds are not used to duplicate amounts available from any other source including insurance, legal settlements, or other financial sources.
6. Verify eligibility of pre-award costs in conformance with 2 CFR Chapters I and II. Application development costs incurred after the disaster declaration date will be eligible for reimbursement upon award of the subgrant.

I. ENVIRONMENTAL REQUIREMENTS

NV DEM will help expedite FEMA's Environmental Planning and Historic Preservation (EHP) and flood plain review by assisting subrecipients with their application attachments. NV DEM's assistance to subrecipients and FEMA includes:

1. Providing subrecipients with an environmental checklist and application instructions (Appendix B) that list the required attachments for an expedited EHP review.
2. Coordinate the EHP kick off meeting where all parties will discuss the project and

view the site.

3. Making the applicant aware of Executive Order 11988 and the eight step process for projects in the flood plain.

The HMGP application is designed to expedite this review by requiring the applicant to identify potential environmental and historic impacts. The application also requires subapplicants to identify project alternatives. The alternatives may be developed for further FEMA review if unresolved conflicts arise from the proposed alternative.

J. ACTIVITY SELECTION PROCESS

1. The projects must be in conformance with the State Enhanced Multi-Hazard Mitigation Plan and the applicable local hazard mitigation plan.
2. Where it is necessary to select from a wide range of activities due to funding or other constraints, the SHMO will determine ranking factors. This ranking will be in accordance with the priorities established by the GAR in Section VII(G) and the criteria in 44 CFR 206.435(b).
3. The GAR will utilize the SHMO and NHMPC in the prioritization process. The GAR retains the option to re-evaluate the priorities and to re-rank activities based upon lessons learned about initial priorities and activities funded under that disaster.
4. Upon completion of the activity selection process, the GAR will determine which HMGP subapplications shall be submitted by the State to the Regional Administrator (RA), FEMA Region IX, for funding approval. The State will forward subapplications for Activities and Waiting List Activities (as defined by this plan).

K. TECHNICAL ASSISTANCE

The State Hazard Mitigation staff, under the direction of the SHMO, may assist subapplicants in completing their HMGP subapplications. Workshops may be provided as described in Section VII (D) above.

L. ADVANCE ASSISTANCE

Advance Assistance is authorized by the Sandy Recovery Improvement Act of 2013, which allows advancing up to 25 percent of the HMGP ceiling or $10 million to Applicants, whichever is less. The purpose is to provide States resources to develop mitigation strategies and obtain data to prioritize, select and develop complete HMGP applications in a timely manner. States may request Advance Assistance by submitting an HMGP application to the Regional Mitigation Division Director. The application must identify the proposed use of the funds, including costs in sufficient detail for each proposed activity and milestones for submitting completed HMGP applications to FEMA. Advance Assistance is subject to the HMGP cost-sharing requirements and Strategic Funds Management. Advance Assistance is a part of the HMGP ceiling amount.

5.1.1.2 Application Procedures (206.437(b)(4)(ii))

1. The SHMO will coordinate with the State Public Assistance and Individual Assistance Officers as well as the Federal Hazard Mitigation Officer (FHMO) to determine deadlines for the HMGP.

2. The SHMO will have responsibility to ensure the proper completion of all applications prior to submission to the FEMA Regional Director. The State requires submission of an electronic copy and a hard copy of all applications.
3. An interested potential subgrantee must submit a Notice of Interest (NOI) to the SHMO within 60 days of the disaster declaration. The SHMO and/or the Public Assistance (PA) officer will announce the 60-day deadline at the Public Assistance and/or Mitigation Applicants' Briefings.
4. The SHMO will forward all applications to the NHMPC for review of eligibility in accordance with Section H, Part 1. The SHMO will obtain additional information necessary to assist NHMPC in making their determination and notifying Subgrantees of ineligible projects.
5. In the event that several eligible projects are competing for limited funding, the NHMPC will prioritize the applications. Applications will be submitted to FEMA according to NHMPC's prioritization.
6. The SHMO will prepare the Hazard Mitigation Grant Program application package for submission to FEMA. The GAR for the HMGP or the Chief of Nevada DEM for PDM will forward state application to FEMA based on the NHMPC's recommendation.
7. The SHMO will notify Subgrantees of the NHMPC's decision regarding application approval or disapproval. Requests and project information will be coordinated with the FHMO.

5.1.2 Funding and Technical Assistance for the Past Five Years

Nevada's SHMO continues to work with local entities to provide funding and technical assistance for local hazard mitigation plans. Technical assistance for local mitigation planning projects has consisted of the following:

a) Providing guidance for organization of resources

b) Mitigation planning presentations for elected officials

c) Putting local entities in contact with appropriate sources of expertise such as NBMG for earthquake information, and NDWR for flood issues

d) Regularly attending local mitigation planning meetings.

Funding for mitigation plans and projects is provided under FEMA mitigation programs through Nevada DEM in close coordination with NDWR. All plans developed at the local and State levels are presented to the SHMO for a preliminary review. Jurisdictions are strongly encouraged to present partial sections to the SHMO allowing for "course corrections" before their final draft submissions. As mentioned before, the SHMO also participates as a State Liaison in key plan development meetings with the jurisdiction whose plan is under development. State funding for development and/or updating of hazard mitigation plans is not available. Local, tribal, and state plans are developed only with funding received through the HMA process. Table 5-3 presents a summary of HMA funding received by counties, regional communities, and the State for plan development and updates during the period since the last state update, 2013-2018.

Table 5-3. HMA Funding for Plans 2013-2018				
Year	County/City	Description	Source	Amount ($)
2013	Washoe County	Update of HM plan	PDM	82,500.00
2014	Carson City	Update of HM plan	PDM	106,014.75
2014	Churchill County	Update of HM plan	PDM	102,135.00
2014	Lincoln County	Update of HM plan	PDM	14,475.00
2015	Clark County	Update of HM plan	PDM	150,000.00
2016	Lyon County	Update of HM plan	PDM	154,999.50
2017	Douglas County	Update of HM plan	PDM	45,173.31
2017	Nye County	Update of HM plan	PDM	74,476.00
2017	Tri-County Pershing, Humboldt, and Lander	Update of HM plan	PDM	60,019.44
2017	Washoe County	Update of HM plan	PDM	225,000.00
Total received during five-year state planning cycle				**1,014,793.00**

5.2 LOCAL PLAN INTEGRATION

The requirements for local plan integration, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)[25]] ***Intent:*** *To guide investment decisions and communicate state priorities for mitigation actions.*	a. The plan must describe criteria for prioritizing jurisdictions to receive planning and project grants under available Federal and non-Federal programs. A principal criterion for prioritizing grants shall be the extent to which benefits are maximized. b. *If the state is interested in an increased Federal share under the FMA program, the plan must address RL and SRL properties when prioritizing funding. (See RL6 in Section 3.8 Repetitive Loss Strategy.)*

ELEMENT	REQUIREMENTS
S16. Does the plan describe the process and timeframe to review, coordinate, and link local and tribal, as applicable, mitigation plans with the state mitigation plan? [44 CFR §§201.3(c)(6),[26] 201.4(c)(2)(ii), 201.4(c)(3)(iii), and 201.4(c)(4)(ii)[27]] ***Intent:*** *To streamline the review and approval of local and tribal, as applicable, mitigation plans, create a common understanding of risk, and align mitigation strategies between state, local, and tribal, as applicable, plans.*	a. The plan must describe the process and timeframe used by the state to review and submit approvable local and tribal, as applicable, mitigation plans to FEMA. b. The plan must describe the process and timeframe used by the state to coordinate and link risk assessments and mitigation strategy information from local and tribal, as applicable, mitigation plans into the state mitigation plan.

[25] 44 CFR §201.4(c)(4)(iii): "Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs."
[26] 44 CFR §201.3(c)(6): "For Managing States that have been approved under the criteria established by FEMA pursuant to 42 U.S.C. 5170c(c), review and approve local mitigation plans in accordance with §201.6(d)."
[27] 44 CFR §201.4(c)(4)(ii): "A description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan."

5.2.1 Process and Timeframe to Review Local Plans

The SHMO or his/her designee requests review of drafts from the communities as the planning process progresses in an effort to provide feedback and guide the plan to meet the federal requirements. While attending local HM planning meetings, State HM staff recommends appropriate action to ensure compliance with federal planning requirements. Once a completed draft of the plan is received, mitigation staff reviews the State Mitigation Plan Review Guide and content of the plan document and together with the lead local planner make revisions. In addition to attending local planning meetings when possible, mitigation staff is available to provide planning technical assistance when requested by the community.

Rapid review of local mitigation plans is hindered by understaffing within the Nevada DEM mitigation section. A consultant hired in 2009 to assist the SHMO with planning, grant, application and technical assistance tasks greatly increased efficiency and timeliness of the SHMO's ability to fully review all local hazard mitigation plans within 45 days of receipt. However, this consultant has since retired and has not yet been replaced. From 2009 to 2016, PDM management costs funded this contractor and, funding from CTP sources was received to continue contractor funding and to provide technical assistance and support to local communities for their annual evaluation through the TTX, or to assist in the update process of an expiring HM plan. This assistance is essential to provide the technical support for local hazard mitigation updates and maintenance in the future. Search for a new contractor is planned but finding adequate help has been hindered by the upswing in the economy. However, with the state's budgetary constraints, no additional staffing is foreseen in the future.

5.2.2 Coordinate and Link Local Plans to the State Hazard Mitigation Plan

The NHM Planning Subcommittee is charged with coordinating and linking the local plans to the Nevada HMP. Once a local plan is completed and approved by FEMA Region IX, the plan must wait for review until the next quarterly Subcommittee meeting. The integration process is expected to take 6 months to a year. The following process will be used for linking the local plan to the Nevada HMP.

1. NHM Planning Subcommittee Meeting (6 months to a year)
2. Local plans are presented to the Subcommittee as new business by SHMO as follows:
    a. Written detailed items found in new local plan, including required analyses, proposed for incorporation into the State Plan (examples of information presented for incorporation are listed below)
        i. Recommended additions to State plan under each identified hazard, noting hazards not identified in the State plan.
        ii. Add capability assessment information
        iii. Add goals, objectives and action (GOAS) items, noting current mitigation activities, funding sources, and link to the State's GOAS.
        iv. Record the completed plan in appropriate State plan locations.
3. The additions are approved, disapproved, or modified by the Subcommittee.
4. Incorporation of new plan data made to the Nevada HMP by the SHMO or designee

Local plans use the state plan to compile information about the communities' hazards, their nature, location, and estimated potential losses. The information for earthquake and flood hazards currently found in the state plan has been used by communities such as Washoe County and Carson City to update their plans. The state in turn uses the local plans to update the data about the communities' capabilities, hazard ratings, and the mitigation strategy.

Since 2007, the integration of local plans with the state plan has really been upside down, with the planning communities using the state plan's information to assist in their risk assessment. This is the primary reason for the NHMPC to work on enhancing the data found in the state plan and making it available in electronic format to Nevada's communities. Much work remains to be done and although priorities exist, these are not always the same for the state as for the communities. As the state is not a source for mitigation funding, support for communities who go above and beyond the norm in mitigation planning and strategy consists basically of written letters of recognition from NHMPC, and the state tracks the activity when notified.

In an effort to better support the integration of local plans with the state plan, the NHMPC has initiated a special project called "MyPlan", implemented by NBMG's GIS staff as time and funding is available for updating and maintenance. This project uses the same format as that created by California's "MyPlan" project, which consists of a website directed to community planners to access hazard risks for each and all communities but populates it with Nevada-specific data. The use of the website as a resource for developing and/or updating hazard mitigation plans with better, more accessible data will make the planning process much easier for locals and for state integration purposes. During the 2013-2018 plan update period, Craig dePolo with NBMG has attended numerous NHMPC meetings, LHMP meetings, and other meetings in Nevada counties to give presentations to those groups in order to familiarize planners with MyPlan and its capabilities in the planning process and to solicit input of additional local hazard data sets into the system.

5.3 PRIORITIZING LOCAL ASSISTANCE

The requirements for prioritizing local assistance, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)[25]] ***Intent:*** *To guide investment decisions and communicate state priorities for mitigation actions.*	a. The plan must describe criteria for prioritizing jurisdictions to receive planning and project grants under available Federal and non-Federal programs. A principal criterion for prioritizing grants shall be the extent to which benefits are maximized. b. *If the state is interested in an increased Federal share under the FMA program, the plan must address RL and SRL properties when prioritizing funding. (See RL6 in Section 3.8 Repetitive Loss Strategy.)*
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)[17]] ***Intent:*** *To ensure that the mitigation strategy addresses the risk and vulnerabilities to existing and potential development, and takes into consideration possible future conditions that can impact statewide vulnerability.*	The plan must provide a summary of the changes in development that have occurred or are projected to occur in hazard prone areas based on the state, local, and tribal, as applicable, risk assessments, specifically: a. Changes in land use and the built environment; b. Changes in population demographics that may affect vulnerability to hazard events; and c. Changes to the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities. ***Changes in development*** means recent development, potential and projected land use and development, or conditions that may affect risk and vulnerability to the state and jurisdictions within the state, such as changes in population demographics.

[25] 44 CFR §201.4(c)(4)(iii): "Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs."

[17] 44 CFR §201.4(d): "Review and updates. Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every 5 years."

5.3.1 Local Funding and Technical Assistance

5.3.1.1 Planning, Review, Ranking, and Selection

The guidelines used by the NHMPC to review, rank, and select projects for HMA are set forth in Section 8. Please refer to Section 8.2.3 and Figure 8-2 for these guidelines on the review, ranking and selection of projects for HMA.

5.3.1.2 Prioritization Evaluation

Application Prioritization criteria used by the NHMPC prioritize projects for HMA funding are set forth in Section 8. Please refer to Section 8.2.3 and Figure 8-2 for these Prioritization criteria

5.3.1.3 Prioritization Form

The Mitigation Grant Prioritization Form used by the NHMPC is shown in Section 8, Figure 8-2 and below.

NHMPC Prioritization Form

Subgrantee: _____ **Activity Name:** _____

Ranking and Selection of Applications:

Application Prioritization Criteria (I-3)		**Assigned Value (0 - 10)**
a.	Population Affected	_____
b.	Public Perception of Need	_____
c.	Emergency Access and Public Inconvenience ***For planning applications:*** *Performance of current plan maintenance activities & Implementation of mitigation activities.*	_____
d.	Cost Effectiveness of the Project (BCA=1) (10 pts) ***For planning applications****: (15 pts)* *Understanding of the planning process and a methodology for completing the proposed mitigation plan.*	_____
e.	Availability of Other Funding Sources	_____
f.	Timing and Implementation	_____
g.	Environmental Enhancement (10 pts) ***For planning applications****: (0 pts)*	_____
h.	Resilience, Maintenance & Sustainability of Project (10 pts) ***For planning applications:*** *(15 pts)* *The description of unique or innovative outreach activities*	_____
	Subtotal Prioritization Criteria (I-3, a thru h)	_____
	Subtotal Criteria - (80-Point Maximum)/2 =	_____ (Max. 40 points)
Additional Prioritization Considerations (I-4)		
a.	Consistent with State & Local Mitigation Plan	_____
b.	Detrimental Impact if Not Taken	_____
c.	Greatest Impact to Reduce Future Disaster Losses	_____
d.	Mitigate Multiple Hazards and/or Accomplish Multiple Objectives	_____
e.	Optimize Total Funds Available	_____
f.	Local Level of Interest & Degree of Commitment to Project	_____
	Additional Considerations Combined (I-4, a thru f)	_____ (Max. 60 points)

Total Criteria + Considerations _____ (Max. 100 points)

Figure 5-2. NHMPC Prioritization Form

5.3.2 Cost Benefit Review of Proposed Projects

Section 8.2.1, Figure 8-2 subsection 3.d, Application Prioritization, letter d. states the consideration of the cost benefit review criteria.

5.3.3 Highest Risk Communities

Section 8, Figure 8-2 subsection 4 lists a series of considerations taken by the committee regarding highest risk communities.

5.3.4 Repetitive Loss Properties

Section 8, Figure 8-1 subsection 4 lists a series of considerations taken by the committee regarding repetitive loss properties.

5.3.5 Intense Development Communities

Population affected is the first criterion used for prioritization of mitigation funding proposals. According to the Nevada State Demographer's office, between April 2010 and July 2017, seven Nevada counties saw population growth of 5.0% or more: Clark-9.0%, Elko-13.3%, Esmeralda- 33.3%, Humboldt- 9.9%, Lander- 17.4%, Lyon- 6.6%, and Washoe- 9.0%. Five counties had very low to no growth and four actually lost population during the same time period. However, Clark and Washoe Counties still contain the greatest percentage of Nevada's population and thus the greatest number of people at risk from flood, wildfire, and earthquake.

During the last five-year period, Washoe, Carson City, Churchill, and Lincoln counties received grants to update their plans, and all were approved. Clark County is updating their plan with funding from the PDM 2015 grant. Lyon county is updating their plan with funding from the PDM 2016 grant. Nye, Douglas, Washoe, Pershing/Humboldt/Lander counties have applied for the PDM 2017 grant and are waiting to hear which applicants are chosen by FEMA.

Washoe, Clark, Douglas, Carson City, Lincoln, Churchill, and Lyon counties and the cities of North Las Vegas and Reno continue to take advantage of available funding sources. All have projects eligible for future HMA funding that include embankment protection, demolition of flood-prone buildings, culvert enhancement and infrastructure protection. NHMPC members discuss and evaluate the criteria for the prioritization process every time applications are submitted to the state. To date, the primary challenge has been to submit applications that are competitive nationally.

As for successes in coordination of Local Mitigation Plans, data in Table 5-1 reveal that Nevada now has 16 counties with approved local county hazard mitigation plans in 2018 (Clark County is awaiting approval), as compared to 11 counties with approved local county hazard mitigation plans in 2013. Four counties are in the process of updating hazard mitigation plans.

Development of Local Mitigation Plans among Nevada's 26 independent tribal entities has presented a challenge to coordination. In 2013, there were five approved tribal hazard mitigation plans. As of 2018, six tribal entities have approved plans, and three tribes are in the process of updating their HM plans. The State, through its tribal liaison member on the NHM Planning Subcommittee and the Intertribal Emergency Response Committee (ITERC) provides an avenue for tribal participation in mitigation planning. The SHMO makes regular visits throughout the year to various tribal communities with mitigation outreach flyers, funding information, planning tools, and technical expertise.

This section provides the State of Nevada's schedule for monitoring, evaluating, and updating the Nevada HMP; including reviewing progress on goals and actions in the mitigation strategy.

No significant changes were made to this Section other than updates to the data referenced and pertinent Section number changes.

6.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The requirements for monitoring, evaluating, and updating the plan, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§201.4(c)(5)(i)[28] and 201.4(d)[29]] ***Intent:*** To ensure the implementation of the plan over time, but also to ensure the plan remains current and reflects changes to the statewide mitigation program.	The plan must describe the process to monitor, evaluate, and update the plan, specifically the: a. Agency/office responsible for monitoring, evaluating, and updating; and b. Schedule for monitoring, evaluating, and updating. ***Monitoring*** means tracking the relevance and implementation of the plan over time and includes all elements of the plan. ***Evaluating*** means assessing the effectiveness of the plan at achieving the goals and objectives. ***Special Consideration:*** Various methods are possible for keeping the plan current. For example, one method may be to amend the plan, as appropriate, using annexes to document changes during the plan approval period.

[28] 44 CFR §201.4(c)(5)(i): "An established method and schedule for monitoring, evaluating, and updating the plan."

[29] 44 CFR §201.4(d): "Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Administrator every five years."

6.1.1 Schedule for Monitoring, Evaluating and Updating the Plan

To ensure that the goals and objectives for Nevada are current and that local mitigation efforts are accomplished, the Subcommittee periodically monitors the Nevada HMP.

The Subcommittee monitors the Nevada HMP quarterly or as situations dictate, such as after a disaster declaration or when new information is obtained. The Subcommittee, along with the SHMO, and his/her designee is responsible for updating the Nevada HMP throughout the entire update process. A record of updates is maintained in the minutes of the Subcommittee meetings. When an evaluation of the plan determines it is necessary, the update process will begin immediately.

6.1.2 Method for Monitoring the Plan

The process to initiate and complete the modification of the Nevada HMP has five basic steps listed below.

1. The Chair of the NHM Planning Subcommittee receives a quarterly report on the status of the Nevada HMP's goals, objectives, action items, and the status of identified hazards.

2. The report evaluates whether the Nevada HMP's current mitigation hazards, goals, objectives, and action items are appropriate and/or effective.
3. The report recommends any needed changes and/or amendments to the Nevada HMP. Any proposed changes are discussed in open forum at the quarterly meetings by Subcommittee members.
4. If the NHM Planning Subcommittee determines to modify the Nevada HMP, the NHM Planning Subcommittee can initiate a modification by a majority vote at a quarterly meeting followed by an agenda item at the next quarterly meeting following the administrative requirements of the state's open meeting law.
5. SHMO or his/her designee records any reviews and updates in formal meeting minutes.

6.1.3 Method for Evaluating the Plan

This methodology did not change during the 2018 update process. The evaluation was accomplished by reviewing each and every section of the 2013 plan and each question listed below was asked as the appropriate section was reviewed by the Subcommittee. Please note the addition of questions 1c and 1d to encompass the hazard profiling and ranking activities.

The Subcommittee Chair incorporates the following process into the quarterly meetings:

1. Risk Assessment Evaluation
    a. Incorporate new and/or updated local mitigation plan risk assessment information.
    b. Have the risks changed at a state level?
    c. Are there new hazards at the local or state level?
    d. Has the current ranking of the hazards changed?
2. Goals Evaluation
    a. Are the goals appropriate for what the State wants to accomplish?
    b. Do the goals reflect what the local jurisdictions want to accomplish?
    c. Do the State's and local jurisdictions' goals and actions complement each other?
    d. Do the goals satisfy the Federal criteria (i.e., the crosswalk)?
    e. Do the goals reflect the local jurisdictions' plans and concerns?
    f. Are the goals feasible given the funding sources available to state, and local jurisdictions?
3. Modify goals in accordance with the results of the evaluation.
4. Action/Project Evaluation
    a. What action items have been accomplished?
    b. Are the action items appropriate to accomplish the plan's goals and objectives?
    c. Do any of the action items need to be changed?
    d. Do new action items need to be added?

5. Does the Nevada HMP meet federal criteria?
    a. Using current FEMA State Mitigation Plan Review Guide to review the plan for appropriate content (https://www.fema.gov/media-library/assets/documents/101659).

6.1.4 Method for Updating the Plan

Once the Nevada HMP is monitored and evaluated, it must be updated to stay current with hazards, mitigation goals, objectives, and activities. The process for updating the plan is in the following list of actions:

1. The Subcommittee Chair, SHMO, or his/her designee submits changes to the Subcommittee. (A NHMPC member can also submit changes to the Nevada HMP).
2. The Subcommittee reviews and recommends (or rejects) the changes, then sends the changes to the NHMPC.
3. The NHMPC approves/rejects the Nevada HMP's changes.
4. SHMO or his/her designee updates the Nevada HMP with approved changes.
5. The changes are recorded in the meeting minutes, which become part of the plan in the form of Appendix D.
6. The process is completed within 90 days.
7. Update the record of adoption if necessary.

As mentioned before, the update of the SHMP is continuous in Nevada. After FEMA approval in October, the next Subcommittee meeting in January marks the beginning of the update process through the monitoring, evaluating, data compilation, and updating of the plan document.

6.1.5 Previous Process and Recommended Changes

No major changes to the previous process for monitoring and updating of the plan were made in this iteration. The Subcommittee used the Annual Questionnaire form at its quarterly meeting as a guide to gather data and solicit input from the members. The Completed Mitigation Activity Report Form (Figure 6-3) was distributed to all members via e-mail and in hard copy at the quarterly meetings. The information collected in these reports is found in Appendix O. Additionally, the planning team developed a form that assisted in gathering the information about public awareness and outreach efforts by members of the NHM Planning Subcommittee. These efforts include, but are not limited to, civil and professional organizations with content about hazard mitigation planning or project activities. These data are summarized in Section 2.2.2, Participation of Interested Groups in the Planning Process.

As events occur in the State, the Subcommittee will continue to learn from them and adjust both the process and the plan to address any deficiencies highlighted by these occurrences.

The periodic monitoring of the plan and process takes place through quarterly meetings of the Subcommittee. Below is a possible list of general agenda items for discussion and/or action at the established quarterly meetings of the Subcommittee, which are scheduled the last Monday of the first month of each quarter at 1:30 pm.

1. Risk assessment review involving both the state and local level:
    a. Local level
        i. New plans

ii. Updated plans

2. Ongoing studies
3. Addition of action items to address risk
4. Modification of action items
5. Deletion of action items completed or no longer applicable
6. Grant application, funding sources
7. Training and workshops

This information will be reported to the NHMPC by the Subcommittee Chair at its quarterly meetings.

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action?			
	Are there procedures (e.g., meeting announcement, plan updates) that can be done more efficiently?			
	Has the Steering committee undertaken any public outreach activities regarding the HMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this HMP and should be?			
	Are additional maps or new hazards studies available? If so, what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
	Are the goals still applicable?			
	Should new mitigation actions be added to a community's Mitigation Action Plan?			
	Do existing mitigation actions listed in a community's Mitigation Action Plan need to be reprioritized?			
	Are the mitigation actions listed in a community's Mitigation Action Plan appropriate for available resources?			

Figure 6-1. Annual Review Questionnaire

6.2 MONITORING PROGRESS OF MITIGATION ACTIVITIES

The requirements for monitoring the progress of mitigation activities, as stipulated in the DMA 2000 and its implementing regulations, are described below.

ELEMENT	REQUIREMENTS
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§201.4(c)(5)(ii)[30] and 201.4(c)(5)(iii)[31]] ***Intent:*** *To establish a process for collecting and evaluating feedback on the state's progress toward long-term goals for resiliency.*	a. The plan must describe the system for tracking the implementation of the mitigation activities and projects identified in the mitigation strategy. This includes all mitigation activities, not just those funded by FEMA. b. The system must include the following: 1. A schedule; 2. Agency/office responsible for coordination; and 3. Role of the agencies/offices identified in the mitigation strategy as responsible for implementation of actions. c. The plan must describe a system for reviewing progress on achieving the goals of the mitigation strategy that includes the criteria and process for evaluating progress.

[30] 44 CFR §201.4(c)(5)(ii): "A system for monitoring implementation of mitigation measures and project closeouts."

[31] 44 CFR §201.4(c)(5)(iii): "A system for reviewing progress on achieving goals as well as activities and projects identified in the Mitigation Strategy."

6.2.1 Monitoring Progress of Mitigation Activities

The SHMO or his/her designee will track, monitor and provide oversight for approved projects under FEMA's HMA programs. The tracking of projects includes a comparison against the mitigation goals, objectives, and actions from Nevada HMP Section 4. The comparison allows the SHMO to verify that Nevada is meeting the goals and objectives set in the updated Nevada HMP as well as the effectiveness of the mitigation program.

For HMA funding, the tracking of projects begins when the SHMO reviews initial project applications for completeness and eligibility. At this time, the SHMO also compares the project with the Nevada HMP Section Four, to determine whether the project is in agreement with the goals, objectives, and actions established in the mitigation strategy. The SHMO maintains records of the applicable action, goal and objective by funding source, year, and hazard. The resulting information is shown in figures and tables found in Section 4.2.4 as Hazard Management Capability changes. This report is presented to the NHMPC at its quarterly meetings. The form shown here in Figure 6-3 is used by Nevada DEM to assist in tracking mitigation actions in Nevada. Data collected from these forms is incorporated into this plan in Appendix O, Completed Mitigation Activities.

After the project closeout, the SHMO will work with the NHM Planning Committee and Subcommittee to re-evaluate two items: one, the mitigation strategy to determine the progress made and, two, if modifications are necessary. The SHMO maintains a record of any modifications to the mitigation strategy in the minutes of the NHM Planning Committee and Subcommittee meetings. This record is used to create the report for the Subcommittee's review at their subsequent meeting.

It is our intent to compile data about the State's accomplishments in the mitigation field. These data are provided by the representatives of the lead agencies participating in the Subcommittee, the NHMPC

and/or the annual survey described in section 6.2 as well as through the annual TTX at local meetings attended by the Hazard Mitigation staff and the incorporation of after-action reports from the TTX.

6.2.2 Project Closeouts

The process described in 2013 remains essentially the same; the only change was the form presented.

1. Subgrantees mark final report accordingly
2. Nevada DEM confirms payment of all reimbursements
3. Nevada DEM requests closure of award to FEMA; closing request includes package with
    a. Expend
    b. Deobligations
    c. Final site visit with photos if applicable
    d. Confirmation that project is complete

When the SHMO determines that all project management procedures have been satisfied, the original signed Final Quarterly Report Form will be filed with the project file. A copy of the form will be forwarded to FEMA with a formal letter, officially requesting closure of the project. Nevada successfully closed PDM projects during the update of this plan following the procedure above. Three HMGP projects remain open at this time.

6.2.3 Review Progress on Mitigation Strategy

The SHMO or his/her designee tracks mitigation objectives, goals, or action items implemented with the HMA programs. To obtain data about activities implemented by local, tribal, other state and private entities with different sources of funding, the form shown in Figure 6-3: Completed Mitigation Activity/Project Report is distributed quarterly to the current tree network of contacts described in Section 5.1.1.1. The information serves as a means for the SHMO to measure progress and capability of the group performing the mitigation activity in the implementation of the mitigation strategy at the community level.

6.2.4 Modifications in Tracking Mitigation Actions

No modification was made to this process during the 2018 plan update. Figure 6-3 is a valid and useful form that provides the SHMO a standardized format to track state agencies and local jurisdictions' objectives, goals, and actions as well as track their progress and accomplishments. The SHMO compiles data and compares the activities to the goals and objectives. This data is presented to the Subcommittee and NHMPC at their regularly scheduled meetings.

6.2.5 Reviewing Progress on Implementing Activities and Projects

The document shown in Figure 6-2 is an example of a quarterly financial and progress report used in the system for reviewing the progress of activities and projects of the Nevada HMP programs managed by Nevada DEM. This form is updated on a quarterly basis by the subgrantees and sent to the SHMO for review. The SHMO reports this information to the NHMPC at its quarterly meeting. The NHMPC discusses the information and formulates recommendations to modify the Nevada HMP accordingly.

All activities requesting funds from HMA programs require NHMPC's input in the prioritization process before submission to FEMA. Beginning in 2012, NDWR and Nevada DEM agreed to have all HMA applications managed by Nevada DEM.

Division of Emergency Management
2478 Fairview Drive
Carson City, Nevada 89701
(775) 687-0300 Fax (775) 687-0323

Reporting Period:	Quarter STARTING month, day & year	Quarter ENDING month, day & year

Quarterly Progress Report

Subgrantee Agency:
Address:
PROJECT NAME:
Project Manager: Phone:
Fiscal Agent: Phone:
Grant Performance Period
% Time Elapsed: (elapsed months / total months)

PROJECT COMPLETION (Note: The Tasks as identified and tracked here come from the Project Plan.)

Task #	Task Description	% Completion of Task	% Total Completion
1			
2			
3			
4			
5			
6			
7			0%
8			
9			
10			
11			
12			
	Total Actual Project Completion To Date:	0%	

MAJOR PROBLEMS (Note: a major problem is one which halts all progress, threatens completion, or both)

Describe any major problem(s) and how it is being addressed.	Have any major problems been encountered? "YES" or "NO":	No

ACCOMPLISHMENTS

Outputs, objectives and capability improvements achieved this qtr.	Any Capability Improvements placed in-service to date? "YES" or "NO":	No

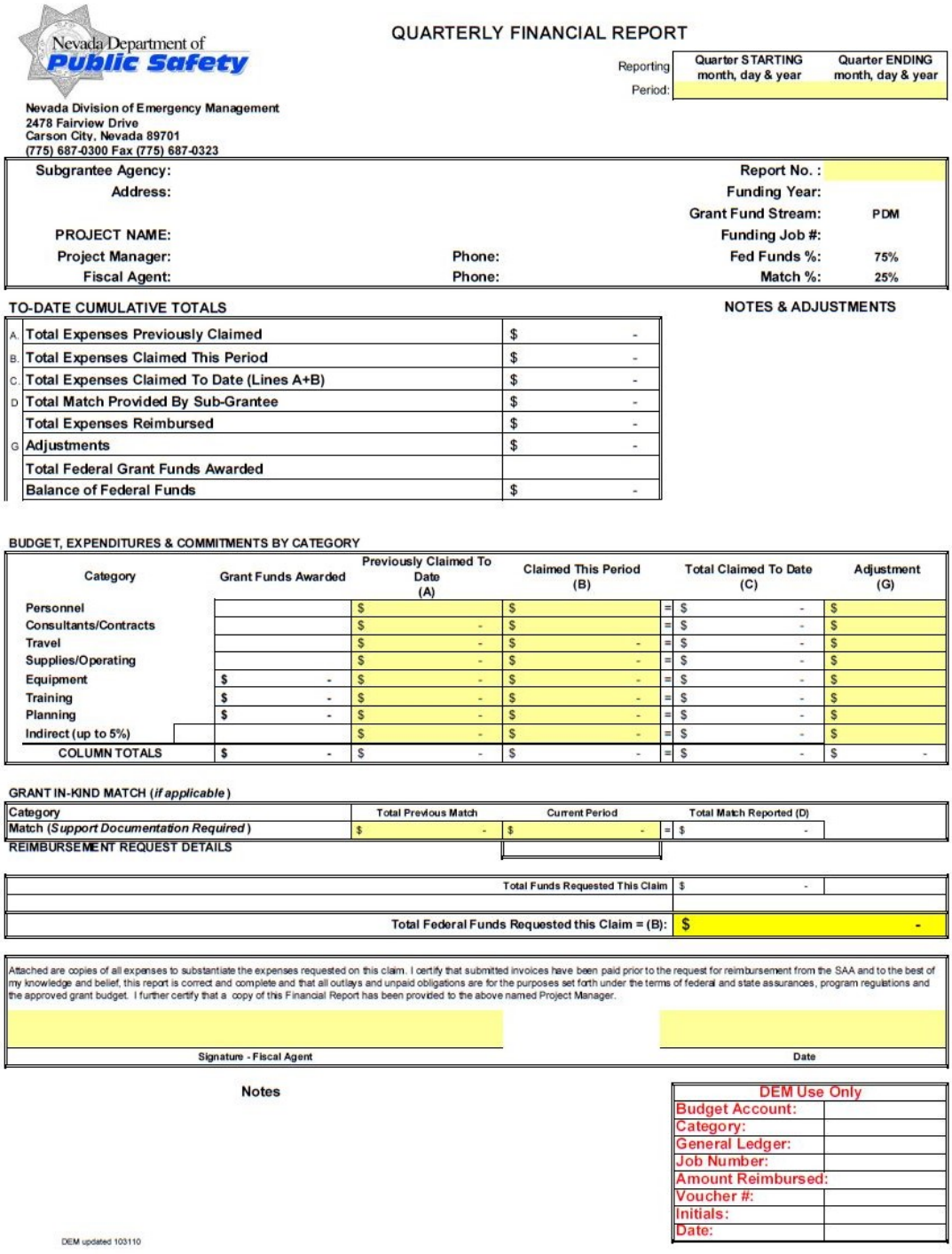
SCHEDULED COMPLETION

Will the Project be completed by the grant award deadline? "YES" or "NO": **Yes**

Will you be de-obligating any funds?	Do you expect a cost overrun/underrun? "YES" or "NO":	No

I certify that to the best of my knowledge and belief, this report is correct and complete and that all pertinent facts regarding the status of this Project are included. I further certify that I have provided a copy of this report to the above named Fiscal Agent.

Signature - Project Manager Date



Nevada Department of Public Safety

Nevada Division of Emergency Management
2478 Fairview Drive
Carson City, Nevada 89701
(775) 687-0300 Fax (775) 687-0323

QUARTERLY FINANCIAL REPORT

Reporting Period:	Quarter STARTING month, day & year	Quarter ENDING month, day & year

Subgrantee Agency:		Report No. :	
Address:		Funding Year:	
		Grant Fund Stream:	PDM
PROJECT NAME:		Funding Job #:	
Project Manager:	Phone:	Fed Funds %:	75%
Fiscal Agent:	Phone:	Match %:	25%

TO-DATE CUMULATIVE TOTALS

NOTES & ADJUSTMENTS

A.	Total Expenses Previously Claimed	$ -
B.	Total Expenses Claimed This Period	$ -
C.	Total Expenses Claimed To Date (Lines A+B)	$ -
D	Total Match Provided By Sub-Grantee	$ -
	Total Expenses Reimbursed	$ -
G	Adjustments	$ -
	Total Federal Grant Funds Awarded	
	Balance of Federal Funds	$ -

BUDGET, EXPENDITURES & COMMITMENTS BY CATEGORY

Category	Grant Funds Awarded	Previously Claimed To Date (A)	Claimed This Period (B)		Total Claimed To Date (C)	Adjustment (G)
Personnel		$	$	=	$ -	$
Consultants/Contracts		$ -	$	=	$ -	$
Travel		$ -	$ -	=	$ -	$
Supplies/Operating		$ -	$ -	=	$ -	$
Equipment	$ -	$ -	$ -	=	$ -	$
Training	$ -	$ -	$ -	=	$ -	$
Planning	$ -	$ -	$ -	=	$ -	$
Indirect (up to 5%)		$ -	$ -	=	$ -	$
COLUMN TOTALS	$ -	$ -	$ -	=	$ -	$ -

GRANT IN-KIND MATCH (*if applicable*)

Category	Total Previous Match	Current Period		Total Match Reported (D)
Match (*Support Documentation Required*)	$ -	$ -	=	$ -

REIMBURSEMENT REQUEST DETAILS

Total Funds Requested This Claim	$ -	
Total Federal Funds Requested this Claim = (B):	$	-

Attached are copies of all expenses to substantiate the expenses requested on this claim. I certify that submitted invoices have been paid prior to the request for reimbursement from the SAA and to the best of my knowledge and belief, this report is correct and complete and that all outlays and unpaid obligations are for the purposes set forth under the terms of federal and state assurances, program regulations and the approved grant budget. I further certify that a copy of this Financial Report has been provided to the above named Project Manager.

Signature - Fiscal Agent | Date

Notes

DEM Use Only	
Budget Account:	
Category:	
General Ledger:	
Job Number:	
Amount Reimbursed:	
Voucher #:	
Initials:	
Date:	

DEM updated 103110

Figure 6-2. Sample Quarterly Financial & Progress Report

As mentioned previously in Section 6.1.4, other programs will be monitored by Subcommittee members. The SHMO will place an action item in the Subcommittee's agenda requesting information about accomplished mitigation projects supported, facilitated and/or funded through/by other state agencies.

Each member reports on the current status of and progress made on any mitigation-related activities or projects within the agency he or she represents and is provided a "Completed Mitigation Activity/Project Report" (shown in Figure 6-3), by the planning team upon completion of any of these mitigation-related activities or projects. These forms are distributed at the same time as the Annual Review Questionnaire to both NHMPC and Subcommittee members and any completed forms are requested to be turned in at each quarterly meeting for reporting purposes. This form was presented to the Subcommittee or NHMPC during the current plan update. The planning team compiles all completed mitigation-related activities and projects submitted by committee members into one document presented as Appendix O.

QUARTER: Jan, Feb, Mar 2011 **Date Submitted:** _____ **Activity/Project**	**Agency and Amount ($)**		**Effect on Loss Reduction**	**Goal, Action # achieved from State Plan (See Table 4-2 for Mitigation Goals and Strategic Actions)**
	State – Manage, support, Fund ($)	**Federal ($)**		
Sample: Silver Spring drainage pipe enhancement at Highways 50 and 95	NDEM Manage	FEMA $53,340	Flood	Action 6.E.2
Complete applicable areas. If unknown, write N/A. Any questions call SHMO Janell Woodward at 775-687-0314				

Figure 6-3. Completed Mitigation Activity/Project Report

The staff reviews each updated section of the plan before the next quarterly Subcommittee meeting and helps to develop future strategic mitigation actions based on those developed in the State or local plans or in supporting agency goals and objectives, or discussed at meetings to include for consideration in the new iteration.

Mitigation actions were implemented as planned during the 3-year update cycle; see Section 4.1.1, Goal Assessment and 4.2.4 Hazard Management Capabilities Changes for details.

Nevada closed PDM 2008, 2009, 2011, 2012, and 2013 awards.

7.1 REFERENCES

All county and tribal hazard mitigation plans used to update the 2018 iteration of Nevada's HMP are referenced in section 7.1.28.1.

7.1.1 Section 0 References

- Great Basin National Heritage Area, 2013, Ely Shoshone Reservation: http://www.greatbasinheritage.org/ely-shoshone-reservation (accessed February 2018).
- Nevada Department of Transportation, 2017, Indian reservations and colonies in Nevada: https://www.nevadadot.com/home/showdocument?id=142 (accessed February 2018).
- Nevada Regional Economic Analysis Project, 2017, Industry structure and performance-earnings across counties and regions of a selected industry:
- https://nevada.reaproject.org/analysis/industry-structure/industries_by_region/average_earnings_per_job/ (accessed February 2018).
- Nevada State Demographer's Office, 2014, 2014 estimates - Estimates by county, city, and unincorporated town: http://www.nvdemography.org/data-and-publications/estimates/estimates-by-county-city-and-unincorporated-towns/ (accessed January 2018).
- Nevada State Demographer's Office, 2015, Population projections for Nevada's counties 2015 to 2019: http://nvdemography.org/wp-content/uploads/2015/02/March-2015-Five-Year-Projections.pdf (accessed January 2018).
- Norris, T., Vines, P.L., and Heoffel, E.M. ,2012, The American Indian and Alaska Native population: 2010, C2010BR-10: http://www.census.gov/prod/cen2010/briefs/c2010br-10.pdf
- Reno-Sparks Indian Colony, 2016, Reno-Sparks Indian Colony -Three tribes one nation: http://www.rsic.org/ (accessed February 2018).
- U.S. Census Bureau, My Tribal Area: https://www.census.gov/tribal/?st=32&aianihh=0165 (accessed February 2018).
- U.S. Census Bureau, QuickFacts Nevada: https://www.census.gov/quickfacts/fact/table/NV/PST120217#viewtop (accessed February 2018).

7.1.2 Section 1 References

- Nevada Legislature, 2015, Nevada Revised Statutes: https://www.leg.state.nv.us/NRS/Index.cfm (accessed April 2018).

7.1.3 Section 2 References

- Elliott, B., 2014, Nevada Drought Strategic Plan – a map for a more drought resilient Nevada: Nevada Division of Water Resources, Nevada Division of Emergency Management, Nevada State Climate Office, 14 p.: http://water.nv.gov/programs/planning/NV_Long_Term_Drought_Strategic_Plan.pdf
- Living with Fire, WUI Fire Summit: http://www.livingwithfire.info/wui-fire-summit
- National Weather Service, About Weather-Ready Nation Ambassadors: https://www.weather.gov/wrn/ambassadors (accessed March 2018).
- Nevada Department of Conservation and Natural Resources, About the Drought Forum: http://dcnr.nv.gov/divisions-boards/nevada-drought-forum/about-the-drought-forum (accessed March 2018).
- Nevada Department of Conservation and Natural Resources, Nevada Division of Forestry, 2010, State Natural Resource Assessment, 86 p.: http://forestry.nv.gov/wp-content/uploads/2010/09/NV_state_assessment_web.pdf
- Nevada Division of Water Planning, Department of Conservation and Natural Resources,1999, Nevada State Water Plan: Nevada Division of Water Planning, Department of Conservation and Natural Resources, 959 p. : http://water.nv.gov/programs/planning/stateplan/documents/NV_State_Water_Plan-complete.pdf
- State of Nevada Division of Water Resources, 2018, Dams and dam safety: http://water.nv.gov/DamsAndSafetyHome.aspx
- State of Nevada Division of Water Resources, 2018, Nevada floodplain management program: http://water.nv.gov/FloodProgramHome.aspx
- U.S. Army Corps of Engineers, Nevada Silver Jackets: http://silverjackets.nfrmp.us/State-Teams/Nevada#activities (accessed December 2017).

7.1.4 Section 3 References

- Ahn, J.H., and Buseck, P.R., 1991, Microstructures and fiber-formation mechanisms of crocidolite asbestos: Am. Mineral, 76, p. 1467–1478.
- American Avalanche Association, National Avalanche Center, 2017, Accidents: https://avalanche.org/avalanche-accidents (accessed December 2017).
- Buck, B.J., Goossens, Dirk, Metcalf, R.V., McLaurin, Brett, Ren, Minghua, and Freudenberger, Frederick, 2013, Naturally Occurring Asbestos: Potential for Human Exposure, Southern Nevada, USA: Soil Science Society of America J. 77, p. 2192-2204.
- Bull, H.W., 1953, The case of the stranded streamliner: Trains and Travel, Vol 13, #3: http://cprr.org/Museum/Stranded_Streamliner_1952/ (accessed December 2017).
- Byrd, D., 2014, NSAA avalanche safety fact sheet: http://www.nsaa.org/media/209454/AvalancheFactSheet10_1_2014.pdf (accessed December 2017).
- Byrne, P., 2012, Pupfish, Downfish: Subterranean tsunami gives vertical shakes to the water-hole home of endangered fishes: Scientific American: https://www.scientificamerican.com/article/earthquake-at-devils-hole/ (accessed March 2018).
- Castillo, A., 2018, Squaw Valley Ski Resort avalanche leaves two injured: Los Angeles Times: http://www.latimes.com/local/lanow/la-me-squaw-valley-avalanche-20180303-story.html (accessed March 2018).
- Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, 2011, Erionite: an emerging North American hazard: http://blogs.cdc.gov/niosh-science-blog/2011/11/erionite/ (accessed May 2012).
- Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, 2011, Erionite: an emerging North American hazard: http://blogs.cdc.gov/niosh-science-blog/2011/11/erionite/ (accessed May 2012).
- Chicago Tribune, 1998, California snowboarder dies in a Donner avalanche: http://articles.chicagotribune.com/1998-02-12/news/9802130294_1_snowboarder-tahoe-forest-hospital-donner-summit (accessed December 2017).
- Clark County, 2017, Voluntary evacuation notice announced for Mount Charleston communities due to avalanche risk: http://www.clarkcountynv.gov/public-communications/news/Pages/Voluntary-Evacuation-Notice-Announced-for-Mount-Charleston-Communitiies-Due-to-Avalanche-Risk.aspx (accessed December 2017).

- Colorado Avalanche Information Center, Avalanche accident statistics: http://avalanche.state.co.us/?s=statistics (accessed December 2017).
- Cousens, B. Wetmore, S., and Henry, C.D., 2013, The Pliocene-Quaternary Buffalo Valley volcanic field, Nevada: Post-extension magmatism in the north-central Great Basin, USA: Journal of Volcanology and Geothermal Research, v. 268, p. 17–35.
- Deffeyes, K.S., 1959, Erionite from Cenozoic tuffaceous sediments, central Nevada: American Mineralogist, v. 44, p. 501-509.
- dePolo, C., , Ramelli, A., , and dePolo, C., 2010,Earthquakes in Nevada- and how to survive them: Nevada Bureau of Mines and Geology, Nevada Seismological Laboratory, and Nevada Division of Emergency Management, 8 p.: https://pubs.nbmg.unr.edu/Earthquakes-in-Nevada-and-how-t-p/e016.htm
- dePolo, C.M., , Jones, L.K, , dePolo, D.M., Tingley, S., .2010, Living with earthquakes in Nevada: NevadaBureau of Mines and Geology Special Publication 27, 3rd edition, 38 p: https://pubs.nbmg.unr.edu/Living-with-earthquakes-in-NV-p/sp027.htm
- dePolo, C.M., 2001, Nevada earthquake risk mitigation plan: Nevada Earthquake Safety Council.
- Federal Emergency Management Agency, 2018, Critical facility: https://www.fema.gov/critical-facility (accessed March 2018).
- Federal Emergency Management Agency, Critical facilities and higher standards – Fact sheet: https://www.fema.gov/media-library-data/1436818953164-4f8f6fc191d26a924f67911c5eaa6848/FPM_1_Page_CriticalFacilities.pdf (accessed March 2018).
- Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy, 2013, Assessment of climate change in the southwest United States - A report prepared for the National Climate Assessment: Southwest Climate Alliance, 531 p.: http://www.swcarr.arizona.edu/sites/all/themes/files/SW-NCA-color-FINALweb.pdf
- Hastings, J.T., Goar, L.D., Armeno, H., Johnson, G., dePolo, C.M., Hess, R.H., and Price, J.G., Johnson, G., Ballard, C.M., Armeno, H., Seelye, I., Goar, L.D., dePolo, C.M., and Hastings, J.T., 2014, Updated Estimated losses from earthquakes near Nevada communities: Nevada Bureau of Mines and Geology Open-File Report 09-8, 46 p.: http://pubs.nbmg.unr.edu/Est-losses-from-EQs-Web-only-p/of2009-08.htm
- Heim, R., 2018, United States Drought Monitor: University of Nebraska- Lincoln, U.S. Department of Agriculture, and the National Oceanic Atmospheric Administration: http://droughtmonitor.unl.edu/

- Hess, R., and dePolo, C.M., 2006, Loss-estimation modeling of earthquake scenarios for each county in Nevada using HAZUS-MH: Nevada Bureau of Mines and Geology Open-File Report 06-1, 517 p.: http://pubs.nbmg.unr.edu/Loss-estimation-modeling-of-EQ-p/of2006-01.htm
- Ichinose, G.A., Anderson, J.G., Satake, K., Schweickert R.A., and Lahren, M.M., 2000, The potential hazard from tsunami and seiche waves generated by large earthquakes within Lake Tahoe, California-Nevada: Nevada Seismological Laboratory, Geophysical Research Letters, vol. 27, p. 1203-1206: http://onlinelibrary.wiley.com/doi/10.1029/1999GL011119/pdf
- Kleinfelder, 2014, INTERSTATE 11- Boulder City Bypass Phase 2 Design Build Project Geologic Evaluation, Sampling, And Testing For Naturally-Occurring Asbestos Boulder City, Clark County, Nevada: Kleinfelder Project No. 137120, prepared for the Clark County Regional Transportation Commission.
- Livingston, I., 2016, Annual and monthly tornado averages for each state (maps): http://www.ustornadoes.com/2016/04/06/annual-and-monthly-tornado-averages-across-the-united-states/ (accessed July 2017).
- Meeker, G., A. Bern, I. Brownfield, H. Lowers, S. Sutley, T. Hoefen, and J. Vance. 2003. The composition and morphology of amphiboles from the Rainy Creek Complex near Libby, Montana. Am. Mineral. 88:1955–1969.
- Mitigation Assessment Team Report, Hurricane Sandy in New Jersey and New York – Definitions of critical facilities and risk categories: p. I-1 – I-2.
- Moore, J.G., Schweickert, R.A., Kitts, C.A., 2014, Tsunami-generated sediment wave channels at Lake Tahoe, California-Nevada, USA: Geological Society of America, v. 10 p. 757-768. https://pubs.geoscienceworld.org/gsa/geosphere/article/10/4/757/132174/Tsunamigenerated-sediment-wave-channels-at-Lake
- Muntean, J.L., and Davis, D.A., 2017, Nevada active mines and energy producers: Nevada Bureau of Mines and Geology OFR 2017-01, scale 1:1,000,000: http://pubs.nbmg.unr.edu/Active-mines-and-energy-2014-p/of2014-01.htm (accessed March 2018).
- Myers, W.B., and Hamilton, W., 1964, Deformation accompanying the Hebgen Lake earthquake of August 17, 1959: U.S. Geological Survey Professional Paper 435–I, p. 55–138.
- National Oceanic and Atmospheric Administration, n.d., Storm events database: National Center for Environmental Information: https://www.ncdc.noaa.gov/stormevents/ (accessed July 2017).

- National Park Service, 2017, Devils Hole: https://www.nps.gov/deva/learn/nature/devils-hole.htm (accessed March 2018).
- Nevada Administrative Code, 2018, Chapter 445A – water controls: https://www.leg.state.nv.us/Division/Legal/LawLibrary/NAC/NAC-445A.html#NAC445ASec3454 (accessed February 2018).
- Nevada Department of Agriculture, Nevada Noxious Weed List: http://agri.nv.gov/Plant/Noxious_Weeds/Noxious_Weed_List/ (accessed January 2018).
- Nevada Department of Transportation, 2017, Base highway map – Nevada: https://www.nevadadot.com/home/showdocument?id=122 (accessed February 2018).
- Nevada Department of Transportation, Traffic crash data: https://www.nevadadot.com/safety/traffic-crash-data (accessed February 2018).
- Nevada Department of Wildlife, 2017, Nevada Aquatic Invasive Species Management Plan, 107 p.: http://www.ndow.org/uploadedFiles/ndoworg/Content/Boat/Aquatic_Invasive_Species/Final_USE_Electronic%20AIS%20Plan_ndow-managment-plan-digital.pdf
- Nevada Division of Environmental Protection, Anaconda Copper Mine - Lyon County, Nevada: https://ndep.nv.gov/land/abandoned-mine-lands/anaconda-site (accessed February 2018).
- Nevada Division of Environmental Protection, Black Mountain Industrial (BMI) Complex: https://ndep.nv.gov/environmental-cleanup/site-cleanup-program/active-cleanup-sites/bmi-complex (accessed March 2018).
- Nevada Division of Environmental Protection, Environmental cleanup: https://ndep.nv.gov/environmental-cleanup (accessed February 2018).
- Nevada Division of Water Resources, 2012, State of Nevada Drought Plan: Nevada Department of Conservation and Natural Resources, Division of Water Resources, Division of Emergency Management, and the State Climate Office, revised, 14 p.
- Nevada Earthquake Safety Council, 2000, Strategic Plan for Earthquake Safety in Nevada: Nevada Earthquake Safety Council.
- Nevada State Demographer, 2015, Population projections for Nevada's counties 2015 to 2019: http://nvdemography.org/wp-content/uploads/2015/02/March-2015-Five-Year-Projections.pdf (accessed December 2017).
- Nevada State Public Works Division, 2017, List of State-Owned Buildings: http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings/ (accessed November 2017).

- New York Times, 1972, A snow avalanche kills 2 youths at Nevada resort: The New York Times Archives, 1 p.: http://www.nytimes.com/1972/01/30/archives/a-snow-avalanche-kills-2-youths-at-nevada-resort.html (accessed December 2017).
- Olive, W.W., Chleborad, A.F. , Frahme, , C.W., Schlocker, J., Schneider, R.R., and Shuster, R.I., 1989, Swelling clays map of the conterminous U.S.: U.S. Geological Survey.
- Oregon Emergency Management and Washington Emergency Management Department, 2013, Mount Hood Coordination Plan: 64 p.: http://www.oregon.gov/OEM/Documents/Mount_Hood_Volcano_Coordination_Plan.pdf (accessed March 2018).
- Papke, K.G., 1972, Erionite and other associated zeolites in Nevada: Nevada Bureau of Mines and Geology Bulletin 79, 32 p.
- Pierce County Department of Emergency Management, 2008, Mount Rainier Volcanic Hazards Plan: Pierce County, Working Draft, 111 p.: http://www.co.pierce.wa.us/DocumentCenter/View/3499 (accessed March 2018).
- Pohll, G., R. Schumer, S. Rybarski, J. Crews, and C. Pearson, 2016, Assessment of drought resilience in rural northern Nevada: Desert Research Institute, Division of Hydrologic Sciences Report.
- Pratt, S.E., 2012, Dangerous dust: erionite – an asbestos-like mineral causing a cancer epidemic in Turkey – is found in at least 13 U.S. states: Earth, p. 36-43.
- Price, J.G., Hastings, J.T., and Arritt, C.M., 2007a, Assessment of risks and vulnerability to earthquake hazards in Nevada: Nevada Bureau of Mines and Geology Open-File Report 07-1, 8 p., with links to plates: http://dwgateway.library.unr.edu/keck/mining/dox/of071.pdf
- Price, J.G., Hastings, J.T., and Arritt, C.M., 2007b, Assessment of risks and vulnerability to flood hazards in Nevada: Nevada Bureau of Mines and Geology Open-File Report 07-2, 6 p., with links to plates, http://dwgateway.library.unr.edu/keck/mining/dox/of072.pdf
- Price, J.G., Johnson, G., Biasi, G., Bausch, D., and Wong, I.G., 2011, Comparison of loss-estimation modeling using HAZUS with ground-motion input from ShakeMap versus default values, Nevada Bureau of Mines and Geology Open-File Report 11-1, 24 p.: https://pubs.nbmg.unr.edu/Loss-estimation-modeling-HAZUS-p/of2011-01.htm
- Price,J, 2006, Biennial report of the Nevada Bureau of Mines and Geology, 2006: Nevada Bureau of Mines and Geology, Open-File Report 2006-20, 88 p. https://pubs.nbmg.unr.edu/Biennial-report-NBMG-2006-p/of2006-20.htm

- Pursell, R., 2018, Inbounds avalanche partially buries eight at Mammoth: Teton Gravity Research: https://www.tetongravity.com/story/news/inbounds-avalanche-partially-buries-eight-at-mammoth (accessed March 2018).
- Resource Concepts Inc, 2005, Nevada Community Risk/Hazard Assessment Project: Nevada Fire Safe Council, Resource Concepts Inc.: http://www.rci-nv.com/project/statewide-wildfire-riskhazard-assessment/
- Resource Concepts, Inc., Nevada Fire Safe Council – Nevada Statewide Wildfire Risk/Hazard Assessment Project: http://www.rci-nv.com/project/statewide-wildfire-riskhazard-assessment/
- Rigby, J., , Crompton, J., Berry, K. , Yildirim, U., Hickman, S., and Davis, D.,1998, The 1997 New Year's floods in western Nevada: Special Publication 23. U.S. Geological Survey and the Nevada Bureau of Mines and Geology, Special Publication 23, 111p. https://pubs.nbmg.unr.edu/1997-New-Year-s-floods-w-NV-p/sp023.htm
- Seelye, I.M., Johnson, G.L., Price, J.G., and Hastings, J.T., 2013, Updated assessment of risks and vulnerability to flood hazards in Nevada: Open-File Report 13-3, Nevada Bureau of Mines and Geology: http://pubs.nbmg.unr.edu/Updated-assess-flood-haz-2013-p/of2013-03.htm
- Seelye, I.M., Johnson, G.L., Richardson, M.T., dePolo, C.M., Faulds, J.E., Price, J.G., Goar, L.D., Ballard, C.M., Armeno, H., and Hastings, J.T., 2014, Updated estimated losses from earthquakes near Nevada communities: Open-File Report 14-5, Nevada Bureau of Mines and Geology: http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm
- Shannahan, J.H., Schladweiler, M.C.,Thomas, R.F., Ward, W.O., Ghio, A.J., Gavett, S.H., and Kodavanti, U.P. , 2012, Vascular and thrombogenic effects of pulmonary exposure to Libby amphibole: Journal of Toxicology and Environmental Health, v. 75 (4), p. 213-231.
- Sheppard, R., 1996, Occurrences of erionite in sedimentary rocks of the western United States: U.S. Geological Survey Open-File Report 96-018.
- Shuette v. Beazer Homes Holding Corp., 2005, 121 Nev. Adv. Op. 82.
- Sierra Avalanche Center, 2017, Winter 2016-2017 annual report, 9 p.: https://www.sierraavalanchecenter.org/sites/default/files/annual-reports/sac_annual_report_2017.pdf
- Smith, E.I. Keenan, D.L., Plank, T. 2002, Episodic volcanism and hot mantle: implications for volcanic hazard studies at the proposed nuclear waste repository at Yucca Mountain, Nevada: GSA Today, v.12, no.4, p. 4-10.

- Smith, K.D., von Seggern, D., Blewitt, G., Preston, L., Anderson, J.G., Wernicke, B.P., Davis, J.L., 2004, Evidence for deep magma injection beneath Lake Tahoe, Nevada-California: Science, v. 305 p. 1277-1280. doi: 10.1126/science.1101304
- Smoot, J.P., Litwin, J.L., and Lund, S.J., 2000, Sedimentary record of the 1872 earthquake and "Tsunami" at Owens Lake, southeast California: Sedimentary Geology, v. 135, p. 241-254. https://pubs.er.usgs.gov/publication/70022432
- State of Nevada, 2014, State Comprehensive Emergency Management Plan: 245 p.: http://dem.nv.gov/uploadedFiles/demnvgov/content/Resources/2014-SCEMP.pdf (accessed March 2018).
- Steinbrugge, K.V., and Moran, D.F., 1956, Damage caused by the earthquakes of July 6 and August 23, 1954: Bulletin of the Seismological Society of America, v. 46, p. 15–33.
- Tahoe Daily Tribune, 2017, 2 backcountry skiers escape Mount Rose Avalanche near Lake Tahoe: https://www.tahoedailytribune.com/news/avalanche-closes-mount-rose-highway-between-lake-tahoe-and-reno/ (accessed December 2017).
- Terry, J. M., 2016, Naturally Occurring Asbestos and Erionite: Nevada Department of Transportation Board Meeting, Presentation: https://www.nevadadot.com/Home/ShowDocument?id=2607 (accessed February 2018).
- Tetra Tech, 2014, Phase I site characterization report Boulder City Bypass Naturally Occurring Asbestos (NOA) Project, Prepared for the Nevada Department of Transportation.
- The Central Cascades Facilitating Committee, 2007, Central Cascades Volcano Coordination Plan – Coordinating efforts among governmental agencies in the event of volcanic unrest in the Central Cascades, Oregon: 44 p.: http://www.oregon.gov/OEM/Documents/Central_Cascades_Coordination_Plan.pdf (accessed March 2018).
- The Mesothelioma Center, What is Asbestos?: https://www.asbestos.com/asbestos/ (accessed February 2018).
- The Organization of American States, Chapter 7 – Critical facilities mapping: https://www.oas.org/dsd/publications/Unit/oea66e/ch07.htm (accessed March 2018).
- U.S. Department of Agriculture National Agricultural Library, 2016, Animals - USDA National Invasive Species Information Center: https://www.invasivespeciesinfo.gov/animals/main.shtml
- U.S. Department of Energy, 1991, The Nevada Railroad System: Physical, operational, and accident characteristics: Yucca Mountain site characterization project: 105 p.: https://digital.library.unt.edu/ark:/67531/metadc624403/

- U.S. Geological Survey, 2018, NAS- Nonindigenous Aquatic Species: https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1008 (accessed January 2018).
- U.S. Natural Resources Conservation Service, A history of soil survey in Nevada: U.S. Department of Agriculture, 34 p.: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_037205.pdf (section of the plan)
- University of Nevada Cooperative Extension, U.S. Bureau of Land Management, 2006,Course of study reports for Nevada's extreme wildfire hazard communities: University of Nevada Cooperative Extension and U.S. Bureau of Land Management.
- Utah Department of Emergency Management, 2014, Utah Hazard Mitigation Plan: https://sites.google.com/a/utah.gov/utah/ (accessed December 2017).
- Van Gosen, B.S., 2008, Reported historic asbestos mines, historic asbestos prospects, and natural asbestos occurrences in the Southwestern United States (Arizona, Nevada, and Utah). United States Geological Survey, Open-File Report 2008-10951.0, v.1.
- Virta, R, 2002, Asbestos: Geology, mineralogy, mining, and uses. United States Geological Survey, Open-File Report 02-149.
- Washington Emergency Management Division, 2014, Mount St. Helens – Mount Adams Volcanic Regional Coordination Plan: Washington Military Department, 36 p.: https://www.mil.wa.gov/uploads/pdf/PLANS/mount-st.-helens---mount-adams-volcanic-region-coordination-plan-october-2014.pdf (accessed March 2018).
- Waste Isolation Pilot Plant, 2018, Shipment & disposal information: http://www.wipp.energy.gov/shipment-information.asp (accessed February 2018).
- Western Governor Association, 2006, A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - 10-Year Strategy Implementation Plan: Western Governor Association, 40p.: .https://www.forestsandrangelands.gov/resources/plan/documents/10-yearstrategyfinal_dec2006.pdf

7.1.4.1 Sources of the flood history data presented in Tables 3-13 and 3-14

- Clark County Regional Flood Control District and website documents major flooding between 1997 and present: http://www.ccrfcd.org/
- Clark County Regional Flood Control District data, earlier: http://gustfront.ccrfcd.org/FileLibrary2/FileLibrary.aspx
- Federal Emergency Management Agency, Subchapter B- Insurance and hazard mitigation: p. 219-227: http://edocket.access.gpo.gov/cfr_2008/octqtr/pdf/44cfr59.1.pdf

- Flood Hazard Analyses, Las Vegas Wash and Tributaries - Clark County, Nevada from 1905 to 1975.
- Nevada Division of Water Resources, n.d., Humboldt River chronology – Part II – Pre-twentieth century: http://water.nv.gov/mapping/chronologies/humboldt/hrc-pt2.pdf
- Nevada Division of Water Resources, n.d., Humboldt River chronology – Part III-Twentieth and twenty-first centuries: http://water.nv.gov/mapping/chronologies/humboldt/hrc-pt3.pdf
- O'Hara, B.F., Barbato, G.E., James, J.W., Angeloff, H.A., Cylke, T., 2007, Weather and climate of the Reno-Carson City- Lake Tahoe region: Nevada Bureau of Mines and Geology, SP34, 82 p.
- O'Hara, B.F., Barbato,G.E., James, J.W.,. Angeloff, H.A., Cylke, T., 2007, Weather and climate of the Reno-Carson City-Lake Tahoe region: Nevada Bureau of Mines and Geology, Special Publication 34, 82 p.: https://pubs.nbmg.unr.edu/Weather-and-climate-of-the-Reno-p/sp034.htm
- Rigby, J.G., Crompton, J., Berry, K.A., Yildirim, U., Hickman, S.F., and Davis, D.A., 1998, The 1997 New Year's floods in western Nevada: Nevada Bureau of Mines and Geology, SP23, 111 p.
- U.S. Department of Agriculture, Soil Conservation Service, 1977, History of Flooding, Clark County, Nevada 1905-1975: U.S. Department of Agriculture, Soil Conservation Service, Clark County Conservation District, City and County Entities of Clark County, Nevada, and Nevada Division of Water Resources,173 p.: http://gustfront.ccrfcd.org/pdf_arch1/Flood%20Event%20Reports/History%20of%20Flooding.pdf
- U.S. Geological Survey,1963b, USGS Chronology of the Humboldt River.
- United States Geological Survey, 2006,Flooding in Clark and Lincoln Counties, Nevada, December 2004 and January 2005: U.S. Geological Survey, 4 p.: https://pubs.usgs.gov/fs/2006/3124/fs2006-3124.pdf
- United States Geological Survey, 2013, Carson River Basin- hydrologic data: https://nevada.usgs.gov/crfld/Carson/hydrodata.cfm
- USGS Fact Sheet 036-01, Flooding in the Amargosa River Drainage Basin, February 23-24, 1998, Southern Nevada and Eastern California, including the Nevada Test Site: http://pubs.usgs.gov/fs/fs-036-01/text/fs03601.htm

7.1.5 Section 4 References

Tribal and Local Hazard Mitigation Plans used in Section 4 are referenced in section 7.1.26.1.

- Centers for Disease Control and Prevention, 2018, Emergency preparedness and response: https://emergency.cdc.gov/
- Centers for Disease Control and Prevention, 2018, Funding: https://www.cdc.gov/funding/index.html
- Environmental Protection Agency, 2015, Source Water Protection Publications Database: https://cfpub.epa.gov/safewater/sourcewater/sourcewater.cfm?action=Programs
- Environmental Protection Agency, 2017, FY 2017 Hazardous Waste Management Grant Program for Tribes: https://www.epa.gov/grants/fy-2017-hazardous-waste-management-grant-program-tribes
- Environmental Protection Agency, 2017, Wetlands protection and restoration: https://www.epa.gov/wetlands#financial
- Environmental Protection Agency, 2018, Brownfields: https://www.epa.gov/brownfields
- Federal Emergency Management Agency, 2017, Community Assistance Program – State support services element: https://www.fema.gov/community-assistance-program-state-support-services-element
- Federal Emergency Management Agency, 2017, Hazard Mitigation Grant Program: https://www.fema.gov/hazard-mitigation-grant-program
- Federal Emergency Management Agency, 2017, National Dam Safety Program: https://www.fema.gov/national-dam-safety-program
- Federal Emergency Management Agency, 2018, Flood Mitigation Assistance Grant Program: https://www.fema.gov/flood-mitigation-assistance-grant-program
- Federal Emergency Management Agency, 2018, Pre-Disaster Mitigation Grant Program: https://www.fema.gov/pre-disaster-mitigation-grant-program
- Federal Emergency Management Agency, 2018, Repetitive Flood Claims Grant Program fact sheet: https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet
- Federal Emergency Management Agency, 2018, The National Flood Insurance Program: https://www.fema.gov/national-flood-insurance-program
- National Earthquake Hazards Reduction Program, 2017, Grants and contracts: https://www.nehrp.gov/contracts/solicitations.htm

- National Nuclear Security Administration, Nuclear Incident Response: U.S. Department of Energy: https://www.energy.gov/nnsa/nuclear-incident-response
- National Science Foundation, Decision, Risk, and Management Sciences (DRMS): https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES
- Natural Resources Conservation Service, Emergency Watershed Protection Program: U.S. Department of Agriculture: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/
- Natural Resources Conservation Service, Watershed and Flood Prevention Operations Program: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/
- Nevada Division of Environmental Protection, Brownfields: https://ndep.nv.gov/environmental-cleanup/brownfields
- Nevada Division of Environmental Protection, Petroleum Fund: https://ndep.nv.gov/environmental-cleanup/petroleum-fund
- Pipeline and Hazardous Materials Safety Administration, 2017, Hazardous Materials Grants Program: United States Department of Transportation: https://www.phmsa.dot.gov/grants/hazmat/hazardous-materials-grants-program
- Southern Nevada Water Authority, 2018, Conservation facts and achievements: https://www.snwa.com/drought-and-conservation/conservation-facts-and-achievements/index.html
- State of Nevada Emergency Response Commission, Welcome: http://serc.nv.gov/
- Truckee Meadows Water Authority, 2018, Water conservation: https://tmwa.com/our-environment/water-conservation/
- U.S. Army Corps of Engineers, 2015, Aquatic Ecosystem Restoration Projects (Section 206): http://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/Section-206/
- U.S. Army Corps of Engineers, Corps planning – Planning assistance to states: https://planning.erdc.dren.mil/toolbox/library/FactSheets/PAS_FS_June2017.pdf
- U.S. Army Corps of Engineers, Environmental Laboratory (EL): http://www.erdc.usace.army.mil/Locations/EL.aspx
- U.S. Army Corps of Engineers, Flood Plain Management Services: http://www.nae.usace.army.mil/Missions/Public-Services/Flood-Plain-Management-Services/

- U.S. Department of Agriculture, 2011, Noninsured Crop Disaster Assistance Program (NAP) for 2011 and subsequent years: https://www.fsa.usda.gov/Internet/FSA_File/nap_august_2011.pdf
- U.S. Department of Agriculture, 2011, Supplemental Revenue Assistance Payments (SURE) Program: https://www.fsa.usda.gov/Internet/FSA_File/sure_2011.pdf
- U.S. Department of Agriculture, 2017, Smith-Lever Special Needs Competitive Grants Program: National Institute of Food and Agriculture: https://nifa.usda.gov/funding-opportunity/smith-lever-special-needs-competitive-grants-program
- U.S. Department of Agriculture, Animal health: Animal and Plant Health Inspection Service: https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/!ut/p/z1/04_iUlDg4tKPAFJABpSA0fpReYllmemJJZn5eYk5-hH6kVFm8T7-Js6GTsEGQNrVycDRNcjc19XV08ggyEjfSz8Kv4KC7EBFANjvecc!/
- U.S. Department of Agriculture, Community Facilities Direct Loan & Grant Program: https://www.rd.usda.gov/programs-services/community-facilities-direct-loan-grant-program
- U.S. Department of Agriculture, Community Facilities Guaranteed Loan Program: https://www.rd.usda.gov/programs-services/community-facilities-guaranteed-loan-program
- U.S. Department of Agriculture, Conservation programs: https://www.fsa.usda.gov/programs-and-services/conservation-programs/index
- U.S. Department of Agriculture, Disaster Assistance Programs: https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/index?utm_source=landing&utm_medium=spotlight&utm_content=spot3&utm_campaign=fsadisasters
- U.S. Department of Agriculture, Financial assistance: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/
- U.S. Department of Agriculture, Landscape Planning: Natural Resources Conservation Service: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/
- U.S. Department of Housing and Urban Development, Community Development Block Grant Program: https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs
- U.S. Department of Housing and Urban Development, Community Development Block Grants (Disaster Recovery Assistance): https://www.hud.gov/hudprograms/disaster-recovery

- U.S. Department of Housing and Urban Development, HOME Investment Partnerships Program: https://www.hud.gov/program_offices/comm_planning/affordablehousing/programs/home/
- U.S. Department of Housing and Urban Development, Sustainable Communities regional Planning Grants: https://www.hud.gov/program_offices/economic_development/sustainable_communities_regional_planning_grants
- U.S. Economic Development Administration, EDA Programs: https://www.eda.gov/programs/eda-programs/
- U.S. Environmental Protection Agency, 2017, 319 Grant Program for States and Territories: https://www.epa.gov/nps/319-grant-program-states-and-territories
- U.S. Environmental Protection Agency, 2018, Drinking Water State Revolving Fund (DWSRF): https://www.epa.gov/drinkingwatersrf
- U.S. Environmental Protection Agency, 2018, Wetland Program Development Grants: https://www.epa.gov/wetlands/wetland-program-development-grants
- U.S. Small Business Administration, Loans: https://www.sba.gov/funding-programs/loans

7.1.6 Section 5 References

Tribal and Local Hazard Mitigation Plans used in Section 5 are referenced in section 7.1.26.1

7.1.7 Section 6 References

Nevada Division of Emergency Management provided all figures and tables.

7.1.8 Section 8 References

- Carson City Building Division, Adopted Codes: http://carson.org/home/showdocument?id=50259 (accessed December 2017).
- City of Boulder City, Building and safety division: http://www.bcnv.org/163/Building-and-Safety-Division (accessed December 2017).
- City of Carson City, Open Space Division: http://carson.org/government/departments-g-z/parks-recreation-open-space/open-space-division (accessed March 2018).

- City of Elko, Building Codes/ Design Standards: http://www.elkocity.com/departments/building_department/building_codes_design_standards.php (accessed December 2017).
- City of Las Vegas, Existing codes:https://www.lasvegasnevada.gov/portal/faces/wcnav_externalId/bp-standards-requirements?_adf.ctrl-state=16u1bvid2p_4&_afrLoop=765663964711117&_afrWindowMode=0&_afrWindowId=null#%40%3F_afrWindowId%3Dnull%26_afrLoop%3D765663964711117%26_afrWindowMode%3D0%26_adf.ctrl-state%3Dosdbc2xuq_4 (accessed December 2017).
- City of North Las Vegas, 2016, Current adopted codes and ordinances: http://www.cityofnorthlasvegas.com/departments/community_development_and_compliance/current_adopted_codes_and_ordinances.php (accessed December 2017).
- City of Reno, 2018, Administrative code city of Reno, Nevada: https://library.municode.com/nv/reno/codes/administrative_code?nodeId=PT2READCO_TIT14BUCO_CH14.04BUHOCO (accessed February 2018).
- City of Sparks, Building and zoning codes: http://cityofsparks.us/resources/resource/building-and-zoning-codes/(accessed December 2017).
- Clark County Building Department, Current codes: http://www.clarkcountynv.gov/building/Pages/currentcodes.aspx (accessed December 2017).
- Douglas County, 2013, Building codes and design criteria: https://www.douglascountynv.gov/DocumentCenter/Home/View/55 (accessed December 2017).
- Federal Emergency Management Agency, 2017, Benefit Cost Toolkit version 5.3: https://www.fema.gov/media-library/assets/documents/128334
- Federal Emergency Management Agency, Disasters: https://www.fema.gov/disasters
- Lyon County, 2013, Building: http://www.lyon-county.org/153/Building (accessed December 2017).
- McGinness, B., 2017, As river crests, Northern Nevada braces for biggest flood in decade: USA Today Network, Reno Gazette-Journal: https://www.usatoday.com/story/news/nation-now/2017/01/08/river-crests-northern-nevada-braces-biggest-flood-decade/96328650/ (accessed February 2018).
- National Association of State Foresters, Nevada Forest Action Plan: https://stateforesters.org/forest-action-plans/nevada

- Nevada Bureau of Mines and Geology, MyHAZARDS – Nevada: https://gisweb.unr.edu/MyHAZARDS/
- Nevada State Public Works Division, 2015, State of Nevada Public Works Division Adopted Codes: http://publicworks.nv.gov/uploadedFiles/publicworksnvgov/content/Documents/Permitting_Code_Enforcement/Adopted_Codes.pdf (accessed December 2017).
- Nye County, Building Department: https://www.nyecounty.net/322/Building-Department (accessed December 2017).
- Silver Jackets, Nevada: https://silverjackets.nfrmp.us/State-Teams/Nevada
- Southern Nevada Water Authority, 2018, Water Smart Landscapes rebate: https://www.snwa.com/rebates/wsl/index.html (accessed February 2018).
- Spillman, B., 2017, Nevada overwhelmed by flooding; hundreds evacuated: USA Today Network, Reno Gazette-Journal: https://www.usatoday.com/story/news/nation-now/2017/01/09/reno-sparks-nevada-flooding/96335958/ (accessed February 2018).
- Swanson, E., 2009, Wells LDS Ward completes total seismic retrofit: Elko Daily Free Press, 1 p: http://elkodaily.com/news/local/wells-lds-ward-completes-total-seismic-retrofit/article_ebdbe37b-bf2c-533c-ab1c-02be286cab9b.html (accessed February 2018).
- The Nature Conservancy, 2018, Nature's benefits in action- Healthy floodplains calm high water, create wildlife habitat: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/truckee-river-watershed.xml (accessed February 2018).
- The Nature Conservancy, 2018, Nevada – Truckee River Project: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/truckee-river-project.xml (accessed February 2018).
- Truckee River Flood Management Authority, Planning: http://trfma.org/the-project/planning/
- U.S. Department of the Interior, 2014, The National Strategy - The final phase in the development of the National Cohesive Wildland Fire Management Strategy, 101 p.: https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf
- Washoe County, Codes: https://www.washoecounty.us/building/Building%20Codes.php (accessed December 2017).

7.1.9 Appendix B References

- Living With Fire, 2017, Nevada Wildfire Awareness Month 2017 – Planning group contact information: http://www.livingwithfire.info/wp-content/uploads/2017/02/NWAM-2017-Planning-Group-Contacts.2.14.17.pdf (accessed March 2018).
- Nevada Division of Emergency Management, 2018, 2018 Emergency manager's list: http://dem.nv.gov/uploadedFiles/demnvgov/content/Resources/2018%20Emergency%20Manager%20List%20City,%20County%20Tribal%20Nations%20Gails%202-20-18.pdf (accessed April 2018).
- Nevada Division of Emergency Management, Nevada Earthquake Safety Council (NESC): http://dem.nv.gov/Boards/nesc/ (accessed March 2018).

7.1.10 Appendix C References

- Nevada Division of Emergency Management, 2017, Members of the NV Hazard Mitigation Planning Subcommittee: 3 p.
- Nevada Division of Emergency Management, 2018, Members of the Nevada Hazard Mitigation Planning Committee, 2 p.
- Nevada Hazard Mitigation Planning Committee, 2016, Nevada Hazard Mitigation Planning Committee Bylaws, 5 p.

7.1.11 Appendix D References

- Nevada Division of Emergency Management, 2017, Archived meeting information: http://dem.nv.gov/DEM/ArchivedMtgs/ (accessed April 2018).

7.1.12 Appendix E References

- State of Nevada Department of Administration, Chapter 414 – Emergency management: https://www.leg.state.nv.us/NRS/NRS-414.html#NRS414Sec135

7.1.13 Appendix F References

- U.S. Geological Survey, 2014, Seismic hazard maps and site-specific data: https://earthquake.usgs.gov/hazards/hazmaps/ (accessed October 2017).

7.1.14 Appendix G References

- State of Nevada Division of Water Resources, 2018, Mapping and data: http://water.nv.gov/mapping.aspx

7.1.15 Appendix H References

- Nevada Bureau of Mines and Geology, 2017, HAZUS flood scenario – 100 year flood depth maps: University of Nevada, Reno.

7.1.16 Appendix J References

- Department of Administration State Public Works Division, 2017, List of state owned buildings: http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings/
- Oregon Department of Forestry, 2013, West wide wildfire risk assessment -final report: https://www.thewflc.org/sites/default/files/WWA_FinalReport_3-6-2016-1.pdf (accessed February 2018)

7.1.17 Appendix K References

- Desert Research Institute, Nevada Climate Summaries: Western Regional Climate Center (WRCC): https://wrcc.dri.edu/summary/climsmnv.html
- National Oceanic and Atmospheric Administration, Storm Events Database: National Centers For Environmental Research (formerly the National Climatic Data Center): www.ncdc.noaa.gov/stormevents

7.1.18 Appendix L References

- Seelye, I.M., Johnson, G.L., dePolo, C.M. , Faulds, J.E., Price, J.G., 2014, Updated estimated losses from earthquakes near Nevada communities: Nevada Bureau of Mines and Geology, OFR 09-8, 25 p.: http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm

7.1.19 Appendix M References

- Nevada Division of Emergency Management (provided), 2017, Threat and hazard identification and risk assessment – executive summary: 2017 Report Nevada.

7.1.20 Appendix N References

- Western States Seismic Policy Council, Adopted recommendations: https://www.wsspc.org/public-policy/adopted-recommendations/

7.1.21 Appendix O References

- Bureau of Land Management. Southern Nevada Public Land Management Act (SNPLMA): https://www.blm.gov/SNPLMA (accessed December 2017).
- Canaday, R., 2017, Reno Public Works conducting flood mitigation efforts: http://www.ktvn.com/story/35091584/reno-public-works-conducting-flood-mitigation-efforts (accessed November 2017).
- Carson River Coalition, 2015, Carson River watershed invasive species forum: http://www.cwsd.org/wp-content/uploads/2015/04/2.17.2015FinalNotesCRWForum.pdf (accessed January 2018).
- City of North Las Vegas, 2015, 2015 Hazardous Materials and Transportation Summit: City of North Las Vegas Office of Emergency Management, 1p.
- City of North Las Vegas, 2017, 2017 Continuity of Operation Plan (COOP) – Tabletop Exercise 8 Jun 2017: City of North Las Vegas Office of Emergency Management, 1p.
- City of North Las Vegas, 2018, North Las Vegas Office of Emergency Management CERT Class (Spanish) – 17-18 February 2018: North Las Vegas Office of Emergency Management, 1 p.
- Clark County Regional Flood Control District, 2017, 2016-2017 annual report, 35 p.: http://gustfront.ccrfcd.org/pdf_arch1/public%20information/annual%20reports/CCRFCD_Annual%20Report_2016-2017.pdf (accessed November 2017).
- dePolo, C.M., 2014, Earthquake hazards in Washoe County: Nevada Bureau of Mines and Geology, 43 p. : http://www.nbmg.unr.edu/nhmpc/Presentations/Earthquake_Hazard_Presentations/Earthquake_Hazards_in_Washoe_Co_19June2014.pdf (accessed November 2017).
- Desert Research Institute, 2016, Wildland Fire Science Center factsheet: https://www.dri.edu/images/stories/centers/wsfc/WFSCFactSheet2_16_6.pdf (accessed January 2018).
- Desert Research Institute, UAS research at DRI: https://www.dri.edu/uas-research/our-research (accessed December 2017).
- Federal Emergency Management Agency, 2017, What is mitigation?: https://www.fema.gov/what-mitigation (accessed November 2017).

- James, E., 2015, Overview of Carson River watershed activities: https://www.leg.state.nv.us/Session/78th2015/Exhibits/Assembly/NRAM/ANRAM279F.pdf (accessed December 2017).
- Lake Tahoe Info (Tahoe Regional Planning Agency), Lake Tahoe EIP Project Tracker: https://eip.laketahoeinfo.org/ (accessed December 2017).
- Las Vegas Valley Water District, Drought and conservation measures: https://www.lvvwd.com/conservation/measures/index.html (accessed December 2017).
- Living With Fire, 2016, 2016 annual report Living With Fire program activity: http://www.livingwithfire.info/wp-content/uploads/2017/03/2016-Living-With-Fire-Program-Activity-Report.pdf (accessed December 2017).
- Living With Fire, Tahoe fire & fuels team: http://tahoe.livingwithfire.info/tahoe-fire-fuels-team/ (accessed December 2017).
- Mehrsorousch, A., Saiidi, M., and Ryan, K., 2017, Development of earthquake-resistant precast pier systems for accelerated bridge construction in Nevada: Center for Civil Engineering Earthquake Research, Nevada Department of Transportation, Report No. CCEER 17-03, p.ii: https://www.nevadadot.com/home/showdocument?id=9167 (accessed January 2018).
- Mohammed, M.S., Biasi, G., and Sanders, D.H., 2016, Post-earthquake assessment of Nevada bridges using ShakeMap/ShakeCast: Center for Earthquake Engineering Research, Nevada Department of Transportation, Report No. CCEER-16-04, p.i: https://www.nevadadot.com/home/showdocument?id=9111 (accessed January 2018).
- Mt. Rose Ski Tahoe, Safety in the Chutes: http://skirose.com/the-mountain/safety-in-the-chutes/ (accessed December 2017).
- Nada, H., and Sanders, D.H., 2017, Analytical investigation into bridge column innovations for mitigating earthquake damage: Center for Civil Engineering Earthquake Research, Nevada Department of Transportation, Report No. CCEER 17-06, p. i: https://www.nevadadot.com/home/showdocument?id=9139 (accessed January 2018).
- Nevada Department of Transportation, 2016, 2016 facts and figures: https://www.nevadadot.com/home/showdocument?id=6446 (accessed January 2018).
- Nevada Department of Wildlife, Boat inspection stations open to combat aquatic invasive species: http://www.ndow.org/Boat-Inspection-Stations-Open-Combat-Aquatic-Invasive-Species/ (accessed December 2017).
- Nevada Division of Emergency Management, 2016, Annual report 2015-2016: http://dem.nv.gov/uploadedFiles/demnvgov/content/About/FINALOrderA14879_DEM_AnnualReport_FRONTandBACK-PROOF04.pdf (accessed November 2017).

- Nevada Division of Emergency Management, 2017, Annual report 2016-2017: http://dem.nv.gov/uploadedFiles/demnvgov/content/About/FINAL_DEM%20Annual%20Report%202016-2017.pdf (accessed November 2017).
- Nevada Division of Forestry, 2016, Report to Nevada State Legislature in compliance with AB75 / NRS 528.150 - Fire-fuels-forest restoration activities and accomplishment at Lake Tahoe, Nevada: http://forestry.nv.gov/wp-content/uploads/2017/02/AB75-FINAL-REPORT-2016.pdf (accessed November 2017).
- Nevada Division of Forestry, 2018, Highlighted projects: http://forestry.nv.gov/highlighted-projects/ (accessed January 2018).
- Nevada Seismological Laboratory, 2014, AlertTahoe: http://www.alertwildfire.org/tahoe/ (accessed January 2018).
- Rosch, D., and Forest, A., 2017, Snow safety specialists talks about avalanche threat at Mt.Charleston: http://news3lv.com/news/local/snow-safety-specialists-talks-about-avalanche-threat-at-mt-charleston (accessed December 2017).
- Russell, T., 2015, NDOT does avalanche control on Mt. Rose Highway: http://www.kolotv.com/content/news/NDOT-Avalanche-Control-on-Mt-Rose-Highway-365505631.html (accessed December 2017).
- Russell, T., 2015, Snow fence could soon be put to work: http://www.kolotv.com/home/headlines/Snow-Fence-Could-Soon-Be-Put-To-Work-361640011.html (accessed December 2017).
- Shine, C., 2015, What Nevada has done to conserve water may serve as example for California: https://lasvegassun.com/news/2015/apr/27/tips-california-what-nevada-has-done-conserve-wate/ (accessed December 2017).
- Southern Nevada Water Authority, 2016, Southern Nevada Water Authority fiscal year 2015-2016 annual report: https://www.snwa.com/about/reports/index.html (accessed December 2017).
- Southern Nevada Water Authority, 2018, Water Smart Landscapes rebate: https://www.snwa.com/rebates/wsl/index.html (accessed February 2018).
- Thao, D., 2018, Avalanche control requires some shutdowns of Mt. Rose Highway: http://mynews4.com/news/local/ndot-shuts-down-mount-rose-highway-for-avalanche-control (accessed January 2018).
- The Nature Conservancy, 2018, Bringing back the Truckee River – Lockwood and 102 Ranch: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/102-ranch.xml (accessed March 2018).

- The Nature Conservancy, 2018, Carson River Project – Conservation to benefit people and nature: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/carson-river-project.xml (accessed March 2018).
- The Nature Conservancy, 2018, Nature's benefits in action- Healthy floodplains calm high water, create wildlife habitat: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/truckee-river-project.xml (accessed March 2018).
- The Nature Conservancy, 2018, Nevada - Places we protect: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/index.htm (accessed January 2018).
- The Nature Conservancy, 2018, Nevada – Truckee River Project: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placeswe protect/truckee-river-project.xml (accessed February 2018).
- Truckee Meadows Water Authority, 2017, Water topics in our community- drought: https://tmwa.com/wp-content/uploads/2017/06/Drought-2017.pdf (accessed December 2017).
- Truckee River Flood Management Authority, 2017, Planning: http://trfma.org/the-project/planning/ (accessed January 2018).
- Truckee River Fund, Completed projects: http://truckeeriverfund.org/status/completed/ (accessed March 2018).
- Truckee River Fund, Grant #52- Truckee River bank stabilization at Oxbow Park: http://truckeeriverfund.org/projects/truckee-river-bank-stabilization-at-oxbow-park/ (accessed March 2018).
- Truckee River Fund, Projects in progress: http://truckeeriverfund.org/status/approved/ (accessed March 2018).
- Welling, S., 2017, Avalanche risk at Mount Charleston continues: http://www.clarkcountynv.gov/public-communications/news/Pages/Avalanche-Risk-at-Mount-Charleston-Continues.aspx (accessed December 2017).
- Western States Seismic Policy, 2014, Nevada Earthquake Safety Council, Nevada Bureau of Mines and Geology, Nevada Seismological Laboratory, and Nevada Division of Emergency Management: http://www.wsspc.org/wp-content/uploads/2014/12/NV_ALL_2014.pdf (accessed November 2017).

- Wharton, C., 2015, Living With Fire Program receives national Wildfire Mitigation Award- Cooperative Extension creates partnerships to lead the way in establishing fire adapted communities: https://www.unr.edu/nevada-today/news/2015/wildfire-mitigation-award (accessed January 2018).
- Wolterbeek, M., 2016, USGS awards $3.7 million for ShakeAlert Earthquake Early Warning System: Nevada Today, University of Nevada, Reno: https://www.unr.edu/nevada-today/news/2016/earthquake-early-warning-system (accessed December 2017).
- Wolterbeek, M., 2017, AlertTahoe fire camera network readies for robust fire season, adds cameras: Nevada Today, University of Nevada, Reno: https://www.unr.edu/nevada-today/news/2017/alerttahoe-readies-for-2017 (accessed December 2017).
- Wolterbeek, M., 2018, AlertWildfire mountaintop camera network tracked 240 western wildfires in 2017 – College of Science leveraging technology for public safety: https://www.unr.edu/nevada-today/news/2018/alertwildfire?utm_source=newsletter030118&utm_medium=email&utm_content=alertfire&utm_campaign=NevadaWeekly (accessed February 2018).

7.1.22 Appendix P References

7.1.22.1 Social Media Sites

The following social mead sites are listed in Appendix P:

- Alpine Watershed Group (@AlpineWatershedGroup): https://www.facebook.com/AlpineWatershedGroup/ (accessed March 2018).
- AlpineWatershedGroup (@AlpineWatershed): https://twitter.com/alpinewatershed (accessed March 2018).
- Desert Research Institute (@driscience): https://www.instagram.com/driscience/ (accessed March 2018).
- Desert Research Institute (@DRIScience): https://twitter.com/DRIScience?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor (accessed March 2018).
- Desert Research Institute (@drisciene): https://www.facebook.com/driscience/ (accessed March 2018).
- FEMA Federal Emergency Management Agency (@FEMA): https://www.facebook.com/FEMA/ (accessed November 2017).
- Great ShakeOut Earthquake Drills (@GreatShakeOut): https://www.facebook.com/GreatShakeOut/ (accessed November 2017).

- Living With Fire (@LivingWithFire): https://www.facebook.com/LivingWithFire/ (accessed March 2018).
- Nevada Bureau of Mines and Geology (@NevadaGeology): https://www.facebook.com/NevadaGeology/ (accessed November 2017).
- Nevada Bureau of Mines and Geology (@NevadaGeology): https://www.instagram.com/nevadageology/ (accessed November 2017).
- Nevada Department of Public Safety (@NevadaDPS): https://twitter.com/nevadadps?lang=en (accessed November 2017).
- Nevada Department of Public Safety (@NevadaDPS): https://www.facebook.com/NevadaDPS/ (accessed November 2017).
- Nevada Department of Transportation (@nevadadot): https://twitter.com/nevadadot?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor (accessed March 2018).
- Nevada Department of Transportation (@NevadaDOT): https://www.facebook.com/NevadaDOT/ (accessed March 2018).
- Nevada Division of Emergency Management Homeland Security: https://www.facebook.com/NVEmergencyMgmt/ (accessed November 2017).
- Nevada Division of Forestry – Southern Region (@NevadaDivisionSouth): https://www.facebook.com/NevadaDivisionSouth/ (accessed November 2017).
- Nevada Division of Forestry – Western Region (@NevadaForestry): https://www.facebook.com/NevadaForestry/ (accessed November 2017).
- Nevada Division of Insurance (@NevadaDivisionOfInsurance): https://www.facebook.com/NevadaDivisionOfInsurance/ (accessed November 2017).
- Nevada Floods (@NevadaFloods): https://www.facebook.com/NevadaFloods/?hc_location=ufi (accessed November 2017).
- Nevada Seismic Network (@NVEarthquakes): https://twitter.com/nvearthquakes (accessed November 2017).
- Nevada Seismo Lab (@NVSeismoLab): https://twitter.com/NVSeismoLab?lang=en (accessed November 2017).
- Nevada Seismological Laboratory (@NevadaSeismo): https://www.facebook.com/NevadaSeismo/ (accessed November 2017).
- NOAA WRN Ambassadors (@WRNAmbassadors): https://twitter.com/WRNAmbassadors?lang=en (accessed November 2017).

- North Lake Tahoe Fire Protection District (@NorthLakeTahoeFire): https://www.facebook.com/NorthLakeTahoeFire/?hc_ref=ARRHycNmwcemaNfXqTjYIGEZjx4D-SU0U55MdJmZzAYM0N20xxKo-XOQsVaEXc4RE7w&fref=nf (accessed March 2018).
- North Tahoe Fire (@NTFPD_): https://twitter.com/ntfpd_?lang=en (accessed March 2018).
- NV Emergency Mgmt (@NVEmergencyMgmt): https://twitter.com/nvemergencymgmt?lang=en (accessed November 2017).
- Regional Flood Control District (@regionalflood): https://www.instagram.com/regionalflood/ (accessed November 2017).
- Regional Flood Control District (@RegionalFloodControlDistrict): https://www.facebook.com/RegionalFloodControlDistrict (accessed November 2017).
- Regional Flood Control District (@RegionalFloodControlDistrict): https://twitter.com/RegionalFlood (accessed November 2017).
- Regional Flood Control District [YouTube channel]: https://www.youtube.com/user/CCRFCD (accessed November 2017).
- ShakeOut (@greatshakeout): https://www.instagram.com/greatshakeout/ (accessed November 2017).
- ShakeOut [YoutTube channel], Great ShakeOut Earthquake Drills: https://www.youtube.com/user/greatshakeout (accessed November 2017).
- ShakeOut, The Great Nevada ShakeOut: https://www.shakeout.org/nevada/index.html (accessed November 2017).
- Sierra Avalanche Center (@sacnonprofit): https://www.facebook.com/sacnonprofit/ (accessed March 2018)
- Sierra Avalanche Center (@savycenter): https://www.instagram.com/savycenter/?hl=en (accessed March 2018).
- Sierra Avy Center (@sierraavalanche): https://twitter.com/sierraavalanche?lang=en (accessed March 2018).
- SNWA (@SNWA_H2O): https://twitter.com/SNWA_H2O (accessed November 2017).
- Southern Nevada Water Authority (@thesnwa): https://www.facebook.com/thesnwa/ (accessed November 2017).
- Southern Nevada Water Authority [@snwavideo – YouTube channel]: https://www.youtube.com/user/snwavideo (accessed November 2017).

- The Nature Conservancy (@NatureNevada): https://www.facebook.com/NatureNevada/ (accessed March 2018).
- The Nature Conservancy NV (@Nature_Nevada): https://twitter.com/nature_nevada?lang=en (accessed March 2018).
- TMWA (@TMWA): https://twitter.com/tmwa?lang=en (accessed March 2018).
- TR Flood Project (@TruckeeRiverFMA): https://twitter.com/TruckeeRiverFMA?lang=en (accessed November 2017).
- Truckee Meadows Water Authority (@truckeemeadowswaterauthority): https://www.facebook.com/truckeemeadowswaterauthority/ (accessed March 2018).
- Truckee River Flood Management Authority (@trfma): https://www.facebook.com/trfma/ (accessed November 2017).

7.1.22.2 Websites/Online Resources

- Carson Water Subconservancy District, Outreach and Education: http://www.cwsd.org/outreach-and-education/ (accessed November 2017).
- Nevada Bureau of Mines and Geology, MyHAZARDS - Nevada: https://gisweb.unr.edu/MyHAZARDS/ (accessed November 2017).
- Nevada Bureau of Mines and Geology, Nevada Hazard Mitigation Planning Committee (NHMPC): http://www.nbmg.unr.edu/nhmpc/ (accessed November 2017).
- Nevada Bureau of Mines and Geology: http://www.nbmg.unr.edu/
- Nevada Division of Emergency Management, Nevada Hazards Mitigation Planning Committee (NHMPC): http://dem.nv.gov/boards/nhmpc/ (accessed November 2017).
- Nevada Division of Emergency Management: http://dem.nv.gov/
- Nevada Division of Forestry, Nevada Natural Resources and Fire Information Portal: https://nevadaresourcesandwildfireinfo.com/Map/Public (accessed November 2017).
- Nevada Division of Forestry: http://forestry.nv.gov/
- Silver Jackets, Nevada: https://silverjackets.nfrmp.us/State-Teams/Nevada
- State of Nevada Division of Water Resources, Home: http://water.nv.gov/index.aspx (accessed November 2017).

7.1.22.3 Flyer/Figure References

- Beyond the Basics, Best Practices in Local Mitigation Planning – Task 3 create an outreach strategy: Coastal Hazards Center, Center for Sustainable Community Design: http://mitigationguide.org/task-3/outreach-strategy-framework/ (accessed January 2018).
- Carson Water Subconservancy District, 2015, Invasive Species Awareness Day.
- City of North Las Vegas, 2014, National Preparedness Month news release: Office of the City Manager, 1 p.
- City of Reno, 2016, Earthquake Economic Resiliency Forum for the greater Reno/Sparks, Carson, Tahoe and Truckee region: https://www.reno.gov/home/showdocument?id=58923 (accessed December 2017).
- Clark County Regional Flood Control District (@regionalflood), 2017, Have you downloaded our #free #app FloodSpot? It has everything you need to stay Flood Safe in the palm of your hands – Flood Zone Interactive Map, #Weather Reports. #Flood Reporting. Photo/Video uploading, Geo-Tagging, Push Notifications, and it includes a fun-for-all ages educational interactive game! Get it at www.befloodsafe.com [Instagram post]: https://www.instagram.com/p/BUM4qBrgNMg/?taken-by=regionalflood (accessed December 2017).
- Clark County Regional Flood Control District, Be Flood Safe: https://befloodsafe.com/ (accessed December 2017).
- dePolo, C.M., 2016, Earthquake hazard and risk in Mineral County: Nevada Bureau of Mines and Geology, Nevada Hazard Mitigation Planning Committee, 83 p.: http://www.nbmg.unr.edu/nhmpc/Presentations/Earthquake_Hazard_Presentations/Earthquake_Hazards_in_Mineral_Co_23Feb2016.pdf (accessed December 2017).
- dePolo, C.M., n.d., The October 2, 1915 Pleasant Valley earthquake- Nevada's largest historical earthquake: Nevada Bureau of Mines and Geology, 59 p. : http://www.nbmg.unr.edu/nhmpc/Presentations/Earthquake_Hazard_Presentations/The_1915_Pleasant_Valley_Eq_100_Years_2-18-16.pdf (accessed December 2017).
- Federal Emergency Management Agency, 2016, Hazard Mitigation Assistance Program in Nevada: 2 p.
- Federal Emergency Management Agency, n.d., The Hazard Mitigation Assitance Grant Programs: 4p.
- Glick, N., 2017, Using floods to prevent flood damage in Nevada: KUNR, 88.7 Reno Public Radio: http://kunr.org/post/using-floods-prevent-flood-damage-nevada#stream/0 (accessed December 2017).

- Inter-Tribal Emergency Response Commission, 2015, Registration opens tomorrow – Nevada Network of Fire Adapted Communities 2nd annual conference [Facebook status update]: https://www.facebook.com/225833830903750/photos/a.249869065166893.1073741827.225833830903750/508137679340029/?type=3&theater (accessed December 2017).
- Living With Fire, 2016, 2016 Annual Report - Living With Fire Program Activity: http://www.livingwithfire.info/wp-content/uploads/2017/03/2016-Living-With-Fire-Program-Activity-Report.pdf (accessed December 2017).
- Living With Fire, 2016, Nevada Wildfire Awareness Month (NWAM) – Debrief meeting minutes: 4 p.
- Living With Fire, 2016, Nevada Wildfire Awareness Month 2016 events and activities: 9 p.
- National Weather Service – Las Vegas, 2017, Certificate of Recognition: City of North Las Vegas, 1p.
- Neddenriep, D., 2017, CWSD floodplain conservation videos debut!: Carson Water Subconservancy District: http://www.cwsd.org/whats-happening/ (accessed December 2017).
- Nevada Broadcasters Association, 2015, Radio copy.
- Nevada Department of Conservation and Natural Resources, 2014, Governor to kick-off Flood Awareness Campaign on Friday, October 10.
- Nevada Department of Conservation and Natural Resources, 2015, 2015 Nevada Flood Awareness Week Events- November 1-7.
- Nevada Department of Conservation and Natural Resources, 2015, Nevada Flood Awareness Week – November 1-7 [press release].
- Nevada Department of Transportation (@NevadaDOT), 2017, Shake it out! Nevada bridges have been ranked the nation's best. But, because Nevada is one of the most seismically active states, we routinely enhance and seismically retrofit older bridges to help them remain safer in a major earthquake. And you also can prepare to stay safer in a quake. "Drop, cover, and hold on" as part of the statewide Great Nevada ShakeOut drill tomorrow and learn more to be safe during an earthquake [Facebook status update]: https://www.facebook.com/NevadaDOT/photos/a.269853149718788.57229.242888319081938/1568755909828499/?type=3&theater (accessed December 2017).
- Nevada Division of Emergency Management, 2017, Wildland fire safety [Facebook status update] (accessed December 2017).

- Nevada Division of Forestry, 2016, Come join us for a fun event to support wildfire awareness [Facebook status update]: https://business.facebook.com/NevadaForestry/photos/a.447877195295932.1073741828.447867818630203/1078675895549389/?type=3&theater (accessed December 2017).
- Nevada Division of Forestry, 2017, Join us for a Wildfire Awareness Event - Junk the Junipers [Facebook status update]: https://www.facebook.com/NevadaForestry/photos/a.447877195295932.1073741828.447867818630203/1402793003137675/?type=3&theater (accessed December 2017).
- Nevada EM Disaster Recovery Project, 2016, Project announcement- Join us for the project meetings and trainings in your region!: Nevada Division of Emergency Management, 1 p.
- Nevada Floods, n.d., Get involved! Nevada Flood Awareness Week (FAW) – Ideas for local activities, events: http://www.nevadafloods.org/docs/get_involved.pdf (accessed December 2017).
- Nevada Silver Jackets Team, 2017, A flood awareness guide for Nevada: U.S. Army Corps of Engineers, Carson Water Subconservancy District, Douglas County, U.S. National Weather Service, and the Silver Jackets, 48 p.
- Office of Emergency Management and Homeland Security, 2014, National Preparedness Month 2014: City of North Las Vegas, 1 p.
- Office of Emergency Management and Homeland Security, 2015, National Preparedness Month 2015: City of North Las Vegas, 1 p.
- Office of Emergency Management and Homeland Security, 2015, The Great Shakeout ’15: City of North Las Vegas, 1p.
- Office of Emergency Management and Homeland Security, 2017, National Preparedness Month 2017: City of North Las Vegas, 1 p.
- Office of Emergency Management and Homeland Security, 2017, The Great Shakeout ’17: City of North Las Vegas, 1 p.
- Powell, G., 2015, The Nevada Division of Emergency Management/ Homeland Security (NDEM) and the National Weather Service (NWS) declare April as Severe Weather Awareness Month in Nevada: Nevada Department of Public Safety, 2 p.
- Sierra Avalanche Center (@sacnonprofit), 2017, Are you looking for OHV avy education. Bridgeport Avalanche Center has another opportunity for you to get into the field and start your training [Facebook status update]: https://www.facebook.com/sacnonprofit/photos/a.10150490793105197.365547.516754301961015455265811019 7/?type=3&theater (accessed March 2018).

- Sierra Avalanche Center (@sacnonprofit), 2017, Hey Reno, SAC is coming out to the Joe Crowley Student Union for Know Before You Go avalanche awareness on Feb 14th. Bring a date and get started in avalanche education. #knowbeforeyougo [Facebook status update]: https://www.facebook.com/sacnonprofit/photos/a.10150490793105197.365547.516754300196/10154410856200197/?type=3&theater (accessed March 2018).
- Sierra Avalanche Center (@sacnonprofit), 2017, Hope to see you all this evening at Granite Chief Ski & Mountain Shop for this winter kick-off event! [Facebook status update]: https://www.facebook.com/events/181149635771508/ (accessed December 2017).
- Sierra Avalanche Center (@sacnonprofit), 2017, Preparing for safe winter backcountry adventures [Facebook status update]: https://www.facebook.com/events/297574580747349/ (accessed December 2017).
- Sierra Avalanche Center, Education: https://www.sierraavalanchecenter.org/education (accessed March 2018).
- Silver Jackets, The Nevada Silver Jackets Team: 2 p.
- Southern Nevada Water Authority (@thesnwa), 2017, The numbers speak for themselves. Through the Water Smart Landscapes Rebate Program, the community is making great strides in water conservation http://bit.ly/1hPmLyM [Facebook status update]: https://www.facebook.com/thesnwa/photos/a.533255146765710.1073741828.499452973479261/1453470088077540/?type=3&theater (accessed March 2018).
- State of Nevada Executive Department, 2014, A proclamation by the governor: 2 p.
- Tahoe Nordic Search and Rescue Team, 2008, TNSAR's Winter Awareness- A guide to winter preparedness and survival: http://www.tahoenordicsar.com/TSARsml.pdf (accessed March 2018).
- Tahoe Nordic Search and Rescue Team, 2018, TNSAR Video- Winter Aware: http://www.tahoenordicsar.com/Education/WinterAware.shtml (accessed March 2018).
- Tahoe Nordic Search and Rescue Team, 2018, Winter Wilderness Survival Program for local 4th graders: http://www.tahoenordicsar.com/Education/4thGrade/ (accessed March 2018).
- Truckee River Flood Management Authority (@trfma), 2017, We had a great time yesterday with our colleagues at Meadowood Mall – thanks to everyone who stopped by our booth to learn more about the Truckee River Flood Management Project! [Facebook status update]: https://www.facebook.com/NevadaFloods/photos/a.900108996742349.1073741835.723488317737752/1557495717670337/?type=3&theater (accessed March 2018).

- U.S. National Weather Service – Reno, Nevada, 2017, Are YOU prepared for disaster? Free disaster preparedness fair tonight at Reno City Hall. Tonight from 5:30pm – 7:30pm!! Don't miss out [Facebook status update]: https://www.facebook.com/NWSReno/photos/a.177815062280342.46434.157117197683462/1554878077907360/?type=3&theater (accessed December 2017).
- U.S. National Weather Service – Reno, Nevada, 2017, If you are in the Mammoth Lakes area and are interested in the upcoming spring flood outlook and a look back at our historic winter, our Warning Coordination Meteorologist will be giving a talk today at the Mammoth Lakes Welcome Center. See flyer for additional details. [Facebook status update]: https://www.facebook.com/NWSReno/photos/a.177815062280342.46434.157117197683462/1413207635407739/?type=3&theater (accessed December 2017).
- U.S. National Weather Service – Reno, Nevada, 2017, Mark your calendars! We will be doing a Facebook Live today around 3PM with one of our newest Weather –Ready Nation Amabassadors, Living With Fire. Hope that you can join us! [Facebook status update]: https://www.facebook.com/NWSReno/photos/a.177815062280342.46434.157117197683462/1440838965977939/?type=3&theater (accessed December 2017).
- U.S. National Weather Service – Reno, Nevada, 2017, US National Weather Service will be at the Aviation Roundup in Minden this weekend along with Nevada Floods. Stop by to say hello and learn more about weather and flooding in Northern Nevada! [Facebook status update]: https://www.facebook.com/AviationRoundup/photos/a.201161619920056.43404.201158953253656/1447353391967533/?type=3&theater (accessed December 2017).
- U.S. National Weather Service – Reno, Nevada, 2017, Winter in the Sierra & Western Nevada: Wondering what Old Man Winter has in store for the Sierra and Western Nevada this year? Will this winter be like last winter? If you answered "yes" to those questions, then come out to "Winter in the Sierra & Western Nevada" hosted by one of our awesome Weather-Ready Nation partners, Great Basin Brewing Company, located at their Taps and Tanks facility on South Rock Blvd in Reno TODAY from 5pm-9pm. Three meteorologists from NWS Reno will be there to discuss the record breaking 2017 winter as well as this upcoming winter and what to prepare for. Hope to see you all there! [Facebook status update]: https://www.facebook.com/events/246516922538648/ (accessed December 2017).
- U.S. National Weather Service- Reno (@NWSReno), 2017, Nevada Flood Awareness Week. Do you know your flood risk? Are you prepared? Two serious questions that you should be asking yourself. To determine your flood risk go to ww.FloodSmart.gov. Most homeowner policies do NOT cover flood damage, so keep yourself informed and prepared [Facebook status

update]:https://www.facebook.com/NWSReno/photos/a.177815062280342.46434.157117197683462/1611918622203305/?type=3&theater (accessed December 2017).

- U.S. National Weather Service- Reno, Nevada, 2017, Wildfire Awareness Month. Follow @NWSReno and @LivingWithFire this week as we revisit historical fires in the Reno-Tahoe area. Let's look back on these fires and think of how we can prepare and prevent future fires in the Sierra and western Nevada. Prepare. Anticipate. Evacuate. [Facebook status update]: https://www.facebook.com/NWSReno/photos/a.177815062280342.46434.157117197683462/1429371843791318/?type=3&theater (accessed December 2017).

7.1.23 Appendix Q References

- Nevada Home Town Locator, 2018, Nevada canals: https://nevada.hometownlocator.com/features/cultural,class,canal,startrow,1.cfm

7.1.24 Appendix R References

- Federal Emergency Management Agency, 2015, State Mitigation Plan Review Guide: U.S. Department of Homeland Security, FP 302-094-2, 57 p.: https://www.fema.gov/media-library-data/1425915308555-aba3a873bc5f1140f7320d1ebebd18c6/State_Mitigation_Plan_Review_Guide_2015.pdf (accessed November 2017).

7.1.25 Appendix S References

- Pohll, G., Schumer, R., Rybarski, S., Crews, J., Pearson, C., 2016, Assessment of drought resiliency in rural northern Nevada: Desert Research Institute, 73 p.
- Pohll, G., Schumer, R., Rybarski, S., Crews, J., Pearson, C., 2016, Assessment of drought resiliency in rural northern Nevada- additional studies: Desert Research Institute, 28 p.

7.1.26 Appendix T References

- Fellows, R.D., Sheetz, E.E., Earl, D., Dominie, H., Macciocca, B., Snow, W.H., 2017, Loss avoidance study - severe storms and flooding. Federal Emergency Management Agency, Hazard Mitigation Performance Analysis, 74 p.

7.1.27 Appendix U References

- Nevada Division of Public and Behavioral Health, 2014, State of Nevada Radiological Emergency Response Plan: 10 p.

7.1.28 Miscellaneous References and Links

7.1.28.1 Local and Tribal Hazard Mitigation Plans

- Carson City Hazard Mitigation Planning Committee, 2016 ,Carson City Hazard Mitigation Plan: Carson City Office of Emergency Management, prepared by RO Anderson, 342 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Carson.pdf

- Churchill County Hazard Mitigation Planning Committee,2016,Churchill County Multi-Jurisdictional Hazard Mitigation Plan: Churchill County Department of Emergency Management, The Fallon-Paiute Shoshone Tribe, The Oasis of Nevada, prepared by RO Anderson, 341 p.

- Clark County Hazard Mitigation Planning Committee,2012,Clark County Multi-Jurisdictional Hazard Mitigation Plan: Clark County, City of Henderson, City of Las Vegas, City of Mesquite, and the City of North Las Vegas, 304 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Clark.pdf

- Douglas County Hazard Mitigation Planning Committee,2013,Douglas County Hazard Mitigation Plan: Douglas County Department of Emergency Management, 290 p. http://www.tahoefire.org/attachments/article/57/2013%20LHMP_FINAL.pdf

- Elko County Hazard Mitigation Planning Committee, 2014, Elko County Hazard Mitigation Plan: Elko County Department of Emergency Management, 233 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Elko.pdf

- Esmeralda County Hazard Mitigation Planning Committee,2016,Esmeralda County, Nevada Local Hazard Mitigation Plan: Esmeralda County Department of Emergency Management, 161 p.

- Humboldt, Landing, and Pershing County Local Emergency Planning Committee, 2015, Regional Tri-County Hazard Mitigation Plan: Prepared by Farr West Engineering, 201 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Pershing-Humboldt-Lander.pdf

- Lincoln County Hazard Mitigation Planning Committee,2016, Lincoln County and City of Caliente Hazard Mitigation Plan: Lincoln County Department of Emergency

Management, 176 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Lincoln.pdf

- Lyon County Local Emergency Planning Committee, 2013, Lyon County Multi-Jurisdictional Hazard Mitigation Plan: Lyon County Office of Emergency Management, 288 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Lyon.pdf
- Mineral County Hazard Mitigation Planning Committee,2016,Mineral County and Walker River Paiute Tribe Multijurisdictional Hazard Mitigation Plan:Mineral County Department of Emergency Management, 234 p.
- Mohave County Multi-Jurisdictional Planning Team, 2016, Mohave County Multi-Jurisdictional Hazard Mitigation Plan: 228 p.
- Nye County Hazard Mitigation Planning Committee, 2013, Nye County Hazard Mitigation Plan, as amended: Duckwater Shoshone Tribe, Nye County, Dyer Engineering Consultants, Inc., 190 p.
- Storey County Hazard Mitigation Planning Committee, 2015, Storey County Hazard Mitigation Plan: Storey County, 150 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Storey.pdf
- Washoe County Hazard Mitigation Planning Committee, 2016, Washoe County Regional Hazard Mitigation Plan: City of Reno, City of Sparks, Pyramid Lake Paiute Tribe, Reno-Sparks Indian Colony Tribal Council, and Washoe County, prepared by RO Anderson, 510 p. http://www.nbmg.unr.edu/nhmpc/Approved_County_and_Tribal_Hazard_Mitigation_Plans/approved_local/Washoe.pdf
- White Pine County Planning Committee and Eureka County Planning Committee, 2014, White Pine County and Eureka County Multi-Jurisdictional Hazard Mitigation Plan 234 p.

7.1.28.2 Miscellaneous References

- Clark County Regional Flood Control District, Annual Reports: Clark County Regional Flood Control District: http://www.ccrfcd.org/pi_annualreports.htm
- Federal Emergency Management Agency, 2016, State Mitigation Plan Review Guide FP 302-094-2: https://www.fema.gov/media-library/assets/documents/101659_(accessed November 2017).

7.1.28.3 Important Links

- Department of Geological Sciences and Engineering: http://www.unr.edu/geology
- Earth Science News and Maps: http://geology.com/
- Living with Earthquakes in Nevada: http://www.seismo.unr.edu/Files/Preparedness/nvguide_2010.pdf
- Living With Fire: http://www.livingwithfire.info/
- National Oceanic & Atmospheric Administration: www.noaa.gov
- Nevada Dam Safety: http://water.nv.gov/DamsAndSafetyHome.aspx
- Nevada Division of Emergency Management: http://dem.nv.gov/
- Nevada Earthquake Safety Council: http://www.nbmg.unr.edu/nesc/index.html
- Nevada Fire Safe Council: http://www.nvfsc.org/
- Nevada Hazard Mitigation Planning Committee: http://www.nbmg.unr.edu/nhmpc/
- Nevada Quick Facts from the US Census Bureau: https://www.census.gov/quickfacts/NV
- Nevada Seismological Laboratory: http://www.seismo.unr.edu/
- Plan Ahead Nevada: http://dps.nv.gov/uploadedFiles/dpsnvgov/content/Citizen/evacuationguide_PAN.pdf
- Southern Nevada Health District: http://www.southernnevadahealthdistrict.org/
- Tahoe Research, Scholarship & Outreach: http://www.tahoe.unr.edu/
- USGS Nevada Aquifer Basics: http://capp.water.usgs.gov/aquiferBasics/ext_snvrock.html
- Washoe County District Health Department: http://www.washoecounty.us/health/
- Western Great Basin Coordination Center: https://gacc.nifc.gov/gbcc/

This section demonstrates the extent to which this plan is integrated with other State and regional programs, as well as with FEMA programs and initiatives. It describes current mitigation program management capabilities and discusses how mitigation efforts can be better integrated with those programs via legislative, policy, institutional, substantive, functional, and financial perspectives. Included is an analysis of mitigation actions and effective use of funds and a system and strategy for monitoring the effectiveness of mitigation efforts and updating the SHMP in the future. It also addresses FEMA criteria for qualifying the 2018 plan as an enhanced plan. *Updates to this section include the revision to reflect the management of all HMA grants by Nevada DEM, updates in the HMA review, ranking and review process due to NHMPC streamlining, and information on disaster recovery framework. Nevada DEM modified terminology for the damage assessment teams. Examples of mitigation activities were also updated.*

8.1 INTEGRATION WITH OTHER PLANNING INITIATIVES

The requirements for the enhanced plan, as stipulated in the DMA 2000, and its implementing regulations, are described below.

ELEMENTS	REQUIREMENTS
E2. Does the plan demonstrate integration to the extent practicable with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives? [44 CFR §201.5(b)(1)] [40] ***Intent:*** *To demonstrate realized integration with other planning initiatives and mitigation programs into ongoing state activities that achieve risk reduction and resilience.*	a. The Enhanced plan must demonstrate integration with other state and/or regional planning initiatives, including, at a minimum, the following sectors: 1. Emergency management; 2. Economic development; 3. Land use development; 4. Housing; 5. Health and social services; 6. Infrastructure; and 7. Natural and cultural resources. Where integration with other state and/or regional planning initiatives representing these sectors is not practicable, the plan must describe the limitations. b. The Enhanced plan must demonstrate integration of FEMA mitigation programs and initiatives, including, if applicable, but not limited to: HMGP, PDM, FMA, NFIP, CRS, Risk MAP, and the National Dam Safety Program, as well as FEMA programs that advance mitigation, such as Threat Hazard Identification and Risk Assessment, Emergency Management Performance Grant Program, and PA C-G. Where integration with FEMA mitigation programs and initiatives is not practicable, the plan must describe the limitations. ***Special Consideration:*** In evaluating integration, consideration will be given to the inherent differences in governance and capabilities among states, crediting measurable progress towards integration of efforts.

[40] 44 CFR §201.5(b)(1): "Demonstration that the plan is integrated to the extent practicable with other State and/or regional planning initiatives (comprehensive, growth management, economic development, capital improvement, land development, and/or emergency management plans) and FEMA mitigation programs and initiatives that provide guidance to State and regional agencies."

8.1.1 Integration with Other Planning Initiatives

Section 2 of the 2018 SHMP provides a legal, institutional, and policy framework that allows the State to readily integrate advances in hazard mitigation practice in Nevada and provide a framework for the local and tribal communities to do the same. Tables 2-1 and 2-2 of Section 2 identify emergency management and hazard mitigation responsibilities of over thirteen different state agencies, one tribal agency and two local agencies who are involved in the NHM Planning Subcommittee and update process. Table 2-7 in Section 2.3.3 provides a detailed listing of the integration of the State plan with more than 15 other major state hazard planning efforts, most of which bear on the highest ranked natural hazards in the State – earthquake, flood, and wildfire. Through the efforts of the NHMPC members, other stakeholders are, at minimum, made aware of the state hazard mitigation planning process and vice versa; members bring to the table the policies and plans developed by other entities outside of state government. While there are vacant spots within the NHM Planning Subcommittee (housing, health and social services, and economic development sectors) the planning committee continues to reach out and contact individuals specializing in all aspects needed to update the state plan. The Subcommittee continues to look for additional stakeholders to help with the planning process. One example of this is the participation of some NHMPC members in NESC, which in turn works closely with the Western States Seismic Policy Council (WSSPC). Their policies are discussed at length at the NESC meetings and presented at the NHMPC meetings for consideration at the state level through common membership. These policies provide guidance in the earthquake mitigation strategy for the state. A sample of these policies can be found in Appendix N.

A second example is the participation of NDF on the NHMPC. NDF staff provide assistance in the development of local and tribal hazard mitigation and contribute to the State plan in the areas of risk assessment, history, and development of goals and objectives for wildfire hazard. NDF also works closely with federal agencies who manage much of Nevada's land when planning wildfire mitigation strategies. The wildfire strategies found in the state plan are based on the National Cohesive Strategy (2014), which has largely replaced the 10 Year Comprehensive Strategy. Federal, state, and local agencies are engaged in the Nevada Cohesive Strategy working group. The group has created multi-agency action plans that are facilitating inter-agency task accomplishments in the areas of safe and effective wildland fire suppression, fire adapted communities implementation, and resilient landscape maintenance. The Nevada Forest Action Plan can be found at http://stateforesters.org/forest-action-plans/nevada.

The National Cohesive Strategy can be found at the following website: https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf

Another example is the partnership with NDWR in Risk MAP resilience activities in coordinating meetings with communities to discuss the risks of flood with customized portfolios showing potential flash flooding locations.

Local planning efforts, such as the Truckee River Flood Management Project (Flood Project), which can be found at http://trfma.org/the-project/planning/, are integrated into the Washoe County's Regional HMP (referenced in the plan as the Living River Plan). Project elements from the Flood Project are listed in Appendix O. Both plans address activities to mitigate flooding in all communities situated along the Truckee River. The County's plan is integrated into the state plan. Additionally, the CWSD works closely with local, state and tribal agencies to preserve the Carson River watershed and reduce flooding using a regional

approach. The CWSD developed a plan for the watershed drafted in conjunction with mutual members of the NHMPC and CWSD.

8.1.2 Integration with FEMA Programs

Table 2-7 lists FEMA mitigation programs and initiatives, the pertinent hazards, a brief statement of the mechanism for integration of the Nevada State plan and local plans with the FEMA program. The pertinent goals and strategic actions are fully outlined in Table 4-2.

Additional efforts to integrate hazard mitigation planning with different planning mechanisms at the local level are demonstrated by NHMPC, holding its meetings in rural communities and bringing awareness of risks and activities that enhance the resiliency of each individual community visited. It is also notable that the NHMPC membership includes a representative whose responsibility is implementing one or more of the FEMA mitigation programs. As the Subcommittee expands to include more stakeholders in the process of updating the state plan, so grows its integration with other planning mechanisms and the FEMA mitigation programs. These stakeholders in turn bring to the planning process their vast network of working relationships with other local, tribal, state and federal agencies that promote integration of mitigation plans and FEMA's programs. During this update process, the Subcommittee acquired new representatives from NDEP, NDWR, NWS, Washoe Tribe (Nevada and California), Nevada Division of Insurance, Nevada State Hospital Association, Safety Specialist Consultants, Nevada Threat Assessment Center, and the State Public Works Board. The resulting plan is used as a guide by other agencies and communities in Nevada in the development of their mitigation strategies and plans. NBMG continues to maintain and update the web-based interactive map, all-hazard risk assessment guide called MyPlan (https://gisweb.unr.edu/MyPLAN/ and https://gisweb.unr.edu/MyHAZARDS/). Data presented in MyPlan, and the public facing MyHazards is used by planners and the public alike to observe risks in their communities.

In coordination with the FEMA Risk MAP program, mitigation staff developed program integration activities by collaborating with the Floodplain Manager and NDWR to implement TTX for the review and evaluation of currently approved hazard mitigation plans.

Table 4-3 in Section 4.2.1 presents the state's capability to mitigate the hazards described in Section 3 and demonstrates pre-and post-disaster hazard management policies, programs, and capabilities. It also presents the state's funding capabilities for hazard mitigation projects - whether it can support, facilitate, or fund such projects. Support implies that the state manages federally funded programs. The state facilitates mitigation programs by providing technical assistance to local, tribal, and other entities. The last column provides details of each listed program or agency and its policies and capabilities to mitigate hazards in the state. Even a brief perusal of this chart reveals that there are dozens of available programs, mostly at the federal level, which the State of Nevada and locals are eligible to apply for to support and facilitate hazard mitigation projects for all types of hazards in the state.

8.2 PROJECT IMPLEMENTATION CAPABILITY

ELEMENT	REQUIREMENTS
E4. Does the Enhanced plan document capability to implement mitigation actions? [44 CFR 42 §§201.5(b)(2)(i), [43] 201.5(b)(2)(ii), and 44 201.5(b)(2)(iv)] ***Intent***: *To exhibit successful application of a statewide mitigation program to advance risk reduction and resilience toward mitigation goals.*	a. The Enhanced plan must describe the system to rank the mitigation measures according to established eligibility criteria, including a process to prioritize between funding programs, jurisdictions, and proposals that address different or multiple hazards. b. The Enhanced plan must describe how the state will assess the effectiveness of mitigation actions, including the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy. Effectiveness may be based on cost factors but may also include other beneficial functions.

[42] 44 CFR §201.5(b)(2)(i): "Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including: Established eligibility criteria for multi-hazard mitigation measures."

[43] 44 CFR §201.5(b)(2)(ii): A system "to rank the measures according to the State's eligibility criteria. A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."

[44] 44 CFR §201.5(b)(2)(iv): "A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action." [45] 44 CFR §201.5(b)(3): "Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals."

Nevada DEM administers the three federal hazard mitigation grant programs in the HMA program, each of which is addressed in this section:

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation Grants (PDM)
- Flood Mitigation Assistance Grants (FMA)

Each of these programs requires applications for proposed activities (usually planning and project activities) and is reviewed for the following:

1. Consistency with federal and state eligibility criteria (Section 5.3)
2. Consistency with state mitigation priorities (Table 4-10)
3. Rank based on state ranking criteria (Section 5.3.1.1 and Figure 8-1 below)

8.2.1 Establishing Eligibility Criteria for Multi-Hazard Mitigation Measures

Before forwarding applications to FEMA, Nevada DEM, NDWR and NHMPC, review proposed activities to ensure consistency with federal and state criteria. Nevada DEM documents the review and keeps a record of it. Figure 8-1 is an excerpt from the currently approved HMA Administrative Plan showing the eligibility

criteria used by both Nevada DEM and NDWR in reviewing applications for funding of mitigation activities under the HMA programs.

The first step in the eligibility review is done when the NOI is submitted by the possible subapplicant. The SHMO and the FM jointly review these notices against the current guidelines and the eligibility criteria found in Figure 8-1 to ensure that both the subapplicant and the proposed project are eligible. A formal notification about the eligibility of each NOI is forwarded to each submitting entity stating the eligibility of the proposed activity. This is done prior to the NHMPC review to ensure that eligibility criteria are met prior to the subapplicant's investment of time in the benefit cost analysis and completion of the remaining required documentation such as commitment letters.

Next, the applications are reviewed by the NHMPC to provide feedback to eligible subapplicant and to ensure the application is feasible, cost effective, and is a long-term solution to the risk. Any recommended revisions are formally presented to the subapplicant to revise. The subapplicants have several weeks to make the recommended revisions and enhance the application prior to a final review by the SHMO, FM, and Mitigation Specialist who work with the subapplicant in making revisions to comply with the recommendations made by the NHMPC members.

Next, applications are prioritized by NHMPC using a numerical scoring process for clarity, consistency, and accuracy. This is done at open meetings where the scores from each NHMPC member are tabulated, added and averaged with the highest scoring proposals rating higher in priority. Immediately after prioritization, the SHMO and/or FM notify all participating subapplicants of the prioritization results and submit all applications to FEMA.

For HMGP funding, applications are submitted to FEMA in order of the priority assigned with consideration to the amount allocated to the state. Applications may be submitted out of order to ensure the use of all funding allocated.

Ranking and Selection of Applications

1. The NHMPC will be the review, ranking and selection panel for the Hazard Mitigation Assistance program funding sources listed below.
    a. Hazard Mitigation Grant Program
    b. Pre-Disaster Mitigation Competitive,
    c. Flood Mitigation Assistance,
    d. Repetitive Flood Claim, and
    e. Severe Repetitive Loss grant programs.
2. Each application will be reviewed for eligibility. It is the function of the NHMPC to review, prioritize and select projects for submission to FEMA for approval and funding.
3. Prioritization Criteria for HMA Applications

    Any application for mitigation funding must include all necessary data to allow the NDEM, NDWR and the NHMPC to evaluate the project in terms of the criteria listed below.

    The NHMPC will use the "NHMPC Prioritization Form" as a tool to help prioritize applications. The form uses the Prioritization Criteria for HMA Applications, Section I-3 "a" through "h" as applicable (weighted 40 percent) and the Additional Selection Criteria in Section I-4 "a" through "h" (weighted 60 percent) to prioritize applications submitted for funding under the HMA programs. Life safety issues shall be the primary consideration during evaluation of an application.

    a. Community Population Affected. The percent of the population benefiting, which equals the number of individuals directly benefiting divided by the community population.
    b. Public Perception of Need. The application will be evaluated in terms of satisfying the public's desire to see their money spent on "worthwhile" activities and the public's perception of the need.
    c. Emergency Access and Public Inconvenience. **Project** applications will be evaluated to determine its impact on the access of emergency vehicles including police, ambulance, and fire vehicles to their respective substation, hospital or station. The evaluation will include an assessment of the project's contribution to the accessibility to isolated residences, businesses, and public facilities created by the hazard. **For planning applications,** the application demonstrates the performance of plan maintenance and implementation of mitigation activities.
    d. Benefit Cost Analysis (BCA). The cost effectiveness of the **project** resulting in a BCA ratio equal to 1. **For planning applications**, the thoroughness of the scope of work demonstrating an understanding of the planning process and a methodology for completing the proposed mitigation plan.
    e. Availability of Other Funding Sources. This includes an evaluation of the potential for funds from other grants, and other public and private interests. Low score if other funding is available.

f. Timing and Implementation. All aspects of timing and implementation will be considered under this item including, but not limited to, the ability to administer, begin, and complete a project or plan within the performance period.

g. Environmental Enhancement. Evaluation of this criterion, for **project** applications, includes benefits derived from improving or mitigating the threat to public health. It also includes, if applicable, information on the project's enhancement of habitat, recreational opportunities, and water quality.

h. A **project's** resilience, sustainability and maintenance plan. Resilience is the ability to recover after an event. Sustainability is the environmental, social and economic concerns. The designation of a responsible party, schedule and funding for continued maintenance during the life expectancy of the project. **For planning applications**, the description of unique or innovative outreach activities appropriate to the planning process that advance mitigation and/or serve as a model for other communities.

4. Additional Prioritization Considerations

   The NHMPC will evaluate and prioritize all eligible applications using the criteria in 3 above and the considerations (a-h) below. See NHMPC Prioritization Form following this section. This ranking will be in accordance with the criteria in 44 CFR Section 206.

   a. Requests for funding must be consistent with the State and Local Hazard Mitigation Plans.

   b. Measures that, if not taken will have a detrimental impact on the subrecipient, such as potential loss of life, loss of essential services, damage to critical facilities, or economic hardship on the community.

   c. Measures that have the greatest potential impact on reducing future disaster losses (Repetitive Loss Properties).

   d. Measures designed to mitigate multiple hazards and/or accomplish multiple objectives including damage reduction, environmental enhancement, and economic recovery.

   e. Measures that optimize the total amount of funding available, including overmatching of Federal funds with non-Federal funds when developing this ranking.

   f. NHMPC will also consider the level of interest and demonstrated degree of commitment of each subrecipient.

5. The NHMPC makes the final decision on applications the State submits to FEMA.

6. When submitting more than one application to the State, the subrecipient must provide an internal ranking to the NHMPC.

PRIORITIZATION EVALUATION

Application Prioritization Criteria Section I-4 "a" through "h" (weighted 40 percent) and the Additional Selection Criteria in Section I-5 "a" through "g" (weighted 60 percent) will be rated by the NHMPC's Proposal Review Subcommittee on a scale of zero (0) through ten (10). The Subcommittee will use the total point values in the **PRIORITIZATION FORM** below as a guide to the overall evaluation.

Figure 8-1. Review, Ranking, and Selection Process

NHMPC Prioritization Form

Subgrantee: _____ **Activity Name:** _____

Ranking and Selection of Applications:

Application Prioritization Criteria (I-3) **Assigned Value (0 - 10)**

a. Population Affected _____
b. Public Perception of Need _____
c. Emergency Access and Public Inconvenience
*For **planning** applications:*
Performance of current plan maintenance activities & Implementation of mitigation activities. _____
d. Cost Effectiveness of the Project (BCA=1) (10 pts)
*For **planning** applications: (15 pts)*
Understanding of the planning process and a methodology for completing the proposed mitigation plan. _____
e. Availability of Other Funding Sources _____
f. Timing and Implementation _____
g. Environmental Enhancement (10 pts)
*For **planning** applications: (0 pts)* _____
h. Resilience, Maintenance & Sustainability of Project (10 pts)
*For **planning** applications: (15 pts)*
The description of unique or innovative outreach activities _____
Subtotal Prioritization Criteria (I-3, a thru h) _____
Subtotal Criteria - (80-Point Maximum)/2 = _____
(Max. 40 points)

Additional Prioritization Considerations (I-4)

a. Consistent with State & Local Mitigation Plan _____
b. Detrimental Impact if Not Taken _____
c. Greatest Impact to Reduce Future Disaster Losses _____
d. Mitigate Multiple Hazards and/or Accomplish Multiple Objectives _____
e. Optimize Total Funds Available _____
f. Local Level of Interest & Degree of Commitment to Project _____

Additional Considerations Combined (I-4, a thru f) _____
(Max. 60 points)

Total Criteria + Considerations _____ (Max. 100 points)

Figure 8-2. NHMPC Application Prioritization Form

8.2.2 System to Determine the Cost Effectiveness of Mitigation Measures

FEMA-funded proposed activities must meet the criteria described in Office of Management and Budget (OMB) Circular A-94 Guidelines. Nevada DEM uses the most current version of FEMA's Mitigation BCA Toolkit, presently found in the portal at https://www.fema.gov/media-library/assets/documents/128334 , which incorporates the discount rate and present day value in the B/C ratio calculations. Grant sub-applicants perform the BCA for each project application. Currently, Nevada DEM provides basic benefit-cost training to potential applicants as part of the application workshops, allowing the applicants to perform their own analysis and request assistance from the helpline for complex questions. Advanced BCA courses are offered by FEMA, although not regularly in Nevada. Nevada DEM makes an effort to notify possible Nevada subrecipients about neighboring states venues where FEMA conducts such training. FEMA provided a training class on the newest version of its BCA software during a 3-day training course in Carson City (February 28 – March 2, 2017). Additional trainings took place February 13 – 14, 2018 in Las Vegas At the state level, all proposed mitigation activities must be cost-effective as stated in criterion 3-d of Figure 8-1.

8.2.3 System to Rank the Measures According to the State's Eligibility Criteria

A task force of the NHMPC developed the criteria described in Figure 8-1 when the PDM competitive grant program was initiated in 2003. These criteria are now used to prioritize mitigation activities for all HMA programs that are managed by Nevada DEM. NHMPC members are very knowledgeable about Nevada's communities, their risks, vulnerabilities, capabilities, and mitigation strategies. Together, the group has combined expertise in the identified and profiled highest-risk hazards for Nevada giving them the necessary professional background to address the proposals for all hazards and to allow competitiveness among a set of very diverse rural and urban communities.

PRIORITIZATION EVALUATION

Application Prioritization Criteria Section I-3 "a" through "h" (weighted 40 percent) and the Additional Selection Criteria in Section I-4 "a" through "f" (weighted 60 percent) will be rated by the NHMPC on a scale of zero (0) through ten (10). The Committee will use the total point values in the **PRIORITIZATION FORM** in Figure 8-2 as a guide.

SUBMISSION OF SELECTED PROJECTS TO FEMA

1. The SHMO will prepare a project package for submission to FEMA containing:
    a. A narrative describing the anticipated project benefits, justification for recommendation and rationale for project selection;
    b. A certification that the project meets all eligibility requirements;
    c. The grantee and subrecipient must review the information submitted for content and make sure all documentation (such as maps, etc.) are included so FEMA can complete a National Environmental Protection Act (NEPA) review; Compliance with the NEPA is a FEMA responsibility.
    d. A completed SF 424, Application for Federal Assistance, signed by the GAR;

e. All projects and supplements must be submitted to FEMA no later than one year from the declaration date or upon approval for extension.

2. The NHMPC will review, approve and prioritize selected projects for submission to FEMA.
3. Upon FEMA project approval, the SHMO will notify the NHMPC and subrecipients of which projects have been approved. A packet containing the following information will be provided to the approved subrecipients:
   a. Reporting requirements;
   b. Requesting funds;
   c. Eligible administrative costs;
   d. State-Local Disaster Agreement;
   e. State and Federal Assurances;
   f. Eligible administrative costs;
   g. State-Local Disaster Assistance Agreement;
   h. State and Federal Assurances
4. Upon FEMA disapproval of a project, the SHMO will advise subrecipients of the appeal process as outlined in 44 CFR part 206.440.

Nevada is a small state and presidentially declared disasters tend to be sporadic and small in comparison to other states in Region IX. Thus, applications for the HMGP program are not submitted in great numbers mostly due to the very limited funding this program brings. Historically, all HMGP applications have been submitted to FEMA with a clear prioritization. The hazard mitigation program currently has a library of proposed activities not funded under PDM or FMA for consideration when HMGP or any funding source is available.

Applications not funded by FEMA are subsequently enhanced by the subrecipients using the NHMPC recommendations, and are resubmitted for funding under any funding source when available.

Below is a list of major disaster declarations in Nevada for the last decade and the amount allocated for mitigation for each declared disaster.

Table 8-1. Mitigation Funding Under Presidential Disaster Declarations

Year	Hazard Type	Mitigation Allocation
2017	Flood	$2,157,558.25 *
2017	Flood	$2,689,362.26 *
2014	Flood	$583,609
2012-2013	Drought	**
2008	Flood	$475,538

*Estimates

**Federal funding for drought relief is provided directly to the affected entity and thus is not tracked by Nevada DEM

8.3 PROGRAM MANAGEMENT CAPABILITY

ELEMENT	REQUIREMENTS
E6. With regard to HMA, is the state maintaining the capability to meet application timeframes and submitting complete project applications? [44 CFR §201.5(b)(2)(iii)(A)[46]]	a. All applications and amendments are submitted by the end of each program's respective application period. b. All applications are entered into FEMA's electronic data systems (such as, NEMIS and/or eGrants). c. Eligibility and Completeness Checklist is prepared for all applications. d. All applications are determined to be complete by FEMA within 90 days of submittal or selection for further review. Required environmental and historic preservation reviews and consultations will not be included in the 90-day review timeframe calculation.
E7. With regard to HMA, is the state maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses? [44 CFR §201.5(b)(2)(iii)(B)[47]]	All applications and amendments are determined to be complete by FEMA within 90 days of submittal or selection for further review, including all data requested by FEMA to support Cost Effectiveness determinations and environmental/historic preservation compliance reviews. Required environmental and historic preservation reviews and consultations will not be included in the 90-day review timeframe calculation.
E8. With regard to HMA, is the state maintaining the capability to submit complete and accurate quarterly progress and financial reports on time? [44 CFR §201.5(b)(2)(iii)(C)[48]	a. All progress reports must be complete and submitted on time. Information in reports must accurately describe grant activities, including data related to the completion of individual property acquisitions. Incomplete progress reports that do not provide information on all open grants and subgrants or include all information required by the HMA Guidance are not considered on time. b. All Federal financial reports (FFR), Standard Form (SF) SF-425 are submitted on time. Information in reports must accurately describe grant activities, as described in the HMA Guidance. c. State consistently complies with the Financial Management Standard requirements described in 2 CFR §§200.300 to 200.309.

[46] 44 CFR §201.5(b)(2)(iii)(A): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (A) Meeting HMGP and other mitigation grant application timeframes and submitting complete, technically feasible, and eligible project applications with appropriate supporting documentation;"

[47] 44 CFR §201.5(b)(2)(iii)(B): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (B) Preparing and submitting accurate environmental reviews and benefit-cost analyses;"

[48] 44 CFR §201.5(b)(2)(iii)(C): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (C) Submitting complete and accurate quarterly progress and financial reports on time;"

ELEMENT	REQUIREMENTS
E9. With regard to HMA, is the state maintaining the capability to complete HMA projects within established performance periods, including financial reconciliation? [44 CFR §201.5(b)(2)(iii)(D)[49]]	a. All work as part of HMA subawards must be completed by the end of Period of Performance as described in the HMA Guidance. b. No major findings on last single audit obtained by the state related to HMA programs. For states without HMA grants, FEMA will review other Federal grants prepared by the responsible agency (such as state Emergency Management Agency). c. All grant close-out activities, including financial reconciliation, are completed within 90 days from the end of the performance period including: 1. Final FFR SF-425 and Performance Reports were submitted within 90 days from the end of the performance period unless an extension is granted by FEMA. 2. Statement submitted that approved Scope of Work and all environmental and historic preservation requirements have been satisfied. 3. SF-270 Request for Advance or Reimbursement or request to de-obligate funds is completed, if applicable due to cost underruns. 4. Other documentation as required in the HMA Guidance. 5. No late drawdowns are requested or performed after the liquidation period has ended. d. Actual expenditures have been documented and are consistent with SF-424A or SF-424C. d. Actual expenditures have been documented and are consistent with SF-424A or SF-424C.

[49] 44 CFR §201.5(b)(2)(iii)(D): "Demonstration that the State has the capability to effectively manage the HMGP as well as other mitigation grant programs, including a record of the following: (D) Completing HMGP and other mitigation grant projects within established performance periods, including financial reconciliation."

8.3.1 Effective Management of HMA Programs

Nevada DEM now administers three federal hazard mitigation grant programs in the Unified HMA program. Both the SHMO and the FM continue to work very closely to implement all applicable mitigation programs. Nevada DEM uses the established application review process shown in Figure 8-3 to ensure timely and adequate implementation of the HMA programs.

In the last 12 months, Nevada had two Presidential disaster declarations. This resulted in Nevada being able to reach out and help local jurisdictions develop successful HMGP applications with five projects for DR-4303 already awarded and DR-4307 still in process. PDM 2017 resulted in four planning applications and two projects that were submitted to both PDM and FMA for consideration. The four planning applications were selected and are in process of being funded and awarded.

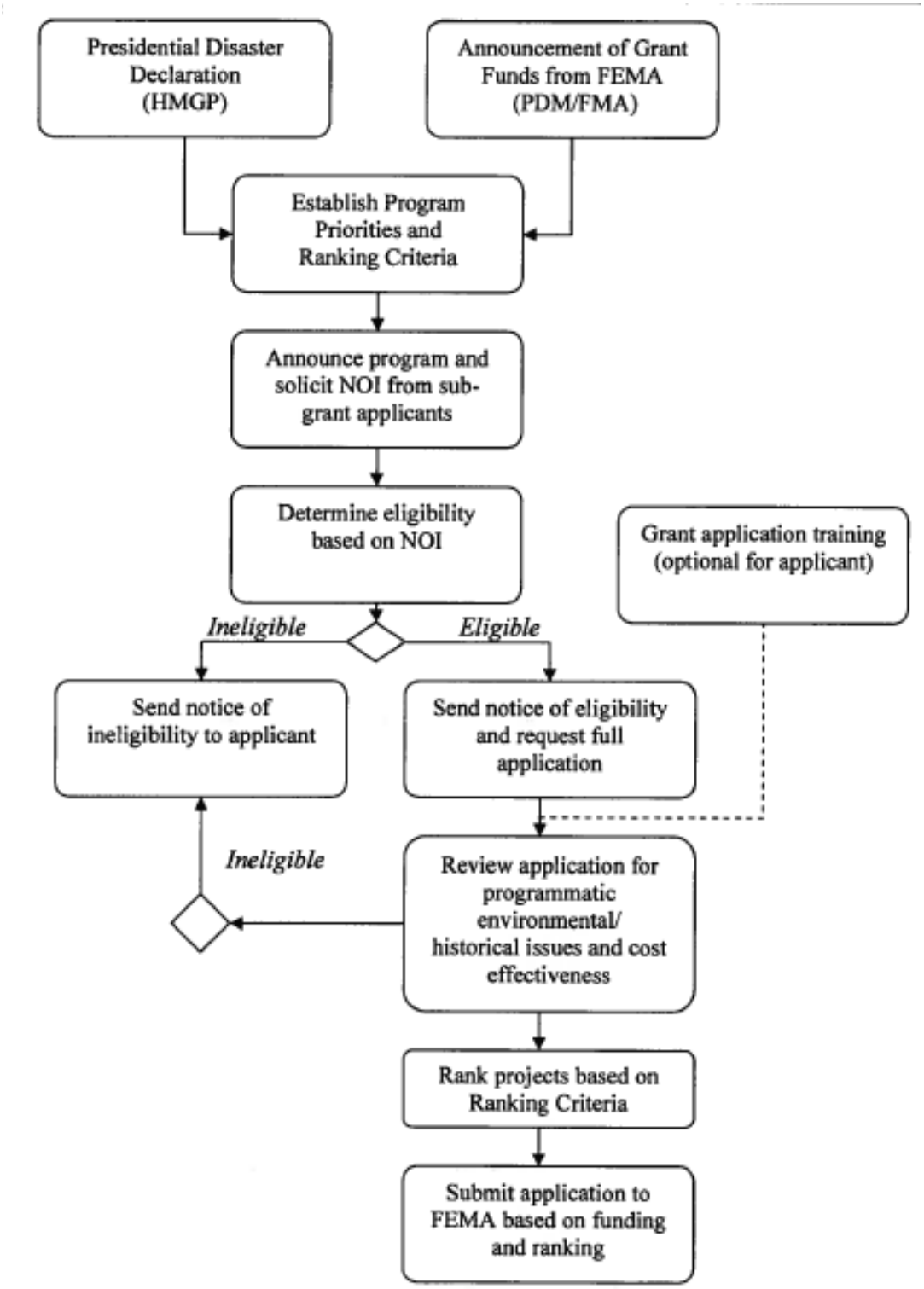


Figure 8-3. Mitigation Activities Review Process

The functions of the SHMO include the following:

1. Working with communities to develop appropriate grant applications for the HMA programs.
2. Fiscal management of grants when received.
3. Grant close-outs.

Based on the number of awards in the 2013 - 2018 period, Nevada DEM has a successful record of meeting mitigation grant application timeframes and submitting complete, technically feasible, and eligible proposed activity applications with appropriate supporting documentation.

When the new federal guidelines for HMA funding are available, the SHMO and the FM hold intensive application training workshops to increase the quality of applications. The last training workshops were held in May 2017. These training workshops cover specific grant programs, preparing an application, contacting a BCA, using the E-Grant system, and meeting all basic requirements of each grant category. Before each new grant cycle or award, the SHMO reviews scoring criteria and considers FEMA changes to grant requirements and criteria. The SHMO notifies the NHMPC and potential subapplicants quickly if any modifications affect the criteria or process. This ensures that Nevada DEM procedures are up-to-date and consistent with federal direction in hazard mitigation.

During the 2013-2018 period, Nevada DEM has successfully processed 13 hazard mitigation awards under HMA programs, not including PDM 17. All applications submitted were reviewed and the sub-applicants were provided feedback about proper documentation and the environmental questionnaire. Feedback and cooperation with the subrecipient occupy the available time of the SHMO. Nevada exceeded its funding minimum allocation of $500,000 in the PDM program in 2013 through 2018. A listing of open, closed and pending awards is maintained by the SHMO in a spreadsheet format that tracks expiration date, quarterly reporting, closure and balances. This information is provided to the NHMPC and the public on a quarterly basis.

Program and financial reports for each award are reviewed by mitigation staff for completeness, content, and appropriate programmatic responses. Mitigation staff, SHMO or Mitigation Specialist, will record any discrepancy or concern found in this initial review in the appropriate file, request a technical assistance meeting with the subrecipient to discuss the issue and note any corrective actions in the report for reference. Follow-up calls, emails and, if necessary, visits, are made to ensure the corrective actions are completed. Fiscal staff will accompany mitigation staff occasionally or depending on the corrective action.

Upon completion of the review by mitigation staff, the reports are forwarded to fiscal staff who audits them for consistency, accuracy, and eligibility of expenditures. Fiscal staff process reimbursement of funding based on quarterly report audits. Fiscal staff also maintain grant reconciliation reports showing balances and expenditures per grant by calendar year. A declining balance report for each HMA award is maintained allowing for consistent tracking of balances. Mitigation staff members use these reports to manage the awards and to update NHMPC at quarterly meetings. A sample of the Monthly Reconciliation report is shown below in Figure 8-4.

PRE DISASTER MITIGATION GRANT
2016
MONTHLY RECONCILIAITON

EMF-2017-PC-0009
PDM15 9704717-3700

SUBRECIPIENT (AGENCY)	GRANT AWARD				CLAIMS										Award Less Claims BALANCE	GRANT CLOSED
	ORIGINAL	Deobligated	Additional	TOTAL	QFR 1		QFR 2		QFR 3		QFR 4		QFR 5	TOTAL CLAIMS		
JURISDICTION	$ 154,999.50			$ 154,999.50	-		-		-					$ -	$ 154,999.50	
TOTALS	$ 154,999.50	$ -	$ -	$ 154,999.50	$ -		$ -				$ -		$ -	$ -	$ 154,999.50	

CAT 23 - RGL 3591	9704717-3700		PROOF	
Fed Performance Period:			Fed AWARD	$ 154,999.50
			Less Subgrants	$ (154,999.50)
			Unallocated	$ -
AWARD AMOUNT =	$ 154,999.50		Locals Balance	$ 154,999.50
Less Claims:	$ -			
GRANT BALANCE:	$ 154,999.50	=	Balance	$ 154,999.50

O/S Pmts
-
-

9704717-3700

RECONCILIATION OF EXPENDITURES VS CLAIMS		
02/09/18	3674 DAWN 74.0 EXP SFY18:	-
	3674 DAWN 74.0 EXP SFY19:	
	Outstanding:	-
	TOTAL EXPENDITURES:	-
	Less Total Claims:	-
	DIFFERENCE:	-

Reconciled 2.13.18 mad

Figure 8-4. Sample Award Tracking Report

8.3.2 Environmental Review and Benefit-Cost Analysis

The SHMO ensures that all applicants have provided all required environmental information and benefit-cost analysis information in the application, including required documentation for all data sources and thorough description of calculations and assumptions. The SHMO and FM rely on the staff of FEMA Region IX to conduct environmental reviews for construction projects seeking hazard mitigation grant funding from the HMA Programs. Before FEMA approval of a hazard mitigation grant, the project activities must comply with all applicable federal, state, and local codes and standards including the National Environmental Policy Act (PL 91-190, as amended) and all federal laws covered within the act, and for securing the necessary permits and approvals. Nevada does not provide funds to cover environmental reviews.

8.3.3 Quarterly Progress Report and Monitoring

The SHMO submits complete and accurate quarterly progress and financial reports on time. Quarterly reports based on measurable outcomes are generated by the sub-grantee and reported to Nevada DEM. Nevada DEM compiles the reports, assesses the programmatic and financial components, and sends the reports to FEMA. The reports include the following:

- Percent completion of the project
- Progress on milestones identified in the original schedule
- Overall assessment of the schedule
- Adherence to budget (including overruns and underruns)

If subrecipients do not submit timely and accurate quarterly reports or the reports indicate problems associated with the above components, Nevada DEM will provide technical assistance and suggest

corrective action. The SHMO requires the subrecipient to submit a plan for corrective action in writing. If the plan of action is not carried through, then payment processing is suspended.

The SHMO monitors the progress by reviewing the Quarterly Progress Report (see Figure 6-2 in Section 6) and may, at any time, contact the subrecipient to review the project. Subrecipient quarterly reports are received both electronically and as hard copy; packaged by program; filed; and sent to the applicable FEMA Region IX staff. HMGP reporting is provided to FEMA via email. All other grant reporting is done through the E-Grant system.

The success of the reporting and monitoring process is documented by two mileposts:

1. We have successfully tracked the progress and money trail of each subrecipient's project through completion and closure.
2. Subrecipients have generally adhered to budget.

The great diversity in the type of projects presents a wide variety of issues to deal with; sometimes a new one with each project. It is a constant learning process. Despite these challenges, the monitoring and reporting process continues to work well.

8.3.4 Mitigation Activities Completion and Closeout

The State of Nevada completes all mitigation grant activities within established performance periods, including financial reconciliation. The SHMO is responsible for HMA closeout procedures. Since the approval of the last plan in 2013, Nevada DEM has successfully disbursed and closed out (or is in the close-out process) approximately 11 HMA individual grants, five overall HMA grants, zero HMGP grants, and two complete HMGP programs.

Nevada successfully closed five overall PDM grants as well as their associated subgrants in the last 12 months. Nevada is dedicated to its process of grant management, including outreach and education to our local jurisdictions, and helping local jurisdictions work toward their mitigation goals reflected in their county hazard mitigation plans.

The HMGP closeout procedures are initiated when the subrecipient informs the SHMO that the project has been completed and all expenditures are reimbursed. As part of the closeout procedure, the subrecipient is required to submit a final Quarterly Financial Report and cost documentation. The PDM grant closeout procedure is initiated when:

1. The subrecipient informs Nevada DEM that the project is completed, or
2. The performance period for the grant will expire.

As part of the closeout procedure, the subrecipient is required to submit a final Quarterly Financial Report and closeout documentation. For projects, the SHMO performs a site visit prior to closeout to confirm that the project has been completed as stated in the approved scope of work.

For each grant program, the SHMO ensures that quarterly reports and closeout documents are submitted on time. Nevada DEM currently has a dedicated auditor position who performs fiscal site audits of subrecipient grant files.

If a project is not close to completion and its performance period is about to expire, first the SHMO evaluates specific details of the project with the subrecipient. The subrecipient is required to submit a plan of action for completion of the work on the project. Usually, a request for time extension is sufficient to complete the

project goals and objectives. In some cases, the subrecipient's agency may provide additional matching funds necessary to complete work on a project. Other innovative approaches may be implemented depending upon the circumstances and the details of the specific project.

8.4 ASSESSMENT OF MITIGATION ACTIONS

ELEMENT	REQUIREMENTS
E4. Does the Enhanced plan document capability to implement mitigation actions? [44 CFR 42 §§201.5(b)(2)(i), 43 201.5(b)(2)(ii), and 44 201.5(b)(2)(iv)] ***Intent:*** *To exhibit successful application of a statewide mitigation program to advance risk reduction and resilience toward mitigation goals.*	a. The Enhanced plan must describe the system to rank the mitigation measures according to established eligibility criteria, including a process to prioritize between funding programs, jurisdictions, and proposals that address different or multiple hazards. b. The Enhanced plan must describe how the state will assess the effectiveness of mitigation actions, including the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy. Effectiveness may be based on cost factors but may also include other beneficial functions.

[42] 44 CFR §201.5(b)(2)(i): "Documentation of the State's project implementation capability, identifying and demonstrating the ability to implement the plan, including: Established eligibility criteria for multi-hazard mitigation measures."

[43] 44 CFR §201.5(b)(2)(ii): A system "to rank the measures according to the State's eligibility criteria. A system to determine the cost effectiveness of mitigation measures, consistent with OMB Circular–94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs."

[44] 44 CFR §201.5(b)(2)(iv): "A system and strategy by which the State will conduct an assessment of the completed mitigation actions and include a record of the effectiveness (actual cost avoidance) of each mitigation action."

8.4.1 System and Strategy for the Assessment of Completed Mitigation Actions

Since 2003, Nevada DEM has maintained a database that contains all HMA project files, from initial funding through project completion. This is made up of over 71 projects, 19 of which have been added since 2013. The database provides information on the scope of the projects, local contacts, and it also provides examples to other communities of mitigation activities that could be done in their areas.

The database is structured such that in the event of a disaster occurring in the State, the SHMO may check the database to determine if a mitigation project has been funded in the immediate vicinity of that disaster area. Existing project files include locations, project particulars, and local contact people. Local contact is made by the SHMO to request a field report on the effectiveness of the mitigation project, with local participants making a determination of cost-avoidance. This process should provide quality assessment information of the effectiveness of local mitigation projects from the local level. In addition, when an event occurs, field-gathered information is used in developing a state emergency proclamation and in requesting a federal disaster declaration. Since the implementation of the database, there has been one disaster occurrence that correlates to completed mitigation projects. The 2017 flood in Reno-Sparks required

hundreds of residents to evacuate. A storm that brought several inches of rain to the area and the nearby snow-covered mountains, which led to the biggest flood in Northern Nevada in more than a decade. The Lockwood property, owned by Washoe County, was restored following flooding issues in 1997. Structures on the property were demolished, and the area is now a park. The project was completed by The Nature Conservancy (TNC), TRFMA, and other partners. The restoration included: one new river meander, eight riffles, two wetlands, and 28 acres of revegetation. Approximately 0.6 miles of river channel was restored, creating approximately 37 acres of native habitat. This restoration rehabilitates the land and reduces flooding risks. TRFMA and TNC are continually trying to acquire critical areas along the Truckee River before it is developed and becomes at risk for future flooding. Another example is the City of Reno's Oxbow Park project, which involved restoring the north river bank of the Truckee River, and reestablishing riparian habitat. The river bank was severely eroded due to flooding in 1997 and 2005. The project helps to protect the Truckee River and reduce erosion and sediment loading. FEMA provided a cash match to assist in the Oxbow project.

For information on the Lockwood property and the Oxbow project, see:

- https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/102-ranch.xml
- http://truckeeriverfund.org/projects/truckee-river-bank-stabilization-at-oxbow-park/

8.4.2 Effectiveness of Mitigation Actions (Loss Reduction)

Nevada DEM currently coordinates volunteers who participate in State Preliminary Damage Assessment (PDA) Teams, which assess damage after an incident. The State PDA volunteers include representatives from the following agencies and professional groups:

- Nevada Attorney General's Office
- Nevada Department of Administration
- Nevada Department of Business & Industry/Insurance Division
- Nevada Department of Transportation
- Nevada Department of Wildlife
- Nevada Division of Emergency Management
- Nevada Division of Forestry
- Nevada Division of Records & Technology
- Nevada Division of Water Resources

as well as voluntary agencies, local governments and other members of the private sector.

This wide range of professional expertise and backgrounds allows the State PDA Teams to work efficiently to assess damage. State PDA Team volunteers are coordinated by the State Recovery Officer. Training and meetings of volunteers take place quarterly and in a just-in-time trainings when disasters strike.

Training sessions have included:

- ATC-20 Post Earthquake Safety Evaluation of Buildings,
- Earthquake hazard mitigation for hospitals Disaster Declaration Process & Data Collection needs
- Damage Assessment for FEMA Public Assistance Program
- Damage Assessment for FEMA Individual Assistance Programs
- Damage Assessment for SBA Disaster Assistance Programs
- NV Disaster Recovery Framework Training
- FEMA IS-2900 National Disaster Recovery Framework
- ArcGIS Camp Collector app
- Orion Mobile PDA app
- Proper safety procedures
- Media management.
- Incident Command System
- National Incident Management System
- Benefit cost analysis

The SHMO coordinates with the State Recovery Officer and FEMA to provide this group with formal training, which in turn allows these volunteers to assess damage, capture data, and prepare reports necessary to complete the studies for losses avoided on completed hazard mitigation projects.

The State PDA Teams participate in drills and training provided by emergency management personnel in the state.

Table 8-2. State PDA Training Sessions in the 2013-2018 Update Period

June 22nd & 23rd, 2015	Disaster Recovery & Damage Assessment Workshops Carson City
June 24th & 25th, 2015	Disaster Recovery & Damage Assessment Workshops Las Vegas
July 7th & 8th, 2015	Disaster Recovery & Damage Assessment Workshops
May 11, 2016	Disaster Recovery TRAINING Las Vegas
June 22, 2016	Disaster Recovery TRAINING Elko
July 13,2016	Disaster Recovery TRAINING Reno
Jan 12,2017	State PDA Team Activation – JIT
Feb 10, 2017	Flood- FEMA IA PDA Training
Feb 13,2017	FEMA PA Damage Assessment Training
Feb 13, 2017	ArcGIS Camp Collector App for State PDA
June 29, 2017	ATC-20 and FEMA 154 refresher class
Feb 9, 2018	Disaster Declaration Process & Data Collection Needs

State PDA Teams are activated when any disaster event occurs and the affected local jurisdiction requests the assistance of the state in assessing damages, whether there is a Presidential declaration or not. The assessment process consists of three phases: information gathering; site visit and damage assessment; and reporting of data to Nevada DEM.

1. **Information gathering**: Nevada DEM mitigation staff members retrieve files on funded mitigation projects in the immediate area based on location coordinates required for all such projects. This information along with the appropriate State PDA Team assessment forms for the type of event (earthquake, flood, wildfire) and a summary of the project background are provided to the State PDA team.
2. **Site visit and damage assessment**: The assembled information and forms are provided to the State PDA Team, which is then sent to the disaster location(s) to contact appropriate local agencies and conduct assessments of previously funded mitigation projects with a primary focus on estimating loss avoidance. This process was used during the 2017 flooding events in Northern Nevada by NBMG geoscientists. It was also implemented during the 2008 Wells earthquake by NBMG staff and worked well in gathering information from local affected stakeholders (government, utilities, residents, businesses, etc.)
3. **Reporting of data to Nevada DEM**: Once the State PDA Team completes the physical site examination, they compile the State PDA report and send it back to Nevada DEM where the SHMO analyzes it in terms of the project's BCA and other factors such as avoidance of injury, loss of life, or environmental degradation.

For example, if the funded project was a structural retrofit to a URM building and an earthquake occurs, then the loss avoidance would be calculated as the construction cost to rebuild the building along with any loss of life or injury of those working in the building at the time of the event.

State PDA Team reports and studies from preliminary damage assessment of recent events in Nevada include:

- Carpenter 1 Fire - Aug 2013
- Clark County - Sept 2014
- Douglas County Aug 2014
- Moapa Flood - Oct 2014
- Carlin Winter Storm - Nov2015
- Douglas County flash flooding- July 2015
- Multi County week long storm- July 2015
- Lyon County - 2015
- Nye County Industrial fire - 2015
- Hawthorne EQ - 2016
- Little Valley Fire - Oct 2016
- Lincoln County Panaca explosion - 2016
- Washoe County Virginia Complex Fires - 2016
- 1 October Shooting Las Vegas - 2017
- February flood event - 2017
- January flood event - 2017
- Spring Thaw - 2017

Reports by State PDA Teams to Nevada DEM following disaster incidents are provided to the NHMPC for their use in prioritizing proposed projects. These reports will also form part of the vulnerability assessment for the community and the state plan updates.

In 2017, a Loss Avoidance Study (LAS) was completed by FEMA, which assessed the efficacy of past mitigation projects where public funding is involved. The study focused on two analysis sites within the declared disaster area of Northwest Nevada (due to flooding in January and February 2017). The LAS addressed two mitigation projects: the Truckee River Flood Project (east Reno) and the Vicee Canyon Basin Expansion Project (northwest Carson City). The Loss Avoidance Study is in Appendix T.

Nevada's long-term strategy is to create a risk reduction portfolio of all HMA type projects as well as to promote activities (such as building code adoption and resilient land use planning) to reduce risks over time. These findings can be used in determining the most effective or the highest priority mitigation projects for Nevada.

8.5 EFFECTIVE USE OF AVAILABLE MITIGATION FUNDING

ELEMENT	REQUIREMENTS
E5. Is the state effectively using existing mitigation programs to achieve mitigation goals? [44 CFR §§201.5(a) and 45 201.5(b)(3)[45]] ***Intent:*** *To exhibit successful application of a statewide mitigation program to advance risk reduction and resilience toward mitigation goals. Also to demonstrate the effective use of the additional HMGP funds for which the Enhanced state is eligible.*	a. The enhanced plan must document how the state has fully made use of the funding available through the FEMA assistance programs (for example, PA C-G, HMGP, PDM, and FMA). If the state has not made full use of available funding, the enhanced plan must document the reasons why funding was not used and explain the process to improve this capability. b. The enhanced plan must document how the state effectively uses existing state programs to achieve its mitigation goals. ***Special Consideration:*** Citing limited staff resources is not considered an acceptable reason for not making full use of funding. Further, citing limited staff resources would document the inability to meet the requirement at §201.5(b)(2)(iii), that requires the state to demonstrate HMA grants management capability.

[45]44 CFR §201.5(b)(3): "Demonstration that the State effectively uses existing mitigation programs to achieve its mitigation goals."

8.5.1 Effective Use of Available Mitigation Funding

Nevada uses many funds and programs to mitigate against injury, loss of life, and damage to property. Some of the major mitigation programs of the state are the federally funded HMA programs, which are administered by Nevada DEM.

Over the 2013-2018 period, 13 FEMA grants are either approved and funded or under environmental review under the HMA programs in Nevada. The primary goal of the NHMPC is to ensure that every community in Nevada develops a hazard mitigation plan. The NHMPC believes that the planning process is the first step in awareness of the risk and vulnerability posed by the hazards and provides the communities with a method to "do something about the risk." This goal includes the updating of existing plans and enhancing

the data available for locals to use in the update process. To date, every plan needing an update has acquired funding through the application process or through the State, and, where needed, communities have joined together to develop regional plans. Since the previous plan was approved in 2013, funding received for planning has allowed and six counties (not including four potential updates for 2017 PDM) to update their current plans and five counties are updating two separate regional plans.

As a result, Nevada continues to maintain its goal of all counties updating hazard mitigation plans by 2018 (at the time of writing, Clark County is awaiting approval by FEMA).

Planning funds have been "shared" by more than one community in the past. Humboldt, Lander and Pershing counties have developed a regional plan under the approved PDM funding. This regional plan has been approved by FEMA. This leveraging of grant monies to develop regional plans is a very cost-effective way for rural communities to work together to become covered by a mitigation plan.

Nevada will use the plan maintenance process found in Section 6 to enhance its collection of data about locally funded mitigation projects to demonstrate the commitment of communities to the reduction of risk. Other funding sources such as the National Earthquake Hazard Prevention program have been used by NBMG to enhance risk assessment tools and awareness of earthquakes statewide, also need to be documented and presented in this plan. Private mitigation activities include the total repair and seismic retrofit of the Church of Jesus Christ of Latter-day Saints Wells Ward Chapel in 2009. The retrofit was completed close to the one year anniversary of the 2008 Wells earthquake. The City of Wells planned a special event for the anniversary, and the church participated in the activities. UNR recently completed a seismic retrofit of Lincoln Hall, an 1800's vintage building that was damaged in the 1914 earthquake. UNR has plans to complete a seismic retrofit of Manzanita Hall.

Local chapters of the Fire Safe Council, a coalition that is spearheaded by homeowners, UNCE, BLM, USFS, along with many state agencies, all work closely to coordinate a WUI Summit. The Summit's sole purpose is to provide homeowners and local government entities information about the wildfire mitigation activities and possible sources for funding that can be done to protect life and property. Summit workshops and sessions cover three main topics: fire adapted communities, operations and suppression, and wildland fire policy and tools. Until 2012, the Summit occurred in September with up to 200 attendees from rural, urban, and "frontier" communities. The 2018 Summit is scheduled for February, and now has a mobile app for attendees. The app allows for easy navigation during the event, and allows users to stay organized, take notes and rate presentations, and stay connected with attendees. Beginning in 2013, UNCE created a customized workshop for rural communities and will assess changes in risk, since the writing of their CWPPs. UNCE also developed a web-based application to update CWPPs. The computer application is an interactive tool involving stakeholders such as community members and local fire prevention professionals with a vested interest in wildfire mitigation activities.

Many agencies have spearheaded a variety of hazard mitigation projects that have been completed or are under way since the last iteration of the plan. These include the following:

- Clark County RFCD completed 36 flood-control projects from 2013 to 2017. As of June 2017, 14 projects are under construction or about to start. During 2016-2017, 54 square miles were removed from FEMA flood zones. For more information on Clark County RFCD's accomplishments and future projects, see Appendix O.
- TRFMA has a long list of accomplishments in flood mitigation, restoration, prevention, public awareness education and outreach since 2009. Completed flood risk management projects include:

the Virginia Street bridge replacement, the Reno-Sparks Indian Colony levee and floodwall construction, and the North Truckee drain relocation project. Additionally, TRFMA has a home elevation program, in which homeowners are eligible to receive grants from Washoe County and TRFMA. Elevating homes in the approved area (Hidden Valley, Rosewood Lakes, and Eastside Subdivision neighborhoods) makes the properties more resistant to flood damage, and thereby making it more cost-effective to elevate flood-prone homes. Additional information about TRFMA's projects can be found in Appendix O.

- CWSD has many mitigation accomplishments. Projects include floodplain management and restoration, weed management, updates to local flood regulations, and many more. CWSD accomplishments are listed in Appendix O.
- NDF has completed numerous hazardous fuels reduction projects, and have more planned. The Tahoe Fire and Fuels Team (TFFT) has also completed numerous hazardous fuels reduction projects. Projects completed by NDF and TFFT are highlighted in Appendix O.

Many county-funded projects were completed during this plan update period. These investments in mitigation are located in the major disaster risk areas of Nevada, according to the GIS modeling maps of local plans. FEMA mitigation funds allocated are closely linked to the state and applying community's plan goals. Prevention or significant reduction of loss of life and injuries is the state's primary goal.

The criteria used by Nevada DEM and NHMPC to solicit, select, and rank projects are clear and linked to maximizing project impacts that support the state plan goals. The Nevada DEM objective is to expend all funds in each grant program. Nevada DEM attempts to maximize local opportunities for receiving federal mitigation funding by establishing a project waiting list of HMA applicants from previous grant cycles from which to identify, prioritize and submit potential mitigation projects.

8.5.2 Nevada's Effective Use of Existing Programs to Achieve Mitigation Goals

A number of HMA programs fund multi-hazard mitigation planning activities at the local or multi-jurisdictional level. In addition to the FEMA support funding shown in Table 8-3, Nevada communities augment mitigation funds with those provided through many other sources. Some of the local and private sources that collaborate with the state are listed in Tables 4-11 and 4-12. Collaborating with local and private groups in mitigation planning and projects promotes increased awareness and participation in mitigation activities on a local level. For example, TNC's Lower Truckee Restoration Project proved to be successful after the major flooding events of 2017. TNC has restored about 10 miles of the Truckee River and its floodplain over the past 14 years. The Lower Truckee Restoration Project has implemented many strategies to restore the Truckee River, including: reshaping the river, reconnecting the river to its floodplain, creating in-stream riffles to provide habitat for native fish, excavating banks to provide habitat, and invasive species management. During the flooding events of 2017, water slowed down and thinly flowed as the floodwaters met the floodplain, protecting life and property. TNC has partnered with numerous agencies on the project, including: City of Reno, NDOW, NDEP, Pyramid Lake Paiute Tribe, Truckee Meadows Flood Management Project, Washoe County, and NDWR, and many more.

To see a complete list of partners and more information on the Truckee River Project, visit: https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/truckee-river-project.xml

SNWA has a Water Smart Landscapes rebate program. SNWA will rebate customers $2.00 per square foot of grass removed and replaced with native, desert landscaping up to the first 5,000 square feet converted, per property and per year. After the first 5,000 square feet, SNWA will rebate customers $1.00 per square foot (maximum of $300,000 in a fiscal year). The program has saved billions of gallons of water, and has upgraded more than 183 million square feet. SNWA is governed by a seven-member board of directors, and has representatives from: Big Bend Water District, City of Boulder City, Clark County Water Reclamation, City of Henderson, City of Las Vegas and North Las Vegas, and the Las Vegas Valley Water District. For more information, please visit:
https://www.snwa.com/rebates/wsl/index.html

As noted on Carson City's Open Space Division webpage, "The Open Space Program was created by the Quality of Life Initiative, or Question 18, passed by Carson City voters in 1996. The Quality of Life Initiative included the acquisition, development and maintenance of parks, opens space, trails and recreation facilities through an increase in the sales tax rate of ¼ of 1 percent. Forty percent of the funds are designated for the Open Space Program, which currently results in approximately $1 million in annual revenue. The Open Space Program does not operate on any revenue from the General Fund." Currently, the Open Space Program manages approximately 6,940 acres, and has acquired over 21 properties, including one 40-year open space protection agreement and one conservation easement. Furthermore, two properties have been donated to the program since its inception. Lands have also been acquired through a lands exchange with the USFS and BLM. Carson City owns land not acquired through the Open Space program but through Public Works Utility funds. These lands also include floodplain. Since October 2017, Carson City has 3,890 acres of SFHA, of that amount 60 percent is in open space (City, State, & private). The City's portion is 30% of the 60% or half.

The City of Yerington and Lyon County filed a joint resolution proclaiming the existence of an emergency and/or disaster within their respective jurisdictions with respect to the immediate necessity to clean the Walker River and remove debris and sediment that had built up since the 1997 flood. This was referred to as the Walker River Clean-up project. The Mason Valley Conservation District was the lead for the project, with assistance from the Walker River Irrigation District, Federal Water master, City of Yerington, and Lyon County. Approximately 300,000 cubic yards of sediment and debris were removed from the Walker River main channel, including all three primary bridge crossings, increasing channel capacity by nearly twice what it was before the project was completed. The Walker River Clean-up project was completed in December 2015.

The "Big Dig" project was the culmination of a series projects providing local flood mitigation measures on the Carson River near Fallon. The projects were the result of forecasts predicting runoff from the Sierra Nevada into the Carson River that would exceed the capacity of Lahontan Reservoir. To mitigate potential flooding from snowpack runoff, a series of projects were completed with coordination between local, state, and federal partners. A weir was installed to divert flows below Lahontan Reservoir out into the desert and into Carson Lake. The completed "Big Dig" project is a 60-foot wide 17-mile long channel that diverts excess water from Carson Lake to the Stillwater Point Reservoir. It is anticipated that these flood mitigation measures will mitigate flooding in the area for many decades. The "Big Dig" project was completed in May 2017.

NDEP's BWQP 319(h) Nonpoint Source Protection Grant Program is funded through the Clean Water Act. The Grant Program provides funding to qualifying counties, conservation districts, higher education institutions, regional agencies, and nonprofit organizations to improve conditions of Nevada's watersheds and protect against nonpoint source water pollution. Mitigation is inherently a part of protecting the quality of Nevada's surface waters. Additional examples of NDEP's mitigation programs and activities are listed in Appendix O.

Nevada Flood Awareness Week (FAW) is an annual event that builds awareness about the danger of flooding, and how to protect life and property from a flood. Nevada FAW is a Nevada Flood Awareness Committee initiative, and involving many agencies. To see a list of partners and more information about NFAW, please see: http://www.nevadafloods.org. Another example is Nevada Wildfire Awareness Month (NWAM), an annual event that builds awareness and encourages action to reduce the wildfire threat to Nevada homes and communities. It is a partnership among federal and state agencies, community members and private entities. A listing of all sponsors may be found at this link: http://www.livingwithfire.info/faqs/planning-group-contact-information

The Great Nevada ShakeOut is another example of a partnership between State and federal agencies, universities, casinos, and other community members, in earthquake hazard mitigation. The ShakeOut is an earthquake drill that is broadcasted simultaneously throughout the state. More information is available online about the 2017 Great Nevada ShakeOut: http://www.shakeout.org/nevada/

Table 8-3. 2005 to 2017 FEMA-Supported Grant Activities in Nevada					
HMGP					
Disaster Number	**Selected**	**Obligated**	**Expended**	**Deobligated**	**Status**
4307	$2,531.731.36				Pending
4303	$2,128,628.62				Pending
4202	$583,609.00	$102,295.00	$22,836.15		In process
1540	$726,541.00	$726,541.00	$519,877.54	$206,663.46	Closed
1583	$533,519.00	$533,519.00	$392,541.00	$140,978.00	Closed
1629	$625,497.00	$625,497.00	$624,552.07	$944.93	Closed
1738	$475,537.56	$71,092.56	$44,906.23		Closed
Total	**$5,073,332.18**	**$2,058,944.56**	**$1,604,712.99**	**$348,586.39**	
PDM					
Funding Year	**Selected**	**Obligated**	**Expended**	**Deobligated**	**Status**
2004-2005	$60,063.50	$60,063.50	$60,063.50	$ -	Closed
2006	$29,115.00	$29,115.00	$29,115.00	$ -	Closed
2007	$467,586.75	$467,586.75	$420,112.49	$47,474.26	Closed
2008	$573,173.43	$573,173.43	$565,090.32	$8083.11	Closed
2009	$1,067,995.50	$1,067,995.50	$229,740.91	$838,254.59	Closed
2010	$3,182,907.31	$1,806,991.31	$326,015.97		In process
2011	$905,824.25	$905,824.25	$904,242.05	$143.84	Closed
2012	$2,532,568.77	$2,532,568.77	$2,427,763.62	$104,805.15	Closed
2013	$364,650.00	$364,650.00	$363,320.93	$1329.07	Closed
2014	$2,470,057.87	$2,470,057.87	$621,763.66		In process
2015	$440,000	$440,000	$8,304.94		In process
2016	$1,482,988.45	$154,999.50	$0		Pending awards
2017	$407,635.61				Pending
Total	**$13,984,566.44**	**$10,873,025.88**	**$5,955,533.39**	**$895,284.87**	

Table 8-3 is a summary of the status of all FEMA grant funds for hazard mitigation activities received between 2005 and 2018. All mitigation activities associated with the grant awards have been completely implemented according to the grant's scope of work. The information found on Table 8-3, regarding HMA awards, includes five disaster declarations beginning in 2004 and ending in 2014. There were two additional disaster declarations that occurred in 2017 that are not added at this time. Note the following items on Table 8-3:

- The HMGP difference between the obligated and expended funds is due to cost savings on two projects awarded in the 2004 and 2005 disasters. During these two disasters, subapplicant awareness of the hazard mitigation program was limited, and the state received only enough applications to cover the amount awarded by FEMA. Since 2005, increased subapplicant awareness of the program has built up an inventory of mitigation on-the-shelf projects that are available for submission when events occur or funding sources become available, allowing the state to utilize all awarded funds when cost-savings occur.
- For Disaster #1629, the $944.93 in the "Deobligated" column is cost savings from subrecipient in travel costs and the expiration of the performance period. For PDM 2007, the $47,474.26 in the Deobligated column results from the project coming in under budget due to changes in the economy. Grant restrictions do not allow the transfer of these funds to another project.
- For PDM 2009, the $838,254.59 in the "Deobligated" column results from a portion of the project being unable to be completed secondary to limitations in FEMA rules regarding pile burning for the fuels reduction project. Grant restrictions do not allow transfer of these funds to another project.
- For PDM 2012, the $104,805.15 in the "Deobligated" column is cost savings from the subapplicant in personnel costs.
- The discrepancy between "Selected" and "Obligated" amounts arise because there are projects pending obligation.
- The dollar difference in the "Selected" and "Obligated" columns is a result of the sluggishness of FEMA's National Environmental Policy Act compliance review process for all HMA selected projects.
- For PDM awards, the difference between the obligated and expended funds is due to pending submission of expenditures by the subrecipient for activities that fall within the performance period.
- Homes listed in the RFC loss listing are included in the home elevation program applications with TRFMA for PDM 2016 and HMGP 4303. TRFMA's home elevation program is discussed in Section 8.5.1.

Nevada has been proactive in addressing repetitive flood property such as the following program targeted at the flood-prone areas of the Truckee Meadows. TRFMA continues to actively support the Flood Project (previously referred to as the Living River Plan) - a flood management plan for the Truckee River under which repetitive flood properties have been acquired, including the following:

- UNR's Mill and McCarran Property (60 acres)
- 85 N. Edison Way (1 acre)
- 105 N. Edison Way (1 acre)
- 195 N. Edison Way (1 acre)
- Monday Property (17 Lockwood - 1 acre)
- Excel Property (8 acres)
- Catholic Diocese Property (14 acres)

- Ferrari Property (22 acres)
- 102 Ranch (128 acres)
- A portion of UNR Farms (60 acres), a portion of Butler Ranch (800 acres), and five other properties.

Nevada's mitigation program has successfully accomplished its planning goal of developing hazard mitigation plans for all Nevada counties (many are in the update process). The State has successfully developed relationships among agencies and brought awareness to communities about their risk, and the State will continue to assist rural communities with mitigation plans to apply for funding to reduce risks. This has been addressed by continuing to hold NHMPC meetings in local communities, which has both heightened awareness of hazard risks and successfully encouraged application for grant funding available to develop local plans to combat these risks. The mitigation staff also continue the TTX, which are performed at each community's LEPC meeting where an approved hazard mitigation plan exists to help with continued plan maintenance.

8.6 COMMITMENT TO A COMPREHENSIVE MITIGATION PROGRAM

ELEMENT	REQUIREMENTS
E3. Does the state demonstrate commitment to a comprehensive mitigation program? [44 41 CFR §201.5(b)(4)] ***Intent:*** *Demonstrate commitment to advancing risk reduction and resilience using a wide range of resources*.	The plan must describe an existing comprehensive state mitigation program that might include, but is not limited to, examples listed in the mitigation planning regulation at 44 CFR §201.5(b)(4). ***Comprehensive state mitigation program*** means a broad range of state-supported initiatives and activities that: 1. Targets risk reduction for each of the identified hazards in the state; 2. Is inclusive of various state agencies and sectors with mitigation capabilities and resources; and 3. Is coordinated to increase statewide resilience from the adverse impacts of future hazard events. Initiatives and activities that demonstrate commitment include, but are not limited to, a combination of current training, partnerships, leadership initiatives, funding, technical assistance, codes and ordinances, or other activities that reduce risks. ***Special Consideration:*** Descriptions of the various programs and initiatives to meet this requirement do not need to be repeated in a separate section. However, if the documentation to meet this requirement is not a separate section, the Plan Review Tool (refer to Appendix B: State Mitigation Plan Review Tool) should identify where in the plan the descriptions are found.

[41] 44 CFR §201.5(b)(4): "Demonstration that the State is committed to a comprehensive state mitigation program, which might include any of the following:

(i) A commitment to support local mitigation planning by providing workshops and training, State planning grants, or coordinated capability development of local officials, including Emergency Management and Floodplain Management certifications.

(ii) A statewide program of hazard mitigation through the development of legislative initiatives, mitigation councils, formation of public/private partnerships, and/or other executive actions that promote hazard mitigation.

(iii) The State provides a portion of the non-Federal match for HMGP and/or other mitigation projects.

(iv) To the extent allowed by State law, the State requires or encourages local governments to use a current version of a nationally applicable model building code or Standard that addresses natural hazards as a basis for design and construction of State sponsored mitigation projects.

(v) A comprehensive, multi-year plan to mitigate the risks posed to existing buildings that have been identified as necessary for post-disaster response and recovery operations.

(vi) A comprehensive description of how the State integrates mitigation into its post-disaster recovery operations."

8.6.1 Commitment to Support Local Mitigation Planning

The SHMO works closely with the State Floodplain Manager (FM) to provide workshops, training, and technical assistance to the local emergency, tribal, and floodplain managers, government officials, firefighters, grant managers, and private sector consultants. The ultimate goal of these workshops is to assist each community in reaching its goal of having an approved local hazard mitigation plan (LHMP). The current status of LHMP is shown in Section 5, Figure 5-1. Details of local and tribal plan status are located in Tables 5-1 and 5-2 of Section 5 of the plan.

The FM sponsors workshops for floodplain managers providing information on the NFIP. These workshops include education about the Community Rating System (CRS), which is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements by reducing their flood insurance premiums. Another workshop presentation is the Risk MAP program, which increases public awareness and leads to action that reduces flood risk to life and property.

- The FM and the SHMO jointly coordinate and present grant application workshops for potential subapplicants to the HMA funding programs.
- During the LHMP, update process mitigation staff attends planning meetings
- SHMO staff schedules an annual visit to each community with an approved LHMP, where it performs a TTX that it has developed to help them with continued plan maintenance.
- In addition, the FM provided a comprehensive weeklong L273 workshop to Floodplain Managers statewide that covered building codes, elevations, insurance, FEMA policies, etc. The last course sponsored by the FM was in 2015. This may be repeated on an as-needed basis.
- SMAC provides critical technical assistance to local, state and tribal entities. SMAC was established to advise the USGS on state priorities for map products and to inform map users about the status of mapping programs and the availability of map products. Membership in SMAC and its subcommittees is open to anyone interested in mapping in Nevada. Two subcommittees are currently active: one for GIS and one for geologic mapping. Participants include representatives of numerous local, state, and federal agencies, community colleges and universities, and the private sector. Additional data about SMAC is available at this website: http://www.nbmg.unr.edu/smac/smac.htm
- NESC educates the public about earthquake hazards and promotes earthquake awareness activities, such as the Great Nevada Shake Out, that help save lives, reduce property loss, and speed recovery from earthquakes. NESC assists local and state agencies in preparing for post-earthquake response and recovery and promotes earthquake resistance in new and existing structures. NESC sponsors yearly earthquake training for the public through the National Earthquake Technical Assistance Program (NETAP), which provides various courses with typically one or more courses provided throughout the State on a rotating basis. ATC-20 and FEMA-154 (pre and post-earthquake evaluation) is offered on a yearly basis and will be offered in May 2018 in Las Vegas.

Nevada DEM and NDWR staff continue to maintain positive working relationships with local governments through phone, e-mail, conference calls, and meetings providing technical assistance, support, and information as needed.

8.6.2 Statewide Programs Promoting Hazard Mitigation

Sections 2, 3, 5 and Section 8.1.1 have already detailed many of Nevada's statewide hazard mitigation programs, including legislative initiatives and executive actions that promote hazard mitigation. Some of the higher profile statewide programs dealing with Nevada's highest ranked hazards are summarized below:

- **Nevada Earthquake Safety Council** is a statewide body representing a partnership of the public and private sectors that uses its professional expertise and community knowledge to make earthquake safety recommendations within the public and private sectors, and serve as the advisory body for State seismic safety policy. The current membership of NESC is listed in Appendix B. Their website includes policy statements, strategic plans, meeting minutes and annual reports, located at this link: http://www.nbmg.unr.edu/nesc/
- **Living With Fire Program** is managed by UNCE, and is a collaborative effort involving many organizations to help make communities more likely to survive a wildfire. Together with Nevada's firefighting organizations, they developed a set of consistent wildfire threat reduction recommendations that are shared with schools, homeowners, community groups, and firefighting professionals to help educate and inform those living in fire-prone areas about mitigating Nevada's wildfire threat. Partners include the UNCE, BLM, USFS, and NDF who promote the development of Fire-Adapted Communities. Please see additional details found on the website at http://www.livingwithfire.info/
- **Silver Jackets Program** is a partnership among federal (USACE, NOAA, FEMA, USGS, NRCS), state (Nevada DEM, NDWR, NDOW,) and local agencies and non-profits formed to reduce the risks associated with flooding and other natural hazards in Nevada. It provides a formal and consistent strategy for an interagency approach to planning and implementing measures. Involvement from other regional, local, and tribal groups within this program will improve and increase flood risk communication with a unified interagency message and help collaboration on flood mitigation, response, and recovery. For more information please visit: https://silverjackets.nfrmp.us/State-Teams/Nevada

Listed below are some statewide programs that involve collaboration among State, local and/or private sector groups to achieve specific local mitigation planning efforts.

- Nevada DEM partners with the Nevada Insurance Pool and NBMG, through PDM grants, to develop information such as HAZUS run data for earthquake and flood for each county. This data is distributed to local jurisdictions for their use in loss estimation and mitigation planning. Additionally, Nevada DEM has worked with UNR through an HMGP grant to develop a statewide report of geocoded potential URM building locations (by county) published as *Preliminary Assessment of Potentially Unreinforced Masonry Buildings: Nevada Bureau of Mines and Geology Report 54*, available free online. A GIS inventory of ditches in the northwest portion of the state was completed by NBMG with grant support from Nevada DEM in 2015.
- FEMA has provided funds for NBMG to develop and maintain the "MyPlan" and "MyHazards" interactive web maps to assist local planning professionals in the data collection necessary to address the risk and vulnerability assessment information required for hazard mitigation planning in their

communities. Craig dePolo, with NBMG, has been conducting informational presentations both to the NHMPC, NHM Planning subcommittee, and to the local LHPCs. The presentations help to familiarize LHPCs with this resource available to help them in development of their mitigation plans, and to inspire them to provide more raw data to enter into it to make it a more valuable tool. In late 2017, the Arizona Geological Survey (AZGS) contacted the Cartography and GIS office at NBMG for information regarding the set-up and implementation of the MyHazards web application in order for the AZGS to develop a similar product. The MyPlan and MyHazards websites have many participating partners across state lines, including; California Emergency Management Agency, Nevada DEM, NDOT, and NBMG, with NBMG acting as the lead in this project. These web applications provide local counties and tribes with information and mapping of local hazards and for counties to upload hazard/risk data. This provides local counties and Nevada with a database that can be improved upon over time when additional data becomes available. It is designed to allow local and tribal communities to observe multiple hazards layers in their regions for a full risk and vulnerability assessment. Providing a more detailed risk assessment to local communities will improve their hazard mitigation planning efforts and allow for a better project identification and prioritization process.

- NBMG continues to update the HAZUS database with current building inventory and posting Open File Reports online with HAZUS flood data on major rivers, as well as earthquake data for more than 38 rural communities in Nevada.
- The NHMPC continues to meet in locations statewide with wide and great acceptance by local communities. The meetings provide awareness of mitigation and resiliency successfully as shown by the completion of LHMPs statewide and the increase in applications for projects for all identified natural hazards.

8.6.3 State Provision of a Portion of the Non-Federal Match for Mitigation Projects

Although there is no provision for any portion of the State to provide a match for mitigation projects, there are other potential sources of State funding that may be used to match federal grants for specific projects. Some examples follow:

- State NRS 414, Emergency Management, provides the Disaster Relief Fund and the Emergency Assistance Account that can be used by the state to match projects in qualifying communities for post-disaster costs including hazard mitigation.
- UNR continues to provide the match on planning activities such as HAZUS earthquake and flood runs.

8.6.4 Promotion of Nationally Applicable Model Building Codes

Since 1981, the State of Nevada has adopted a series of nationally applicable, model building-related codes that local governments (with the exception of Clark County in some instances) are required to enforce. The existing State codes are shown in Table 8-4. Local governments may also adopt these codes with amendments that are more restrictive than the state adoption, but may not be less restrictive. Adoption of these codes by local jurisdictions will make local mitigation more effective. NHMPC takes into

consideration the adoption of the State building codes when prioritizing proposals by the communities applying for hazard mitigation funding. NHMPC identifies those local governments with policies currently in place that include strong hazard mitigation programs and offers them as positive examples to other Nevada communities and local governments in developing their own effective hazard mitigation plans and ordinances. The State provides guidance to these communities, and supports pass-through funds available to communities interested in adopting hazard mitigation actions.

Table 8-4. Existing State Model Codes Promoted for Adoption by Local Governments

Policy	Description of Model Codes	Applicability
Building and Fire Codes	The State has adopted a building code and local governments are required to adopt and enforce this code with the exception of Clark County. (see NRS 477.030 (12)). NRS 278.580 – Building codes: Adoption; fees for permits; applicability to State and Nevada System of Higher Education; authorization of use of materials and technologies that conserve resources in construction and use of solar or wind energy; adoption of seismic provisions and standards NRS 461.170 – Division required to adopt by regulation nationally recognized codes and standards for construction, reconstruction and alteration. NRS 477.030 (1)–Requires the State Fire Marshal to adopt minimum fire and building codes to ensure fire safety, except as otherwise provided. NRS 477.030 (12) - Except as otherwise provided in this subsection, any regulations of the State Fire Marshal concerning matters relating to building codes, including, without limitation, matters relating to the construction, maintenance or safety of buildings, structures and property in this State. Exemptions are provided to a county whose population is 700,000 or more (Clark County, only) and have adopted a code at least as stringent as the *International Fire Code* and the *International Building Code*, published by the International Code Council. NRS 514.040(3) – Apply geologic engineering principles to problems of conservation, environment, construction, mineral industry and other scientific matters that may be of importance to the welfare of the State. NRS 623 – Architects, Interior Designers and Residential Designers.	The adoption and enforcement of building and fire codes relates the design and construction of structures to standards established for withstanding wildfires, earthquakes, flooding, dam failure, and high winds.

Table 8-4. Existing State Model Codes Promoted for Adoption by Local Governments

Policy	Description of Model Codes	Applicability
Zoning	Laws and ordinances regulate development by dividing the community into zones and by setting development criteria for each zone. NRS 278.147 – Facilities for use, manufacture, processing, transfer or storage of explosives or certain other substances: Conditional use permit required; application for and issuance of conditional use permit. NRS 278.160 – Elements of the master plan (planning and zoning). NRS 278.580— Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction NRS 410.095 through 410.210 – Regulation and restriction of outdoor junkyards.	Zoning can keep inappropriate development out of hazard-prone areas and can designate certain areas for such things as conservation, public use, or agriculture. Zoning can also be used to control construction by dedicating areas for cluster development or planned unit development. The State currently works with local governments on implementing these last two policies.
Land Use Planning	Comprehensive land use planning provides a mechanism to prevent development in hazardous areas or allows development in a manner that minimizes damage from hazards. Land use planning gives local governments "the big picture" of what is happening in their jurisdiction. NRS 278.02521 – Legislative intent (protecting environmentally sensitive areas and maintaining the economic viability of rural lands). NRS 278.160 – Elements of master plan (planning and zoning). NRS 278.580—Standards for the investigation of hazards relating to seismic activity, including, without limitation, potential surface ruptures and liquefaction. NRS 321.640 through 321,770 – State planning of use of land. NRS 324 – Lands under Carey Act (regulates use of water and reclamation of water projects). NRS 376A – Taxes for development of open space land. NRS 472 – State Forester Fire Warden (management of vegetation, cooperative agreements, rangeland fire protection associations, elimination of fire hazards, etc.). NRS 528 – Forest practice and reforestation. NRS 534 – Underground water and wells	Local governments can use land use planning to identify those areas subject to damage from hazards and work to keep inappropriate development out of those areas. Land use planning can also be used for more regional approach when local governments work together.

Table 8-4. Existing State Model Codes Promoted for Adoption by Local Governments		
Policy	**Description of Model Codes**	**Applicability**
Subdivision Regulations	Sets construction and location standards for subdivision layout and infrastructure. NRS 445D – Environmental covenants (Uniform Act).	Contains standards for such things as storm water management and erosion control
Capital Improvements Planning	Identifies where major public expenditures will be made over the next 5 to 10 years.	Capital Improvement Plans can secure hazard-prone areas for low risk uses, identify roads or utilities that need strengthening, replacement, or realignment, and can prescribe standards for the design and construction of new facilities.

Table 8-5 below provides the status of adoption of different building codes by local governments in Nevada. Acronyms are defined below Table 8-5.

Table 8-5. Code Adoption by Jurisdiction, as of January 2018

JURISDICTION	IBC	IRC	UPC	UMC	NEC	IECC	IFC	OTHER	AMENDMENTS
CARSON CITY	2012	2012	2012	2012	2011	2012	2012	2012 IMC 2012 IFGC 2012 IPMC 2012 IEBC 2012 USPSHT 2012 ISPSC 2012 IWUIC 2009 ICC/ANSI A117.1	2015 Northern NV Amendments 2012 Northern NV Fire Amendments 2012 Northern NV Amendments 2011 Northern NV Energy Code Amendments
CLARK COUNTY SCHOOL DIST	2012		2012	2012	2011	2012	2012	2009 ICC A117.1 Accessibility 2013 NFPA 13 & 72	YES
CLARK COUNTY BLDG DEPT	2012		2012	2012	2011	2012	2012	2014 Clark County Building Administrative Code 2012 ISPSC	YES
CITY OF LAS VEGAS	2012	2012	2011	2012	2011			2012 ISPSC Amendments 2012 Administrative Code ordinance 2012 IBC ordinance 2012 IEBC ordinance 2012 IRC ordinance 2012 UMC ordinance 2012 UPC ordinance NEC Requirement Applicable to Special Events Special Events Permit Guidelines 5152014	YES: Existing Building Code CLV Amendments to the SNV 2012 IBC
BOULDER CITY	2012	2012	2012	2012	2011	2009	2012	2017 BSDAC 2012 ISPSC	YES
CITY OF NORTH LAS VEGAS	2012	2012	2012	2012	2011	2009		2012 ISPSC	YES:

Table 8-5. Code Adoption by Jurisdiction, as of January 2018									
JURISDICTION	**IBC**	**IRC**	**UPC**	**UMC**	**NEC**	**IECC**	**IFC**	**OTHER**	**AMENDMENTS**
								Building Policies and Procedures Building Administrative Code ASHRAE ANSI A117. 1-2009 The Blue Book	Southern Nevada Amendments
DOUGLAS COUNTY	2012	2012	2012	2012	2011	2012	2012	2012 International Urban Wildfire Interface Fire Code for Lake Tahoe area	YES
STATE OF NV (NAC 341.045)	2012	2012	2012	2012	2011	2012	2012	2012 IEBC 2010 SAD	YES(NAC 341.045)
CITY OF SPARKS	2012	2012	2012	2012	2011	2012		2012 IEBC 2012 IMC 2012 IFGC 2012 ISPSC 2012 IGCC NFPA 58 & 54	YES
WASHOE COUNTY	2012	2012	2012	2012	2011	2012	2012	2012 IEBC 2012 IFGC 2012 IMC 2012 ISPSC 2012 IWUIC 2012 IGCC NFPA 58 & 54	YES: Northern Nevada amendments (2012 & 2015)
CITY OF RENO	2012	2012	2012	2012	2011	2012		2012 IFGC 2012 IMC	YES
LYON COUNTY	2012	2012	2012	2012	2011	2009		2012 IFGC	YES
ELKO COUNTY*	2003	2003	2003	2003	2002	2003	2003 (including the NFPA's)	1997 UAC 2003 IEBC	YES
NYE COUNTY	2006	2006	2006	2006	2005	2012	2006	2006 IPMC, 2006 USPSHT	

TABLE 8-5 NOTES:
ANSI- American National Standards Institute
ASHRAE- American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BSDAC- Building and Safety Division Administrative Code
IBC- International Building Code
ICC - International Code Council
IEBC- International Existing Building Code
IECC- International Energy Conservation Code
IFC- International Fire Code
IFGC - International Fuel Gas Code
IGCC- International Green Construction Code
IMC- International Mechanical Code
IPMC- International Property Maintenance Code
IRC- International Residential Code
ISPSC - International Swimming Pool and Spa Code
IUWIFC- International Urban Wildfire Interface Fire Code
IWUIC- International Wildland-Urban Interface Code
NEC- National Electrical Code
NFPA- National Fire Protection Association
SAD- Standards for Accessible Design
UAC- Uniform Administrative Code
UMC- Uniform Mechanical Code
UPC- Uniform Plumbing Code
USPSHT- Uniform Swimming Pool, Spa & Hot Tub Code
Nevada L_P Gas Board – National Fire Protection Act - NFPA 54 (2009 edition)– applies statewide.
Nevada Division of Industrial Relations –Safety Codes for Elevators and Escalators A17.1 (2013 edition), A17.3 (2011 edition) and others.
**Elko County's 2003 IBC with Appendix Chapters B, C, E, G, H, J, & I and 2003 IRC (Building and Electrical Chapters) with Appendix's G, H, & L. The State Fire Marshal's Office adopted the 2012 IBC and Fire Code and the 2012 UMC.*
Clark County School District will be adopting the Southern Nevada Building Official amendments for the 2018 ICC series along with the UMC and UPC in early 2019

8.6.5 Post-Disaster Mitigation of Building Risks

Through partnerships with the NESC, the Nevada Fire Safe Council, the FM, and other groups, the state has begun a comprehensive, multi-year effort to mitigate risks posed to existing buildings identified as necessary for post-disaster response and recovery operations.

Buildings identified as necessary for post-disaster response and recovery operation include:

- Facilities used by first responders
- Buildings used as evacuation centers, such as schools
- Water facilities needed by communities
- Critical communication infrastructure
- Hospitals and clinics
- Major utility sources

NBMG has completed a project in which all potential URM buildings in the state were identified and geotagged with GPS coordinates in a user-friendly database. This database provides a starting place for field-checking to verify which ones are definitely URMs. The next step in completion of this project will be developing a grant that includes a funding request for field verification of the potential URMs statewide, with particular reference to identifying which are critical facilities and schools. Field verification has begun in the Clark County unincorporated areas, Reno, and Carson City. Once this is complete, a subset of critical

state and local buildings will be compiled and mapped providing vulnerability assessment information for mitigation activities as well as information for the response effort. This database will be expanded to include additional critical facilities and structures as they are identified and located. This will help mitigate the risks posed to these structures essential to post-disaster response and recovery operations. Also as part of the Risk MAP program, NDWR and Nevada DEM work together in the development and update of local plans to provide risk data for communities to bring awareness of the location of the hazard in reference to the current building inventory with the development of flood depth grids as data (mostly locally funded LiDAR) becomes available.

8.6.6 Integration of Mitigation with Post-Disaster Recovery

Hazard mitigation is an integral part of Nevada's post-disaster recovery operations. When a presidentially declared disaster occurs, a joint field office is opened and operated by FEMA. The SHMO is co-located with the recovery PA Officer who manages the public assistance program. Staff members from several other state agencies such as NDOT, NDF, NBMG as well as local stakeholders may also be situated here, allowing for the identification of a wide spectrum of mitigation elements in recovery, repair, and restoration projects. Mitigation and public assistance program staff jointly conduct applicant briefings to discuss mitigation opportunities through both public assistance and HMGPs. The SHMO quickly disseminates letters of intent and information on the HMGP, and provides technical assistance to potential applicants. The SHMO coordinates with NHMPC members and with FEMA staff to develop a strong hazard mitigation strategy that includes the following elements:

- Technical services
- Support to 406 mitigation
- Hazard Mitigation Planning
- HMGP Technical Assistance
- Community Education and Outreach

The intent of Nevada's HM program is to increase the resiliency of communities in Nevada. As always, more work in outreach can be done to bring additional programs to partner in hazard mitigation efforts. In Nevada, the THIRA program is a good example of a new program integrating hazard mitigation data for response and recovery purposes.

Nevada had two presidential disaster declarations in 2017. Nevada DEM set a goal of 50% of project worksheets to include 406 Hazard Mitigation funding. Actual 406 mitigation was 47% for the combined disasters.

8.6.7 Disaster Recovery Framework

Recovery and mitigation work closely together with ongoing mitigation planning efforts. Implementation of mitigation projects play a key role in ensuring the state's preparedness to recover. The State Enhanced HMP identifies projects that have direct impacts on long-term recovery activities. This framework recognizes that recovery-planning efforts must work in concert with mitigation planning activities and that there may be an overlap between the two aspects of emergency planning.

Mitigation and Recovery work together with eight Recovery Support Functions (RSF). These RSFs include Community Planning and Capacity Building, Economic Recovery, Health and Social Services, Disaster Housing, Infrastructure Systems, and Natural and Culture Resources. The Recovery Framework brings together many supporting agencies including the Governor's Office of Economic Development, Department of Employment, Training and Rehabilitation, DCNR, NDA, Department of Public Safety, Department of Corrections, NDOT, Nevada Housing Division, Department of Education, NDHHS, SPWD, Department of Business and Industry, NDOW, Department of Taxation, Nevada Contractors Association, and the Rural Community and Economic Development Division. Mitigation is woven throughout the Recovery Framework including working together for planning, technical support in identifying recovery and mitigation projects, and monitoring post disaster recovery and mitigation projects to ensure proper oversight. Our goal is to help build accessibility, resiliency, sustainability, and mitigation measures into identified recovery strategies, preparedness, and operational pans.

Executive order 2018-4, Implementation of Nevada's Statewide Resilience Strategy, discusses the fact that Nevada experienced an unprecedented number of emergencies and disasters during calendar year 2017, which resulted in disruption and tragedy throughout Nevada. It states "Nevada's lessons learned from its unprecedented year, its commitment to recovering fully, and its established policy development and implementation framework through the Nevada Homeland Security Working Group can be combined to build and implement a plan for building statewide resilience". This executive order outlines the plans and measures that will be taken to recover from these events as well as plan for increased resilience regarding future disasters. Recovery efforts work together with effective mitigation efforts to make Nevada a more resilient state. The executive order in its entirety can be found here: http://gov.nv.gov/News-and-Media/Executive-Orders/2018/2018-4-Implementation-of-Nevada_s-Statewide-Resilience-Strategy/

State of Nevada

Executive Department

Executive Order 2018-25

ORDER AMENDING THE OCTOBER 30, 2007, OCTOBER 6, 2010, AND OCTOBER 3, 2013 EXECUTIVE ORDERS ADOPTING THE NEVADA STANDARD MULTI-HAZARD MITIGATION PLAN AND THE SUBSEQUENT NEVADA MULTI-HAZARD MITIGATION PLAN

WHEREAS, the Nevada Department of Public Safety, Division of Emergency Management, in coordination with the Nevada Hazard Mitigation Planning Committee, has developed the Enhanced Hazard Mitigation Plan for the State of Nevada; and

WHEREAS, the Plan identifies hazards that threaten Nevada's citizens and property, and identifies and prioritizes projects to reduce or eliminate those threats; and

WHEREAS, the State of Nevada must adopt the Enhanced Hazard Mitigation Plan in order to be compliant with the Section 322 of the Federal Disaster Mitigation Act of 2000, and to be eligible for increased disaster assistance; and

WHEREAS, Article 5, Section 1 of the Nevada Constitution provides that, "The supreme executive power of this State, shall be vested in a Chief Magistrate who shall be Governor of the State of Nevada."

NOW, THEREFORE, by authority vested in me as Governor by the Constitution and laws of the State of Nevada, I hereby direct and order as follows:

The Enhanced Hazard Mitigation Plan, as updated on September 25, 2018, is hereby adopted by the State of Nevada.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Nevada to be affixed at the State Capitol in Carson City, this fifth day of October, in the year two thousand eighteen.

Governor of the State of Nevada

By the Governor:

Barbara K. Cegavske

Secretary of State

Deputy Secretary of State

The State Plan was prepared by the Nevada Hazard Mitigation Planning Committee and Subcommittee members (listed in Section Two) with the support of their participating agencies and participation from various other State, local, and tribal entities. The names of groups that provided representatives and contributed technical information in support of the plan are listed and further described below:

- The Nevada Earthquake Safety Council—http://www.nbmg.unr.edu/nesc/
- The Wildland Urban Interface Summit and Nevada Wildfire Awareness Month—http://www.livingwithfire.com/?click=nevadawildland
- Nevada Local Emergency Managers—listed in section B.2.
- State, County, Tribal Emergency Managers
- State Preliminary Damage Assessment (PDA) Teams
- Living With Fire Program cooperating partners
- Silver Jackets Program partners
- Nevada Bureau of Mines & Geology

In addition to those listed, the following groups provide their expertise and support to the NHM Planning Committee and Subcommittee:

- State Emergency Response Commission—http://serc.nv.gov/Members/Members/
- State Mapping Advisory Committee—http://www.nbmg.unr.edu/smac/smac.htm
- State PDA Teams
- Nevada League of Cities
- Nevada Association of Counties
- Voluntary Organizations Active in Disasters (north and south)
- Community Development Block Grants
- Floodplain Managers

B.1 NEVADA EARTHQUAKE SAFETY COUNCIL

The mission of the NESC is to advise the Nevada Earthquake Risk Reduction Program. The Council facilitates public input, develops consensus about seismic issues within the public and private sectors, and is the public advisory body for State seismic safety policy. The Board of Directors is listed in the latest meeting minutes. The business of the Council is conducted by the Board of Directors, which is composed of 22 Directors. Twelve Directors shall constitute a meeting quorum. Voting shall be by Directors and a representative from Nevada DEM.

The Board of Directors shall be appointed by Nevada DEM. Prior to the fall meeting, the Chairperson shall appoint a three (3) person ad hoc nominating committee. At the fall meeting, the Committee shall nominate their proposed list of Directors. Additional Directors may be nominated from the floor. The nominations shall conform to the board membership categories as shown. These nominations will be forwarded to the Chief, Division of Emergency Management for an official appointment. The recommended term for Board of Directors is two years, with no limitation on re-appointment. Newly appointed Directors shall assume their office immediately if the position is vacant; otherwise at the next scheduled Council meeting. Any Director who is unable to attend a specific meeting of the Board of Directors of the NESC may designate, in writing

to the Chairperson, an alternate. This alternate shall be for a specific meeting and is empowered to take all actions the Director is empowered to take. Board membership is composed of representatives from:

Business and Industry: 1 Southern

Government: 2 (1 State, 1 Local/City, 0 Local/County jurisdictions)

Geosciences: 2 (1 Northern, 1 Southern)

Engineers: 2 (1 Northern, 1 Southern)

Community: 2 (1 Northern, 1 Southern)

University: 2 (1 Northern, 1 Southern)

Building Officials: 2 (1 Northern, 1 Southern)

Insurance Industry: 1(Statewide)

Education: 1(Statewide)

Seismologist: 1 (Statewide)

State Legislators: 0 (0 from Senate, 0 from Assembly)

Member at Large: 2 (1 Northern, 1 Southern or Statewide)

NESC current membership is listed in Table B-1, on the next page.

Table B-1. Nevada Earthquake Safety Council Members 2018	
Name	**Department/Organization**
Mike Blakely	Structural Engineers
Ian Buckle	University of Nevada, Reno – Center for Civil Engineering Earthquake Research
Wayne Carlson	Nevada Public Agency Insurance Pool
Craig dePolo	Nevada Bureau of Mines and Geology
Jim Faulds (Sabbatical) Richard Koehler (Interim)	Nevada Bureau of Mines and Geology (Member at Large)
Timothy Ghan	Nevada Division of Insurance
Jeff Hahn	Las Vegas Convention and Visitors Auth
Graham Kent	Nevada Seismological Laboratory
Chris Lake	Nevada Hospital Association
Ron Lynn (Chair)	Nevada State Contractor's Board
Connie Morton	Community Organizations Active in Disasters
Jim O'Donnell	Geophys. Contractor, Boulder City; (Member at Large)
Rob Palmer	Nevada Department of Transportation
Woody Savage	UNLV, Geosciences
Wanda Taylor	UNLV Department of Geoscience
Jim Werle	NOVA Geotechnical and Inspection Services
Kyle West	City of Reno
Michael Wilson	Clark County School District, Office of Emergency Mgmt.
Janell Woodward	Nevada Division of Emergency Management, staff

B.2 STATE, COUNTY, AND TRIBAL EMERGENCY MANAGERS

2018 Emergency Manager's List
(Revised 02/20/2018)
*All area codes are 775 unless otherwise noted
*All phone numbers are office lines unless otherwise noted

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Hawthorne, NV 89415
firechief@mineralcountynv.org
Dorothy Fowler, County Assessor 945-3684
djfassessor@mineralcountynv.org
Randall Adams, County Sheriff 945-2434
mcsosheriff@mineralcountynv.org
Web: www.mineralcountynv.us

NYE COUNTY

Vance Payne, Emergency Manager 751-4278
1510 E. Siri Lane Suite 100
Pahrump, NV 89060
vpayne@co.nye.nv.us
Pamela Webster, County Manager 482-8138
nyeadmin@co.nye.nv.us
Sharon Wehrly, County Sheriff 751-7012
sheriff@co.nye.nv.us
751-7000 Pahrump
County website: www.nyecounty.net

PERSHING COUNTY

Charles L. Sparke,
Director 857-7911 (Cell)
Office of Emergency Management
Lovelock Correctional Center
Box Drawer E, County Courthouse
Lovelock, NV 89419
clsnvdem@att.net
Darin Bloyed, Commission Chairman
273-2342
dbloyed@pershingcounty.net
Jerry Allen, County Sheriff 273-2641
County Website: www.pershingcounty.net

STOREY COUNTY

Joe Curtis, EM Director 847-0986
Office of Emergency Management 847-0954
P.O. Box 7
372 South C St.
Virginia City, NV 89440
jcurtis@storeycounty.org
Cherie Nevin,
Emergency Management 847-0986
P.O. Box 7
141 North C Street
Virginia City, NV 89440
cnevin@storeycounty.org
Pat Whitten, County Manager 847-0968
pwhitten@storeycounty.org
Gerald Antinoro, County Sheriff 847-0959
gantinoro@storeycounty.org
Jeff Nevin, County Fire Chief 847-0954
ghames@storeycounty.org
County Website: www.storeycounty.org

WASHOE COUNTY
Aaron Kenneston,
CEM Emergency Manager 337-5898
Office of Emergency Management & Homeland Security
5195 Spectrum Blvd.
Reno, NV 89512-0027
akenneston@WashoeCounty.us
EM/HS website: www.ReadyWashoe.com
John Slaughter, County Manager 328-2000
jslaughter@washoecounty.us
Chuck Allen, County Sheriff 328-3001
sheriffweb@washoecounty.us
County Website: www.washoecounty.us

WHITE PINE COUNTY
Tim Woolever 293-6503
Fire Chief/Emergency Management
HC 33 Box 33447
1150 US Highway 93 North
Ely, NV. 89301
TWoolever@whitepinecountynv.gov
Richard Howe,
Commission Chairman 293-6561
rhowe@whitepinecountynv.gov
Dan Watts, County Sheriff 289-8808
dwatts@whitepinecountynv.gov
County website:
http://www.whitepinecounty.net/

Tribal Contacts:

DUCK VALLEY SHO-PAI TRIBE
Brent Hunter, 757-2473
Fire Management Officer / EM
1935 Fire Lane, Nevada Highway 225
Owyhee, NV 89832
hunter.brent@shopai.org
Chairman: Lindsey Manning
manning.lindseyw@shopai.org

DUCKWATER SHOSHONE TRIBE
Marian Perez, Emergency Manager
P.O. Box 140068 863-0227
511 Duckwater Falls Rd.
Duckwater, NV 89314-0087

Chairman: Kathy Adams-Blackeye
863-0227
nyevee@yahoo.com

ELY SHOSHONE TRIBE
VACANT
16 Shoshone Circle 293-7238
Ely, NV 89301
kathryngriffith077@att.net
Chairman: Alvin Marques
elkmounter@yahoo.com

FALLON PAIUTE SHOSHONE TRIBE
Jackie Conway, 423-8848 x202
Emergency Management Coordinator
987 Rio Vista Dr.
Fallon, NV 89406
emd@fpst.org
Chairman: Len George
chairman@fpst.org

FORT MCDERMITT PAI-SHO TRIBE OF NV & OR
Duane Masters Sr,
Emergency Manager 532-8259
P.O. Box 457
McDermitt, NV 89421
dmasterssr@gmail.com
Chairman: Tildon Smart
tildon.smart@fmpst.org

FORT MOJAVE INDIAN TRIBE (CA, AZ & NV)
Luke Johnson,
EM Director 760-326-9650
Mailing Address: 500 Merriman Ave
Physical Address: 800 West Broadway Ste B
Needles, CA 92363
lukejohnson@fortmojave.com
Chairman: Timothy Williams
Timothywilliams@fortmojave.com

CONFEDERATED TRIBES OF GOSHUTE
Helen Steele,
Asst. Emergency Manager 435-234-1143
Ibapah, Utah 84034
helensteele@goshutetribe.com
Chairman: Madeline Greymountain
mgreymountain@goshutetribe.com

LAS VEGAS PAIUTE TRIBE
Darrel Dawkins,
Emergency Manager 702-471-0844
ddawkins@lvpaiute.com
Chairman: Benny Tso contact@lvpaiute.com

LOVELOCK PAIUTE TRIBE
Emergency Manager: VACANT
Chairman: Victor Mann 273-7861
victormann86@yahoo.com

MOAPA BAND OF PAIUTES
Paul Martino 702-865-2828
Police Chief / Emergency Manager
#3 Lincoln St.
Moapa, NV 89025
pmartino@moapatribalpd.com
Chairman: Darren Daboda
d_daboda@yahoo.com

NEVADA URBAN INDIANS, INC.
Warren Cartright,
Emergency Manager 788-7600 x114
745 W. Moana Lane, Suite 375
Reno, NV 89509
wcartright@nevadaurbanindians.org
Chairwoman: Janet Reeves

PYRAMID LAKE PAIUTE TRIBE
Don Pelt,
Emergency Respond Coord. 574-1000
PO Box 256
Nixon, NV 89424
dpelt@plpt.nsn.us
Chairperson: Vinton Hawley
vhawley@plpt.nsn.us
Vice Chairman: Alan Mandell

RENO-SPARKS INDIAN COLONY
David Hunkup, Emergency Services Manager Public Safety 785-1373
Office: 34 Reservation Rd.
Reno, NV 89502
Email: dhunkup@RSIC.org
Chairman: Arlan D. Melendez
amelendez@rsic.org
RSIC Tribal Health Center EM
Daniel Thayer 329-5162 x1918
1715 Kuenzli St.
Reno, NV 89502

SUMMIT LAKE PAIUTE TRIBE
William Cowan,
Emergency Manager 827-9670
Jerry Barr
1001 Rock Blvd.
Sparks, NV 89431
william.cowan@summitlaketribe.org
Chairman: Randi DeSoto
randi.desoto@summitlaketribe.org

TE-MOAK TRIBAL COUNCIL
Battle Mountain Band
Elko Band
South Fork Band
Wells Band
Each band has their own EM
Chairman: Davis Gonzales
tmkchairman@yahoo.com

BATTLE MOUNTAIN BAND COUNCIL
Cheryl Dixon (Interim) 635-2004 x120
37 Mountain View
Battle Mountain, NV 89820
bmbraide@yahoo.com
Chairman: Joseph Holley
jhchairman1@yahoo.com

ELKO BAND OF THE TE-MOAK TRIBE OF WESTERN SHOSHONE
Clifford Banuelos,
Environmental Coord. 753-9248
1521 Shoshone Circle
Elko, NV 89801
ebcepa@gmail.com
Chairman: Gerald Temoke
grtebcchair@yahoo.com

SOUTH FORK BAND
VACANT 744-2387
21 Lee
Spring Creek, NV 89815
Chairman: Alice Tybo
south_forkadm@hotmail.com
adt2556@gmail.com
Chairwoman: Michelle Cure
michellecure79@yahoo.com

WELLS BAND COUNCIL
Marla Stanton,
Environmental Coord/EM 752-2601
1705 Mountain View Dr.
Wells, NV 89835
wbcenviro@gmail.com
Chairwoman: Michelle Cure
michellecure79@yahoo.com

TIMBISHA SHOSHONE TRIBE
Mikaela Griffiths,
Environmental Director 760-872-3614
621 West Line St. Suite 109
Bishop, CA 93514
environmental@timbisha.com
Chairman: George Gholson
george@timbisha.com

WALKER-RIVER PAIUTE TRIBE
VACANT,
Emergency Manager 773-2306 x312
Office
P.O Box 220
Shurz, NV 89427
Chairman: Amber Torres 530-6276

WASHOE TRIBE OF NV AND CA
Lisa Christensen,
Emergency Manager 265-8618
919 US Highway 395 South
Gardnerville, NV 89410
Lisa.Christensen@washoetribe.us
Chairperson: Neil Mortimer 256-8600
Neil.mortimer@washoetribe.us

YERINGTON PAIUTE TRIBE
Mark Moore, Emergency Manager
171 Campbell Lane
Yerington, NV 89447
policechief@ypt-nsn.gov or policechief@ypt-nsn.gov
Chairwoman: Laurie Thom 463-3301 x22
171 Campbell Lane
Yerington, NV 89447
lthom@ypt-nsn.gov
Justin Whitesides, 463-7866
Alt. Emergency Manager/
Environmental
Director
Environmentaldirector@ypt-nsn.gov

YOMBA SHOSHONE TRIBE
Sarah Caligiuri,
Emergency Manager 964-2114
yombawater@gmail.com
John Brady
yombaer@gmail.com
Chairperson: James Birchim Jr.
tribalchair@yombatribe.com

INTER-TRIBALEMERGENCY RESPONSE COMMISSION (ITERC)

Dan Hourihan 355-0600 x 154
ITERC Program Administrator
dhourihan@itcn.org
Brent Hunter, ITERC Chairman 757-2473
Hunter.brent@shopai.org
ITCN Executive Director:
Daryl Crawford 355-0600

WASHOE COMMUNITIES - EMERGENCY MANAGERS

Carson Colony Council
Chairperson: Chad Malone
Chad.malone@washoetribe.us
Dresslerville Community Council
Chairperson: Lisa Christensen
Lisa.christensen@washoetribe.us
Stewart Community Council
Chairperson: Jacqueline Stewart
Redhawk_57@yahoo.com
Woodfords Colony Council
Chairperson: Irvin Jim
i.jim@washoetribe.us

B.3 NEVADA WILDFIRE AWARENESS MONTH 2017

Table B-2. NWAM 2017

Planning Group Contact Information

Bureau of Land Management		
Carson City District	Dennis Terry	775-885-6197
Elko District	Clint Mothershead	775-753-0345
Winnemucca and Battle Mountain Districts	Bradley Milam	775-623-1518
Carson City Fire Department	Rodd Rummel	775-283-7161
City of Elko Fire Department	John Holmes	775-388-2428
City of Reno Fire Department	Trey Palmer	775-813-8599
Clark County Fire Department	Larry Haydu	702-455-7311
Mt. Charleston Fire District	Jorge Gonzalez	702-305-4010
Elko County Fire Protection District	Steven Hamilton	775-738-9960
Eureka County Dept. of Natural Resources	Jessica Santoyo	775-237-6010
Nevada Division of Emergency Management		
Hazard Mitigation Officer	Karen Johnson	775-687-0314

Bureau of Land Management		
Public Information Officer	Gail Powell	775-687-0325
Nevada Division of Forestry		
Community Protection Program	Ryan Shane	775-684-2511
Western Nevada	Chanse Hunwardsen	775-430-0106
Southern Nevada	Chris Faehling	775-962-5543
Northeastern Nevada	Ben Bolton	775-289-1627
Nevada League of Cities	Wes Henderson	775-882-2121
Nevada State Fire Marshal Division	Danny Brennan	775-684-7526
North Lyon County Fire Protection District	Ron Eagleye Johnny	775-575-3310
Storey County Fire Department	Patty Blakely	775-847-0954
	Fritz Klingler	775-351-5936
Truckee Meadows Fire Protection District	Amy Ray	775-326-6005
USDA Forest Service		
Carson Ranger District	Jennifer Diamond	775-355-5372
Ely Ranger District	Susan Greenleaf	775-289-5114
University of Nevada Cooperative Extension		
Extension Educator-White Pine County	Juan Cervantes	775-289-1462
Extension Educator-Carson City	Lindsay Chichester	775-887-2252
Living With Fire Program Outreach Coord.	Jamie Roice-Gomes	775-336-0261
Living With Fire Program	Sonya Sistare	775-887-2252
Natural Resources Specialist	Ed Smith	775-782-9960
The Network Coordinator	Elwood Miller	775-336-0266
Marketing/Public Relations - Southern Area	Marilyn Ming	702-257-5516

B.4 STATE PRELIMINARY DAMAGE ASSESSMENT TEAMS

State PDA volunteers include representatives from the following agencies and professional groups:

- Nevada Attorney General's Office
- Nevada Department of Administration
- Nevada Department of Business & Industry/Insurance Division
- Nevada Department of Transportation
- Nevada Department of Wildlife
- Nevada Division of Emergency Management
- Nevada Division of Forestry
- Nevada Division of Records & Technology
- Nevada Division of Water Resources

As well as voluntary agencies, local governments, and other members of the private sector. For more information on State PDA volunteers, please see section 8.4.2.

B.5 NEVADA LIVING WITH FIRE COOPERATING PARTNERS

- United States Forest Service—Humboldt Toiyabe National Forest: http://www.fs.usda.gov/htnf
- United States Forest Service—Lake Tahoe Basin Management Unit: http://www.fs.usda.gov/main/ltbmu/
- United States Department of Interior, Bureau of Land Management: www.blm.gov/nv
- Nevada Fire Safe Council (NFSC): http://www.unce.unr.edu/blogs/livingwithfire/about/
- Nevada Association of Counties (NACO) : http://www.nvnaco.org/NACo
- Nevada Insurance Council (NIC) : http://www.nevadainsurancecouncil.com/
- Sierra Front Wildfire Cooperators (SFWC) http://www.sierrafront.net/
- Nevada Division of Forestry: http://forestry.nv.gov/
- University of Nevada Cooperative Extension: http://www.unce.unr.edu/

B.6 SILVER JACKETS PROGRAM

Silver Jackets is an innovative State, federal, tribal and local interagency program that works together to reduce flood risk. It serves as a catalyst to develop comprehensive and sustainable solutions to flood hazard issues including mitigation planning, flood hazard mapping risk reduction, response and recovery planning. Website: https://silverjackets.nfrmp.us/State-Teams/Nevada

Current Participating Agencies:

- Nevada Division of Water Resources
- State of Nevada Division of Emergency Management
- Federal Emergency Management Agency
- National Weather Service
- USDA Natural Resources Conservation Service
- U.S. Geological Survey Water Resources Division
- U.S. Army Corps of Engineers

APPENDIX C NHMPC Bylaws and Subcommittees

C.1 NEVADA HAZARD MITIGATION PLANNING COMMITTEE

The advisory body, known as Nevada Hazard Mitigation Planning Committee (NHMPC) was formed July 21, 2003, to advise the Nevada DEM concerning hazard mitigation planning, activities and policies.

Nevada Hazard Mitigation Planning Committee Board of Directors and their agencies are listed below.

1. Clark County Emergency Management

Jeremy Hynds
City of Henderson Emergency Mgmt.
240 Water Street
Henderson, NV 89015
(702) 267-2339
Fax: (702) 267-2223
Jeremy.Hynds@cityofhenderson.com

2. Washoe County Emergency Management

Aaron Kenneston
Emergency Manager
5195 Spectrum Blvd.
Reno, NV 89512
775-337-5898
775-742-6944 (cell)
akenneston@washoecounty.us

3. Rural County Emergency Management

Vacant

4. Local or Multi-Jurisdictional Emergency Management

Vacant

5. Local or Multi-Jurisdictional Floodplain Management – Northern Nevada

Robert D. Fellows, P.E.
Senior Project Manager,
Chief Stormwater Engineer,
Floodplain, CRS & NPDES Manager
Carson City Public Works
3505 Butti Way
Carson City, NV 89701
775-283-7370
fax 775-887-2164
Rfellows@carson.org

6. Local or Multi-Jurisdictional Floodplain Management – Southern Nevada

Andrew Trelease
Clark County Regional Flood Control District
600 South Grand Central Parkway, #300
Las Vegas, NV 89106-4511
702-685-0000
702-683-5467 cell
ATrelease@regionalflood.org

7. Nevada Bureau of Mines and Geology

Craig dePolo
Nevada Bureau of Mines and Geology
University of Nevada, Reno/MS 178
Reno, Nevada 89557-0088
775-682-8746
Fax: 775-784-1709
cdepolo@unr.edu
eq_dude@sbcglobal.net

8. Nevada Department of Conservation and Natural Resources/Division of Forestry

Vacant

9. Nevada Department of Conservation and Natural Resources/Division of Water Resources

Bunny Bishop
State Floodplain Manager
901 S. Stewart St., Suite 2002
Carson City, NV 89701
775-624-2847
775-722-6793 (cell)
dwillard@water.nv.gov

10. Nevada Department of Transportation

Rob Palmer
NDOT, Maintenance and Operations Division
1263 South Stewart St Room 211
Carson City, NV 89712
775-888-7862
Fax: 775-888-7211
rpalmer@dot.state.nv.us

11. Nevada Earthquake Safety Council

Ron Lynn
2310 Corporate Circle, Suite 200
Henderson, NV 89074
702-271-8470
rlynn@nscb.state.nv.us

12. Private Sector

Vacant

13. Member of the Public

Terri Garside
Phone available upon request
tmgarside@gmail.com

14. Tribal Member

Dan Hourihan
ITERC
680 Greenbrae Dr. #228
Sparks, NV 89431
775-355-0600 x 154
dhourihan@itcn.org

15. State Hazard Mitigation Officer

Janell Woodward
DEM
2478 Fairview Dr.
Carson City, NV 89701
775-687-0314
jwoodward@dps.state.nv.us

OFFICERS

Chair: Craig DePolo

C.2 NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

The planning process for the 2018 update was started in July 2014. The NHMPC formed a NHM Planning Subcommittee to update the NHMP, as required by the DMA 2000 and its implementing regulations. The members of the Subcommittee and their agencies are listed below.

Nevada Division of Emergency Management
Jim Walker
Emergency Management Programs Manager
2478 Fairview Drive
Carson City, NV 89701
Ph: (775) 687-0305
Email: james.walker@dps.state.nv.us

Nevada Department of Agriculture
Dr. Keith Forbes, D.V.M.
Veterinary Diagnostician
350 Capitol Hill
Reno, NV 89502
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Nevada Division of Environmental Protection
Harold Dawson
Info: Jeff Collins, Rebecca Bodnar
901 South Stewart Street
Carson City, NV 89470-5249
Ph: (775) 687-9480
E-mail: hdawson@ndep.nv.gov
jrcollins@ndep.nv.gov,
Rebecca.bodnar@ndep.nv.gov

Churchill County Emergency Management
Mike Heidemann
Emergency Manager
155 N. Taylor St., Suite 177
Fallon, NV 89406
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E-mail: mheidemann@churchillcounty.org

Nevada Division of Water Resources
Bunny Bishop
State Floodplain Manager
901 South Stewart St., Suite 2002
Carson City, NV 89701
Ph: (775) 684-2834
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Dept of Admin./ Risk Mgmt. Division
Vacant
Info: Maureen Martinez
Safety Specialist Consultant
201 South Roop St., Suite 201
Carson City, NV 89701
Ph: (775) 687-3190/881-8892
E-mail:
memartinez@risk.state.nv.us

City of North Las Vegas Office of Emergency Mgmt.

Rick Diebold

7551 Sauer Ave

Las Vegas, NV 89128
Ph: (702) 229-0067

Nevada Division of Insurance

Rajat Jain

Chief Insurance Examiner, Property & Casualty Section
Nevada Division of Insurance
1818 E. College Pkwy., Suite 103
Carson City, NV 89706
Ph: (775) 687-0774
E-Mail: rjain@doi.nv.us

City of North Las Vegas Office of Emergency Mgmt.
Carlito Rayos
Emergency Manager
4040 Losse Rd
North Las Vegas, NV 89030
Ph: (702) 633-2145
E-mail: rayosc@cityofnorthlasvegas.com

Inter-Tribal Emergency Response Commission
Dan Hourihan
Director
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Nevada Division of Emergency Management
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Nevada Bureau of Mines and Geology
Craig dePolo
Research Geologist/NHMPC Chair
MS 178/University of Nevada, Reno
Reno, NV 89557-0178
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E-mail: cdepolo@unr.edu

Nevada Division of Forestry
Ryan Shane
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Community Protection
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E:Mail: sarasmussen@forestry.nv.gov

State Public Works Board
Branden Pearson
Project Coordinator III
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Carson City, NV 89701
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Nevada State Hospital Association
Chris K. Lake, Ph.D.
Executive Director, Hospital Preparedness
5190 Neil Road, Suite 400
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Nevada Department of Transportation
Vacant
Supervisor II – Associate Engineer
1301 Old Hot Springs Rd.
Carson City, NV 89706
Ph: (775) 888-7862
E-mail: @dot.state.nv.us

National Weather Service/Reno
Chris Smallcomb

STAFF:
Nevada Division of Emergency Management

Warning Coordination Meteorologist
2350 Raggio Parkway
Reno, NV 89512
Ph: (775) 673-8100 x223
E-mail: chris.smallcomb@noaa.gov

Janell Woodward
State Hazard Mitigation Officer
2478 Fairview Dr.
Carson City, NV 89701
Ph: (775) 687-0314
E-mail: jwoodward@dps.state.nv.us

Nevada Threat Analysis Center
Selby Marks
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Carson City, NV 89701
Ph: (775) 687-0452
E-mail: smarks@dps.state.nv.us

Nevada Division of Emergency Management
Karen Johnson
Mitigation Specialist
2478 Fairview Dr.
Carson City, NV 89701
Ph: (775) 687-0373

State Fire Marshal
Bart Chambers
107 Jacobsen Way, Stewart Facility
Carson City, NV 89711
Ph: (775) 684-7525
E-mail: bchambers@dps.state.nv.us

Nevada Bureau of Mines and Geology
Rachel Micander
Analyst - GIS and Cartography
MS 178/University of Nevada, Reno
Reno, NV 89557-0178
Ph: (775) 682-8772
E-mail: rmicander@unr.edu

State Historical Preservation Office
Vacant
100 N. Stewart St.
Carson City, NV 89701
Ph:
Email:

Nevada Bureau of Mines and Geology
Sydney Wilson
Cartographer/GIS Specialist
MS 178/University of Nevada, Reno
Reno, NV 89557-0178
Ph: (775) 682-6346
E-mail: sydneywilson@unr.edu

C.3 BYLAWS OF THE NHMPC

NEVADA HAZARD MITIGATION PLANNING COMMITTEE
BYLAWS

I. Authority

The Nevada Hazard Mitigation Planning Committee ("Committee") was established through the authority contained in Nevada Revised Statutes ("NRS") Chapter 414, which authorizes the Chief of the Nevada Division of Emergency Management ("NDEM") to carry out the emergency management program for the State of Nevada.

II. Purpose and Mission

The purpose of the Committee is to advise the NDEM concerning hazard mitigation assistance ("HMA"), which includes planning, projects, and policies. All hazards, including natural and man-made, may be considered, and the Committee should adhere to the State Hazard Mitigation Plan prepared in accordance with the federal Disaster Mitigation Act of 2000. Specific charges to the Committee are to:

1. Implement the State Hazard Mitigation Plan, through the following actions:
    a. Encourage local and region, multi-jurisdictional governmental agencies and the private sector to prepare their own hazard mitigation plans;
    b. Initiate the preparation of appropriate proposals from state agencies and encourage local and regional, multi-jurisdictional governmental agencies to submit proposals for HMA in Nevada;
    c. Review proposals submitted for HMA and make recommendations to NDEM for priorities for funding;
    d. Assist NDEM in the preparation of formed proposals to FEMA for HMA;
    e. Promote activities that contribute toward building disaster-resistant communities throughout Nevada; and
    f. Assess risks from natural hazards in Nevada, and use risk assessments in the development of Hazard Mitigation Plans and in the evaluation of proposals for HMA.

2. Review and revise the State Hazard Mitigation Plan, as required by federal law or as needed.

III. Membership

Committee members will serve a three (3) year term. There is no limit to the number of terms a member can serve on the Committee.

Members will be appointed by, and serve at the pleasure of, the Chief of NDEM. The Chief will appoint membership to meet the following minimum representation:

1. The Nevada State Hazard Mitigation Officer;
2. Emergency Management in Clark County or any incorporated city or agency within the county;
3. Emergency Management in Washoe County or any incorporated city or agency within the county;
4. Emergency Management from a rural county or any incorporated city within a rural county in Nevada;
5. Any local or multi-jurisdictional agency within Nevada;
6. Floodplain Management, either local or multi-jurisdictional, in Northern Nevada;
7. Floodplain Management, either local or multi-jurisdictional, in Southern Nevada;
8. Nevada Bureau of Mines and Geology;
9. Nevada Department of Conservation and Natural Resources/Division of Forestry;
10. Nevada Department of Conservation and Natural Resources/Division of Water Resources;
11. Nevada Department of Transportation;
12. Nevada Earthquake Safety Council;
13. Private Sector; and
14. A member of the public.
15. A Tribal member.

All Members are expected to attend every Committee meeting in person, via teleconference, or via video conference. If a Member is unable to attend three consecutive meetings, the Chief of NDEM will conduct appropriate membership actions, up to and including, removal from the Committee.

VI. Officers and Duties

The Officers of the Committee shall consist of the Chair and Vice Chair.

a) Chair – The Chair is elected by the membership of the Committee. The Chair will serve a one year term starting on January 1st. The Chair is the leader of the Committee and will be the presiding officer at all of the meetings.

The Chair shall provide reports to the Chief of NDEM on or before June 30 and December 31 of each year detailing the activities of the Committee.

b) Vice Chair – The Vice Chair is elected by the membership of the Committee. The Vice Chair will serve a one year term starting on January 1st. The Vice Chair will automatically assume the position of Chair of the Committee for a one year term at the expiration of the Chair's term on December 31st.

In the absence of the Chair, the Vice Chair will assume the responsibilities of the Chair.

In the event that both the Chair and the Vice-Chair are unable to perform their duties, the Chief of NDEM will appoint an Interim Chair.

There is no limit to the number of terms that a member can serve as the Chair or Vice Chair. Only members of the Committee are eligible to serve as the Chair or Vice Chair of the Committee.

V. Meetings

Committee meetings will be called quarterly. Special meetings of the Committee may be called by the NDEM, the Chair of the Committee or the Vice Chair of the Committee.

All committee meetings are subject to the Nevada Open Meeting Law contained in Chapter 241 of the Nevada Revised Statutes.

VI. Subcommittees

Subcommittees may be established during a Committee meeting by the Chair, or the Vice Chair if the Chair is not available, to assist with the business of the Committee. The Chair will appoint a Subcommittee Chair. The Chair is not required to be a member of the Committee however at least one member of the Committee will be a member of the subcommittee. An appointment to a subcommittee may be made by NDEM, Chair, by the Vice-Chair if the Chair is not available,

or by majority vote of the Members. All subcommittees will provide quarterly status reports to the Chair.

Subcommittee meetings are subject to the Nevada Open Meeting Law contained in Chapter 241 of the Nevada Revised Statutes.

VII. Voting

A simple majority of voting members constitutes a quorum for the transaction of business pursuant to the Nevada Open Meeting Law.

Proxies are not recognized by the Nevada Open Meeting Law. Proxies do not count towards quorum and cannot vote.

VIII. Administrative Support

The Chief of NDEM will appoint a Secretary to the Committee. Non members of the Committee are eligible to be appointed as the Secretary. The Secretary will be responsible for maintaining the current membership list, the attendance records of the Members, and the distribution of the Committee agendas to the Committee members and other individuals who specifically request notification of meetings.

The Nevada Division of Emergency Management shall provide administrative support to the Committee.

IX. Adoption and Amendment to the Bylaws

The Bylaws shall be adopted by a majority vote of the Members present at a Committee meeting, with the approval of the Chief of NDEM.

The Bylaws may be amended by a majority vote of the Members present at a Committee meeting, with the approval of the Chief of NDEM.

These Bylaws were adopted by the Nevada Hazard Mitigation Planning Committee on May 8, 2012, by majority vote of the Committee.

Craig DePolo, Chair 4/25/16 Date

4

Caleb S. Cage, Chief of NDEM 4/1/16 Date

5

STATE OF NEVADA
MEETING NOTICE AND AGENDA
Nevada Hazard Mitigation Planning Committee

Name of Organization: Nevada Hazard Mitigation Planning Subcommittee
Meeting Location: Nevada Division of Emergency Management, State Emergency Operations Center (SEOC); 2478 Fairview Drive, Carson City, Nevada.

Date and Time of Meeting: Monday, July 28, 2014, 1:30 pm

DIAL-IN INFORMATION: TELEPHONE NUMBER: 1-877-402-9753 ACCESS CODE 5109100

This meeting will begin at the location specified above beginning at 1:30 pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Subcommittee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Subcommittee members. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, ROLL CALL AND ESTABLISH QUORUM** – *Chair, Jim Walker, NDOT*

2. **PUBLIC COMMENT**– (Discussion only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint. *Chair, Jim Walker*

3. **INTRODUCTION OF NV STATE HAZARD MITIGATION OFFICER** (Discussion only) - *Debbie Tanaka, NDEM*

4. **APPROVAL OF THE MEETING MINUTES FROM August 29, 2013** (For possible action) – *Chair, Jim Walker*

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP)** (Discussion only) – *Chair, Jim Walker*

6. **WEATHER FORECAST/DROUGHT OUTLOOK** (Discussion only) – *Chris Smallcomb, NOAA*

7. **NV STATE DROUGHT COMMITTEE & NHMPC DROUGHT RISK ASSESSMENT PROJECT** (Discussion only) – *Debbie Tanaka, NDEM*

8. **PUBLIC COMMENT** (Discussion only)– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

9. **ADJOURN** – (For possible action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on July 23, 2014 at the following locations:

Las Vegas Grant Sawyer Building, 555 E. Washington Avenue,
Las Vegas, NV; Carson City Governor's Office, 101 N. Carson Street, Carson City, NV;
NV State Emergency Operations Center, 2478 Fairview Drive, Carson City, NV;
Clark County Development Services, 4701 West Russell Road, Las Vegas, NV
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: **http://dem.nv.gov/**

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, please notify the Division of Emergency Management at (775) 687-0300. 24-hour advance notice is requested. Thank you.

For further information about supporting documentation, please contact Debbie Tanaka, SHMO, Nevada Division of Emergency Management (NDEM) by email at debbie.tanaka@dps.state.nv.us (775) 687-0314. Supporting documentation is stored at NDEM, 2478 Fairview Dr., Carson City, NV 89701

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Thursday, July 28, 2014	
	TIME	1:30 P.M.	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Janell Woodward	
Committee Members	**Present**	**Staff and Others**	**Present**
Lisa Christensen	X	Debbie Tanaka (Staff)	X
Jeff Collins	X	Karen Johnson (Staff)	
Craig dePolo	X	Janell Woodward (Staff)	X
Rick Diebold	X	Henna Rasul (DAG)	
Matt Donaldson	X		
Bill Elliott		Rick Martin (Staff)	X
Dr. Keith Forbes		Robert Whitney (DAG)	X
Stacey Giomi	X		
David Gould			
Rajat Jain	X		
Jennifer Johnson			
Kacey KC			
Maureen Martinez			
Robert Martinez	X		
Ryan Miller			
Peter Mulvihill	X		
Branden Pearson			
Mike Rife	X		
Chris Smallcomb	X		
Josh Taff			
James Walker	X		

1. CALL TO ORDER, ROLL CALL AND ESTABLISH QUORUM

Chair, Jim Walker, called the meeting to order, welcoming returning members back to the committee after the break as well as welcoming new members. As the planning subcommittee took a break after completing the 2013 Nevada Enhanced Hazard Mitigation Plan, Jim asked that everyone introduce themselves.

2. PUBLIC COMMENT

Chair, Jim Walker asked for any public comment and there was none.

3. INTRODUCTION OF NV STATE HAZARD MITIGATION OFFICER

Debbie Tanaka was introduced as the new Nevada State Hazard Mitigation Officer taking Elizabeth Ashby's place in this position. Debbie stated she is still new to the position holding that position for 2-1/2 months at this point.

4. APPROVAL OF THE MEETING MINUTES FROM August 29, 2013

Stacey Giomi moved to approve the minutes as presented and Craig dePolo seconded. There was no discussion. The minutes were approved unanimously.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP)

Nevada received an enhanced standing for the State Hazard Mitigation Plan for the second time. Previously there was a 3-year cycle and FEMA has now changed that to a 5-year cycle to mirror the update cycle of the counties. This removes the rush that was previously in place to complete the next plan update. The next update will be due in 2018. The process will remain the same to go through the plan methodically as this works very well.

As in the past, the chair will ask for updates from all members on any new information they are aware of with regard to how others are successfully updating their plans.

Rick Martin stated the Nevada Division of Emergency Management Planning, Training and Education section has taken on the job of updating the THIRA. The THIRA is updated on an annual basis so this will have an impact on the committee. The State Hazard Mitigation Plan focuses more on natural disasters and the THIRA focuses on manmade threats. This manmade aspect will add to the state plan down the road.

Craig dePolo asked whether the Governor signed off on the plan when it was completed. Rick Martin stated that the Governor is aware of the plan and gives a letter of promulgation that is supplied to FEMA with submission of the plan. Craig also asked what else could be done with the plan to get the most out of it. Rick Martin stated that we could do a better job with promotion of the plan. Discussion ensued regarding the counties and their LEPCs and county-level hazard mitigation plans.

6. WEATHER FORECAST/DROUGHT OUTLOOK PRESENTATION BY CHRIS SMALLCOMB

Chris Smallcomb gave a presentation regarding the weather forecast and drought outlook as well as the outlook for the winter. Much of the rain that fell recently was scattered with some areas receiving 1 inch and others receiving very little. Chris stated that this type of scattered rainfall is good for lawns but does little address a drought situation. We are seeing a lot more dust storms with the drought. New research on cycles of drought shows an average cycle of roughly every 15 years. You don't know how long a drought lasts until it is over. Typically a flood event ends a drought cycle. Most precipitation comes from a handful of atmospheric rivers and missing just one or two of these events can cut our precipitation in half for a given year. Last three winters starting in 2011 were dry with normal precipitation about 22" but have actually received 12". Currently, this coming winter would need to be double the amount of yearly precipitation to get erase the drought. This has never happened. This is probably the worst drought western Nevada has seen since the Drought Monitor started in 2000. The website for the Drought Monitor is www.droughtmonitor.unl.edu. Confidence in the winter outlook at this point is low. Question was asked regarding wildlife in areas not typically inhabited because of drought but Chris was did not have an answer from a weather standpoint.

7. NV STATE DROUGHT COMMITTEE & NHMPC DROUGHT RISK ASSESSMENT PROJECT

The NV State Drought Commission completed their strategic plan and submitted it for approval. They are working on an executive order to make the committee permanent. They have submitted a proposal for a DRI project with deliverables including reports and assessments for use in the mitigation plan. Approximate cost will be $175,000 and this was submitted with the PDM 14 application cycle.

8. PUBLIC COMMENT

Chair, Jim Walker opened the meeting again for public comment and there was none.

9. ADJOURN

Chair, Jim Walker asked for a motion to adjourn. Pete Mulvihill moved and Craig dePolo seconded. Meeting adjourned.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE
Date and Time of Meeting: WEDNESDAY, MARCH 11, 2015 – 1PM

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting will be video or teleconferenced between the locations specified above beginning at 1:30p.m. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Subcommittee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER AND ROLL CALL** – Chair, Jim Walker

2. **PUBLIC COMMENT**– (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker. This agenda item will discuss whether to approve the minutes of the July 28, 2014 Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (nhmp)** – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation – Mr. Walker will provide an update regarding the status of the State of Nevada Enhanced Hazard Mitigation Plan.

5. **RAINBOW CANYON PROJECT** – (Discussion Only) – Debbie Tanaka, Nevada Division of Emergency Management – Ms. Tanaka will provide an overview of the Rainbow Canyon project in Clark County.

6. **SEPTEMBER 7-9, 2014 FLOOD EVENT I-15 ROAD REPAIRS and presidential declaration** – (Discussion Only) – Mr. Walker, Nevada Department of Transportation, will provide an overview of I-15 road repairs and Debbie Tanaka, Nevada Division of Emergency Management will brief the subcommittee on the September 7-9, 2014 flood event that occurred in Clark County and the subsequent Presidential Declaration for the Moapa Band of Paiutes.

7. **DISCUSSION OF NEVADA MITIGATION ACTION IN 2014 –** (Discussion Only) – Chair, Jim Walker, A round table discussion of any mitigation actions started and or completed in 2014.

8. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker

9. **PUBLIC COMMENT** – (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

10. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 1pm on March 7, 2015 at the following locations:

Clark County Development Services, 4701 West Russell Road, Las Vegas, NV;
Governor's Office, 101 North Carson Street, Carson City, NV;
Las Vegas Grant Sawyer Building, 555 East Washington Avenue, Las Vegas, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: http://www.dem.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Debbie Tanaka at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Wednesday, March 11, 2015	
	TIME	1pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Debbie Tanaka	
Committee Members	**Present**	**Staff and Others**	**Present**
Lisa Christensen		Karen Johnson (Staff)	X
Jeff Collins		Debbie Tanaka (Staff)	X
Craig dePolo	X	Janell Woodward (Staff)	X
Rick Diebold		Henna Rasul (DAG)	X
Matt Donaldson			
Bill Elliott	X		
Dr. Keith Forbes	X		
David Gould			
Rajat Jain	X		
Jennifer Johnson			
Maureen Martinez	X		
Robert Martinez	X		
Ryan Miller	X		
Peter Mulvihill	X		
Branden Pearson			
Mike Rife	X		
Ryan Shane	X		
Chris Smallcomb	X		
Mary Taitano	X		
James Walker	X		

1. **CALL TO ORDER, ROLL CALL AND ESTABLISH QUORUM**
   Chair, Jim Walker, called the meeting to order after establishing a quorum.

2. **PUBLIC COMMENT**
   Chair, Jim Walker asked for any public comment and there was none.

3. **APPROVAL OF THE MEETING MINUTES FROM JULY 28, 2014**
   Michael Rife moved to approve the minutes as presented and Robert Martinez seconded. There was no discussion. The minutes were approved unanimously.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP)**
   Chair, Jim Walker stated the Enhanced State Hazard Mitigation Plan is due every 5 years instead of every 3 years and that the Subcommittee will start on the update. Jim Walker stated that we will need to include public outreach and stressed that nothing is too small.

   An outline of how the plan will be addressed, with a tentative timeframe will be provided during the next meeting, to inform everyone of what is expected. Jim also mentioned that input is needed from Subcommittee members as well as subject matter experts to address all the hazards in the State.

   Robert Martinez asked Jim Walker if we will include FEMA's feedback into the update and Chair, Jim Walker replied, yes.

   Craig dePolo asked for a general timeframe and Karen Johnson stated the update is due in October 2018 and that we will review the objectives, brainstorm ways to make the plan work and come up with ideas to suggest to locals/Tribes for their hazard mitigation plans.

   Rajat Jain asked for a refresher on how the State Hazard Mitigation Plan translates into mitigation efforts. Jim Walker explained that without the plan, the State is not eligible for federal funding for hazard mitigation. He explained that the plan includes procedures on how projects are prioritized and documents the mitigation efforts made in the State and makes sure that we are responsive to local communities.

   Craig dePolo asked why FEMA requires a plan. Chair, Jim Walker explained that some states were not aware of risks and hazards and that it is a good idea to pool together experts to discuss mitigation. Jim reported that local hazard mitigation efforts have improved because the State has a good plan to give them ideas and that the Nevada Hazard Mitigation Planning Committee encourages local jurisdictions to get involved with mitigation efforts.

   Rajat Jain stated that the explanation Jim Walker provided gives him a better perspective. Jim also mentioned that at the Nevada Hazard Mitigation Planning Committee (NHMPC) meetings, presentations of what has been done are provided and this will be done for the Subcommittee as well.

   Karen Johnson related the Enhanced State Hazard Mitigation Plan to recent events. She stated that the Moapa Band of Paiutes had a flood event in September 2014 and since they did not have a hazard mitigation plan, but the State did, the State requested a Presidential Declaration. If the State did not have a hazard mitigation plan, the Tribe would have only received approximately $400k for emergency services in response to the flood instead of approximately $3 million for additional categories. Karen also mentioned that the Fire Management Assistance Grants that the

Nevada Division of Forestry and other local communities receive would not be available without the State Hazard Mitigation Plan. Also, with the enhanced plan, the State receives 20% instead of 15% of the disaster funds for mitigation projects.

Additionally, Karen mentioned that with the NHMPC and the Subcommittee promoting Pre-Disaster Mitigation and mitigation, the State receives approximately $2 million to $3 million per year for the mitigation program.

Robert Martinez stated that a document stating the benefits would be beneficial for the Subcommittee members to take to Administrators to provide a better understanding of why participation in the Subcommittee is important.

5. RAINBOW CANYON PROJECT

Debbie Tanaka provided an overview of the Rainbow Canyon project in Mount Charleston within Clark County, which is a joint partnership between Nevada Division of Emergency Management, Nevada Department of Transportation, Nevada Department of Conservation and Natural Resources, Clark County Public Works, the United States Army Corps of Engineers and the United States Forest Service. Debbie explained the history starting from the Carpenter 1 Fire that occurred in the area in July 2013, which created burn scars and caused flooding concerns, to the request for Advance Measures from the United States Army Corps of Engineers for a temporary diversion structure and provided pictures of the construction.

6. SEPTEMBER 7-9, 2014 FLOOD EVENT I-15 ROAD REPAIRS AND PRESIDENTIAL DECLARATION

Debbie Tanaka explained the severity of the September 7-9, 2014 flood event on the Moapa Band of Paiutes Reservation, the process in which the Nevada Division of Emergency Management requested a Presidential Declaration and the assistance being provided to the Tribe. She also provided a timeline of events and informed the Subcommittee of possible mitigation projects that the Tribe may seek, with the mitigation funding that becomes available from a Presidential Declaration.

Chair, Jim Walker explained the Nevada Department of Transportation's actions during the flood events in September 2014 in Clark County, along I-15. Jim stated that on September 8, 2014, the flood event caused water to create a riverbed between the I-15 southbound and northbound lanes for about a mile. With I-15 being a major commercial traffic artery, it caused a big problem but luckily a paving company was already on-site and an emergency change order was executed. Jim also reported that there was only one injury to an employee of the paving company who broke his arm from attempting to help someone from a vehicle that washed down the middle of the road. Jim encouraged people to view the YouTube video capturing footage of the flood and the "Flood in the Desert, Special Edition".

Additionally, Jim explained that there was a 10-mile back-up of traffic and the Nevada Department of Transportation coordinated detours and the paving company immediately started on the repairs.

Furthermore, Jim stated that trucking companies provided feedback and that the Nevada Department of Transportation will look to improve communication methods to keep vehicles moving.

Jim also provided an overview of the September 26, 2014 flood event that affected the same area, where the I-15 was washed again, about 5 miles north of the previous damage. The Nevada Department of Transportation did another emergency contract with the paving company, received positive feedback for the short time it took to get the roads open again and learned that emergency management planning was effective.

Jim stated that the Nevada Department of Transportation did not qualify under the FEMA Presidential Declaration, however, they qualified under the Federal Highway Administration and while 95% of the repairs have been completed so far, the Nevada Department of Transportation received approximately $6.3 million for the road repairs including I-15 as well as roads in other counties due to the damage to the roads from the detouring of commercial vehicles on routes they were not intended to drive on. Chair, Jim Walker also mentioned that Utah received approximately $3 million for road repairs due to the detours from the flood events.

7. DISCUSSION OF NEVADA MITIGATION ACTION IN 2014

Chair, Jim Walker stated that this agenda item of the, "Discussion of Nevada Mitigation Action in 2014" will be kept on the agenda to capture public outreach efforts for mitigation. Jim asked the Subcommittee members of public outreach efforts.

Bill Elliott reported that Nevada is in its third year of drought and the Nevada Division of Emergency Management provided a presentation to the Governor's Office. Billalso mentioned that the Desert Research Institute has a drought dashboard, where information on drought-related resources for farmers and small business owners impacted by the drought. Additionally, the Nevada Division of Emergency Management is working on an award with the Desert Research Institute to look at municipal water supply and if they are resilient to long-term drought. Karen Johnson stated that through the funding the Nevada Division of Emergency Management receives for the Enhanced State Hazard Mitigation Plan Update, it will fund the Desert Research Institute to do a drought risk assessment for Northern Nevada rural communities for well-depth and groundwater, which will be conducted over the next year.

Craig dePolo mentioned that Diane dePolo is working on a 5-year analysis of the shakeout program in Nevada and will ask her to share the information.

Ryan Shane and Peter Mulvihill reported that in every May, there are Living with Fire events in each of the Counties throughout the State. Ryan stated that in 2014, there were 153 partners, 4,400+ participants in community education events and 15,000 pieces of literature were distributed. Ryan also mentioned that the Nevada Division of Forestry worked with the Tahoe Regional Planning Agency on the standards for forest practices to allow implementation of fuels reduction around homes to create safer environments and for homeowners to keep their insurance policies.

Chair, Jim Walker reported that the Nevada Department of Transportation has a joint agreement with other States to learn from each other and engage in different exercises.

Ryan Miller reported that the Fusion Center has numerous outreach efforts to teach people about signs of terrorism and how to report it as well as conduct vulnerability assessments. Ryan also stated that information is readily available through the Nevada Threat Assessment Center's website.

Michael Rife stated that the State Public Works Board received Pre-Disaster Mitigation funding for the Caliente Youth Center bridge and that he will provide a status update during the next meeting.

Craig dePolo expressed that distribution of certificates signed by the Chair or the Governor may be a good way to recognize and award people for their mitigation activities and projects. Craig dePolo mentioned that it could be popularized through a website, with the intention of emphasizing excellence.

8. ANNOUNCEMENT OF FUTURE MEETINGS

Debbie Tanaka stated the next regularly-scheduled meeting will be in April. Chair, Jim Walker stated that the Subcommittee did not have a quorum for the previous regularly-scheduled meeting in January and mentioned that these meetings are scheduled to be every quarter.

9. PUBLIC COMMENT

Chair, Jim Walker opened the meeting again for public comment. Robert Martinez announced his retirement and that Mary Taitano, also a Subcommittee member, will be leaving the Nevada Division of Water Resources. Jim Walker expressed his appreciation to Robert Martinez and his contribution to making an impact in the State, relating to mitigation.

10. ADJOURN

Chair, Jim Walker adjourned the meeting.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: NEVADA HAZARD MITIGATION PLANNING COMMITTEE
Date and Time of Meeting: MONDAY, MAY 4, 2015 AT 1PM

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting will be video or teleconferenced between the locations specified above beginning at 1pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Committee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, Jim Walker, Nevada Department of Transportation

2. **PUBLIC COMMENT**– (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker, Nevada Department of Transportation. This agenda item will discuss whether to approve the minutes of the March 11, 2015 Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) –** (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation – Mr. Walker will provide an update regarding the status of the State of Nevada Enhanced Hazard Mitigation Plan.

5. **benefits of subcommittee efforts** – (Discussion Only) – Jim Walker, Nevada Department of Transportation – Mr. Walker will give an overview of the importance of the Subcommittee and the results of their efforts. Debbie Tanaka, Nevada Division of Emergency Management – Ms. Tanaka will provide an update on the status of open pre-disaster mitigation and hazard mitigation grant programs to the Subcommittee.

6. **STATE ENHANCED HAZARD MITIGATION PLAN EXERCISE** – (Discussion Only) – Karen Johnson, Nevada Division of Emergency Management – Ms. Johnson will conduct an exercise on the State Enhanced Hazard Mitigation Plan.

7. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation.

8. **PUBLIC COMMENT** – (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

9. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on April 29, 2015 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Debbie Tanaka at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	DATE	Monday, May 04, 2015	
	TIME	1pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD		
	RECORDER		
Committee Members	Present	Staff and Others	Present
Lisa Christensen	Phone	Karen Johnson (Staff)	X
Jeff Collins		Debbie Tanaka (Staff)	X
Craig dePolo	X	Rebecca Boduar (NDEP)	X
Rick Diebold	X	Sue Coyote (NDEM)	X
Matt Donaldson		Stephanie Hicks (RO Anderson)	X
Bill Elliott	X	Connor Long (NDEM)	X
Dr. Keith Forbes		Justin Luna (NDEM)	X
David Gould		Kenju Okuma (NTAC)	X
Rajat Jain		Rachel Wearne (NBMG)	X
Jennifer Johnson		Sophia Long (DAG)	Phone
Ronald Juliff	X		
Maureen Martinez			
Robert Martinez			
Ryan Miller	X		
Peter Mulvihill	X		
Branden Pearson			
Mike Rife	X		
Ryan Shane			
Chris Smallcomb	X		
Bunny Souza	X		
James Walker	X		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chairperson – Jim Walker stated that since there was no quorum the meeting would focus on discussion items only. Craig dePolo arrived, establishing a quorum and the meeting was called to order.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment and there was none.

3. **APPROVAL OF MINUTES**
   Bill Elliott moved to approve the minutes as presented and Michael Rife seconded. There was no discussion. The minutes were approved unanimously.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP)**
   Chairperson Jim Walker stated that a schedule for addressing the state hazard mitigation plan is due every 5 years and must be completed by September of 2018. Nevada has an enhanced mitigation plan and is continuously updated through the five year cycle. The call was also made for participation from different agencies involved to make the plan more robust. It was stated that updates to specific hazards will be addressed and discussion on events related to hazards and new mitigation efforts will be incorporated.

   Karen Johnson stated that personnel from the Health Department, Department of Agriculture, or the Nevada Bureau of Mines and Geology (NBMG) will be demonstrating epidemic infestation and volcanic risk. However, the section being concentrated on most for this update will be drought. Earthquake and fire hazards are also deemed high risk and will be looked at carefully. Other sections will be reviewed and any changes will be noted. The committee with be presented with any changes to these sections. By April of 2016, a drought risk assessment study from DRI should be completed and incorporated into the plan. Risk Assessment will be conducting a review for Terrorism due by July of 2016. Karen Johnson asked if land subsidence and expansive soils would be covered by Craig dePolo and NBMG and stated that no addition will be needed – only a review of history. In July of 2017 Extreme heat and severe weather events should be reviewed and any changes will be added by Chris Smallcomb and the National Weather Service. Karen Johnson stated once all sections are updated the plan will be submitted to FEMA by September of 2018.

   Jim Walker stated that the state enhanced mitigation plan exercise will be used to update the plan as well. Karen Johnson suggested a portion of the exercise should be completed at this meeting and remaining portions at following meetings.

5. **BENEFITS OF SUBCOMMITTEE EFFORTS**
   Jim Walker provided a review of subcommittee efforts as discussed during the last meeting as well as the benefits to the state and funding impacted by the plan. Roads, bridges, buildings and other public infrastructure all benefit from public assistance funding. A portion of funding can also be used for mitigation as well. Having a plan is required to receive any funding for disaster recovery. Jim Walker stated that there is pre disaster mitigation plan funding as well and that having a plan has made a significant impact on the state of Nevada.

   Debbie Tanaka provided a review of pre disaster mitigation (PDM) projects from 2008 through 2014, performance periods, recipients of funding, and who is completing the funding (see attachment). Karen Johnson stated that these are open grants still in process. Debbie Tanaka stated that there is a 25% match from FEMA for communities, unless the community is a small or impoverished community in which case the match is only 10%.

Debbie asked Craig dePolo for a brief review of the HAZAUS and MyPlan Programs. Craig stated that MyPlan is a web application showing hazards that are present in the state including earthquakes, radon, and wildfires (among others). These data are password protected, and users are able to run and create maps and reports based on communities and hazards. Furthermore, Craig dePolo stated that HAZUS is used to model earthquakes and flooding based on locations. It uses damage and statistics from previous earthquakes, population, and buildings to create reports.

Debbie Tanaka stated that Pershing, Lander, and Humboldt Counties have come together to create a multi-jurisdictional hazard mitigation plan in PDM 2011. These are the last counties to develop a hazard mitigation plan. Once this plan is completed, all counties within the state of Nevada will have a FEMA approved plan. Craig dePolo asked if combining counties was an option for developing a plan. Karen Johnson stated that since these three counties were small and faced similar hazards this was a cost-effective method for developing a FEMA approved plan.

Debbie Tanaka stated that the UNCE-NFAW (University of Nevada Cooperative Extension and Nevada Flood Awareness Week) has posted billboards as public outreach as part of PDM 2012. This project will be continued using future sub grants. Karen Johnson stated that they are using management costs to fund those public awareness items with the possibility for funds being granted to the UNCE for drought, wildfire, and flood awareness in the future.

In PDM 13 Debbie Tanaka indicated that Washoe County, Carson City and Lincoln County are updating their hazard mitigation plan in addition to the State Plan.

Jim Walker outlined the funding that has been brought into the state by hazard type from the FEMA hazard mitigation assistance funding to Nevada from 2001 to 2014. He stated that a total of $12,373,163.11 has been brought in for total projects. The total including planning and management costs is $16,021,050.91. He stated that these efforts have made an important and positive impact on the state.

Craig dePolo stated that this plan is the guiding document for the counties and other communities and acts as a good starting point. Jim Walker added that the plan does help to cover entities within the state that do not have a plan.

6. STATE ENHANCED HAZARD MITIGATION PLAN EXERCISE

Karen Johnson gave a brief overview of the list of questions for the state level plan and what they will be looking for feedback on. This feedback will then be included in the state plan for actions that have been taken by the state. Karen Johnson asked if the committee has taken any measures towards public awareness and outreach. Peter Mulvihill stated that this coming Saturday will be the UNCE wildfire awareness week kick off at Washoe Lake State Park. There will be another similar event at Red Rock in Clark County. The UNCE has also been present at the legislature with a booth display. Craig dePolo stated that in October 2014 the NBMG had an open house featuring earthquake presentations. Bill Elliott indicated that an earthquake regional plan is being worked on for Washoe County. Additionally, he added that the Nevada-a-thon took place in late April which covered wildfire, flood, and earthquake awareness and preparedness. Bunny Souza stated that flood awareness week will be starting up again in November of 2015.

Karen Johnson asked if anyone was aware of disasters that had occurred in this reporting year. These events included flooding in Moapa, Mount Charleston, and multiple day flooding in the Johnson Lane are of Douglas County. Multiple wildfires over 1000 acres and the disaster

declaration of the drought were also noted. December 11th 2014 and February 6th 2015 wind events were reported as well. Galena reported a wind gust of 109mph during the December wind event.

Karen Johnson also asked if there had been changes to development patterns that could influence the effects of patterns or create additional risks.

Karen Johnson suggested the review of the Strategic Action Plan Matrix (See attachment) and elected not to review anything associated with Nevada Division of Forestry (NDF) since they were not in attendance.

Action number 1A (improve awareness of locations, potential impacts and links among hazards, vulnerability and measures to protect life, safety, and health) is ongoing and will continue as the plan is updated. Tabletop exercises have also been conducted in communities to assist in developing actions for response.

For action number 3G (encourage seismic retrofit of public safety and critical facilities) it was noted that the Nevada Earthquake Safety Council (NESC), NBMG, and the Nevada Seismic Laboratory (NSL) are the responsible agencies. Craig dePolo stated that NBMG is still conducting the annual shake out activity and that there will be an activity associated with the 100 year anniversary of the M7.3 Pleasant Valley earthquake.
Karen Johnson indicated that action number 4B (Identify and prioritize areas in the state where existing flood mapping is inadequate) will be discussed at the next meeting.

It was stated that the Division of Water Resources (DWR) and the Division of Emergency Management (DEM) attend table top exercises and conduct statewide outreach for action number 2A (provide technical assistance, guidance, and resources to local governments and tribal entities).

For action number 4G (upgrade state owned or operated infrastructure related to state owned or operated critical facilities to protect from flood damage) DWR identifies flood hazards while the Nevada Department of Transportation and State Public Works Board address specific facilities.

It was noted that for action number 1B (provide current information about hazards, vulnerabilities, mitigation processes and technical assistance for planning and grant availability and application) there were five applications being submitted to FEMA this year. Since FEMA has limited funding for PDM there have not been any grant applications classes held. Going forward, if FEMA does have more funding these classes will resume.

For action number 2G (promote understanding by the general public of the bennifits of hazard mitigation) DWR conducted Nevada flood awareness week and Nevada wildfire awareness month was also held. Public awareness activities regarding drought are also looking to be conducted once the DRI drought study for rural northern Nevada and the impact on their wells is completed. Craig dePolo stated that the Nevada Shakeout activity should also be included in this list of statewide efforts.

For action number 4K (install early warning weather stations in watersheds with dams above populated areas) Chris Smallcomb stated that there was some interest to install early warning weather stations in the regions upstream of flash flooding events in Douglas County.

Karen Johnson stated that action number 4A (protect existing assets and future development from the effects of flooding) would fall to the state public works board. It was noted that there would be minimal input from the board.
For action number 2F (continue to build operational links between hazard mitigation, disaster preparedness, and recovery programs with public and private sectors) Craig dePolo asked if the regional plan would be included in this action number. Bill Elliott suggested that these regional plans are. Furthermore, he indicated that additional plans can then be made through mutual aid, and prioritization for deployment can be addressed.

Karen stated that all high action numbers had been addressed and that medium actions numbers will be covered at the next meeting. NDF will also review action items that pertain to them.

7. ANNOUNCEMENT OF FUTURE MEETINGS

Debbie Tanaka stated that these meetings are held quarterly on the last Monday of the month. The decision was made to change the scheduled meeting time from 1:00pm to 1:30pm. The next meeting will be held on July 27th at 1:30pm.

8. PUBLIC COMMENT

Chairperson Jim Walker opened the meeting up for public comment. There was none.

9. ADJOURN

Bill Elliott moved to adjourn the meeting and Craig dePolo seconded. Chairperson Jim Walker adjourned the meeting at 2:00pm.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: NEVADA HAZARD MITIGATION PLANNING COMMITTEE
Date and Time of Meeting: MONDAY, July 27, 2015 AT 1:30PM

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting will be video or teleconferenced between the locations specified above beginning at 1pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Committee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, Jim Walker, Nevada Department of Transportation

2. **PUBLIC COMMENT**– (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker, Nevada Department of Transportation. This agenda item will discuss whether to approve the minutes of the May 4, 2015 Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) EPIDEMIC SECTION –** (Discussion Only) – Chris Lake, Preparedness, NV Hospital Association will provide an update regarding the Epidemic Hazard Profile of the State of Nevada Enhanced Hazard Mitigation Plan.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) VOLCANO SECTION –** (Discussion Only) – Dr. Craig DePolo, UNR, Bureau of Mines & Geology will provide an update regarding the Volcano Hazard Profile of the State of Nevada Enhanced Hazard Mitigation Plan.

6. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation.

7. **PUBLIC COMMENT** – (Discussion Only) – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

8. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on July 22, 2015 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Debbie Tanaka at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, July 27, 2015	
	TIME	1:30pm	
	LOCATION	Nevada Division of Emergency Management Executive Conference Room2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Wearne	
Committee Members	**Present**	**Staff and Others**	**Present**
Lisa Christensen	X	Karen Johnson (Staff)	Phone
Jeff Collins		Caleb Cage (NDEM)	X
Craig dePolo		Matt Donaldson (NDEP)	X
Rick Diebold		Suz Coyote (NDEM)	X
Matt Donaldson		Stephanie Hicks (RO Anderson)	X
Bill Elliott	X	Connor Long (NDEM)	X
Dr. Keith Forbes		Dan Hourihan (ITERC)	X
David Gould		Kenji Okuma (NTAC)	X
Rajat Jain		Rachel Wearne (NBMG)	X
Jennifer Johnson		Robert Whitney (DAG)	Phone
Ronald Juliff	X	Annie Wonson (sp?) (Moapa)	Phone
Maureen Martinez		Christopher Lake (NHA)	X
Robert Martinez		Rick Martin (NDEM)	X
Ryan Miller		Jared Walker (BSA)	X
Peter Mulvihill		Janell Woodward (NDEP)	X
Branden Pearson		Ben Wilkinson (NDEP)	X
Mike Rife			
Ryan Shane	X		
Chris Smallcomb			
Bunny Souza	X		
James Walker	X		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chairperson – Jim Walker requested roll-call in order to establish a quorum. Janell Woodward called role and it was determined that a quorum was not present. Jim Walker stated that since there was no quorum the meeting would focus on discussion items only. Robert Whitney with the Attorney General's office indicated that this would be appropriate. Jim Walker introduced Caleb Cage, the new Chief of the Division of Emergency Management.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment and there was none.

3. **APPROVAL OF MINUTES**
   Jim Walker stated that the minutes would not be approved since there was no quorum. Approval of the minutes will be put off until the next meeting.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) EPIDEMIC SECTION**
   Chris Lake reported that definitions were added and changed in the first section in order to align more with what the World Health Organization (WHO) identifies and uses. The definition of "outbreak" was added and the definition of "pandemic" was changed to reflect WHO definitions. The definition of emerging disease was also added. Chris Lake stated that the paragraph discussing influenza was dated and had been deleted. Verbiage had also been included to indicate how common epidemics are in the world – every country on earth has experienced at least one epidemic since 2000 (WHO). Chris Lake stated that current examples of emerging diseases were added extending back 25 years. These diseases include HIV/AIDS, Hepatitis C, Ebola, Lyme disease, Hantavirus, SARS, MERS, Enterovirus D68, and Chikunguny virus. Also included in emerging diseases were diseases that had previously been reduced significantly, but due to the anti-microbial medications, and lack of people receiving vaccines, have started to become more common. Chris Lake reported that the number of reportable diseases changes from year to year and links to websites of current reportable diseases and current disease outbreaks had been updated and included in the epidemic section of the plan. Chris Lake added that he had reached out to the state veterinarian and reported that the number of reportable diseases from the Department of Agriculture's list is down from 97 to 66. This information was updated and website link included in the epidemic section. Chris Lake reported that occurrences of Enterovirus D 68, Measles, the effects of the Ebola outbreak, and the Chikunguny virus were added to the "20th Century U.S. Pandemic and Occurrences" table. Chris Lake added that outbreaks of Bovine Trichomoniasis, heightened awareness or Ebola and associated planning, and Measles cases were all added to the "Recent Historical Occurrences or Outbreaks in Nevada" table. Finally, Chris Lake stated that the last update to the section discussed new technology, known as Epidemic Intelligence, which is being developed in order to provide early warning of potential outbreaks and epidemics. He continued that these messages are distributed through social media outlets and are being developed through public and private partnerships.

   Karen Johnson asked if there was anyone in the health community in Nevada that should review the changes that are being made to this section. Chris Lake stated that he had reached out to the state Epidemiologist, the state veterinarian, and the University of Nevada, Reno. Karen Johnson stated that as a new requirement from FEMA, climate change should be included in the probability section of any hazards where there might be an effect from climate change. Karen also stated that this was the first hazard for the committee to review and indicated that these changes would be voted on at a later date.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) VOLCANO SECTION

Chairperson Jim Walker asked in the absence of Craig dePolo if anyone had information or an update on the Volcano Section. Karen Johnson stated that Craig would be going through this document at the next meeting.

6. ANNOUNCEMENT OF FUTURE MEETINGS

Karen Johnson stated that the next meeting will be on October 26th. Jim Walker indicated that these meetings are being held on the last Monday of the month following the end of the quarter at 1:30 in the afternoon.

7. PUBLIC COMMENT

Chairperson Jim Walker opened the meeting up for public comment. There was none.

8. ADJOURN

Jim Walker called to end the meeting. Since there was no quorum, the meeting was not adjourned. The meeting ended at 1:58pm.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: NEVADA HAZARD MITIGATION PLANNING COMMITTEE
Date and Time of Meeting: MONDAY, January 25, 2016 AT 1:30PM

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

Teleconference Number:

Conference Line 877-402-9753
Access Code 5109100

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting is also a teleconference; please access with the number specified above beginning at 1:30 pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Committee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Co - Chair, Rick Diebold, Las Vegas Emergency Management.

2. **PUBLIC COMMENT**– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker, Nevada Department of Transportation. This agenda item will discuss whether to approve the minutes of the May 4, 2015 and July 27, 2015 Nevada Hazard Mitigation Planning Subcommittee meetings.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) VOLCANO & TSUNAMI/SEICHE HAZARD PROFILE –** (Discussion Only) – Dr. Craig DePolo, UNR, Bureau of Mines & Geology will provide an update regarding the Volcano & Tsunami/Seiche Hazard Profile of the State of Nevada Enhanced Hazard Mitigation Plan.

5. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation.

   April 25, 2016 – Drought, Hazardous Materials, Terrorism
   July 25, 2016- Landslide/Land subsidence/Expansive Soils, Infestation
   October 31, 2016 – Extreme Weather

6. **PUBLIC COMMENT** –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

7. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on January 19, 2015 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Traci Pearl at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, January 25, 2016	
	TIME	1:30pm	
	LOCATION	Nevada Division of Emergency Management Executive Conference Room2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Micander	
Committee Members	**Present**	**Staff and Others**	**Present**
Lisa Christensen	X	Traci Pearl (NDEM)	X
Bunny Bishop	X	Karen Johnson (Staff)	X
Rick Diebold	X	Rachel Micander (NBMG)	X
Bill Elliott	X	Suz Coyote (NDEM)	X
Keith Forbes		Rick Martin (NDEM)	X
Ron Juliff	X	Stephanie Hicks (RO Anderson)	X
Justin Harris	X	Tammy Kinsley (RO Anderson)	X
Rajat Jain		Henna Rasul (AGO)	X
Dan Hourihan			
Ryan Shane	X		
Chris Lake			
Chris Smallcomb	Phone		
Kenji Okuma	X		
Peter Mulvihill			
Craig dePolo	X		
Branden Pearson	X		
Harold Dawson	X		

1. CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM

Co-chair, Rick Diebold called the meeting to order at 13:34 pm and asked for introductions around the room.

2. PUBLIC COMMENT

Rick Diebold stated: No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint. Rick then called for public comment and there was none.

3. APPROVAL OF MINUTES

Bill Elliot moved to approve the minutes from the July 27th meeting. Ron Juliff seconded the motion. The minutes were approved. No minutes were approved for the May meeting since a quorum was not present.

4. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) VOLCANO & TSUNAMI/SEICHE HAZARD PROFILE

Craig dePolo stated that the information compiled for the updated Tsunami/Seiche and Volcano Sections will require further discussion and are not final. Craig stated that these are two low-risk hazards for the state, but would like to discuss if either of these should be considered moderate risk hazards. With several young volcanoes in the state, it would be beneficial to re-visit the ranking of this section.

Craig explained that a tsunami is caused by disturbance in the water, such as an earthquake or landslide. Craig discussed the potential failure points around Lake Tahoe that are currently being studied and may be subject to future failure, resulting in a tsunami. A seiche is an oscillatory wave set up in a water body. An earthquake near Gabbs in 1932 caused a seiche on Mono Lake. Craig then stated that there was an earthquake at Hebgen Lake in Montana that caused a tsunami which overtopped the dam. After the tsunami, a seiche set up as the water equilibrated.

Craig stated the biggest risk of tsunami and seiche in Nevada is at Lake Tahoe, but is not the only place they can occur. Tsunami and seiche are possible on other large lakes in Nevada including Pyramid Lake, Walker Lake, and even Lake Mead. The assessment in the current plan was made based on Lake Tahoe and a recurrence interval of every few thousand to 10,000 years was established based on movement of the faults under Lake Tahoe.

Craig indicated that in working on other county reports, paleo earthquake data in Carson City County over the past 5,000 years has been collected. With these data, he determined if there was a corresponding tsunami at Lake Tahoe. He found that here have been at least 3 tsunamis on Lake Tahoe, and possibly as many as 11. Tsunamis on Lake Tahoe are a hazard in Incline village in Washoe County, Stateline in Douglas County, and pose risk to a few homes located in Carson City County. Craig stated that the report for the Carson City County area indicated that the tsunami risk was low because of sparse population in the area. In Washoe and Douglas counties, tsunami risk is higher than Carson City. Craig stated he is unsure how to characterize the tsunami hazard for the state given different risk levels in different counties. He indicated he would like to discuss the risk in more detail at the Nevada Hazard Mitigation Planning Committee meeting.

Karen stated she would like to have the subcommittee conduct a survey at the end of the plan update to determine what constitutes as a low, medium, or high hazard and re-categorize the different hazard profiles based on expert input from each field. She went on to state that the hazards were ranked prior to profiling of each of the hazards during the last plan update. Craig stated he wanted to start by making sure the hazard was reported in the right perspective and make sure it is understood that a tsunami/seiche can happen on a lot of water bodies in Nevada – not just Lake Tahoe.

Craig stated that specific updates included changes to the nature section, the definitions of tsunami and seiche, and additions to the historical examples section. The probability and ranking was low based on the time interval previously defined in the report. With recent findings, occurrence interval of tsunamis may be as low as 100's of years.

Karen added that specific locations of communities that would be impacted by a tsunami on any of Nevada's lakes should be included in the report. She stated that this would benefit the counties when they update their reports.

Rick Diebold asked if given a 30 foot wave, Craig could show what the inundation of the wave would be on surrounding shorelines for assessing property and economic loss. Karen explained that this was covered in the vulnerability analysis which is only conducted for the earthquake section of the plan. Craig stated that inundation takes modeling to determine and that California may have conducted this type of modeling in the past.

Craig stated that the Volcano section needs to be looked at in more detail as well. He stated that there are several volcanoes throughout Nevada that are around 1 million years old. Churchill County has the youngest volcano – the Soda Lake and Little Soda Lake Maars. These events occurred after magma encountered ground water creating a phreatic eruption. Craig stated that in the Community of Mammoth Lakes, a road has been built to evacuate people in the event of a phreatic eruption at Mammoth Lakes.

Craig stated that volcanos have their own unique seismic signature, which makes them easier to predict and monitor. They are considered to be a low hazard, but the risk can increase to a high hazard in a short period of time.

Craig indicated that Soda Lakes near Fallon is the only volcano within Nevada that is monitored by the USGS and is considered an active volcano. This Maar is less than 1,500 years old and is classified as a moderate hazard by the USGS.

Craig stated that in 2003, there was an earthquake sequence near the north end of Lake Tahoe near several volcanoes that are about 800,000 years old. The earthquakes appeared to be the result of a magma injection that moved upwards about three miles in the lower crust and stopped. Craig indicated that even though these volcanoes are old, they still could pose a risk.

Craig stated the most likely volcanic hazard posed to Nevada is an eruption in California. Ash from the 1915 eruption of Lassen Peak deposited ash in Winnemucca. There has been a lot of activity at Mammoth Lakes every few hundred to few thousand years. These are not major eruptions, but they would be enough to cause flight delays and other impacts to Nevada. Craig stated that he is unsure how best to rank the volcano hazard for the state since there is more work that needs to be done, and the volcano risk for Churchill county has not been assessed yet. He also stated that in order to properly update this section, there needs to be an inventory of the

volcanoes in Nevada. He stated that the probability hazard at Yucca Mountain should be looked at and incorporated into the plan as well as studies in California. He stated that we need to take an honest look at these hazards and make sure we are defining them as best as possible. Karen stated that this could be done with another update grant next year to better define the volcano hazard.

5. ANNOUNCEMENT OF FUTURE MEETINGS

Rick Diebold stated the announcement of future meetings and deferred to Karen to discuss who is scheduled to present in the coming meetings.

Karen stated that presentations at the next meeting will include Greg Pohll from DRI who will present on drought risk assessment in rural northern Nevada. He will also review the section on drought and help to update that section. Hazardous materials will be covered by Harold Dawson. Kenji Okuma will work on the terrorism section and provide recommended updates. Public awareness will begin to be updated as well; however it will not be part of the presentations. Craig asked if the plan was advertised to the public. Karen stated an ad was placed in all the papers asking for public comment during the last plan update. Karen then clarified that the public awareness section of the plan encompassed all efforts that are going on with the different state agencies, including flood awareness week and wildfire awareness month.

Karen stated that Jim Walker is no longer with NDOT and is now employed with NDEM. The NHMPC bylaws previously required that a chair of a subcommittee be a member of the committee. Jim is volunteering to continue on as chair of the committee. The changes to the bylaws will be discussed at the February NHMPC meeting.

Craig asked who would be conducting the landslide and expansive soils section. Karen stated that it would be Craig, with help from Rachel Micander.

Chris Smallcomb asked about his involvement with the drought section. Karen asked that Chris review the section before Greg Pohll submits his reviews. It was also suggested that the drought section be given to the state climatologist for review.

6. PUBLIC COMMENT

Rick Diebold stated: no action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint. Rick Diebold then called for any other public comments and there was none.

7. ADJOURN – (Discussion/For Possible Action)

Rick asked for a motion to adjourn. Bill Elliott moved to adjourn the meeting and Craig dePolo seconded the motion. The meeting was adjourned at 14:21 pm.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING COMMITTEE**

Date and Time of Meeting: **MONDAY, April 25, 2016 AT 1:30PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

Teleconference Number:

Conference Line 877-402-9753
Access Code 5109100

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting is also a teleconference; please access with the number specified above beginning at 1:30 pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Committee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Co - Chair, Rick Diebold, Las Vegas Emergency Management.

2. **PUBLIC COMMENT**– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Co- Chair, Rick Diebold. This agenda item will discuss whether to approve the minutes of the January 25, 2016, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) DROUGHT HAZARD PROFILE –** (Discussion Only) – Dr. Greg Pohl, Dessert Research Institute will provide a the results from an Assessment of Drought Resiliency in Rural Northern

Nevada. Mr. Chris Smallcomb will provide an update of the Drought Hazard Profile for the State Hazard Mitigation Plan.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) HAZARDOUS MATERIALS HAZARD PROFILE** – (Discussion Only) – Rebecca Bodnar, Superfund Branch Supervisor, and Hal Dawson, Environmental Assistance Program Coordinator, Nevada Division of Environmental Protection will provide an update to the Hazardous Materials Hazard Profile to the State Hazard Mitigation Plan.

6. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) TERRORISM HAZARD PROFILE** – (Discussion Only) – Selby Marks, Deputy Director, Nevada Threat Analysis Center will provide a an update to the Terrorism Hazard Profile to the State Hazard Mitigation Plan.

7. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation.

   July 25, 2016- Landslide/Land subsidence/Expansive Soils (Craig dePolo), Infestation (Dr. Forbes)
   October 31, 2016 – Extreme Weather (Chris Smallcomb)
   January 30, 2017 – Wildfire (Ryan Shane)

8. **PUBLIC COMMENT** –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

9. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on April 19, 2015 at the following locations:
Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Karen Johnson at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, April 25, 2016	
	TIME	1:30pm	
	LOCATION	Nevada Division of Emergency Management Executive Conference Room2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Micander	
Committee Members	**Present**	**Staff and Others**	**Present**
Lisa Christensen	X	Karen Johnson (Staff)	X
Hal Dawson	X	Janell Woodward (Staff)	X
Bunny Bishop	Phone	Rachel Micander (NBMG)	X
Rick Diebold	Phone	Suz Coyote (NDEM)	X
Bill Elliott	X	Greg Pohl (DRI)	X
Keith Forbes		Shaun Rahmeyer (NVDPS)	X
Ron Juliff	X	Rick Martin (NDEM)	X
Justin Harris	X	Stephanie Hicks (CC Public Works)	X
Rajat Jain	Phone	Tammy Kinsley (RO Anderson)	X
Dan Hourihan	X	Henna Rasul (AGO)	X
Ryan Shane	Phone	Kelven Hickenbottom (NDWR)	X
Chris Lake	X	Justin Harris (NVRISK)	X
Chris Smallcomb	Phone	John Cobourn (UNCE)	X
Peter Mulvihill	X	Eddie Quaglieri (NDWR)	Phone
Craig dePolo	X	Hugo Sehlesener (OIS)	X
Branden Pearson		Alisanne Maffei (EITS)	Phone
		Harold Hughes (NVDPS)	Phone
		Rebecca Bodnar (NDEP)	X

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   In the absence of co-chair Rick Diebold, Craig dePolo called the meeting to order and asked for introductions around the room. A quorum was established

2. **PUBLIC COMMENT**
   Craig called for public comment at 13:36. There was none.

3. **APPROVAL OF MINUTES**
   Craig asked if attendees had had a chance to review minutes and entertained a motion to approve the minutes. Rick Diebold moved to approve the minutes from the January 25th meeting. Ron Juliff seconded the motion. Craig asked for discussion, hearing none, he called for a vote. The minutes were approved unanimously.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) DROUGHT HAZARD PROFILE**
   Greg Pohl with Desert Research Institute (DRI) stated he would discuss the recently completed study that assessed at the impacts of drought primarily on rural NV communities. The purpose of this study was to look at water systems in northern rural Nevada, determine the drought criteria for drought vulnerability for public supply systems, and look at drought resilience mitigation. Lastly, a brief update was provided to the state plan drought risk assessment. Greg stated that computer models were developed to complete the task and included all types of wells in the system (domestic, municipal, and agricultural). The purpose if the analysis was to review impacts of drought. A 15 year long drought was used with 50% precipitation rates for this study. The main focus was to determine how the water levels in the aquifers might change in this 15 year period. 11 different basins were initially looked at in northern Nevada. The study took into account pumping rates and recharge rates of the different basins. They then looked at the ratio of the total amount being pumped vs. the perennial yield to determine which basins were in excess of a 20% ratio. Out of the 11 basins observed, 8 of them were found to have a ratio over 20%, indicating a larger impact from drought. Greg Pohl then stated he would review these 8 different basins, and what the analysis show, with the subcommittee.
   Greg stated that two different types of aquifers were modeled: those located in basin fill within the valleys are the primary aquifers and the mountain block aquifers where aquifers are limited in capacity. Simulations were run for 15 years with the sub-average recharge rates. Greg states that the full reported water rights were used in this study. In reality, some locations are not extracting their total water rights.
   Greg showed that during a 15 year period without drought with full pumping and 100% recharge, high levels of drawdown are seen near the pumping sites. He then showed how this compared with the effects of a drought lasting for 15 years with precipitation rates of 50% of normal for these 8 basins, starting with Diamond Valley. Karen asked for clarifications: the maps on the left show 100% pumping rates in a normal year, without drought while the maps on the right show levels of additional drawdown during the modeled drought year. Greg stated that none of the domestic wells in the Diamond Valley would have additional drawdown due to the drought. Craig asked if there had been any recent problems with the current drought in the Diamond Valley. Greg stated that they are not seeing substantial drawdowns due to drought in this valley. What they are seeing is an increase in pumping due to decreased flow on area streams and rivers. Greg stated the Lovelock in also in a state of drawdown. Municipal wells are located in the northeastern portion of this basin due to high salt content in the southwestern portion of the basin. This basin showed a 5 foot decline of water in the aquifer over a 15 year period. Greg stated that it makes a big difference in what pumping rates are actually used. If the actual rates are used,

drawdown is much more limited. However, if the full water righted rates are used, significant drawdown is seen.
Greg stated Hawthorne basin is also experiencing over drafting conditions, however no significant drawdowns are seen in over the 15 year model drought period if the full water right pumping rates are not used for both municipal wells and domestic wells.
Greg then discussed the Steptoe Basin where a substantial amount of pumping is occurring. Greg indicated that there a small amount of drawdown is modeled for the municipal and domestic wells. Craig stated that the well located south of Ely may be on springs that are controlled by the range bounding faults. Greg stated that this type of detailed data was not included for this study.
Greg stated that for the Spring Creek Basin, the ratio is over 100% is the total water rights are being used. The estimated measured water rights show a ratio of 78%. Higher elevation domestic wells are impacted first in the drought scenarios.
Greg stated the Elko Basin shows a large discrepancy between total water rights and estimated use. If full water rights are pumped, significant drawdown is seen assuming a non-drought scenario.
Greg stated that not quite as much pumping is occurring in the Reese River Valley Basin where Austin is located. Within the valley, 20 feet of drawdown is seen primarily in agricultural wells while 1-3 feet of drawdown is observed in Austin given full pumping scenarios in non-drought conditions. Given drought conditions, an additional .1 to 1.3 feet of drawdown is seen.
Greg stated that similar scenarios are seen in the Battle Mountain area as in Austin.
Greg concluded that the take home message of this study is that declines due to pumping, not drought, pose the greatest threat to the resilience of municipal water supplies. While all basins appear to be resilient to drought conditions, muni water supplies may be at risk due to the amount of pumping that is occurring. Greg stated that Diamond Valley, Lovelock, Spring Creek, and Elko have the highest amount of risk to municipal wells simply due to pumping. Drought impacts are generally small; if they do occur they occur next to mountains making the wells in these areas more vulnerable to drought. Greg stated that there were a few domestic wells identified in this study that were at risk due to drought conditions. He indicated that any new muni well should be drilled as close to the valley center as possible to minimize drought impacts.
Craig asked if these studies were incorporated into the state plan section. Greg indicated that they were.
Karen distributed updates to this section for review since Chris Smallcomb was not present to speak to the updates. Craig asked for questions or comments, there were none. Karen stated that if there were any questions she would take them by email and direct them to the person that drafted the section.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) HAZARDOUS MATERIALS HAZARD PROFILE

Rebecca Bodnar with NDEP stated that she and Hal Dawson are part of the Bureau of Corrective actions within NDEP. Rebecca stated they have been making significant updates to the hazardous materials section of the state plan, however more work is needed. Rebecca indicated that a lot of the information was out of date or inaccurate and measures have been taken to begin updating and correcting this information.

Rebecca stated the Environmental Assistance Program (EAP) is a technical resource and they are not on-scene coordinators. They rely mainly on the DOT, local emergency planning committees, and tribes. They will work with them and help coordinate, but will never go on scene. Updates were made to identify what exactly the EAP does.

Other major highlights included updates to the Nevada highway hazmat incidents. Historical hazmat events were not updated but will be in the future. Karen stated that these are used primarily for awareness. Rebecca indicated that the Anaconda mine site and the US Ecology event have not been included in the hazardous materials section but will be.

Craig asked for clarification of the US Ecology event. It was stated that there was an underground fire at the location in October and the situation is being remediated.

Craig asked if there were any updates on the erionite section from UNLV. Rebecca stated that this has not been updated or checked and is a work in Progress. Hal asked if NBMG would like to work on the erionite section – Craig stated that NBMG would look into it.

Rebecca asked if there were any questions and stated again that this is not a final version.

Karen stated that the plan update is due in 2018 and each quarter will be profiling 2 or 3 hazards and updating as we move forward. Craig stressed the need for a timely update on these sections.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) TERRORISM HAZARD PROFILE

Shaun Rahmeyer with the Nevada threat analysis center stated that he was not involved in the last plan update and the section has been re-written to provide a more current look and outlook of the threat environment. He indicated that it is important that the public be aware of today's dynamic and dangerous threat environment. Domestic terrorism and foreign inspired domestic terrorism rates continue to rise.

Shaun stated that the information included in the terrorism hazard profile reflect international and domestic threats that may impact the state of Nevada, its citizens, visitors and overall public safety.

Shaun stated that the international terror organizations that are id within the document represent the most potential threat within the next 5 year timespan. Domestic terror groups are not specifically identified, but ideologies are.

Craig asked if this covers individual terrorists/lone wolf terrorism. Sean stated that this document was not designed to address specific groups, but the lone wolf concept is addressed. Karen asked if this was document was final and Sean indicated that it was. Craig asked if the changes that had been made warranted a quick review. Sean stated that he did not believe this was needed.

Craig asked if terrorism mitigation was fundamentally on law enforcement. Sean stated that terrorism mitigation takes a team effort while enforcement and investigation are the responsibility of law enforcement.

7. ANNOUNCEMENT OF FUTURE MEETINGS

Craig stated that the next meetings of the subcommittee will be held on July 25, October 31, and January 30, 2017.

8. PUBLIC COMMENT

Craig called for public comment at 14:29. Karen stated that this committee is so focused on the planning that the end result of the planning is not really seen. Karen discussed the different

hazards and where the funds were going, and which projects were being supported within the state.
Karen indicated that the NHMPC will be reviewing the different grant applications in the coming months and forwarding their suggestions onto FEMA.
Karen stated that the State of Nevada has an enhanced plan, which gives Nevada an additional 20% towards projects and additional points towards future projects.
It was stated that the work Karen has done on the state plan has helped make us a nationally acclaimed program.
Craig called for additional public comment, there was none.

9. ADJOURN

Craig dePolo adjourned the meeting at 14:34.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: NEVADA HAZARD MITIGATION PLANNING COMMITTEE
Date and Time of Meeting: MONDAY, October 24, 2016 AT 1:30PM

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

Teleconference Number:

Conference Line 877-402-9753
Access Code 5109100

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1. CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM – Chair, James Walker, Division of Emergency Management.

2. PUBLIC COMMENT– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. APPROVAL OF MINUTES – (Discussion/For Possible Action) –Chair, James Walker. This agenda item will discuss whether to approve the minutes of the April 25, 2016, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. CO-CHAIR OF PLANNING SUBCOMMITTEE – (Discussion/For Possible Action) – Rick Diebold retired and a new co-chair is needed for the committee. Committee may vote on nominating a new co- chair.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) LANDSLIDE, LAND SUBSIDENCE, EXPANSIVE SOIL HAZARD PROFILE – (Discussion Only) – Dr. Craig dePolo, Nevada Bureau of Mines & Geology will

provide an update to the Landslide, Land Subsidence, and Expansive Soil Hazard Profiles for the State Hazard Mitigation Plan.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) EXTREME WEATHER HAZARD PROFILE – (Discussion Only) – Chris Smallcomb, National Weather Service will provide an update to the Extreme Weather Hazard Profile to the State Hazard Mitigation Plan.

7. ANNOUNCEMENT OF FUTURE MEETINGS – (Discussion Only) – Chair, Jim Walker, Nevada Department of Transportation.

January 30, 2017 – Wildfire (Ryan Shane)
April 24, 2017 – Flood (Dave Willard & Bunny Bishop)
July 31, 2017 – Earthquake Risk Assessment (Craig dePolo) & Rank Hazards
October 23, 2017 – Capability Assessment, Plan Maintenance, Local Coordination (Rachel Micander)

8. PUBLIC COMMENT – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

9. ADJOURN – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on October 18, 2015 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV; Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov & www.notice.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Janell Woodward at the Nevada Division of Emergency Management, (775) 687-0300. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, October 24, 2016	
	TIME	1:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Micander	
Committee Members	**Present**	**Staff and Others**	**Present**
Jim Walker	x	Janell Woodward (Staff)	x
Hal Dawson		Rachel Micander (NBMG)	x
Bunny Bishop	x	Irene Seelye (NBMG)	x
Rick Diebold		Stephanie Hicks (CC Public Works)	x
Bill Elliott	x	Brett Kandt (DAG)	x
Keith Forbes			
Ron Juliff	x		
Justin Harris			
Rajat Jain	x		
Dan Hourihan			
Ryan Shane			
Chris Lake			
Chris Smallcomb	x		
Peter Mulvihill			
Craig dePolo	x		
Branden Pearson	x		
Lisa Christensen			
Rebecca Bodnar (NDEP)	x		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chair Jim Walker called for introductions and a quorum was established.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment at 13:36. There was none.

3. **APPROVAL OF THE MINUTES**
   Jim Walker asked for any discussion of the minutes from the last meeting and called for a motion. Bill Elliot moved to approve the minutes and Craig dePolo seconded the motion. The minutes were approved.

4. **CO-CHAIR PLANNING SUBCOMMITTEE**
   Jim Walker called for a nomination and vote for a new co-chair of the subcommittee since past co-chair, Rick Diebold, has retired. Bunny Bishop asked what the co-chair position entailed. Jim Walker explained that when the chair is absent, the co-chair chairs and assists with the meeting when he is unavailable to do so. Janell Woodward nominated Bunny Bishop for the position. Jim Walker asked for a motion to nominate Bunny as the co-chair for the subcommittee. Craig dePolo moved to nominate Bunny Bishop, Bill Elliot second the motion. The motion passed and Bunny was elected co-chair.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) LANDSLIDE, LAND SUBSIDENCE, EXPANSIVE SOIL HAZARD PROFILE**
   Jim Walker gave a brief explanation of the enhanced state hazard mitigation plan. Nevada is one of 13 states with an enhanced plan. Having an enhanced plan gives the state an advantage when requesting funding. The enhanced plan also brings additional funding into the state in the event of a disaster. Mitigation projects can be statewide and the enhanced plan is a significant benefit to the state. The enhanced plan is required to be updated every 5 years and must be updated by September 2018.

   Craig dePolo stated that in this update of the hazard section, one active hazard and two passive hazards were reviewed. Landslides are considered active hazards while land subsidence and expansive soils are considered passive hazards. Craig stated that some major updates had occurred in the landslide section and indicated that he would like to consider updating the risk from low to moderate since landslides do impact roadways fairly frequently. He indicated that if we were a wetter state, the risk would definitely be considered moderate. Landslides can be induced by and event such as an earthquake or rainfall. They may also be compound events if the landslide were to enter into a river or lake, creating displacement of water.

   Craig stated that examples had been added to the section showing the different types of landslides. The most common types of landslides that occur in Nevada are rockslides and rock falls. Some other landslide types are also common. Craig stated that debris flows are also common especially in areas that have burned, and can cause deadly impacts. Craig indicated that historically, almost every major earthquake has caused landslides in Nevada. He also touched on the 1983 Slide Mountain landslide where a large granite slab detached from Slide Mountain and toppled into Upper Price Lake, causing a debris flow. Craig stated that it is possible to have a landslide that enters into a large body of water, resulting in a tsunami. For mitigation, Craig stated that it is typically best to locate areas that show evidence of past landslides, and determine the risk in order to establish locations to avoid. Craig stated again that the subcommittee should re-consider the landslide risk in the state. It is a low hazard, which may have a high impact. It was

stated that the more mountainous areas of the state (Virginia City, Austin, Tonopah) may be at a higher risk for landslides given the topography.

Craig discussed the risk of expansive soils and swelling clays in Nevada. He stated that there have been engineering issues with roads and some buildings throughout the state with swelling clays. In Las Vegas there have been surveys of some damaged homes that were impacted by the swelling clays. Mitigation of this type of hazard is to identify the presence of these clays and remove them before building. He stated that this is a slow hazard that can be easily mitigated.

Craig indicated that land subsidence and ground failure had been re-written extensively to improve the syntax. Craig stated that these hazards become an issue when groundwater is withdrawn and not replaced, which has been a larger issue in the Las Vegas area. Mine collapses are also included in this hazard section – some recent examples include the collapse of state route 342 in the vicinity of Gold Hill. This has been a reoccurring issue in the area of Virginia City and Silver City. Mitigation for these hazards would include increased monitoring of groundwater withdrawal as well as locating old mine workings to determine the cause and potential location of future sinkholes and how to manage resulting incidents.

6. UPDATE OF THE STATE ENHANCED MITIGATION PLAN (NHMP) EXTREME WEATHER HAZARD PROFILE

Chris Smallcomb (phone) indicated that he had reviewed all of the sections included in the severe weather hazard profile. For the extreme heat he stated that the medium risk was probably a fair assessment since Nevada will continue to be prone to heat waves. Some of the wording of the impacts was changed to include the effects of heat on air traffic. Power infrastructure and power outages were also added as a possibility. He stated that heat waves are highly predictable which make them easy to monitor and give people advanced warnings and time to prepare. All the impacts in the past five years have been fairly limited to southern Nevada. Chris stated that some additional updates should be made to tables, but will need to be addressed by the state climatologist. Chris stated that climate change will increase the risk and frequency of future events, especially in Southern Nevada. An increase in overnight low temperatures statewide is likely, contributing to an overall warming trend.

Severe thunderstorms and associated wind, lightning, and hail are a low risk and will continue to be considered a low risk. The nature section text was updated and a focus on damaging microburst winds was added. Chris indicated that the predictability was fairly limited for severe thunderstorms, and that the wind and lightning were more of a risk than the hail events, since they are extremely rare, but can happen. Thunderstorms are hard to predict to begin with and it is unknown how climate change with effect the intensity and frequency of severe thunderstorms. Craig asked what category of hazards the wind is included in for this section. Chris indicated that the wind for this section is specifically associated with thunderstorms and that the other large wind events are included in the winter storm portion of the state plan update.

Chris went on to discuss the winter storm and extreme snowfall sections which are a medium to significant risk. They are recurring hazards that may be considered extreme hazards in any given year. The large scale events do occur with high infrequency and should be discussed more with members of the public that are unfamiliar with these weather phenomena. The text in the nature section was updated to include more modern terminology and predictability of each type of storm system. Chris also stated that he included the “inside slider” and “Tonopah low” systems which are less predictable. The history section was updated to include a table with more recent storms across the region. Southern Nevada storms were more wind events, while northern Nevada

experienced more snow/rain events. Chris indicated that the power infrastructure is at risk during these high wind event storms and that the region does experience wind/heavy snow events frequently enough that there is not too much of a strain on resources. Chris stated that as far as climate change is concerned, observations have shown that the rain/snow line has crept up over time. As a result, a larger percentage of storms that impact the region are observed to have more rain and less snow. This will need to be addressed in terms of water supply, since there will not be as much snow pack; therefore reservoirs will become more relied on. Chris stated that the simulations used to predict future climate are mixed, but most projections show precipitation coming in fewer but larger storms, making Nevada more of a boom and bust climate.

Chris then discussed tornadoes which are a low risk hazard. Nevada is one of the lowest risk states for tornadoes. Predictability is low, similar to sever thunderstorms. Chris stated that warnings for tornadoes is very low given the mountainous terrain of the state, and in some cases, there is no warning. The history section was updated to include a recent tornado in Hawthorne that caused damage in June of 2015. Chris indicated that it is unknown how climate change will affect the development and frequency of tornadoes in Nevada.

7. ANNOUNCEMENT OF FUTURE MEETINGS

Jim Walker stated that the next meeting will be on 1/30/2017 and the focus will be on wildfire, followed by a meeting on 4/24/2017 which will focus on flooding. This will be followed by the 7/31/2017 meeting which will focus on earthquakes and the 10/23/2017 meeting will focus on capability assessment and plan maintenance.

8. PUBLIC COMMENT

Chair Jim Walker called for public comment at 14:38. Craig dePolo stated that he would like to make the state plan an interactive PDF, indicating it would make it a faster document for locating information. Rachel Micander discussed the benefits of making the plan an interactive document and how it would save users time in reading and looking at the plan. Jim walker stated that this would be dependent upon funding and how much time there was left when we moved closer to the deadline. Craig also asked if there should be a presentation on the state plan at the emergency managers group of Nevada meeting in order to solicit comments and ideas from other counties. Jim stated that he could bring this idea up to the emergency managers group and that this could add to the public outreach section of the state plan.

9. ADJOURN

Craig dePolo moved to adjourn the meeting and Rebecca Bodnar seconded. The meeting was adjourned at 14:43.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE**
Date and Time of Meeting: **MONDAY, April 24, 2017 AT 1:30 PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

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1. CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM – Chair, James Walker, Division of Emergency Management.

2. PUBLIC COMMENT– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair.
Comments will not be restricted based on viewpoint.

3. APPROVAL OF MINUTES – (Discussion/For Possible Action) –Chair, James Walker. This agenda item will discuss whether to approve the minutes of the October 24, 2016, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS – (Discussion Only) – Chair, James Walker. Mr. Walker will lead a discussion regarding public awareness and education activities for 2016 and the January – March 2017 quarter.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN WILDFIRE HAZARD PROFILE – (Discussion Only) – Ryan Shane, Nevada Division of Forestry will provide an update to the Wildfire Hazard Profiles for the State Hazard Mitigation Plan.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN FLOOD HAZARD PROFILE – (Discussion Only) – Vice Chair, Bunny Bishop, Floodplain Manager, Nevada Department of Water Resources, will provide a an update to the Flood Hazard Profile to the State Hazard Mitigation Plan.

7. ANNOUNCEMENT OF FUTURE MEETINGS – (Discussion Only) – Chair, Jim Walker
July 31, 2017 – Earthquake Risk Assessment (Craig dePolo) & Rank Hazards
October 23, 2017 – Capability Assessment, Plan Maintenance, Local Coordination (Rachel Micander)

8. PUBLIC COMMENT –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

9. ADJOURN – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on April 19, 2017 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov & www.notice.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Janell Woodward at the Nevada Division of Emergency Management, (775) 687-0300 for pickup at the Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, April 24, 2017	
	TIME	1:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Micander	
Committee Members	**Present**	**Staff and Others**	**Present**
Craig dePolo	X	Janell Woodward (Staff)	x
Bunny Bishop	X	Rachel Micander (NBMG)	x
Chris Lake	X	Tammy (RO Anderson)	x
Justin Harris	X	Katherine Clancy (NDWR)	x
Ryan Shane	X	Brett Kandt (DAG)	x
Branden Pearson	X		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Bunny Bishop led the meeting, as Jim Walker was unable to attend.

2. **PUBLIC COMMENT**
   Bunny Bishop called for public comment at 13:34. There was none.

3. **APPROVAL OF THE MINUTES**
   Bunny Bishop asked for any discussion of the minutes from the last meeting and called for a motion. Craig dePolo moved to approve the minutes and Chris Lake seconded the motion. The minutes were approved.

4. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION IN HAZARD MITIGATION PLANNING AND ACTIONS (DISCUSSION ONLY)**
   Bunny Bishop asked for the committee to let DEM know when public awareness and outreach activities were being done so that they can be tracked in the State Plan and submitted to FEMA.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN WILDFIRE HAZARD PROFILE**
   Ryan Shane asked for input on how best to present the updates for the wildfire profile as they were extensive. Craig dePolo indicated that and overview followed by questions and discussion would be best. Ryan mentioned that some of the major updates included noting that the timing of wildfires has changed since the last plan update. We are now seeing more wildfires in the winter

off-season when the landscape is dry from drought. The magnitude of wildfires has also increased exponentially. Ryan indicated that desert wildfires are burning post-wet years as opposed to mountain fires burning during times of drought. He mentioned that while the magnitudes of fires are increasing, the numbers of fires are going down. This may be due to the increased size and magnitude (more land burning means less to burn later) or it may speak to prevention methods. Craig dePolo asked how the beneficial aspects of fires are working into mitigation efforts. Ryan indicated that NDF does not want to change or decrease any mitigation efforts since this will lead to more disastrous fires.

Ryan went on to state that wildfires are a statewide threat with Playas and Large Lakes being somewhat safe. However, there are areas of emphasis. Craig asked if most fires in Nevada are human-caused and Ryan indicated that 50-60% of fires in Nevada are caused by humans. The national statistic for human-caused fires is ~90%. NDF will continue to use prevention as a mitigation strategy. NDF is working to engage local fire services and are continuing to use outreach and education to educate communities. Ryan mentioned that the state doesn't have the resources to reach every community and has been working with the UNR cooperative extension to develop the Network of Fire Adapted Communities to support mitigation efforts and outreach.

Ryan mentioned the cohesive strategy which focuses on three tenants which are safe and effective fire suppression, fire adapted communities, and landscape resilience. This works to manage the landscape so that they are not ticking time bombs. There are subcommittees for each of the three tenants to help fill what is needed and make sure the goals are met. This is a national strategy and has gained a lot of funding attention.

Bunny asked for questions or comments. Craig asked if we treat the communities with extreme wildfire risk any differently than the other communities. Ryan stated that at the state level there are no mitigation funds so everything comes from the federal government. The federal government dictates that if they spend funds in a community it must have a community wildfire protection plan in place. Part of formatting that plan is doing an assessment on the community and establishing a risk level. The communities are then treated preferentially based on that risk level. Craig asked what current funding is like and Ryan indicated they are getting less than half of what they ideally need.

Ryan reviewed the new appendix which contains the number and location and threat to state-owned facilities and the total valuation of assets at risk. Things that are natural resource based are difficult to assess so NDF viewed all state buildings in Nevada. The maps show what level of risk the buildings are at and what risk different parts of the community have. These assets were broken out by county and a value was determined for each county, and state-wide. There are a disproportional number of state-owned buildings that are located within areas of high risk. These include all state-owned structures (picnic areas, campsites, state park structures, signs, etc.…).

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN FLOOD HAZARD PROFILE

Bunny Bishop stated that there were minimal changes in the flood section. The situation has not really changed – floods are cyclical and the region experiences droughts followed by floods. The things that needed the most updating were the chronologies of events that have happened. These charts have been updated to reflect the most current events the state has experienced. She indicated that more updates are needed and will be added as soon as possible. The two flooding events from 2017 have been added as well as the Johnson Lane flooding events of 2014 and 2015. Bunny mentioned that flooding mitigation efforts come mainly from grants submitted to FEMA

and education and outreach through groups like the Silver Jackets and informing communities about the NFIP. Communicating the flood insurance program has been a major goal this year with all of the recent flooding.

Bunny indicated that historically there have not been many dam breaches, but there have been a couple since the last plan update. Since the last update there was a dam failure in Southern Nevada near Moapa, an unpermitted dam failure occurred in 2016, and the dam breach near Montello which occurred in early 2017. Bunny mentioned that the dam breach is not what flooded the town of Montello but rather excess water from rain and snow on saturated soils.

Bunny indicated that not much needed to be changed for the irrigation ditches, canals, and rivers sections. The large rivers are the biggest risk and very little has changed with the canals and irrigation ditches. Craig asked if this year's incidents along the irrigation ditches in Reno would be included in the plan update. Janell mentioned that Steamboat had a lot of damage and Craig went on to state that McCarran Blvd. needed significant repairs in some places as well as flooding in neighborhoods and houses in the area. Janell stated that some of this information should be added to the plan and Craig stated that NBMG documented some of these events and he would share that information with Bunny.

Bunny indicated that she would add the remaining information and updates and send the finished draft product out to the committee before the next meeting.

7. ANNOUNCEMENT OF FUTURE MEETINGS

Bunny Bishop stated that the next meeting is tentatively scheduled for July 31, 2017. This meeting will cover review of the Earthquake Section by Craig dePolo and discussion and ranking of all of the hazards for inclusion in the state plan. The next meeting is scheduled for October 23, 2017 and will cover capability assessment, plan maintenance, and local coordination.

8. PUBLIC COMMENT

Bunny Bishop called for public comment at 14:37. There was none.

9. ADJOURN

Bunny Bishop asked for any final remarks, hearing none the meeting was adjourned at 14:38.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE**
Date and Time of Meeting: **MONDAY, July 31, 2017 AT 1:30 PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room 2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

This meeting is also a teleconference; please access with the number specified beginning at 1:30 pm. The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Committee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, James Walker. Division of Emergency Management.

2. **PUBLIC COMMENT–** No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) –Chair, James Walker. This agenda item will discuss whether to approve the minutes of the April 24, 2017, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS** – (Discussion Only) – Chair, James Walker. Mr. Walker will lead a discussion regarding public awareness and education activities to date. This will include any actions throughout the state and local jurisdictions.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN INFESTATION HAZARD PROFILE** – (Discussion Only) – Dr. Keith Forbes, Nevada Department of Agriculture, will provide an update to the Infestation Hazard Profiles for the State Hazard Mitigation Plan.

6. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN EARTHQUAKE HAZARD PROFILE** – (Discussion Only) – Dr. Craig dePolo, Nevada Bureau of Mines and Geology, will provide a an update to the Flood Hazard Profile to the State Hazard Mitigation Plan.

7. **RANKING OF HAZARDS** – (Discussion/For Possible Action). Chair, Jim Walker. The Committee will collect any outstanding ranking forms and allow for any missing forms to be filled out at the meeting. The Committee will discuss the ranking of hazards to ensure consensus on the outcome of the ranking by members. If all ranking forms have been collected and finalized, the Committee may vote to accept this ranking for the State Hazard Mitigation Plan or move this to the next meeting.

8. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker
October 23, 2017 – Capability Assessment, Plan Maintenance, Local Coordination (Rachel Micander)

9. **PUBLIC COMMENT** – No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

10. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on July 26, 2017 at the following locations:
Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Nevada Bureau of Mines and Geology, 1664 North Virginia Street, Reno, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov & www.notice.nv.gov

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Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, July 31, 2017	
	TIME	2:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Irene Seelye	
Committee Members	**Present**	**Staff and Others**	**Present**
Jim Walker	X	Shay Schultz (NDEM)	
Craig dePolo	X	Rachel Micander (NBMG)	
Bill Elliott	X	Irene Seelye (NBMG)	
Christopher Lake	X	Stephanie Hicks (CC Public Works)	
Rajat Jain	Phone	Luke Opperman (DWR)	
Chris Smallcomb	Phone	Lori DeGristina (NDEM)	
Dan Hourihan	X	Hal Dawson (DEP)	
Branden Pearson	X	Emily Maher (DWR)	
		Bill Hoyt (NDEM)	
		Henna Rasul (DAG)	

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   14:35 - Jim Walker gave a brief introduction and thanked everyone for their participation and hard work. Brief personal introductions were made around the room. It was determined that a quorum was present.

2. **PUBLIC COMMENT**
   14:38 – Jim Walker called for public comment. There was none.

3. **APPROVAL OF THE MINUTES**
   14:39 – Jim walker asked for any discussion of the minutes from the last meeting and called for a motion. Craig dePolo moved to approve the minutes and Bill Elliot seconded the motion. The minutes were approved.

4. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS.**

14:40 – Jim Walker introduced that in previous years there had been better documentation of the public outreach and education regarding the NHMP. He proposed resurrecting the effort to maintain documentation of these talks, presentations, and general public outreach actions. He emphasized the importance to the Plan of including this information for FEMAs review, and stated that the goal is to query all the committee members on a regular basis and request all talks, presentations, public outreach, education, such actions be submitted for cataloging within the Plan. Even something as small as discussion in other meetings could count.

- Craig dePolo stated that he has numerous talks he can submit to the list.
- Chris Lake stated that the plan is linked to and used by the hospital association on their website and in the practice scenarios.
    - Jim Walker asked if there were any statistics available, such as Google Analytics, regarding the use of that link.
        - None currently known, but will look into it.
- Craig dePolo posed a question regarding if the LEPSY meetings had been tabulated and included.
    - Jim Walker said that had not yet been done, but could be.
- Dan Hourihan also stated that he had several presentations to submit
- Rachel Micander volunteered to create and send out to everyone a spreadsheet form that could be filled out by each member to aid in this data collection.
    - Rachel Micander also stated that she could include her educational and outreach efforts as an example on spreadsheet.
    - Will send out and ask for responses by August 31st for the first round of cataloging, per discussion with Craig dePolo.
- Question regarding if specific pans and actions taken within the last year would count in this tabulation, such as the Mosquito Plan.
    - Absolutely, there is no limit listed as to what form of mitigation counts in this effort, in fact the more variety the better. Good to show diversity of planning and of funding.
- Lori DeGristina asked about County School plans, the contractor working on county plans provided plans for each school district. These could potentially also be included.
- Craig dePolo stated that this request for documentation should also be sent out to the general committee as well, not just the subcommittee. High potential for diverse information that the subcommittee members may not be aware of.
- Jim Walker reiterated that it is not just education they are seeking documentation of, also projects and actions.
- Branden Pearson asked for clarification about a couple recent projects
    - Jim Walker clarified that repair projects would only count if a portion of the repair work was devoted to mitigation to prevent future repairs, or if during repairs some analysis or planning towards future mitigation took place.
- Craig dePolo mentioned that the seismic retrofit of builds at the University of Nevada, Reno campus would also be includable.
- Rajit Jain brought up some discussion about the form that had previously been sent years ago requesting this type of information.
    - Jim Walker reiterated that request forms would be sent out again soon, possibly in conjunction with meeting minutes and agendas.

No further comments or discussion ensued.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) INFESTATION RISK ASSESSMENT

14:52 – Jim Walker stated that Dr. Keith Forbes had a last minute change of planes and was unable to attend the meeting. However, Dr. Forbes submitted the written Infestation Hazard Profile, with all of his changes and updates. It is requested for all the committee members to read the section and submit and comments, questions, or suggestions to either Janelle Woodward or Shay Schultz by the end of the week. He also encouraged all committee members to speak up at any time on any section even if it is not their specialty or if it was not assigned to them. There were no comments from the committee at this time. This section will be brought to vote for approval at the next meeting.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN (NHMP) EARTHQUAKE HAZARD PROFILE

14:56 – Jim Walker introduced Craig dePolo to present on this section.
Craig dePolo stated that he did not have the section rewrite completed yet, it has been rewritten once already and still needs to be reviewed by the Nevada Seismology Laboratory. For this meeting, Craig dePolo had a short PowerPoint and discussion highlighting the main points of the Earthquake Hazard Profile. Discussion as follows:

- All maps are/will be updated through 2017. The number of earthquakes in the state is rather nerve wracking. Generally, there have been a lull in earthquakes in Nevada since the 1960's. Historically there have been far more large earthquakes than recorded in recent decades.
- There are over a quarter million earthquakes on record since 1857. Most likely missing approximately 1 million in that period. There is no record of the aftershock sequences for nearly all the large earthquakes in the record. Likewise there is no historic record of earthquakes swarms like are commonly seen today.
- Current methods record about 8-17 thousand earthquakes a year. This last year is on the high end of that range. The state is also not fully covered by a seismic tracking sensor net, so there are unknowns. Nevada is definitely an earthquake state.
- Generally, earthquakes come in two general categories. Background earthquakes that can go as high as 6.5. Such as the 2008 Wells earthquake, which was near a community and caused 11-15 million dollars of damage and 5 years to recover. Also the Mogul earthquake, 4.9 magnitude, 2-11 million dollars in damage. Background earthquakes can occur anywhere in the state, and are not necessarily associated with a fault structure. There are about 1500 known faults, background earthquakes are occurring on unknown faults. These can cause severe damage and require emergency response. Outlying communities can also have some damage, but the nearer communities will be most affected. The large 7.0 earthquakes are a separate category of earthquake. For example the 1915 earthquake. Near communities, such as Pleasant Valley, 100% of the ranches had some damage. Outlying communities such as Winnemucca had severe damage as well. To compare in Winnemucca 50% of chimneys collapsed in 1915, whereas only 15% collapsed in 2008 (Wells). For the larger earthquakes, multiple communities will need emergency response. Craig proposes to run a scenario/drill on this at some point.
- Looking at a profile of Nevada communities, over 25 communities have had damage from earthquakes. At least eight communities have had repetitive damage from earthquakes. Fifteen out of the 17 Nevada counties have had earthquake damage since 1857.

- The intensity map of shaking in Nevada figure will also be updated and statistics calculated. A significant portion of the state has experience strong shaking, mostly before 1954.
- 1857-2016 Statistics: 23 magnitude 6's, 3 magnitude 7's. On average a magnitude 6.x once every 6.9 years. Shortest time between to 6.x earthquakes is 4 min 20 sec. Magnitude 7.x events average out to every 53 years, however all three occurred between 1915-1954. Shortest time between magnitude 7.x is 17 years.
- There are approximately 1500 known quaternary faults. Thousands more too small to count. Every part of the state has faults, and most faults are unstudied.
- Earthquake threat is high. Earthquakes happen without warning and there is no way to predict them at this time. Most damage and injuries occur with the first few minutes. Damage is comprehensive at all scales. It is a compound disaster: damages, injuries, fires, hazmat, and rescue… all associate to earthquakes. Earthquakes tend to overwhelm emergency resources, as everything is needed immediately. Requires a strategic response.
- Recovery time measured in years. Immediate goal is stabilization. Recovery is generally a minimum of 5 years.
- Review of the HAZUS earthquake scenario summaries: small communities are still millions of dollars to recover, larger communities in the billions.
- Mitigation goals: work towards steady progress of retrofitting bridges, buildings, and continuing education. Best to keep people well informed and the best way to minimize injuries is an educated reaction. Despite the lack of damaging events in recent years, Nevada has done a lot to steadily reduce risks.
- After major earthquakes in other states/countries, there is a period of heightened awareness. These are small windows of opportunity to offer reminders and education while everyone is thinking about earthquakes.
- Branden Pearson asked if there is a similar pattern in neighboring states of fewer earthquakes.
    - Craig dePolo said yes, and there is no explanation which is concerning to scientists. However, activity is picking up, which could indicate potential future earthquakes.
- Branden Pearson also asked if the drought/moisture and snowpack have any effect.
    - Theoretically, there may be a relationship, but none proven. That is a theoretical explanation for the recent activity around Mammoth Mountain.
- Branden Pearson also asked about measuring damage, how is it defined as earthquake or not.
    - Generally, chimney or wall collapse is used as a basic measure. All counties have felt shaking, but not all have reported damage.
- Luke Opperman asked whether the state plan covered responses and actions that an individual should take in case of a hazard.
    - Craig dePolo stated the plan was a higher-level document and should be a model for the counties.
    - Jim Walker stated that the plan was not intended to guide individual citizens; it is intended more as an overarching plan. The intent is partly to encourage local jurisdictions to be prepared and to educate individuals.

No other comments or discussion ensued.

7. RANKING OF HAZARDS

15:15 – Jim Walker discussed that all members had been sent a survey asking them to rank the hazards in the plan by highest concern. It is recognized that each person has their own bias due to

their particular expertise, but it is felt that by polling a wide variety of experts a consensus can be accurately determined.

- Rachel Micander noted that there was typo in the info that was sent out regarding the ranking of warning times. That will be corrected in the plan.

Based on responses received so far there is a sheet of preliminary rankings to use in this discussion. There are some significant changes from previous plan updates, but the top three remain flood, wildfire, and earthquake. Four and five are the human caused categories.

- Chris Lake commented that these all seem to be based on perception, was interested to know if there had been any statistics done on whether these numbers actually bore out in the past.
    - Jim Walker says no. Statistics in this are misleading because you cannot directly compare vastly different type of hazards and the response to them. That is why the method of polling experts is used.
    - Continue comments from Chris Lake stating that it seemed odd to have something like a tsunami ranked as a higher risk than an epidemic.
    - Response from Craig dePolo discussed that these surveys actually do seem to work. A precision response is not required, just an educated ranking.
- Brenden Pearson asked if it was known how other states do this
    - Jim Walker says they are not aware how other states go through this process
    - Craig dePolo stated that this method is acceptable to FEMA
- Jim Walker did note that the questions asked do tend to skew the responses slightly. For example a tsunami is going to have a higher risk of infrastructure damage that an epidemic and that may push it to a high rank when the scores are calculated
- Chris Lake brought up that he thought it was interesting that there is no cyber-attack listed under the human caused hazards, a major topic of concern for the hospital field.
    - Discussion ensued about whether cyber-attack counted as an act of terrorism or extortion/criminal, and if this was an issue that should be covered in hazard mitigation, or if it was more of a Homeland security issue only.
    - Craig dePolo suggested maybe adding cyber-attack to the terrorism/human caused category.
    - Jim Walker suggested that maybe this was a discussion to have with FEMA before it is considered for addition to the plan.
    - Bill Elliott asked how much time we have before this list and the rankings must be finalized.
        - Discussion regarding the quickly shrinking timeline ensued.
    - Stephanie Hicks brought up that one of the challenges with adding anything like cyber-attack to the plan would be similar to when terrorism was added, this is a public document and you don't necessarily want to publicize certain portions of the response plan.
        - Jim Walker discussed some of the added challenges of considering adding a completely new hazard. Potential delays and the need to create a new mitigation effort.
        - Craig dePolo mentioned that cyber-attack could fit under the umbrella of terrorism and that if there were a cyber-attack that caused significant trouble it may be easier to declare it a disaster if it is in the plan.
    - Dan Hourihan encouraged that this discussion be put off until after Jim Walker could speak to FEMA about whether cyber-attack would be appropriate to add to the plan.

- Due to the cyber-attack discussion, Jim Walker determined that the decision on hazard rankings should be tabled until the next subcommittee meeting. He encouraged all members who had not yet done so to fill out the survey. If cyber-attack is added, the survey may be sent again.
- Jim Walker asked for any other additional comments on the rankings as they stand.
    - Craig dePolo stated he was surprised by the current tentative ranking of heat and thunderstorms. He felt that would be higher.
        - Jim Walker stated what resources are available to respond effects the rankings, such as shelters being better prepared lowers the threat.
        - Branden Pearson also brought up that both of those have a fairly good warning time so the threat can be more easily mitigated, compared to hazards like earthquakes

8. ANNOUNCEMENT OF FUTURE MEETINGS

15:34 – The next meeting is scheduled for October 23, 2017 and will cover: Capability Assessment, Plan Maintenance, and Local Coordination. In addition, this meeting will revisit and complete the discussion on Hazard Rankings.

9. PUBLIC COMMENT

15:36 – Jim Walker called for public comment. There was none.

10. ADJOURN

15:36 – Jim Walker asked for any final remarks, hearing none the meeting was adjourned.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING
SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE**
Date and Time of Meeting: **December 4, 2017 AT 1:30 PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room 2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Subcommittee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.

Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, Jim Walker, Division of Emergency Management.

2. **PUBLIC COMMENT**– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker. This agenda item will discuss whether to approve the minutes of the July 31, 2017, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS** – (Discussion Only) – Chair, Jim Walker. Mr. Walker will lead a discussion regarding public awareness and education activities to date. This will include any actions throughout the state and local jurisdictions.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN INFESTATION HAZARD PROFILE –** (Discussion/For Possible Action) – A representative of the Nevada Department of Agriculture, will provide an update to the Infestation Hazard Profiles for the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

6. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN EARTHQUAKE HAZARD PROFILE –** (Discussion/For Possible Action) – Dr. Craig dePolo, Nevada Bureau of Mines and Geology, will provide an update to the Earthquake Hazard Profile to the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

7. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN FLOOD HAZARD PROFILE** – (Discussion/For Possible Action) – Bunny Bishop, Nevada Division of Water Resources, will provide an update to the Flood Hazard Profile to the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

8. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker The 2018 schedule will be sent out in the next couple of months so everyone can get them on their calendars.

9. **PUBLIC COMMENT** –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

10. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on November 29, 2017 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Carson City Governor's Office, 101 N. Carson Street, Carson City, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov & www.notice.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Janell Woodward at the Nevada Division of Emergency Management, (775) 687-0300 for pickup at the Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, December 4, 2017	
	TIME	2:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Sydney Wilson	
Committee Members	**Present**	**Staff and Others**	**Present**
Jim Walker	X	Janell Woodward (Staff)	X
Branden Pearson	X	Shea Shultz (Staff)	X
Bunny Bishop	X	Rachel Micander (NBMG)	X
Rick Diebold		Sydney Wilson (NBMG)	X
Bill Elliot	X	Tammy Kinsley (Lyon Co.)	X
Keith Forbes		Michael Heidemann (Churchill Co.)	X
Ron Juliff		Nathan Hastings (DAG)	X
Justin Harris		Bart Chambers (SFM)	X
Rajat Jain	Phone	Selby Marks (NTAC)	X
Dan Hourihan	X	Sean Gephart (NDA)	X
Ryan Shane	X	Kate Cunningham (ROA)	X
Chris Lake	X		
Chris Smallcomb			
Craig dePolo			

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chair Jim Walker called for introductions and a quorum was established.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment at 13:35. There was none.

3. **APPROVAL OF THE MINUTES**
   Jim Walker asked if there was any comment or discussion of the minutes from the last meeting and called for a motion. Dan Hourihan moved to approve the minutes and Chris Lake seconded the motion. The minutes were approved.

4. COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS.

Jim Walker noted that it is important to capture mitigation activities to show that we are a state that doesn't just talk about mitigation but does mitigation. Ryan Shane noted that NDF sponsors and partners with Living with Fire, in conjunction with many other agencies. Ryan asked what kind of data is useful for tracking mitigation and outreach activities. Rachel Micander noted that the spreadsheet discussed in the July 2017 meeting can be used to track outreach and mitigation activities, and useful data includes: what was presented, date, target audience, and number of people present. Rachel stated that if members use the spreadsheet, it can be easily incorporated into the plan. Janell Woodward stated that she can re-send the spreadsheet. Ryan asked about the table that shows how much was spent in mitigation. Jim suggested if NDF has a summary of annual report with expenditures that could be used. Janell Woodward discussed how it would be acceptable to use particular projects conducted by NDF that contained information on expenditures. Ryan noted that it is difficult to track NDF's funding and the collective efforts going on. Ryan stated that a lot of funding and efforts are sourced from a local level. Jim suggested the narrative can explain that a lot more is being done at local jurisdictions, and by explaining the limitations, we can avoid NDF being misrepresented. Michael Heidemann asked how pre-mitigation fit into public awareness and education activities. Michael explained how the Bureau of Reclamation wants to pay for LiDAR data collection. Jim Walker thought it fit in to the public awareness and mitigation activities section because studies and information gathering are needed in order to do mitigation projects. Janell Woodward stated members should send the outreach tracking spreadsheets to the Nevada Bureau of Mines and Geology (NBMG). Janell will send out NBMG's contact information as well.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN INFESTATION HAZARD PROFILE

Sean Gephart noted that the revisions that have been made to the infestation hazard profile are acceptable. Sean stated that there are changes to the noxious weed list, and he expects that the changes will be adopted to the statutes in February. Sean mentioned NDA used EDDMapS in the proposed documents to collect data on noxious weeds since 2012. Sean noted that insects and aquatic species will probably need to be updated, and that the state entomologist and the Nevada Department of Wildlife (NDOW) should be consulted. Sean mentioned that NDOW put together a new aquatic species management plan that includes riparian plant species. Sean said he can reach out and get a copy if it would be useful. Jim Walker stated that the aquatic species management plan would be good to have. Jim asked if Sean could consult with the entomologist and NDOW for updates, and Sean stated that he would. Jim noted that to move forward, changes need to be made to the noxious weeds, insects, and aquatic species, and the state entomologist and NDOW needs to be contacted by the next meeting. Janell Woodward asked Sean if he could send the section to her in the next month or two so it can be worked on. Sean stated yes. Jim stated the infestation hazard profile will be reviewed and approved at the next meeting. Jim Walker asked if there were any questions or comments. There were none.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN EARTHQUAKE HAZARD PROFILE

Craig dePolo was unable to attend the meeting. Rachel Micander stated that the major changes to the hazard profile include new figures and maps. Rachel also mentioned that Craig submitted the document to the Nevada Seismological Lab at UNR for input and no significant changes were made. Bill Elliot moves to accept the section as is. Dan Hourihan seconded the motion. The motion passed.

7. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN FLOOD HAZARD PROFILE

Bunny Bishop stated that tables 3-13 and 3-14 were updated. Bunny noted she added events on record from Clark County's Regional Flood Control District. Bunny also stated she updated tables 3-16 and 3-17. In section 3.3.7.3.3, Bunny mentioned she added language about mitigation efforts for code 406. Janell Woodward stated that for section 3.3.7.3.3 the wording and terminology is not quite right. Janell noted that the pictures in the hazard profile are outdated, and stated it would be good tohave more recent pictures, and has some that could be used. Rachel Micander stated she also has pictures that could be incorporated into the flood hazard profile section. Jim Walker suggested that the motion should include: changes need to the wording in 3.3.7.3.3, remove the old map, and add recent pictures. Nathan Hastings recommended that before moving to pass, the language should be changed in section 3.3.7.3.3. Janell Woodward and Bunny Bishop made the changes to section 3.3.7.3.3. Jim Walker read the paragraph to confirm the changes. Dan Hourihan moved to accept the section with the changes to the language, removing the old map, and adding in recent pictures. Bunny Bishop seconded the motion. The motion passed. Jim Walker asked if there were any comments. Michael Heidemann asked about permitting for pre-mitigation, and ways to facilitate the permitting process. Bunny suggested to Michael that he could use the data to make a case to the permitting agencies. Bunny Bishop mentioned that attending a Silver Jackets meeting might be helpful. Jim Walker and Janell Woodward suggested that it might be helpful to attend a NHMPC meeting to discuss permitting.

8. ANNOUNCEMENT OF FUTURE MEETINGS

Jim Walker stated the meeting schedule for 2018 will be sent out soon.

9. PUBLIC COMMENT

Chair Jim Walker called for public comment at 14:34. Jim Walker reminded the committee that Section 4 was sent via email this morning. Jim Walker asked members to review the document and provide feedback in order to update it by the next meeting.

10. ADJOURN

Bill Elliot moved to adjourn the meeting and Bart Chambers seconded. The meeting was adjourned at 14:37.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING
SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE**
Date and Time of Meeting: **February 26, 2018 AT 1:30 PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room 2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Subcommittee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.
Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, Jim Walker, Division of Emergency Management.

   PUBLIC COMMENT– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

2. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker. This agenda item will discuss whether to approve the minutes of the December 4, 2017, Nevada Hazard Mitigation Planning Subcommittee meeting.

3. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS** – (Discussion Only) – Chair, Jim Walker. Mr. Walker will lead a discussion regarding public awareness and education activities to date. This will include any actions throughout the state and local jurisdictions.

4. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN INFESTATION HAZARD PROFILE** – (Discussion/For Possible Action) – A representative of the Nevada Department of Agriculture, will provide an update to the Infestation Hazard Profiles for the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

5. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN AVALANCHE HAZARD** PROFILE – (Discussion/For Possible Action) – Sydney Wilson, Nevada Bureau of Mines and Geology, will review the Avalanche Profile to the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

6. **UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN HAZARDOUS MATERIALS HAZARD PROFILE** – (Discussion/For Possible Action) – A representative from the Nevada Division of Environmental Protection will provide an update to the Hazardous Materials Hazard Profile to the State Hazard Mitigation Plan. The Subcommittee may vote to accept the updated changes to the profile.

7. **REVIEW AND COMPLETE THE SOCIAL, TECHNICAL, ADMINISTRATIVE, POLITICAL, LEGAL, ECONOMIC, AND ENVIRONMENTAL FEASIBILITY (STAPLEE) REVIEW** – (Discussion/For Possible Action) – Chair, Jim Walker, Division of Emergency Management. Mr. Walker will lead the committee in the review of and completion of the STAPLEE.

8. **UPDATE OF BELOW NAMED SECTIONS FOR THE STATE HAZARD MITIGATION PLAN** - (Discussion/For Possible Action) – The Subcommittee will discuss the sections listed below from the State Hazard Mitigation Plan. Revisions will be made as necessary from input by the Subcommittee. The Subcommittee may vote to accept the updated changes to the profile.

    a. Section 0
    b. Section 1
    c. Section 2
    d. Section 3 (full)
    e. Section 4
    f. Section 5
    g. Section 6
    h. Section 7
    i. Section 8

9. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker One more subcommittee meeting may be needed prior to the completion of the update of the State Plan.

10. **PUBLIC COMMENT** –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

11. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on February 21, 2018 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV;
Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV;
Carson City Governor's Office, 101 N. Carson Street, Carson City, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov & www.notice.nv.gov

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Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, February 26, 2018	
	TIME	1:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Rachel Micander	
Committee Members	**Present**	**Staff and Others**	**Present**
James Walker	X	Janell Woodward (Staff)	X
Craig dePolo	X	Shea Shultz (Staff)	X
Bunny Bishop	X	Sydney Wilson (NBMG)	X
Bill Elliott	X	Rachel Micander (NBMG)	X
Rebecca Bodnar	X	Chris Thorsen (NDWR)	X
Branden Pearson	X	Nicole Goehring (NDWR)	X
Sean Gephart	X	Mike Detmer (DAG)	Phone
Chris Lake	Phone		
Rajat Jain	Phone		
Dan Hourihan	Phone		
Mike Heidemann	Phone		
Carlito Rayos	Phone		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chair Jim Walker called for introductions at 13:35. A quorum was not established. Jim Walker discussed the process and importance of completing the STAPLEE since it helps add to Nevada's enhanced status. Craig dePolo indicated that this is used to determine the feasibility of doing hazard mitigation. Mike Heidemann (phone) joined the meeting and a quorum was established at 13:42.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment at 13:43. There was none.

3. **APPROVAL OF THE MINUTES**
   Jim Walker asked for any discussion of the minutes from the last meeting and called for a motion. There was no discussion. Bill Elliott moved to approve the minutes. Bunny Bishop seconded the motion. The motion passed at 13:44.

4. COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS

Jim Walker emphasized the importance of capturing mitigation projects and/or outreach activities to include in the plan. Jim Walker stated that by tracking outreach and mitigation projects, it shows FEMA that Nevada is a mitigation state. Jim Walker asked if anyone had outreach or mitigation tracking forms or documents to add. Rebecca Bodnar, Nevada Division of Environmental Protection (NDEP), asked where the spreadsheet was, since NDEP has completed activities to incorporate into the outreach tracking spreadsheet. Rachel Micander indicated that outreach tracking and mitigation activities be sent to Janell, and NBMG would incorporate into the state plan. Jim Walker asked that outreach and mitigation activities be emailed to Janell and the updates would be included.

5. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN INFESTATION HAZARD PROFILE

Sean Gephart, Nevada Department of Agriculture (NDA), provided an overview of the infestation hazard profile. Sean stated that the noxious weed section had been finalized, and the insect infestation and aquatic species sections had been updated as well. Sean noted that the document as it stands should be considered current. Jim Walker asked if there were any questions or comments. Sean asked why changes are tracked in the infestation hazard profile, when he had removed them. Sydney Wilson stated that the changes are tracked in each profile to make it easier to locate updates. The changes will be accepted after the hazard profile has been approved. Jim Walker asked for a motion to accept the infestation profile with the updates made. Bill Elliott moved to accept the infestation profile. Craig dePolo seconded the motion. The motion passed at 13:50.

6. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN AVALANCHE HAZARD PROFILE

Sydney Wilson, Nevada Bureau of Mines and Geology (NBMG) provided an overview of the changes that were made to the avalanche hazard profile. Sydney stated that input was received from Brandon Schwartz of the Sierra Avalanche Center and Dr. Bob Watters of the UNR Department of Geosciences and Engineering. Sydney reviewed the updates Brandon and Dr. Watters made to the profile. Sydney stated that, per Brandon's comments, Table 3-5 had many reporting errors. Sydney reviewed each event listed in the table in order to identify the errors and correct as needed. Sydney then discussed the updates that were made to the hazard profile, including adding an updated map of Sierra Avalanche Center's forecast area and new figures. New figures that were added included the Sierra Avalanche Center's observations and snowpit profiles, avalanche fatalities by state, and avalanche fatalities triggered by primary activity. Major updates included new figures and updated tables throughout the profile. Jim Walker asked if there were any questions or comments. Bill Elliott moved to accept the avalanche profile with the updates made. Bunny Bishop seconded. The motion passed at 13:57.

7. UPDATE OF THE STATE ENHANCED HAZARD MITIGATION PLAN HAZARDOUS MATERIALS HAZARD PROFILE

Rebecca Bodnar, NDEP, provided an overview of the hazardous materials hazard profile. Rebecca stated that NDEP completed a general update of the hazard profile. Rebecca noted that NDEP changed the wording in the profile for clarification, updated relationships between agencies, and updated the NDOT map (figure 3-20). Rebecca stated that NDEP was unsure of were the numbers in table 3-22 were sourced. As a result, they were removed for this update.

Rebecca noted that tables 3-23 and 3-24 were updated with current numbers; however, the table title needed to be updated to read 2012-2017. Rebecca stated that NDEP included the Anaconda Copper Mine site in the profile, and updated the BMI Complex and Carson River mercury. Rebecca also indicated that NDEP did not get a chance to update Table 3-25 (Historical HAZMAT Events in Nevada), and if given more time and is deemed necessary, NDEP would update the table. Jim Walker and Craig dePolo indicated that it was important to update the table. Rebecca indicated that NDEP would do so.

Rachel Micander stated that NBMG has updated the erionite and naturally occurring asbestos (NOA) subsection of the HAZMAT profile, having been tasked with it at a previous meeting. NOA and its history were added to the subsection, and input was received from two mapping specialists with NBMG who had worked in southern Nevada where NOA has been documented. Rachel Micander indicated that a new a new table listing historic NOA occurrences in Nevada was also added.

Craig dePolo stated that considering there were only three changes needed in the hazardous materials profile, the subcommittee could accept the profile as long as the three changes were made. Jim Walker suggested that the subcommittee should wait until the next meeting for approval. Crag noted that the changes were minor and suggested the profile be approved with the caveat that those changes be made. Craig dePolo moved to approve the hazardous materials profile, understanding three changes needed to be made including: update the date for tables 3-23 and 3-24, update the broken links, and update table 3-25. Bill Elliott seconded the motion. The motion passed at 14:06. Craig asked Rebecca if she could finish the three remaining updates in a week. Rebecca indicated that she would.

8. REVIEW AND COMPLETE THE SOCIAL, TECHNICAL, ADMINISTRATIVE, POLITICAL, LEGAL, ECONOMIC, AND ENVIRONMENTAL FEASIBILITY (STAPLEE) REVIEW

Jim Walker reviewed the STAPLEE, and emphasized that only one number is to be assigned to each section (social, technical, administrative, political, legal, economic, and environmental feasibility sections), and even though there are subsections, the subcommittee members can only put down one number per section.

Janell Woodward suggested that the subcommittee review an example together. Jim Walker agreed that the first one can serve as an example and then the subcommittee members can complete the rest of the STAPLEE individually. Jim Walker started reviewing the first row of the STAPLEE as an example for the subcommittee. Craig dePolo asked for clarification about entering a single number for each STAPLEE section. Jim Walker stated that it was how NDEM and the subcommittee has done it in the past. Janell noted that the STAPLEE is used to determine the priority for each STAPLEE section. Additionally, Janell stated that the most important STAPLEE items, according to FEMA, are technical, economic, and environmental feasibility. Bill Elliott asked if the STAPLEE would be completed by subcommittee members during the meeting or on their own. Janell Woodward and Jim Walker said the intent was to complete the STAPLEE during the meeting. Craig dePolo asked if the subcommittee could promise to complete the STAPLEE in 48 hours, instead of completing the STAPLEE during the meeting. Craig dePolo noted it would be more efficient to complete the STAPLEE outside of the meeting.

An attendee left the conference call and Jim Walker indicated the need to check for a quorum. Jim Walker asked who was still on the phone. The following members identified themselves: Dan Hourihan, Carlito Rayos, Rajat Jain. There was no longer a quorum. Jim Walker reviewed action

items left on the agenda. Rachel Micander stated that for agenda item nine, a list of questions for the subcommittee needs to be discussed, and she did not think anything would be approved at this date. Jim Walker stated that without a quorum, it would not be feasible to complete the STAPLEE during the meeting. Craig dePolo suggested subcommittee members complete the STAPLEE and send it back to NDEM within 48 hours. Janell Woodward stated that she would resend the STAPLEE out to the subcommittee. Rebecca Bodnar asked whom should fill out the STAPLEE. Craig dePolo said the goal would be for every subcommittee member to complete the STAPLEE. The subcommittee reviewed an example together and discussed. Craig dePolo reiterated that this was a study for feasibility. Jim Walker asked if there were any more questions. Jim Walker stated that if anyone needs help filling out the STAPLEE, to contact Janell Woodward or himself. Chris Lake rejoined the meeting (phone) and the quorum was reestablished. Jim Walker asked for additional questions or comments. Hearing none, the subcommittee moved onto agenda item number nine.

9. UPDATE OF BELOW NAMED SECTIONS FOR THE STATE HAZARD MITIGATION PLAN

Jim Walker said that he wanted a review of all sections of the State Hazard Mitigation Plan on the agenda so the subcommittee can think of the plan as a whole, and hear a quick update for each section. Craig dePolo said that in addition to a quick update of each section, there will also be questions for the subcommittee to answer. Sydney Wilson and Rachel Micander reviewed sections 0-8 and asked the subcommittee remaining questions:

Section 0 – Rachel Micander said Section 0 is an overview of the state. Rachel indicated that a NBMG cartographer had made new maps, and that demographic tables have been updated. Rachel Micander said Section 0 is nearing completion.

Section 1 – Rachel stated that Section 1 is the adoption of the state plan. Rachel said Section 1 would be completed at the end of the update period.

Section 2 – Rachel stated that Section 2 is the planning process. Rachel said there are remaining questions in this section that needs to be answered by the subcommittee. Rachel asked if she could go through them. Jim Walker said to go through them now so the subcommittee could provide feedback.

The first question, asked by Sydney Wilson, was regarding hazard mitigation outreach presentations presented to the Wildland Urban Interface (WUI) committee or Nevada Earthquake Safety Council (NESC). Janell Woodward said she has not been involved with the WUI committee, so she is not sure. Craig dePolo said something will be done with NESC, and to delete WUI from the subsection, but to keep NESC. The second question asked was regarding public comment, and if a draft version of the plan will be posted for public comment. Craig dePolo said that it would be good idea to post the plan for public feedback. Janell Woodward said typically, NDEM posts the plan for public comment on their website. Jim Walker argued that because NDEM posts subcommittee meetings and agendas, and meetings are public; these meeting should be considered for public comment as well. Craig emphasized that posting a draft version of the plan for public comment would be a good idea as well. Rachel indicated that section 2 would continue to be updated until the plan is submitted to FEMA.

Rachel Micander asked the subcommittee if there were any new examples of cooperation among agencies in order to comply with federal requirements of hazard mitigation planning. Rebecca Bodnar said she could give NBMG examples to include in Section 2. Craig dePolo asked if

anyone else has examples. Bill Elliott mentioned that NDOT created a new storm water protection division. He also indicated that there is a drought task force for Nevada. Carlito Rayos asked if the weather ready nation ambassadors could be an example. The subcommittee agreed that weather ready nation ambassadors should be used as an example. Carlito also mentioned that there is a monsoon month PSA in southern Nevada during September.

Section 3 – Rachel Micander indicated that the majority of the questions in Section 3 were located in subsection 3.6. Rachel said this section refers to state-owned facilities and state-owned critical facilities. Rachel stated that NBMG, as the state geological survey, does not have access to updated information regarding facilities and has been reaching out to other agencies to acquire new information. Rachel indicated the need for the subcommittee to provide new and updated information in order for this subsection to be completed. As an example, Rachel reviewed table 3-37 (State Critical Facilities and Infrastructure) with the subcommittee. Rachel said it would be helpful if someone on the subcommittee could review this section and send updates back to NBMG. Sydney Wilson stated that the suggested method of reviewing the list of state-owned buildings to determine which should be considered critical is confusing, especially without any outside input. Janell Woodward said that the process implemented during the 2013 plan update, reviewing the list of state-owned buildings, and determining which buildings are to be considered critical, is a judgement call. Rachel said that NBMG went through the list; however, NBMG is not comfortable making that judgement call. Craig dePolo asked who could update Section 3.6, and noted that NBMG should not be responsible for updating this subsection. Branden Pearson said he has a building database, and that critical facilities are very difficult to define. Branden said he would review Section 3.6 and table 3-37 and provide updates. Bunny Bishop asked if the wells listed in table 3-37 are state owned. Rachel Micander stated that wells are listed as state-owned. Bunny Bishop said she would look into state-owned wells.

Rachel Micander said there were remaining questions in section 3.6.3.2, Loss Estimation for Flood for State Facilities. Rachel Micander said she could send the section to Bunny Bishop for review. Branden Person suggested contacting Department of Administration- Risk Management or Division of Insurance. Craig asked where these data were sourced during the last plan update and Rachel indicated that it came from the state flood plain manager.

Rachel Micander also indicated that there were remaining questions in Section 3.6.3.3, Loss Estimation for Wildland/Urban Interface Fires for State Facilities. Rachel noted that in the 2013 plan, a replacement cost of $200 per square foot was used. Rachel asked if this number should be changed for the 2018 plan update. Branden Pearson indicated that it was a difficult question, and thought that $250 a square foot would be a better average, given inflation.

Section 4 – Sydney Wilson provided an overview of Section 4. Sydney Wilson stated that she and Janell Woodward made updates to this section. Sydney updated all of the links listed in Section 4, and changed the wording in a few paragraphs to reflect the current status of local hazard mitigation plans. Sydney made updates to table 4-7 (Existing State Model Codes). Sydney indicated that Section 4 would be finished at the end of the update period (April), and that Janell would provide the remaining charts and tables that need to be updated. This section update is also dependent on the STAPLEE.

Section 5 – Sydney Wilson said there were no questions for Section 5. Rachel Micander indicated that Section 5 was nearing completion, with a few minor things to wrap up.

Section 6- Rachel Micander said Section 6, the Plan Maintenance Process, was almost complete.

Section 7- Rachel Micander indicated that Section 7 was a list of references. Sydney Wilson said she had been working on this section and asked the subcommittee how to handle references. Specifically, Sydney noted that references were listed at the end of hazard profiles in Section 3, so she was unsure if they should be removed from the hazard profiles, and only included in Section 7. Craig dePolo indicated that there was an advantage having them included at the end of the hazard profiles. Sean Gephart agreed that the hazard profile references should be kept in Section 3, and listed in Section 7 as well. Sydney said she had been compiling references for all sections, updating bad links, and formatting.

Section 8 – Rachel Micander stated that Section 8 is the enhanced plan status section and that there were a few remaining questions in Section 8. Rachel Micander asked the subcommittee if there were any new private mitigation examples to add, specifically on page 8-27. Craig dePolo said this could be sent out to the subcommittee as a whole and members should respond with examples.

Rachel Micander asked if there were any new examples of Nevada's effective use of existing programs to achieve mitigation goals, as noted in Section 8.5.2. Rachel said that this should be sent to the subcommittee via email for additional input. Bill Elliott mentioned drought mitigation efforts in Southern Nevada (removal of lawns). Additionally, Bill mentioned the dredging of the Walker River in Yerington. Craig dePolo asked if there were any infestation mitigation projects. Sean Gephart said NDOT has been looking at weed mitigation plans submitted by contractors. Furthermore, Sean said that NDOW and NDA conduct water vessel inspections. Sean also indicated that NDOW has been looking for aquatic invasive species, and NDA has been looking for aquatic invasive weeds. Craig dePolo asked Sean if he could write up a sentence or two about the vessel inspection stations. Sean said yes, that he would provide a summary. Bunny Bishop mentioned the 2015 dredging for flood mitigation in Yerington. Bunny indicated that she would write a sentence or two about these projects. Bunny also mentioned using the big dig as an example. Craig dePolo asked Bunny about the big dig, and Bunny explained the project. Janell Woodward noted the need to add Nevada's Flood Awareness Week (FAW) to Section 8.5.2. Rachel Micander said she would add FAW to Section 8.5.2. Rachel indicated that she would compile a list of remaining questions for the subcommittee and send it to Janell for distribution to the subcommittee. Jim Walker asked if there were any additional questions about the plan as a whole.

10. ANNOUNCEMENT OF FUTURE MEETINGS

Jim Walker announced the need for another meeting since all of the sections need approval from the subcommittee. Jim said the meeting would be scheduled soon. Jim said an email was sent out regarding the scheduling of the next meeting, and asked the subcommittee members to respond to the email.

11. PUBLIC COMMENT

Jim Walker called for public comment at 15:18. There was none.

12. ADJOURN

Bill Elliott moved to adjourn the meeting and Craig dePolo seconded. The meeting was adjourned at 15:18.

STATE OF NEVADA
MEETING NOTICE AND AGENDA
NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE

Name of Organization: **NEVADA HAZARD MITIGATION PLANNING SUBCOMMITTEE**
Date and Time of Meeting: **April 9, 2018 AT 1:30 PM**

Carson City Location
Nevada Division of Emergency Management
Executive Conference Room
2478 Fairview Drive
Carson City, NV 89701

NOTE: Valid photo identification will be required prior to entrance to the Division of Emergency Management building on the Nevada National Guard complex in Carson City.

The Subcommittee may take action on items marked "For Possible Action." Items may be taken out of the order presented on the agenda at the discretion of the chairperson. Items may be combined for consideration by the Subcommittee at the discretion of the chairperson. Items may be pulled or removed from the agenda at any time.
Please Note: Witnesses wishing to have their complete testimony/handouts included in the permanent record of this meeting should provide a written or electronic copy to the Nevada Hazard Mitigation Planning Subcommittee administrative support staff. Minutes of the meeting are produced in a summary format and are not verbatim.

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM** – Chair, Jim Walker, Division of Emergency Management.

2. **PUBLIC COMMENT**– No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

3. **APPROVAL OF MINUTES** – (Discussion/For Possible Action) – Chair, Jim Walker. This agenda item will discuss whether to approve the minutes of the February 26, 2018, Nevada Hazard Mitigation Planning Subcommittee meeting.

4. **COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS** – (Discussion Only) – Chair, Jim Walker. Mr. Walker will lead a discussion

regarding public awareness and education activities to date. This will include any actions throughout the state and local jurisdictions.

5. **UPDATE OF BELOW NAMED SECTIONS FOR THE STATE HAZARD MITIGATION PLAN** - (Discussion/For Possible Action) – The Subcommittee will discuss the sections listed below from the State Hazard Mitigation Plan. Revisions will be made as necessary from input by the Subcommittee. The Subcommittee may vote to accept the final updated changes to the profile.

All sections of the draft plan can be found on the following website for review: http://www.nbmg.unr.edu/nhmpc/State_of_Nevada_Enhanced_Multihazard_Mitigation_Plan/NV_plan_2018_DRAFT/index.html

a. Section 0
b. Section 1
c. Section 2
d. Section 3
e. Section 4
f. Section 5
g. Section 6
h. Section 7
i. Section 8
j. Appendices A-U

6. **ANNOUNCEMENT OF FUTURE MEETINGS** – (Discussion Only) – Chair, Jim Walker

Future meetings dependent upon need and first meeting after eventual plan approval by FEMA to begin the next planning cycle.

7. **PUBLIC COMMENT** –No action may be taken upon a matter raised under this item of the agenda until the matter itself has been specifically included on an agenda as an item upon which action may be taken. Public comments may be limited to 3 minutes per person at the discretion of the Chair. Comments will not be restricted based on viewpoint.

8. **ADJOURN** – (Discussion/For Possible Action)

This is a public meeting. In conformance with the Nevada Public Meeting Law, this agenda was posted or caused to be posted on or before 9:00 a.m. on April 4, 2018 at the following locations:

Clark County Department of Building and Fire Prevention, 4701 West Russell Road, Las Vegas, NV; Clark County Government Center, 500 South Grand Central Parkway, Las Vegas, NV; Carson City Governor's Office, 101 N. Carson Street, Carson City, NV;
Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV;
Posted to the NV Department of Public Safety Division of Emergency Management and Homeland Security web site located at: www.dem.nv.gov
State of Nevada meeting notice website located at: www.notice.nv.gov

We are pleased to make reasonable accommodations for members of the public who are disabled. If special arrangements for the meeting are necessary, or if there is a need to obtain copies of any supporting meeting materials, please contact Janell Woodward at the Nevada Division of Emergency Management, (775) 687-0300 for pickup at the Nevada Division of Emergency Management, 2478 Fairview Drive, Carson City, NV. 24-hour advance notice is requested. Thank you.

Meeting Minutes
Nevada Hazard Mitigation Planning Subcommittee

Attendance	**DATE**	Monday, April 9, 2018	
	TIME	1:30 pm	
	LOCATION	Nevada Division of Emergency Management State Emergency Operations Center 2478 Fairview Drive Carson City, Nevada 89701	
	METHOD	Teleconference	
	RECORDER	Sydney Wilson	
Committee Members	**Present**	**Staff and Others**	**Present**
James Walker	X	Janell Woodward (Staff)	
Craig dePolo		Shea Shultz (Staff)	X
Bunny Bishop	X	Sydney Wilson (NBMG)	X
Bill Elliott	X	Rachel Micander (NBMG)	X
Rebecca Bodnar	X	Chris Thorsen (NDWR)	X
Branden Pearson	X	Nicole Goehring (NDWR)	X
Sean Gephart	X	Justin Luna (NDEM)	X
Chris Lake	X	Henna Rasul	Phone
Hal Dawson	X	Kendall Herzer	Video
Selby Marks	X		
Rajat Jain	Phone		
Dan Hourihan	Phone		
Mike Heidemann	Phone		
Carlito Rayos	Phone		

1. **CALL TO ORDER, INTRODUCTIONS AND ESTABLISH QUORUM**
   Chair Jim Walker called for introductions at 13:31. A quorum was established.

2. **PUBLIC COMMENT**
   Jim Walker called for public comment at 13:33. There was none.

3. **APPROVAL OF THE MINUTES**
   Jim Walker asked for any discussion of the minutes from the last meeting and called for a motion. There was no discussion. Bill Elliott moved to approve the minutes. Bunny Bishop seconded the motion. The motion passed at 13:33.

4. COLLECTION OF MEMBER INPUT ON PUBLIC AWARENESS AND EDUCATION ACTIVITIES IN HAZARD MITIGATION PLANNING AND ACTIONS

Jim Walker emphasized the importance of capturing mitigation projects and/or outreach activities to include in the plan. Jim Walker asked the subcommittee members if they had any input. Mike Heidemann commented that Churchill County is working with the Carson Water Subconservancy District to develop a grant for a flow study. The flow study will allow personnel to plan for building projects. It will also be used for mitigation strategies. Hal Dawson and Rebecca Bodnar, Nevada Division of Environmental Protection (NDEP), asked if NDEP's outreach activities are included in the plan. Rachel Micander said that NDEP's examples are in the plan. Rebecca described NDEP's recent outreach efforts, and asked if these efforts can be included in the plan. Jim Walker stated that if hazard mitigation is a component of the outreach efforts, then yes.

5. UPDATE OF BELOW NAMED SECTIONS FOR THE STATE HAZARD MITIGATION PLAN

Jim Walker explained that since all subcommittee members had an opportunity to review all sections and appendices of the plan before the meeting, there would not be a discussion of each section and appendices. Rather, the discussion will focus on questions and comments about specific sections and appendices. Hal Dawson commented that there are typos and formatting issues in the plan, and that he has a few edits for the hazardous materials profile. Rachel Micander noted that formatting has not been done, and this will be completed during the final check. The following sections were discussed:

Section 0: Jim Walker asked if there were questions or comments regarding section zero, and called for a motion. There was no discussion. Bill Elliot moved to approve section zero as is. Carlito Rayos seconded the motion. The motion passed at 13:54.

Section 1: Jim Walker asked if there were questions or comments regarding section one, and called for a motion. There was no discussion. Bill Elliot moved to approve section one as is. Dan Hourihan seconded the motion. The motion passed at 13:55.

Section 2: Rachel Micander indicated that a few tables in section two would continue to be updated until the plan is submitted to FEMA. However, she stated the section could be approved today, understanding that additions would be made to the tables, as this was done in the past. Jim Walker called for a motion. Bill Elliott moved to approve section two, understanding that the tables Rachel addressed will continue to be updated. Carlito Rayos seconded the motion. The motion passed at 13:57.

Section 3: Bunny Bishop asked subcommittee staff if they received her edits to a paragraph in Section 3. Rachel Micander emphasized that section 3.6 is not complete, and that staff is waiting to receive data from outside agencies to finish updating the tables in section 3.6. Rachel Micander stated that section three is complete, except for two tables in section 3.6. Jim Walker stated that he does not

think it is appropriate to approve section three, and that the subcommittee should wait until data is received to update section 3.6. Chris Lake noted that the data might not be received in time for the next meeting, and would need to be addressed again. Jim Walker called for a motion. Bill Elliott moved to approve section three at the next NHM Planning subcommittee meeting. Chris Lake seconded the motion. The motion passed at 14:00.

Section 4: Sydney Wilson asked the subcommittee to review table 4-8, which needs to be updated; however, she is unsure how to update the table. Sydney Wilson and Rachel Micander explained that it appears the NHMPC rated local hazard mitigation plan's capabilities assessment, but were unsure how to determine the rating for each plan. Jim Walker indicated that the table might have been updated by the State Hazard Mitigation Officer in the previous iteration of the plan, or this data was derived from FEMA. Rachel Micander noted that the staff is unclear on how to update the table, and asked if this should be brought to the NHMPC. Jim Walker recommended following up with FEMA or the SHMO about this. Jim Walker called for a motion. Bill Elliott moved to approve section four at the next NHM Planning subcommittee meeting. Chris Lake seconded the motion. The motion passed at 14:01.

Sections 5-8 and Appendices A-U: Jim Walker called for a motion to approve the remaining sections, sections 5-8, and all of the appendices, because there were no questions or comments. Bill Elliott moved to approve section five, section six, section seven, section eight, and all of the appendices. Chris Lake seconded the motion. The motion passed at 14:02.

Jim Walker reiterated that sections three and four would be approved at the next meeting. Chris Lake asked if the subcommittee should create a contingency plan in event the data is not received by the next subcommittee meeting. Rachel Micander suggested leaving the tables as is, and adding language about the limitations if data is not received to update section 3.6. Rachel Micander explained that she is concerned about the timeline for the plan, and asked if there will be another subcommittee meeting prior to the NHMPC meeting coming up in a few weeks. There was a discussion about potential dates for another subcommittee meeting.

Bill Elliott asked staff if the remaining tables in sections three and four are an integral component of the plan, or a requirement from FEMA. Bill Elliott suggested deleting the tables if current data is not received, or to publish as is. Rebecca Bodnar asked if sections three and four could be approved at the current meeting, understanding the motion will include caveats. Chris Lake agreed, and emphasized that there could be problems if the sections were to be pushed to the next meeting, such as not establishing a quorum or not receiving the data. A discussion regarding a new motion to approve sections 3 and 4 followed.

Chris Lake asked if it would be possible to accept sections three and four as is, and if the updated information is received, authorize staff to update the tables. If the data is

not received, the tables stay as is. Rachel Micander stated that for staff, that would be a practical solution.

Rebecca Bodnar asked when the plan would be submitted. Rachel stated that the plan needs be submitted to FEMA in June, and the plan is scheduled to be posted for public comment in May. During this time, the plan will be formatted and finalized (including NHMPC edits). Jim Walker said that even if the entire plan is approved today by the subcommittee, the plan is still open to change. Therefore, Jim Walker called for a motion, understanding that if updated data is received, it can still be added to the plan during the public comment period. Rebecca Bodnar moved to approve sections three and four as is. Dan Hourihan seconded the motion. The motion passed.

6. ANNOUNCEMENT OF FUTURE MEETINGS

Jim Walker stated that future meetings would follow the schedule of next planning cycle. Generally, the meetings are quarterly. Jim Walker asked if there were any questions or comments. There was none.

7. PUBLIC COMMENT

Jim Walker called for public comment at 14:32. There was none.

8. ADJOURN

Rebecca Bodnar moved to adjourn the meeting and Bunny Bishop seconded. The meeting was adjourned at 14:33.

NAC 414.105 Application for assistance: General requirements. (NRS 414.135)

1. Except as otherwise provided in subsection 3, a state agency or political subdivision that seeks assistance from the Emergency Assistance Account for an emergency or disaster must submit, in writing, an application for assistance to the Division in accordance with the requirements for the application set forth in this section.
2. A state agency or county submitting an application for assistance from the Emergency Assistance Account must submit the application for assistance directly to the Division.
3. Before a city may submit an application to the Division for assistance from the Emergency Assistance Account, the city must apply for any available assistance from the county in which the city is located.
4. An application for assistance from the Emergency Assistance Account for an emergency or disaster must be received by the Division:
    (a) Within 30 days after the determination of an emergency or disaster, if the applicant is a state agency or county; or
    (b) Within 45 days after the determination of an emergency or disaster, if the applicant is a city.
5. Each application for assistance from the Emergency Assistance Account must include the following:
    (a) A copy of the declaration of emergency or disaster.
    (b) Any official report of a governmental entity concerning any actual or potential threat to the life, health, safety or property of persons in this state.
    (c) Any professional reports or certifications supporting the existence of an emergency or disaster.
    (d) Any preliminary damage assessment conducted:
        (1) If the applicant is a state agency, by officials of the agency and a preliminary damage assessment team deployed by the Division to arrive at a consensus pertaining to the preliminary damage assessment; or
        (2) If the applicant is a political subdivision, by a preliminary damage assessment team.
    (e) A full disclosure of the financial records of the applicant for a determination of the financial need of the applicant by the Division.
    (f) A certification that the existing financial or physical resources of the applicant are insufficient and no other funding sources are available to support all the estimated costs in providing a satisfactory remedy to the emergency or disaster. Such a certification from a state agency must be submitted by the Budget Division of the Department of Administration.
    (g) A certification that all other available resources have been exhausted, including, without limitation, interlocal agreements, mutual aid agreements and private resources.

(h) A description of all the projects to be paid, in whole or in part, by any allocation from the Emergency Assistance Account.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.110 Application for assistance: Duties of Division upon receipt. (NRS 414.135)

Upon the receipt of an application for assistance from the Emergency Assistance Account, the Division will:

1. Verify the declaration of emergency or disaster.
2. Verify that the emergency or disaster meets the criteria as to a threat to the life, safety, health or property of persons in this state.
3. Review any professional reports or certifications supporting the existence of an emergency or disaster.
4. If the applicant is a state agency and a preliminary damage assessment team has not been deployed before application is made, appoint a preliminary damage assessment team to work with officials from the agency to conduct a preliminary damage assessment.
5. Review the financial records of the applicant for a determination that the applicant has exhausted or will exhaust the existing financial or physical resources as a result of the emergency or disaster.
6. Review the certification of financial need submitted by the applicant.
7. Verify that the applicant has exhausted all other available resources.
8. Review the projects submitted for approval by the Division.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.115 Allocation and expenditure of money for emergency or disaster. (NRS 414.135)

1. Except as otherwise provided in subsection 2, an allocation from the Emergency Assistance Account for an emergency or disaster must be expended within 60 days after the approval of the allocation by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.
2. An allocation for a project that the Division reasonably determines to be a long-term project pertaining to the health or safety of human life must be expended within the fiscal year in which the allocation is approved by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.
3. A request for an extension of the time in which an allocation is required to be expended must be submitted to the Division in writing and approved by the Division before the expiration of the period in which the allocation is required to be expended pursuant to this section.
4. Any money advanced but not expended within the period required pursuant to this section must be returned to the Emergency Assistance Account. Any money returned or obligated but not expended within the period required pursuant to this section will be made available for reallocation.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.120 Allocation and expenditure of money pursuant to subsection 4 of NRS 414.135. (NRS 414.135)

1. A state agency or political subdivision that seeks an allocation of money pursuant to subsection 4 of NRS 414.135 must submit, in writing, an application to the Division.
2. Any money allocated from the Emergency Assistance Account pursuant to subsection 4 of NRS 414.135 must be expended within 60 days after the approval of the allocation by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.
3. A request for an extension of the time in which an allocation is required to be expended must be submitted to the Division in writing and approved by the Division before the expiration of the period in which the allocation is required to be expended pursuant to this section.
4. Any money advanced but not expended within the period required pursuant to this section must be returned to the Emergency Assistance Account. Any money returned or obligated but not expended within the period required pursuant to this section will be made available for reallocation.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.125 Completion of project: General requirements. (NRS 414.135)

1. Each project must be completed within 90 days after the date the application was approved by the Division, unless such time is extended by the Division based upon a showing of good cause by the requesting entity.
2. A request for an extension of time to complete a project must be submitted to the Division in writing and approved by the Division before the expiration of the period required pursuant to subsection 1.
3. If the period authorized for completion of a project is more than 90 days or is extended to more than 90 days, the applicant shall submit quarterly reports of each project to the Division. Every applicant shall submit a final report of each project to the Division not later than 30 days after the end of the period authorized to complete the project.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.130 Payments from Account on basis of reimbursement or advance funding. (NRS 414.135)

1. Except as otherwise provided in this section, all payments from the Emergency Assistance Account must be made on the basis of reimbursement.
2. Assistance will be provided from the Emergency Assistance Account on a basis of advance funding only if:
    (a) The applicant is unable to begin recovery from the emergency or disaster without advance funding; and
    (b) The amounts budgeted by the applicant for an emergency or disaster are not sufficient to support the purchase of equipment or supplies.

3. Advance funding will be provided at a maximum of 25 percent of the total cost of the project. Progressive advances will be provided based on the percentage of the project that has been completed and the submission of documentation evidencing all costs incurred to date.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.135 Requests for reimbursement from Account. (NRS 414.135)

An applicant submitting a final request for reimbursement shall submit documentation evidencing all costs incurred for the project not later than 60 days after the completion of the project. An applicant may submit periodic requests for reimbursement during a project that the Division determined to be a long-term project pursuant to NAC 414.115. Upon the receipt of a request for reimbursement, the Division will:

1. Review the eligibility of the project costs for money from the Emergency Assistance Account;
2. Require documentation evidencing all costs claimed on the request for reimbursement;
3. Verify the availability of money approved for the project; and
4. Process any claim that has been approved by the Division for payment to the applicant.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

NAC 414.140 Applicant to reimburse Account from certain money received. (NRS 414.135)

An applicant receiving money from the Emergency Assistance Account shall reimburse the Emergency Assistance Account from any money the applicant receives from:

1. Any federal, state or local governmental agency or private source for the emergency or disaster;
2. Legal action taken against any person or entity responsible for the emergency or disaster; or
3. Payments received as a result of coverage from a policy of insurance relating to the emergency or disaster,
4. not later than 30 days after the applicant receives such money.

(Added to NAC by Div. of Emergency Mgt. by R202-01, eff. 4-24-2003)

In the previous state plan, a single scenario earthquake was portrayed for each county in Appendix F. Although this is an example of the effects of an event, there are many such events possible in each county. A single event can be misleading by underestimating the actual earthquake hazard of parts of the county that are farther away from the event than may exist. Using the National Seismic Hazard Map eliminates this potential underestimation.

Therefore, this update now has earthquake hazard maps for each county. The maps are made from the 2014 U.S. Geological Survey National Seismic Hazard Map and are peak ground accelerations with a 2% non-exceedance in 50 years. Modified Mercalli Intensities that correlate with these accelerations are also shown to aid in the interpretation of the probabilistic seismic hazard maps. Note that any part of Nevada can be subjected to damaging shaking from earthquakes.

Figure F-1.

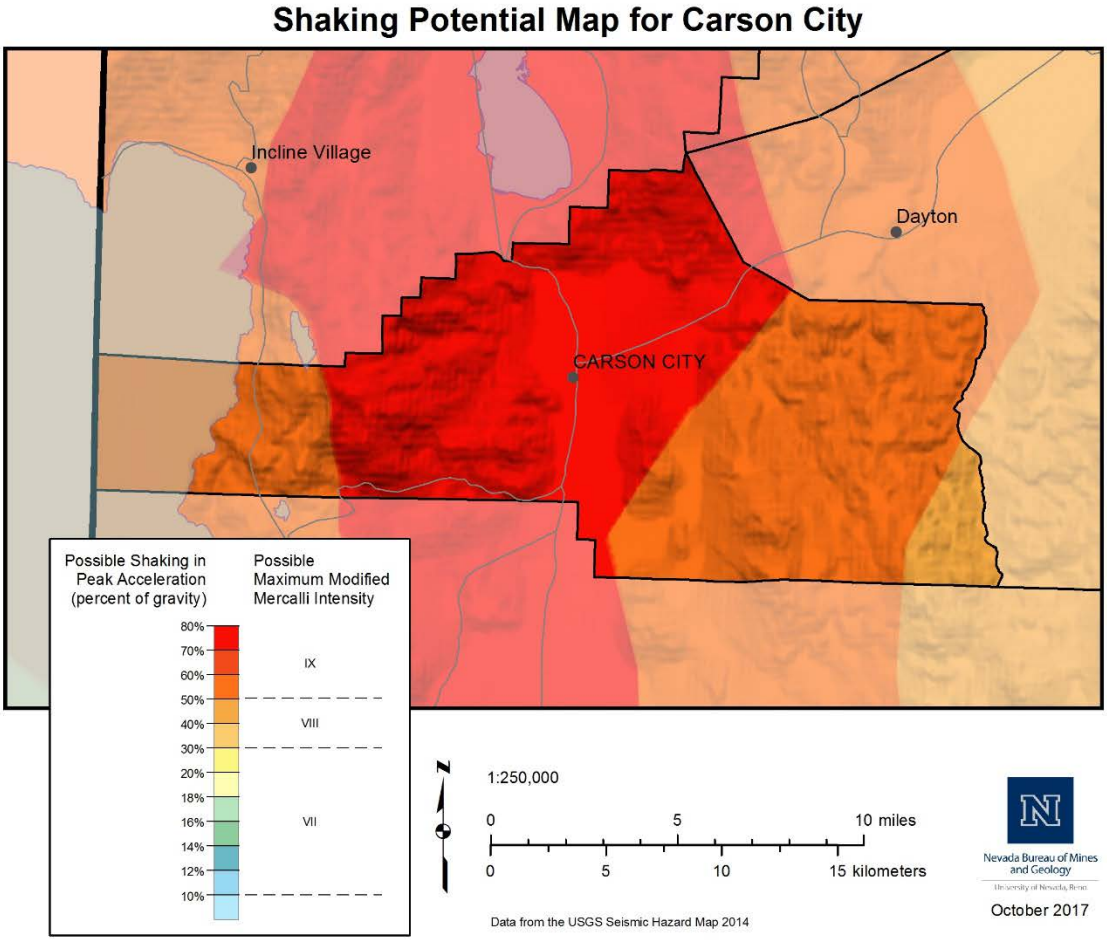


Figure F-2.

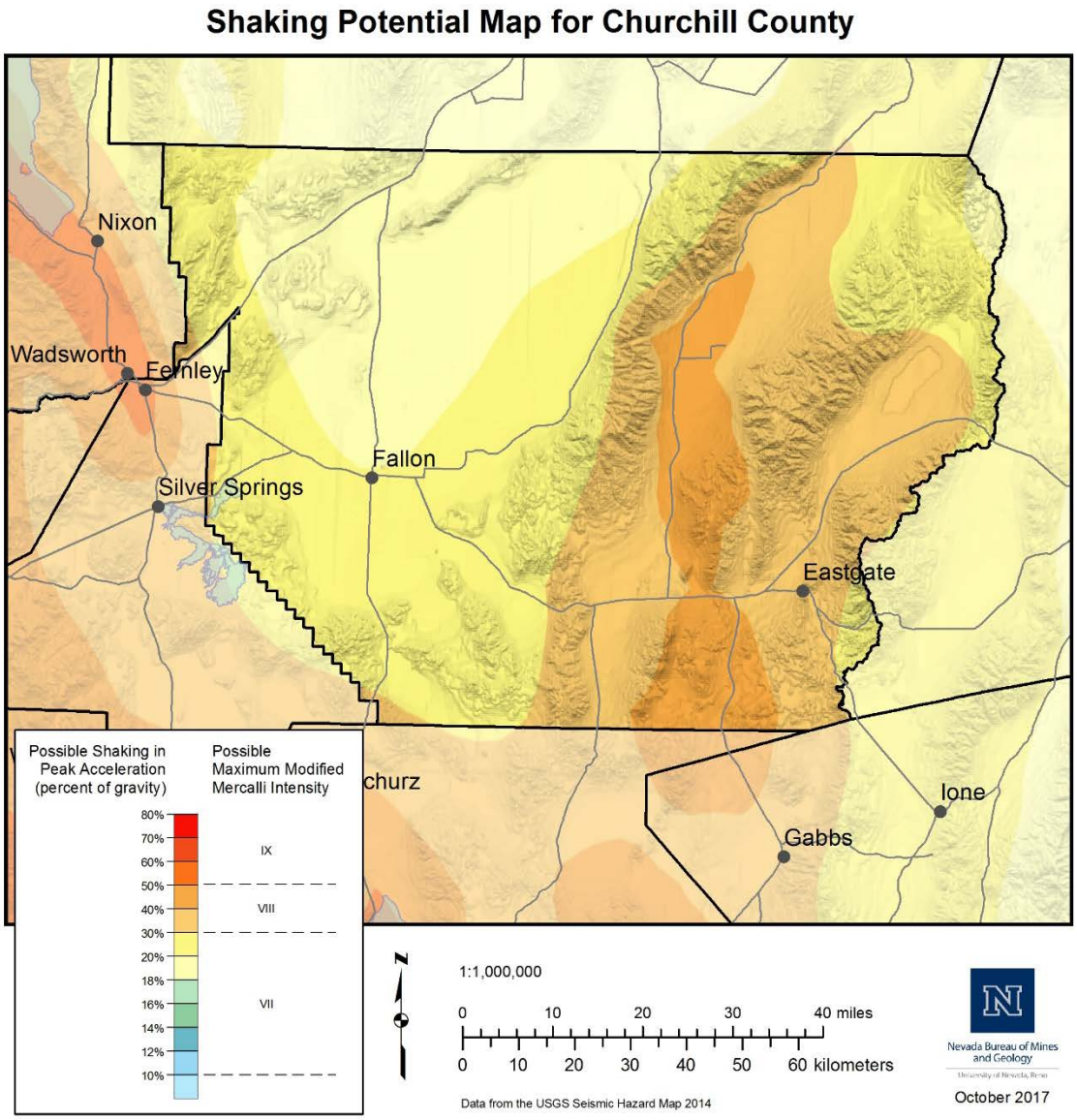

Shaking Potential Map for Churchill County
Nixon
Wadsworth
Fernley
Fallon
Silver Springs
Eastgate
churz
Ione
Gabbs
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,000,000
0 10 20 30 40 miles
0 10 20 30 40 50 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-3.

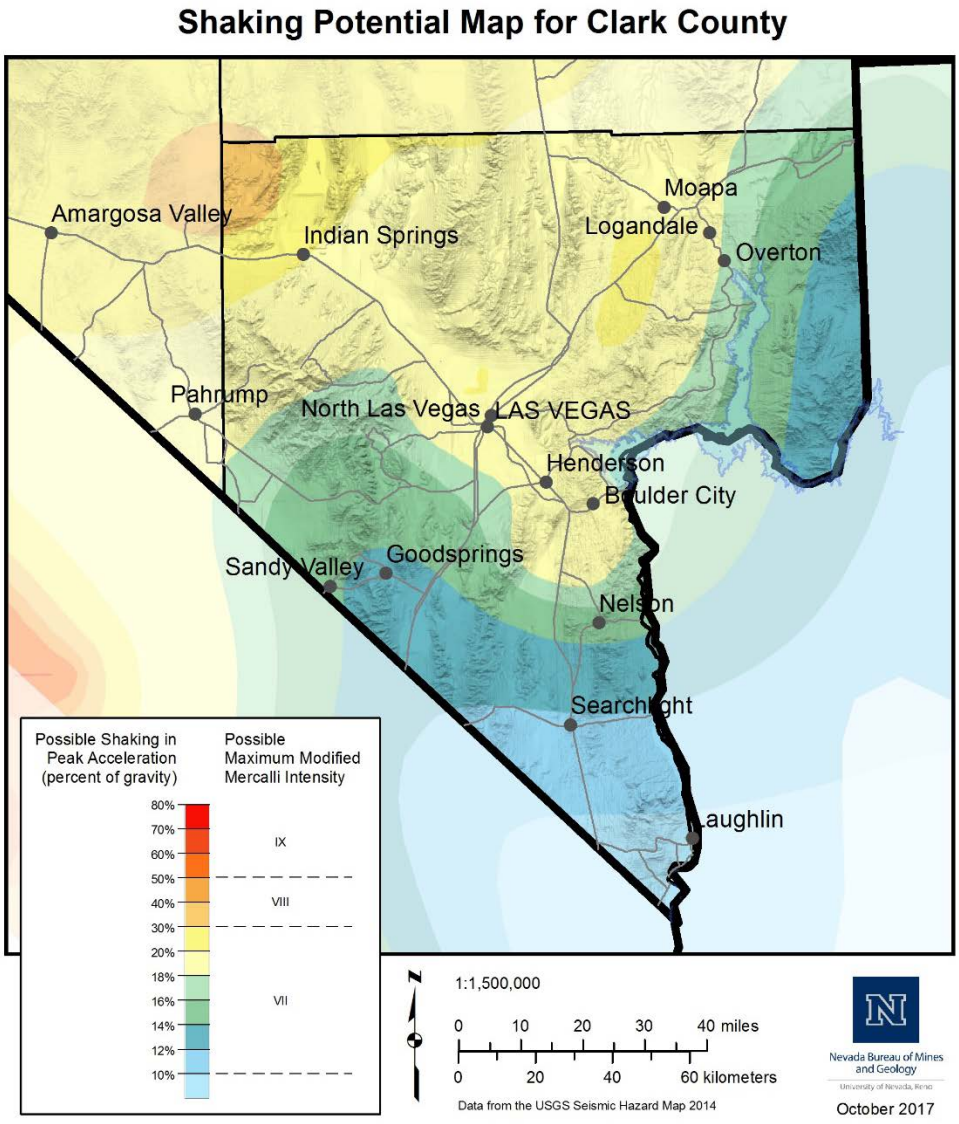

Shaking Potential Map for Clark County
Amargosa Valley
Indian Springs
Moapa
Logandale
Overton
Pahrump
North Las Vegas
LAS VEGAS
Henderson
Boulder City
Goodsprings
Sandy Valley
Nelson
Searchlight
Laughlin
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-4.

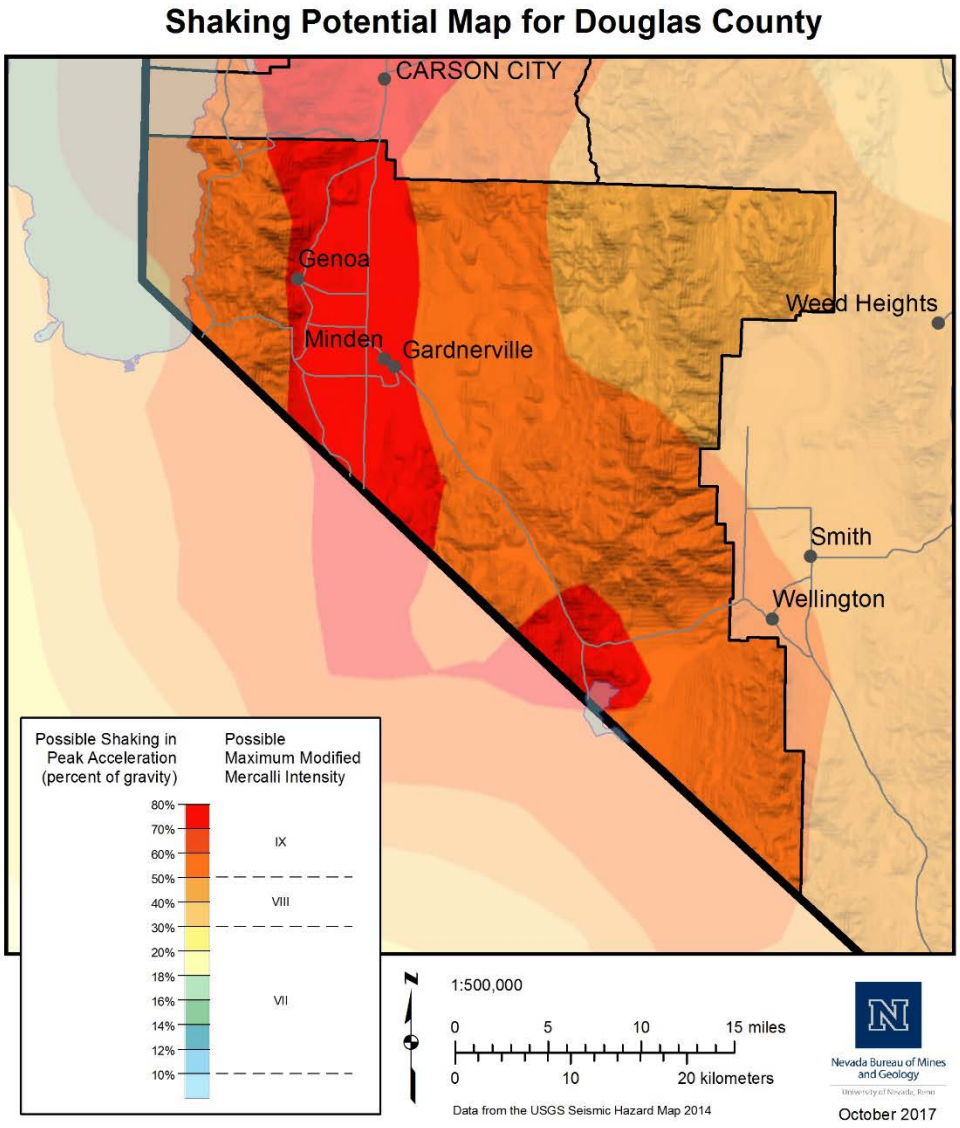

Shaking Potential Map for Douglas County
CARSON CITY
Genoa
Minden
Gardnerville
Weed Heights
Smith
Wellington
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:500,000
0 5 10 15 miles
0 10 20 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-5.

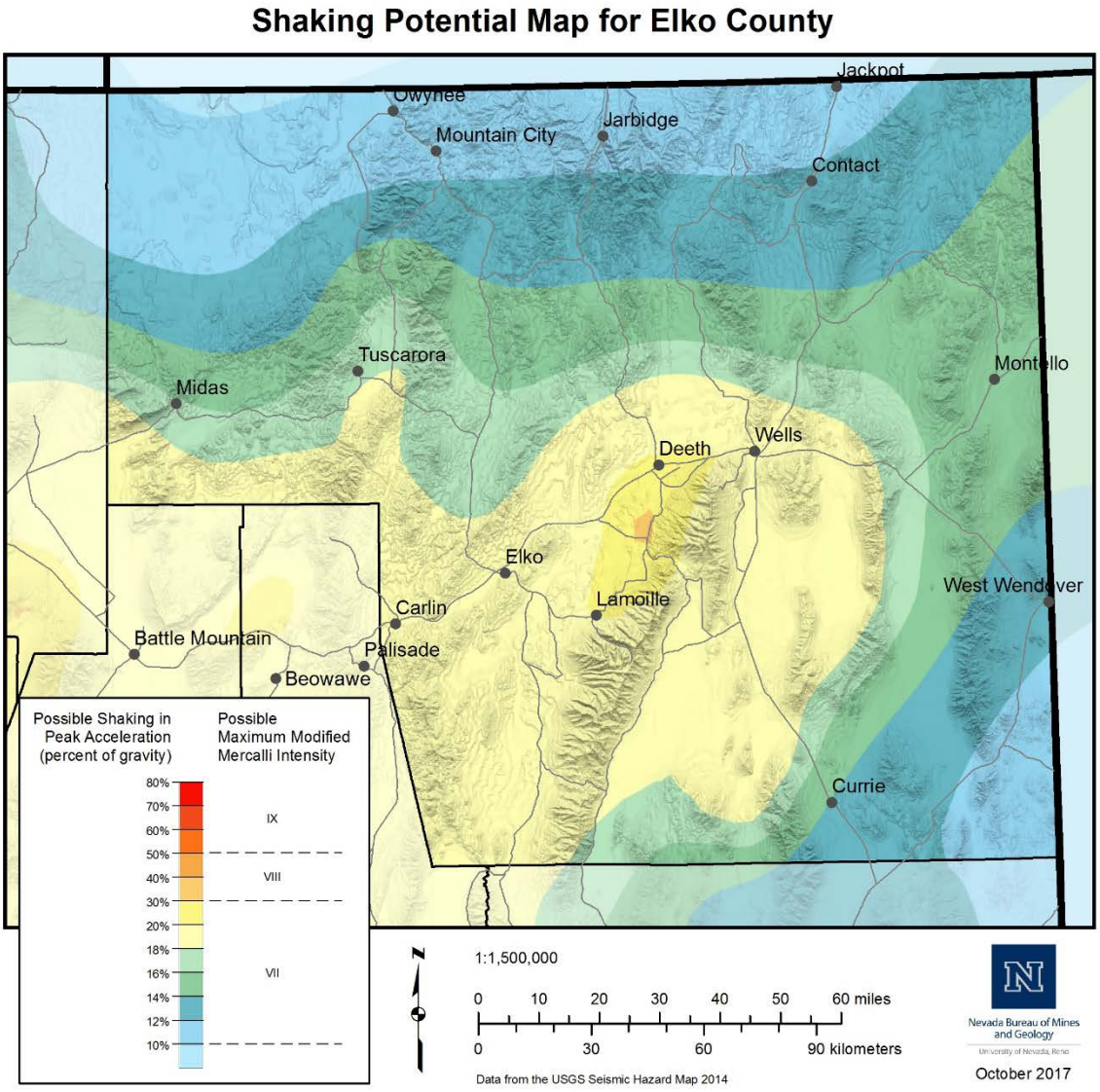

Shaking Potential Map for Elko County
Jackpot
Owyhee
Mountain City
Jarbidge
Contact
Tuscarora
Midas
Deeth
Wells
Elko
Carlin
Lamoille
Battle Mountain
Palisade
Beowawe
Currie
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
N
1:1,500,000
0 10 20 30 40 50 60 miles
0 30 60 90 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-6.

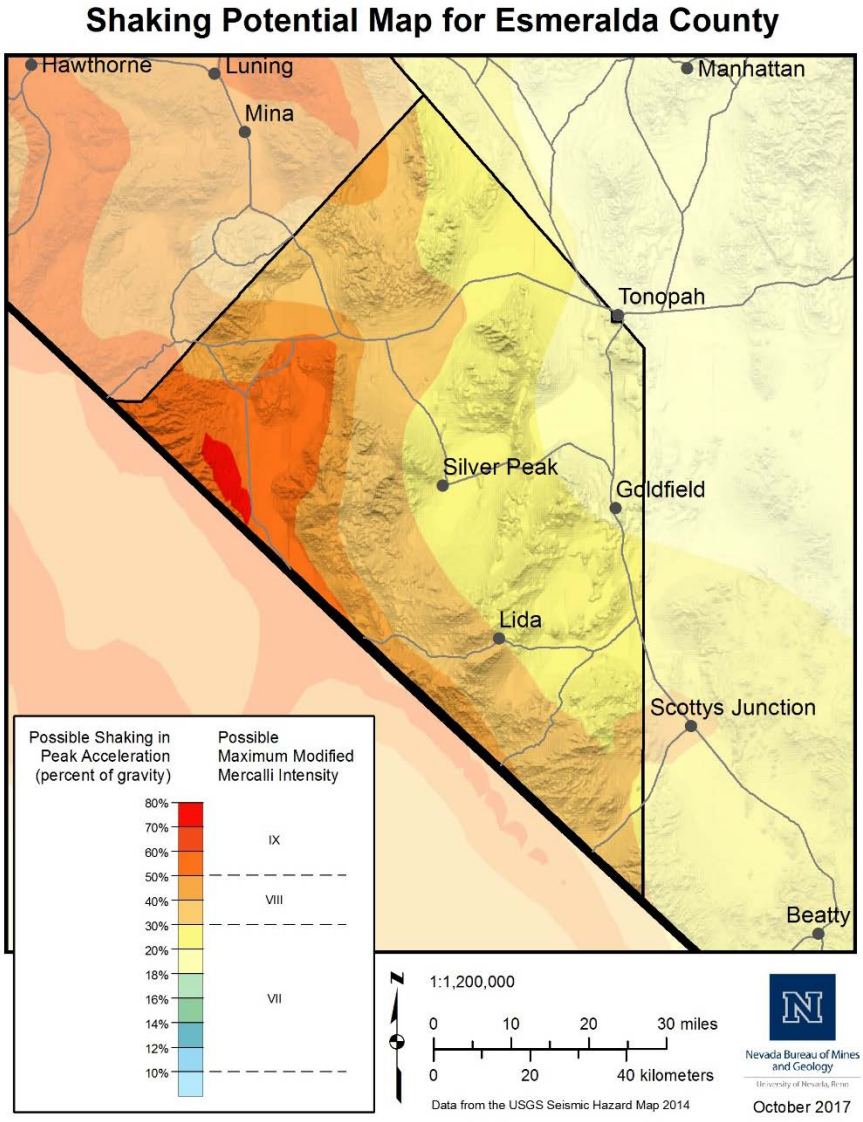

Shaking Potential Map for Esmeralda County
Hawthorne
Luning
Mina
Manhattan
Tonopah
Silver Peak
Goldfield
Lida
Scottys Junction
Beatty
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,200,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-7.

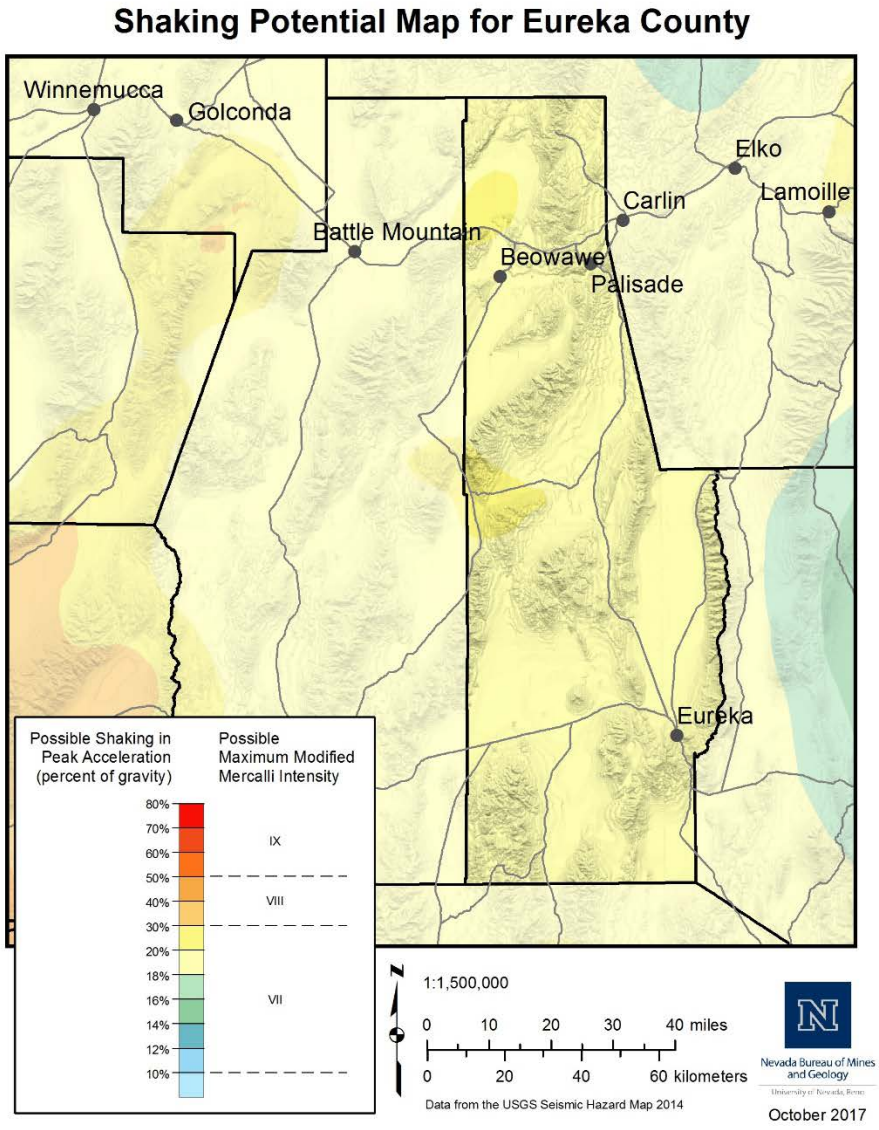

Shaking Potential Map for Eureka County
Winnemucca
Golconda
Battle Mountain
Elko
Lamoille
Carlin
Beowawe
Palisade
Eureka
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-8.

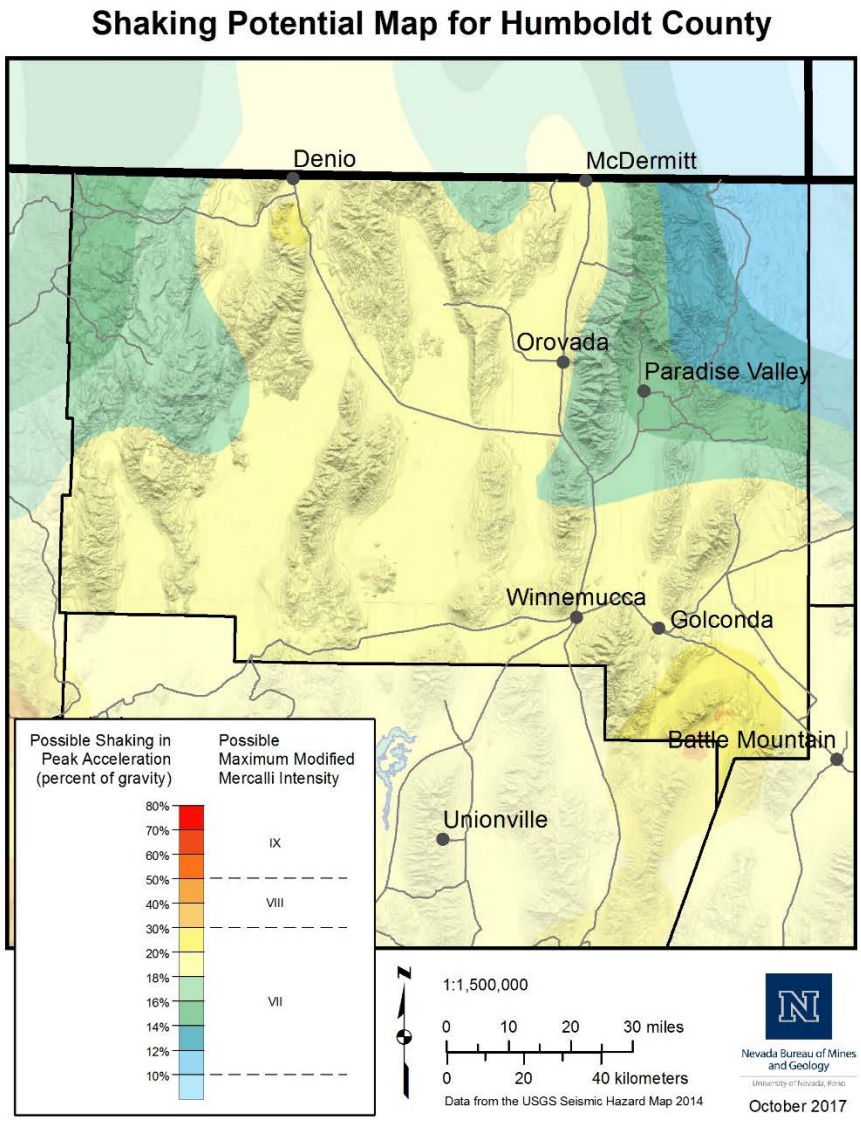

Shaking Potential Map for Humboldt County
Denio
McDermitt
Orovada
Paradise Valley
Winnemucca
Golconda
Battle Mountain
Unionville
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-9.

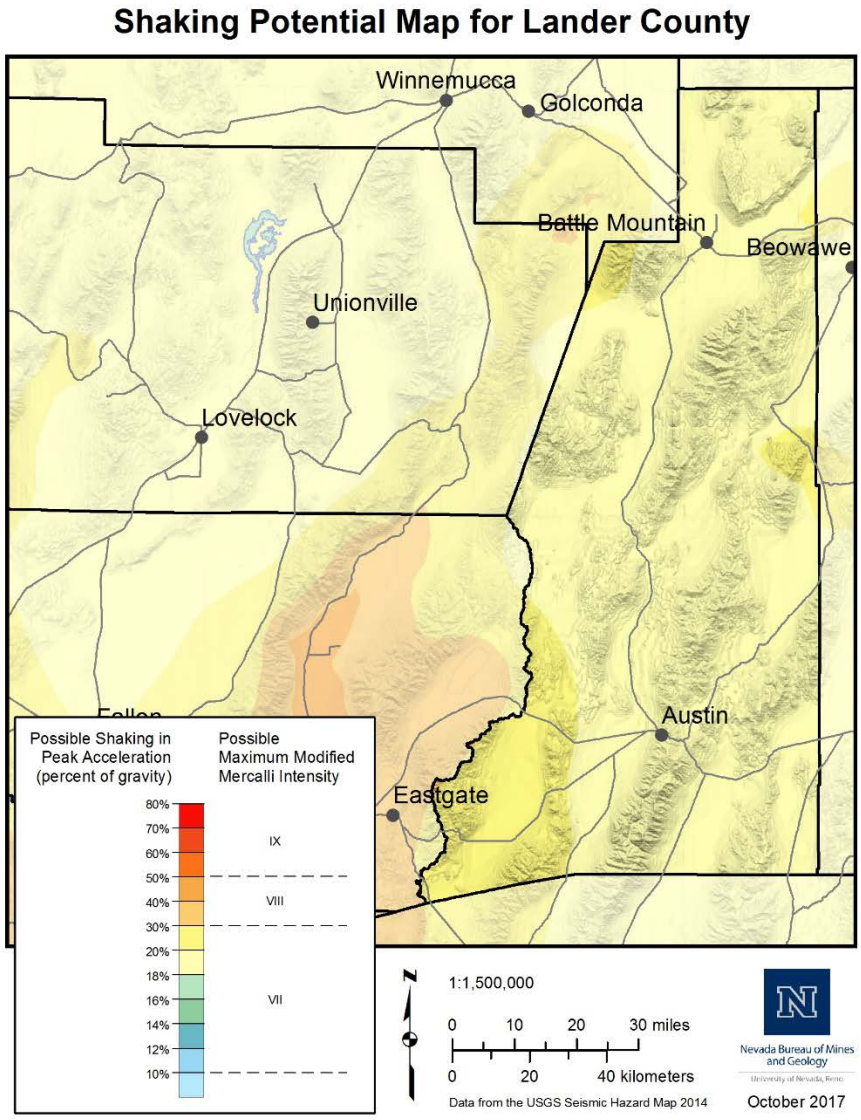

Shaking Potential Map for Lander County
Winnemucca
Golconda
Battle Mountain
Beowawe
Unionville
Lovelock
Austin
Eastgate
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-10.

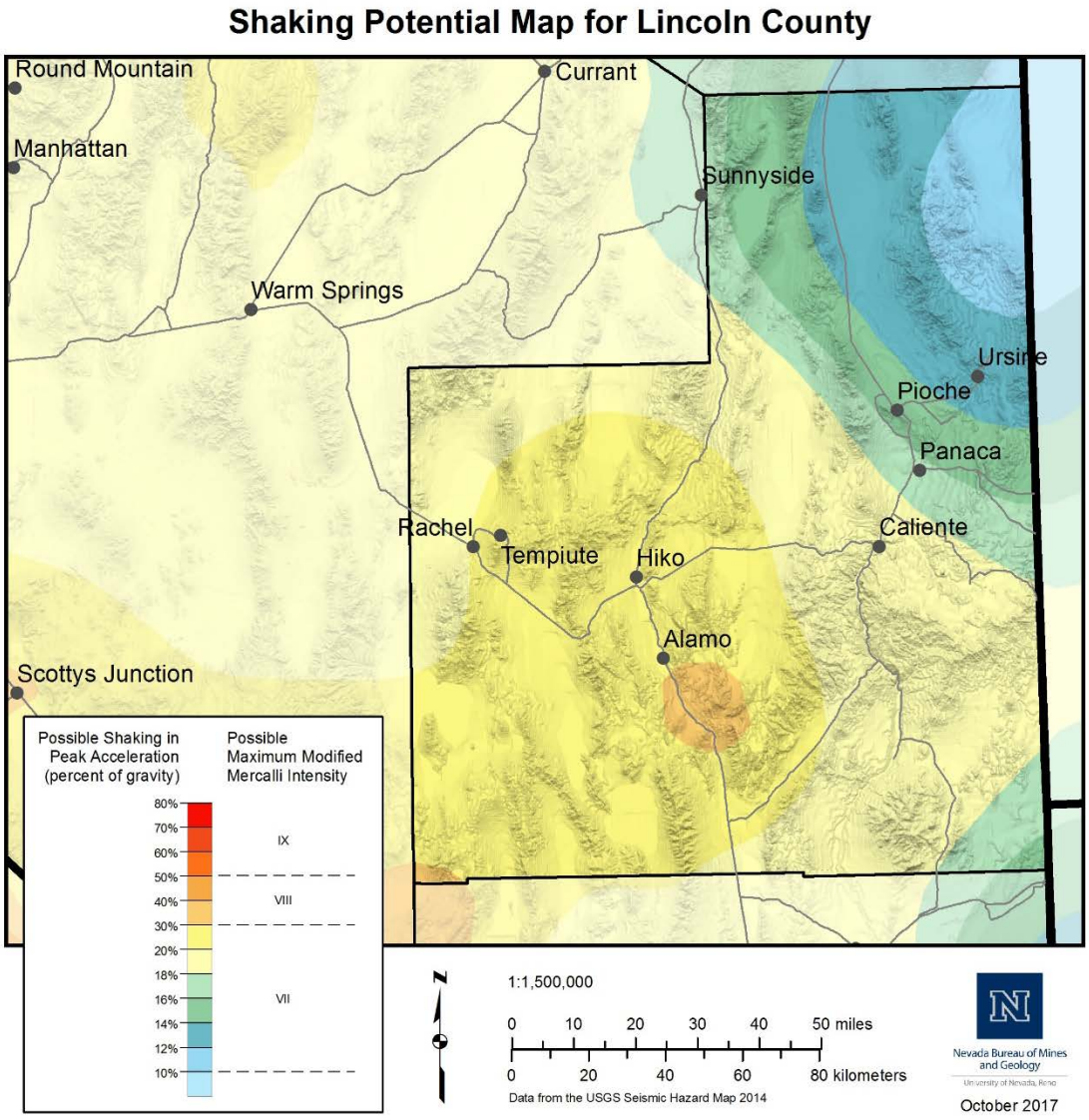

Shaking Potential Map for Lincoln County
Round Mountain
Currant
Manhattan
Sunnyside
Warm Springs
Ursine
Pioche
Panaca
Rachel
Tempiute
Hiko
Caliente
Alamo
Scottys Junction
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,500,000
0 10 20 30 40 50 miles
0 20 40 60 80 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-11.

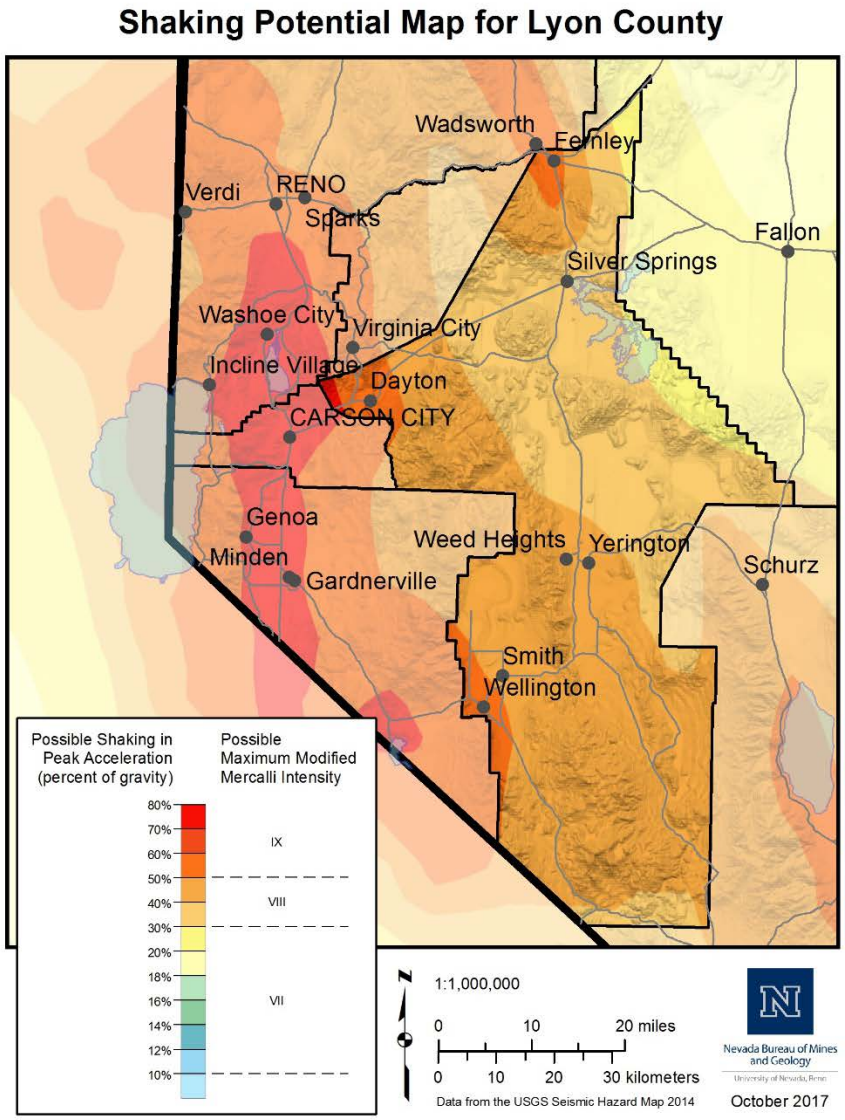

Shaking Potential Map for Lyon County
Wadsworth
Fernley
Verdi
RENO
Sparks
Fallon
Silver Springs
Washoe City
Virginia City
Incline Village
Dayton
CARSON CITY
Genoa
Minden
Gardnerville
Weed Heights
Yerington
Schurz
Smith
Wellington
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,000,000
0 10 20 miles
0 10 20 30 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-12.

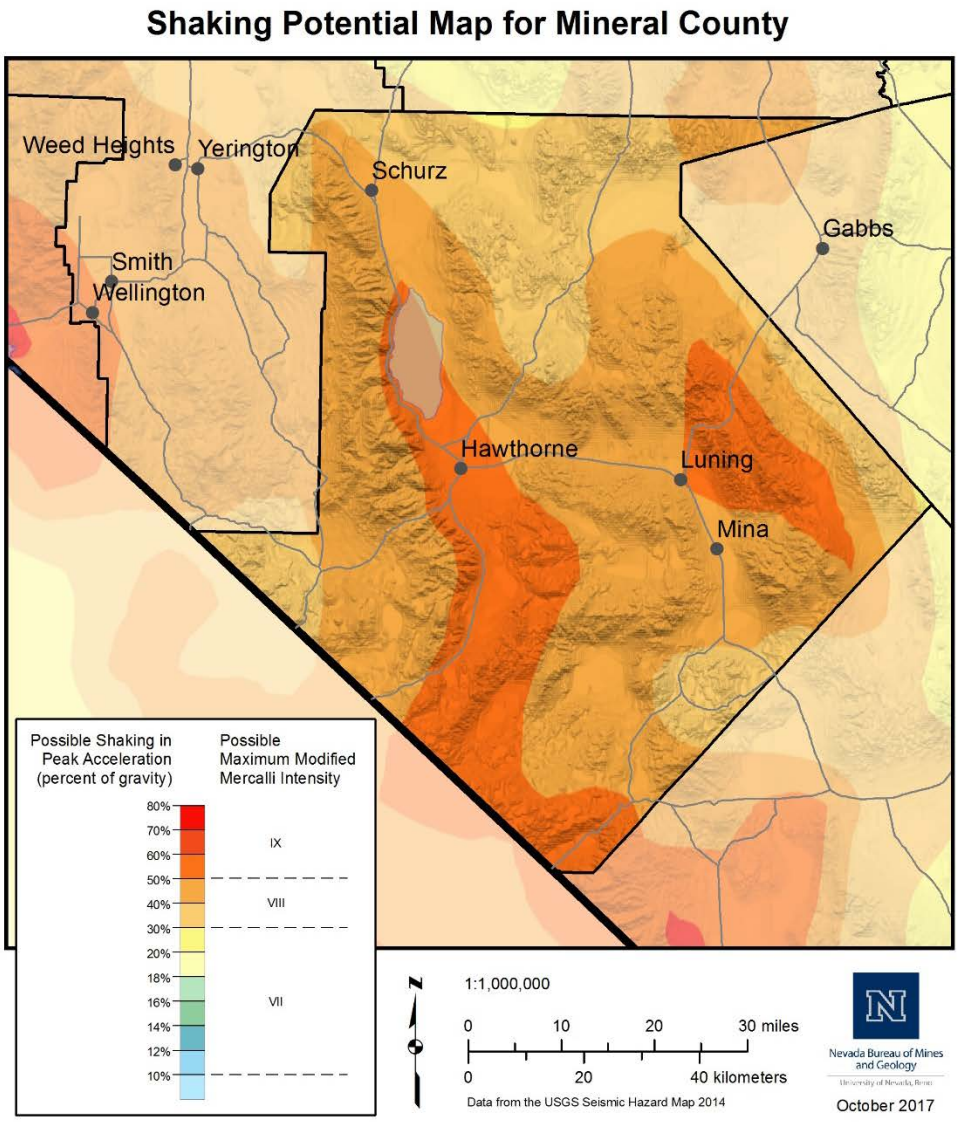

Shaking Potential Map for Mineral County
Weed Heights
Yerington
Schurz
Gabbs
Smith
Wellington
Hawthorne
Luning
Mina
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,000,000
0 10 20 30 miles
0 20 40 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-13.

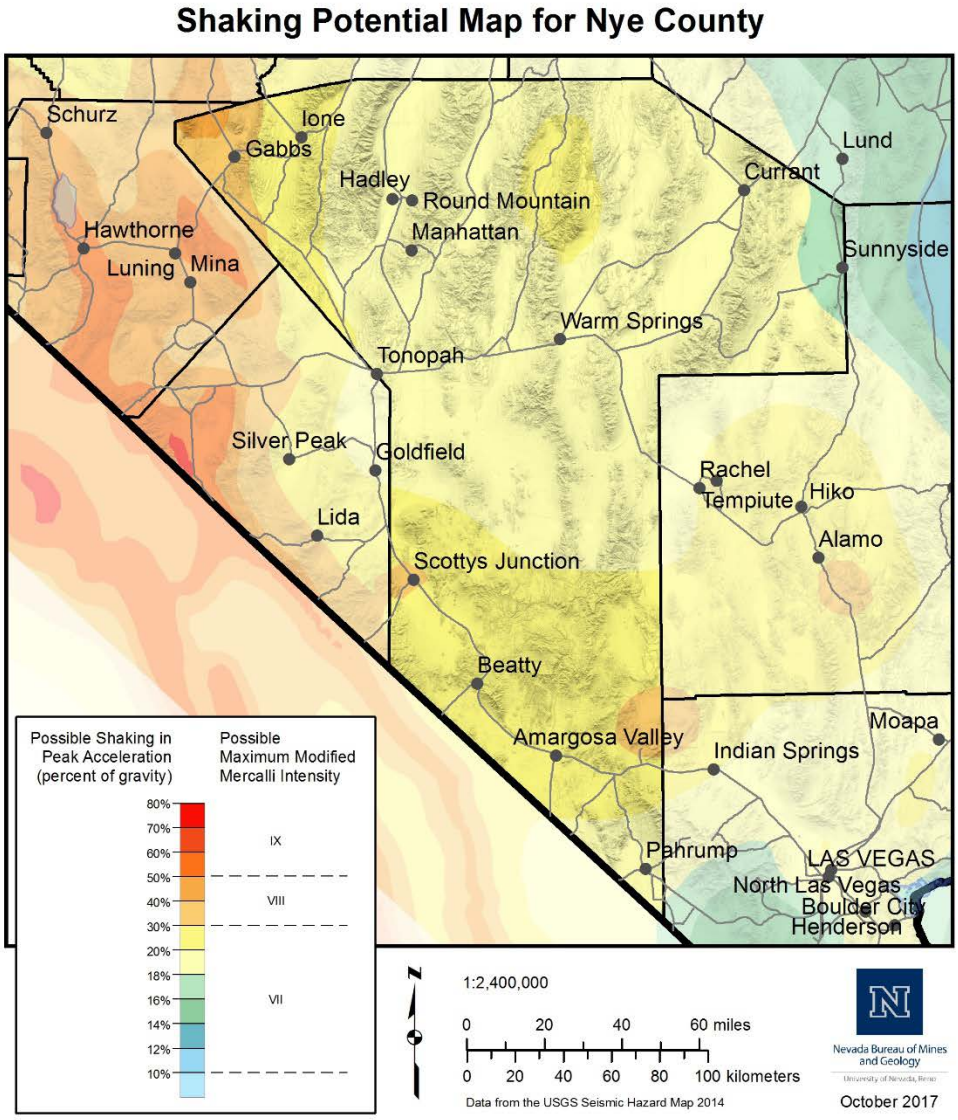

Shaking Potential Map for Nye County
Schurz
Ione
Gabbs
Hadley
Round Mountain
Manhattan
Hawthorne
Luning
Mina
Lund
Currant
Sunnyside
Warm Springs
Tonopah
Silver Peak
Goldfield
Rachel
Tempiute
Hiko
Alamo
Lida
Scottys Junction
Beatty
Amargosa Valley
Indian Springs
Moapa
Pahrump
LAS VEGAS
North Las Vegas
Boulder City
Henderson
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:2,400,000
0 20 40 60 miles
0 20 40 60 80 100 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Figure F-14.

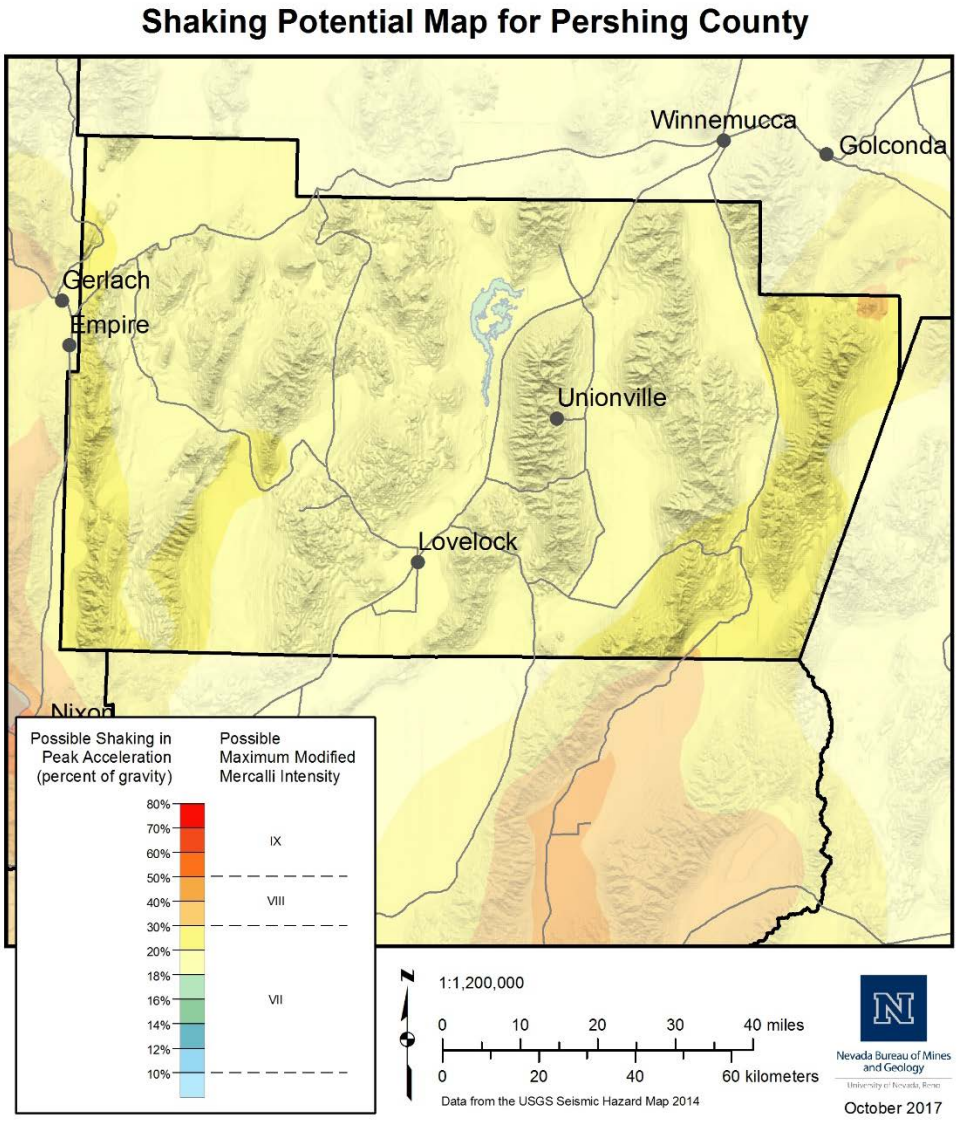

Shaking Potential Map for Pershing County
Winnemucca
Golconda
Gerlach
Empire
Unionville
Lovelock
Nixon
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,200,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-15.

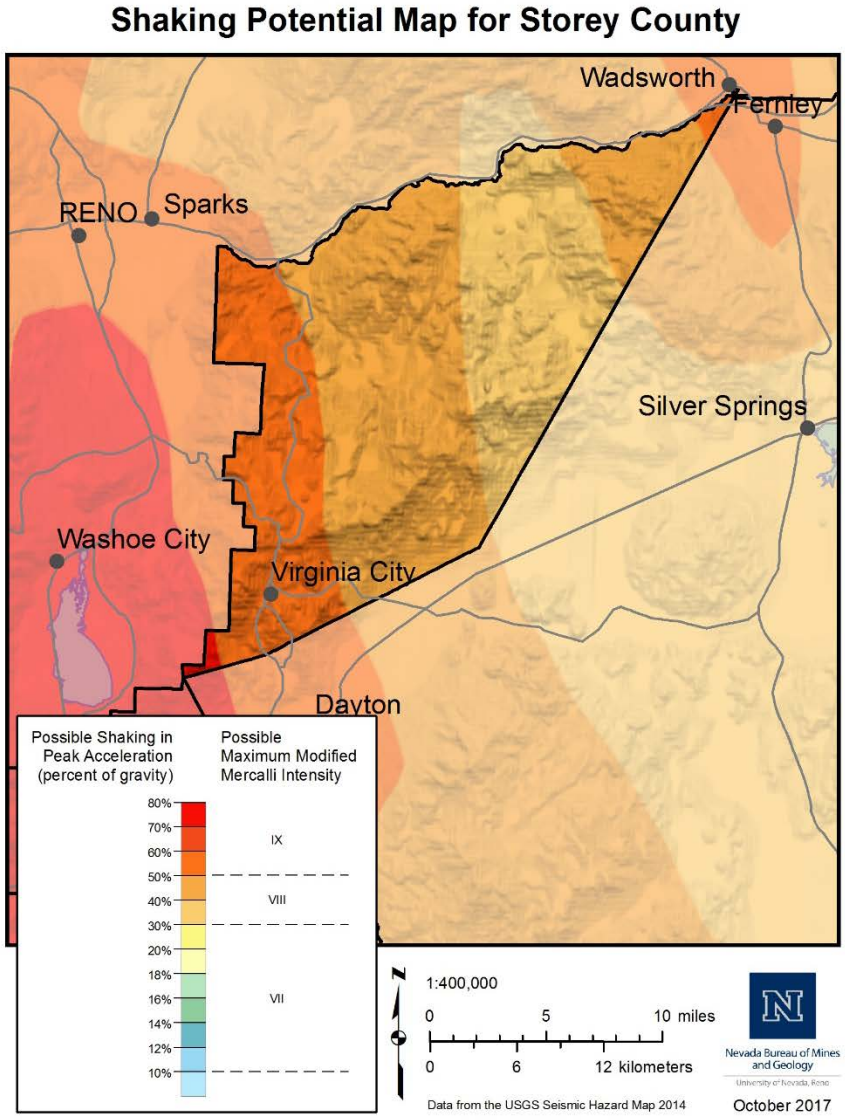

Shaking Potential Map for Storey County
Wadsworth
Fernley
RENO
Sparks
Silver Springs
Washoe City
Virginia City
Dayton
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:400,000
0 5 10 miles
0 6 12 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-16.

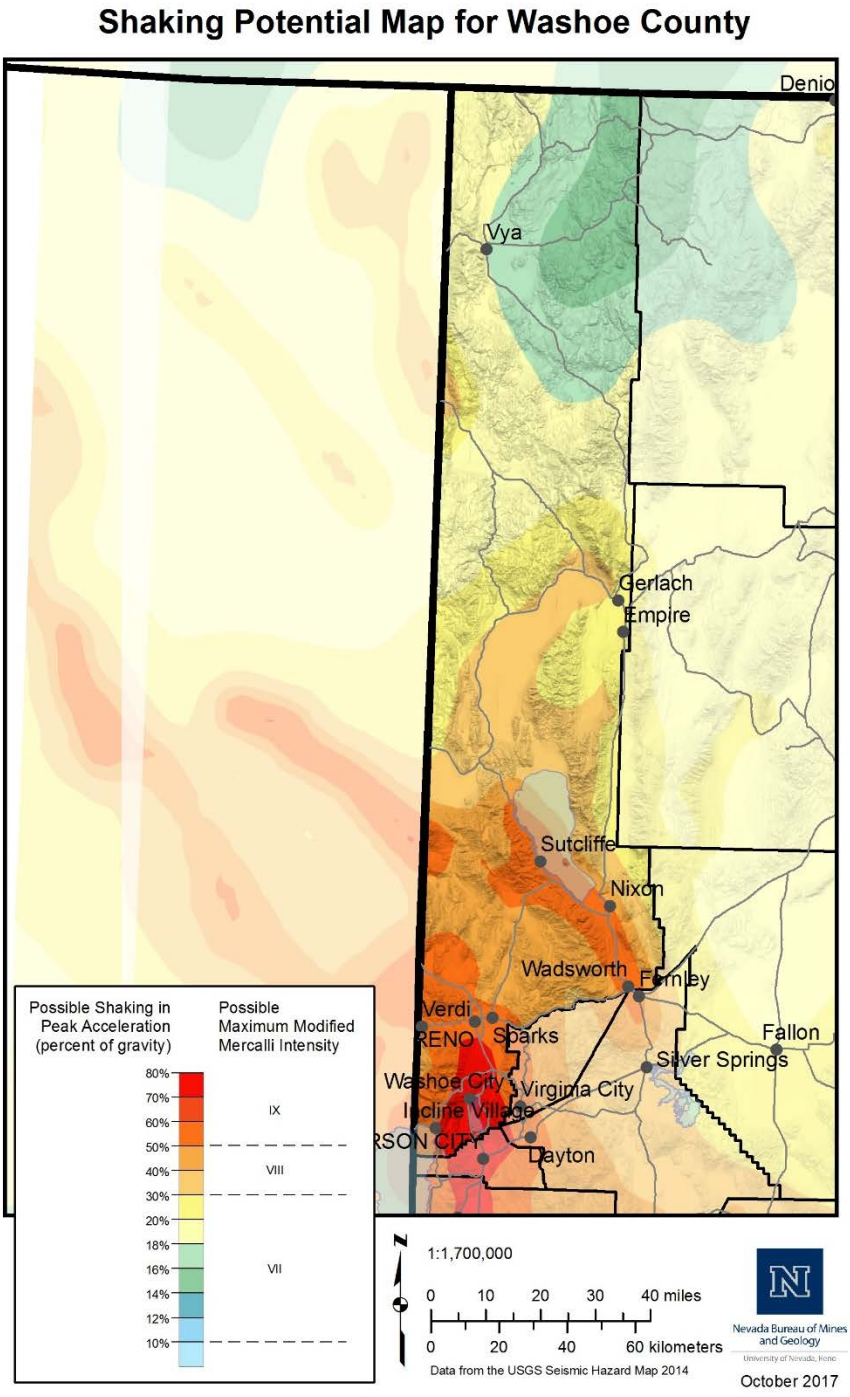
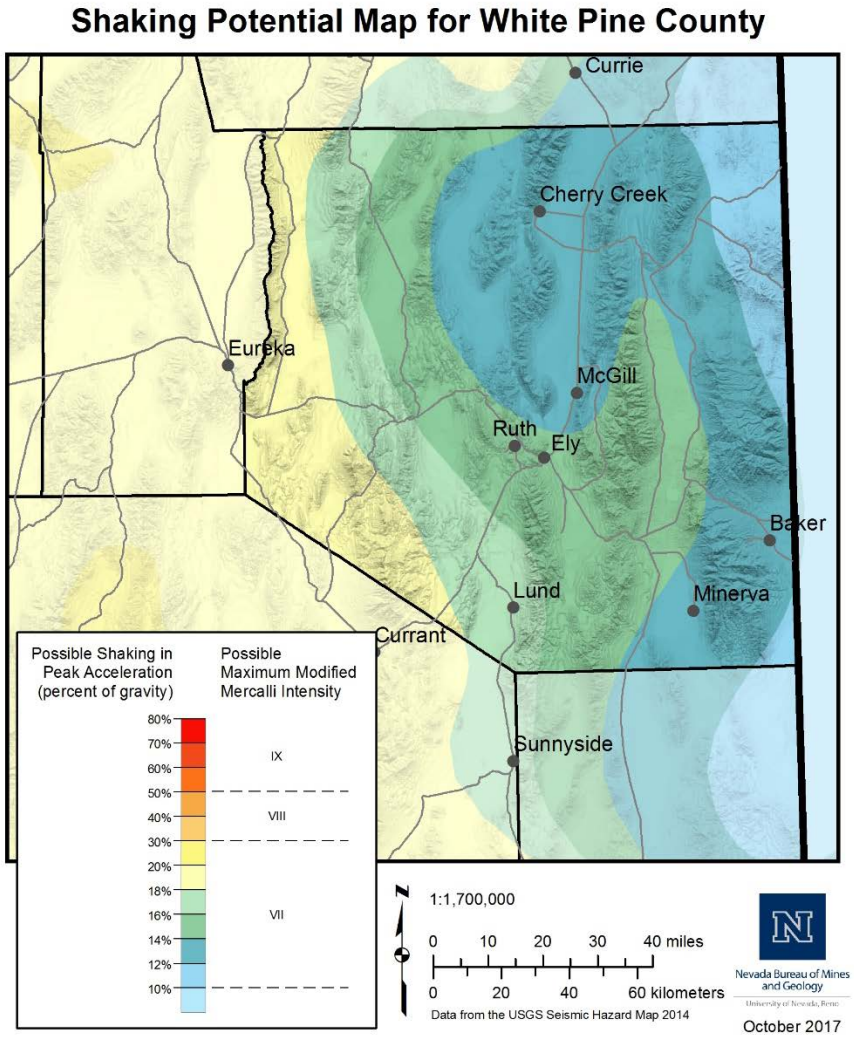

Shaking Potential Map for Washoe County
Denio
Vya
Gerlach
Empire
Sutcliffe
Nixon
Wadsworth
Fernley
Fallon
Silver Springs
Verdi
RENO
Sparks
Washoe City
Virginia City
Incline Village
Dayton
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,700,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure F-17.


Shaking Potential Map for White Pine County
Currie
Cherry Creek
Eureka
McGill
Ruth
Ely
Baker
Lund
Minerva
Currant
Sunnyside
Possible Shaking in Peak Acceleration (percent of gravity)
Possible Maximum Modified Mercalli Intensity
80%
70%
60%
50%
40%
30%
20%
18%
16%
14%
12%
10%
IX
VIII
VII
1:1,700,000
0 10 20 30 40 miles
0 20 40 60 kilometers
Data from the USGS Seismic Hazard Map 2014
Nevada Bureau of Mines and Geology
October 2017

Edits made to this section since the 2013 plan update include an updated dam list, summary of damns by county, and map showing the location and hazard level of each dam in Nevada.

Thank you to the Nevada Department of Conservation and Natural Resources, Division of Water Resources for providing the following data.
Summary table and map produced by the Nevada Bureau of Mines and Geology.

State law defines the hazard classification of dams as follows:

NAC 535.140—Hazard classifications. (NRS 532.120, 535.030, 535.040)

1. The State Engineer will assign a hazard classification to each dam.
2. The State Engineer will determine the immediate consequences to persons and property located downstream from the dam in the event of a failure of the dam. The State Engineer will classify a dam as:
    a. High hazard if failure of the dam carries a high probability of causing a loss of human life.
    b. Significant hazard if failure of the dam carries a:
        i. Reasonable probability of causing a loss of human life; or
        ii. High probability of causing extensive economic loss or disruption in a lifeline.
    c. Low hazard if failure of the dam carries a:
        i. Very low probability of causing a loss of human life; and
        ii. Reasonable probability of causing little, if any, economic loss or disruption in a lifeline.
3. If changes in the persons or property located downstream from a dam change the immediate consequences in the event of a failure of the dam, the State Engineer will change the hazard classification of the dam accordingly.
4. The hazard classification of a dam does not constitute a warranty in favor of anyone concerning the actual safety of the dam

Table G-1. List of Dams by County

NAME OF DAM	COUNTY	HAZARD RANKING
CARSON CITY GOLF COURSE DETENTION BASIN	CARSON CITY	S
CARSON CITY SOUTH STORAGE PONDS	CARSON CITY	L
CARSON CITY TREATED EFFLUENT DAM	CARSON CITY	H
CARSON CITY TREATMENT PLANT DRYING BEDS	CARSON CITY	L
RMGC LOWER WATER STORAGE POND	CARSON CITY	L
SHENANDOAH DETENTION BASIN	CARSON CITY	H
BENCH CREEK DAM	CHURCHILL	L
BENCH CREEK LOWER DAM	CHURCHILL	L
CARSON RIVER DIVERSION	CHURCHILL	S
HARMON RESERVOIR	CHURCHILL	L
HILLSIDE DAIRY LAGOON	CHURCHILL	L
LAHONTAN	CHURCHILL	H

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
OLD RIVER DAM	CHURCHILL	L
OLLIE'S POND	CHURCHILL	L
S LINE DAM	CHURCHILL	L
SAGOUSPIE DIVERSION DAM	CHURCHILL	L
SHECKLER DAM	CHURCHILL	S
STILLWATER GEOTHERMAL EVAP POND	CHURCHILL	L
STILLWATER POINT DAM	CHURCHILL	L
AARON WAY DETENTION BASIN	CLARK	H
ABBOTT WASH DETENTION BASIN	CLARK	H
ANGEL PARK NORTH DETENTION BASIN	CLARK	H
ANGEL PARK SOUTH DETENTION BASIN	CLARK	H
ANN ROAD DETENTION BASIN	CLARK	H
APEX LANDFILL STORM DAM MA-11	CLARK	L
APEX LANDFILL STORM DAM MA-9	CLARK	L
ARROW CANYON DAM	CLARK	S
BLACK MOUNTAIN DETENTION BASIN	CLARK	H
BLUE DIAMOND BUS. CTR. DET. BASIN #1	CLARK	H
BLUE DIAMOND UPPER DETENTION DAM	CLARK	H
BOOTLEG DETENTION BASIN	CLARK	H
BOULDER WASTEWATER STORAGE DAM	CLARK	L
BOWMAN DAM	CLARK	H
CAPD 8	CLARK	H
CAREY/LAKE MEAD DETENTION BASIN	CLARK	H
CHEYENNE PEAKING DETENTION BASIN	CLARK	H
CHUCK LENZIE NORTH EVAPORATION POND	CLARK	L
CHUCK LENZIE SOUTH EVAPORATION POND	CLARK	L
CLARK STATION EVAPORATION POND A	CLARK	L
CLARK STATION EVAPORATION POND B	CLARK	L
CLARK STATION EVAPORATION POND C	CLARK	L
CLARK STATION EVAPORATION POND D	CLARK	L
CLARK STATION EVAPORATION POND E	CLARK	L
CONFLUENCE DETENTION BASIN	CLARK	H
COYOTE SPRINGS DETENTION BASIN 1	CLARK	H
COYOTE SPRINGS DETENTION BASIN 1-2	CLARK	H
COYOTE SPRINGS DETENTION BASIN 2	CLARK	H
DESERT INN DETENTION BASIN	CLARK	H
DUCK CREEK INTERIM UPPER DETENTION BASIN	CLARK	H
DUCK CREEK LOWER DETENTION DAM	CLARK	H
DUCK CREEK RAILROAD DETENTION BASIN	CLARK	H
EAST C-1 DETENTION BASIN	CLARK	H

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
EQUESTRIAN DETENTION BASIN	CLARK	H
F-1 DETENTION BASIN	CLARK	H
F-2 DETENTION BASIN	CLARK	H
F-3 (SUMMERLIN V16A BLM DETENTION BASIN)	CLARK	H
F-4 DETENTION BASIN	CLARK	H
FLAMINGO WASH LOWER DETENTION BASIN	CLARK	L
FLAMINGO WASH UPPER DETENTION BASIN	CLARK	H
FLOYD LAMB PARK SOUTH ENHANCEMENT EMBANKMENT	CLARK	L
FORT APACHE DETENTION BASIN	CLARK	H
GOWAN DETENTION MIDDLE	CLARK	H
GOWAN DETENTION NORTH	CLARK	H
GOWAN DETENTION SOUTH	CLARK	H
GW-1 POND	CLARK	H
HARRY ALLEN NORTH EVAP POND	CLARK	L
HARRY ALLEN SOUTH EVAP POND	CLARK	L
HEMENWAY VALLEY FLOOD CONTROL DAMS (2)	CLARK	H
HIGGINS EVAPORATION POND	CLARK	S
HIKO SPRINGS DETENTION BASIN DAM	CLARK	H
HONEYBEE DAM	CLARK	S
HOOVER	CLARK	H
INDIAN SPRINGS DETENTION BASIN	CLARK	H
KYLE CANYON DETENTION	CLARK	H
LAKE LAS VEGAS	CLARK	S
LAS VEGAS WASH LOWER DETENTION BASIN	CLARK	H
LAS VEGAS WASH UPPER DETENTION BASIN	CLARK	H
LEE CANYON RESERVOIR	CLARK	S
LONE MOUNTAIN DETENTION BASIN	CLARK	H
LONE MOUNTAIN-BELTWAY DETENTION BASIN DAM	CLARK	H
LOWER BLUE DIAMOND DETENTION DAM	CLARK	H
MCCARRAN AIRFIELD DETENTION DAM	CLARK	H
MCCULLOUGH HILLS PARK DETENTION BASIN	CLARK	H
MEADOWS DETENTION BASIN	CLARK	H
MILL 1 POND A	CLARK	L
MILL 1 POND B	CLARK	L
MILL 2 POND C	CLARK	S
MILL 2 POND E	CLARK	S
MISSION HILLS DETENTION BASIN	CLARK	H
MOHAVE GEN STA DAM	CLARK	L
NORTH LAS VEGAS DETENTION BASIN	CLARK	H

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
NORTH RAILROAD DETENTION BASIN	CLARK	H
NORTHEAST C-1 DETENTION BASIN	CLARK	H
OAKEY DETENTION	CLARK	H
ORCHARD DETENTION BASIN	CLARK	H
PABCO TAILINGS POND #13	CLARK	L
PABCO TAILINGS POND 10	CLARK	L
PABCO TAILINGS POND 11	CLARK	L
PABCO TAILINGS POND 2	CLARK	L
PABCO TAILINGS POND 3	CLARK	L
PABCO TAILINGS POND 4	CLARK	L
PABCO TAILINGS POND 5	CLARK	L
PABCO TAILINGS POND 6	CLARK	L
PABCO TAILINGS POND 7	CLARK	L
PABCO TAILINGS POND 8	CLARK	L
PABCO TAILINGS POND 9	CLARK	L
PABCO TAILS POND 12	CLARK	L
PIONEER DETENTION BASIN	CLARK	H
PITTMAN ANTHEM DETENTION BASIN	CLARK	H
PITTMAN EAST DETENTION BASIN	CLARK	H
PITTMAN HORIZON RIDGE DETENTION BASIN	CLARK	H
PITTMAN NORTH DETENTION BASIN	CLARK	H
PITTMAN PARK DETENTION BASIN	CLARK	H
POND GW-11	CLARK	L
PULSIPHER WASH DETENTION BASIN	CLARK	H
R-4 DETENTION DAM	CLARK	H
RAINBOW DETENTION BASIN	CLARK	S
RANCHO DETENTION BASIN	CLARK	H
RED ROCK DETENTION	CLARK	H
RGS BLOWDOWN POND	CLARK	L
RGS MESA EVAPORATION POND M5	CLARK	S
RGS MESA EVAPORATION POND M7	CLARK	S
RGS POND B1	CLARK	L
RGS POND B2	CLARK	L
RGS POND B3	CLARK	L
RGS POND C1	CLARK	L
RGS POND C2	CLARK	L
RGS POND E1	CLARK	L
RGS POND E2	CLARK	L
RGS POND F	CLARK	L
RGS POND G	CLARK	L
RGS UNIT 4 RAW WATER POND	CLARK	S

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
RGS UNITS 1-3 RAW WATER POND A	CLARK	S
RGS UNITS 1-3 RAW WATER POND B	CLARK	S
RIVER MOUNTAINS IMPOUNDMENT DAM	CLARK	H
SIMPLOT SILICA TAILINGS RAISE	CLARK	L
SIMPLOT TAILINGS	CLARK	L
SKYE CANYON DETENTION BASIN 1	CLARK	H
SOUTH EDGE EAST 1 HEADWORKS DETENTION BASIN	CLARK	H
SPRING MOUNTAIN RANCH	CLARK	H
SUMMERLIN DETENTION BASIN #5	CLARK	H
SUNRISE MOUNTAIN LANDFILL DETENTION BASIN	CLARK	L
THE LAKES DETENTION BASIN	CLARK	L
TOWN WASH DAM	CLARK	H
TRONOX WASTEWATER HOLDING POND EAST	CLARK	L
TRONOX WASTEWATER HOLDING POND WEST	CLARK	L
TROPICANA DETENTION BASIN	CLARK	H
TROPICANA NORTH BRANCH DETENTION BASIN	CLARK	H
VAN BUSKIRK CHANNEL DETENTION BASIN - SITE A	CLARK	L
WEST RANGE WASH DIVERSION DIKE	CLARK	S
WINDMILL WASH DETENTION BASIN	CLARK	H
ALLERMAN #1 DAM	DOUGLAS	H
AMBROSETTI POND	DOUGLAS	L
BENTLY RESERVOIR	DOUGLAS	H
BOURNE RESERVOIR DAM	DOUGLAS	H
BUCKEYE CREEK LOWER EFFLUENT STORAGE POND	DOUGLAS	H
BUCKEYE CREEK MIDDLE EFFLUENT STORAGE POND	DOUGLAS	H
BUCKEYE CREEK UPPER EFFLUENT STORAGE POND	DOUGLAS	H
BUCKSKIN TAILINGS	DOUGLAS	L
EAST PEAK LAKE	DOUGLAS	H
FRIDAYS STATION DAM	DOUGLAS	S
INDIAN HILLS EFFLUENT POND #5	DOUGLAS	S
INDIAN HILLS EFFLUENT POND #6	DOUGLAS	S
LIPPINCOTT SKI DAM	DOUGLAS	L
LIPPINCOTT SKI DAM II	DOUGLAS	L
MINDEN-GARDNERVILLE SANITATION DISTRICT	DOUGLAS	S
MUD LAKE	DOUGLAS	H
NORTH CARSON VALLEY TREATED EFFLUENT STORAGE DAM	DOUGLAS	S
ROUNDHILL EFFLUENT	DOUGLAS	H

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
SIERRA SPRINGS	DOUGLAS	S
SONORA BUCKSKIN TAILS	DOUGLAS	L
SPOONER LAKE DAM	DOUGLAS	S
TOPAZ LAKE	DOUGLAS	H
WETLANDS ENHANCEMENT CELL 1 2	DOUGLAS	L
WETLANDS ENHANCEMENT CELL 2	DOUGLAS	L
WETLANDS ENHANCEMENT CELL 3 4 5	DOUGLAS	L
WETLANDS ENHANCEMENT CELL 6	DOUGLAS	L
WETLANDS ENHANCEMENT CELL 7	DOUGLAS	L
WETLANDS ENHANCEMENT CELL 8	DOUGLAS	L
WETLANDS ENHANCEMENT EXISTING	DOUGLAS	L
ANGEL LAKE DAM	ELKO	S
ARTURO EAST PIT STORMWATER POND	ELKO	L
BILLY SHAW DAM	ELKO	L
BISHOP CREEK DAM	ELKO	H
BISHOP CREEK DAM	ELKO	H
BOIES RESERVOIR	ELKO	L
BOYD RESERVOIR	ELKO	L
BULL RUN DAM	ELKO	L
BURNS CREEK LOWER SILTATION DAM	ELKO	L
CARLIN WW EAST RIB	ELKO	L
CARLIN WW STORAGE POND	ELKO	L
CARLIN WW WEST RIB	ELKO	L
CARLIN WWTP TREATMENT LAGOON CELL 1	ELKO	L
CARLIN WWTP TREATMENT LAGOON CELL2	ELKO	L
CHARLESTON RESERVOIR	ELKO	L
CHIMNEY CREEK DAM	ELKO	L
CIRCLE DAM	ELKO	L
COW CREEK	ELKO	L
COYOTE HOLE DAM	ELKO	L
CRITTENDEN DAM	ELKO	L
DAKE RESERVOIR	ELKO	S
DEEP CREEK DAM	ELKO	L
DINNER STATION DAM	ELKO	S
DORSEY CREEK DAM	ELKO	L
DRY CREEK DAM	ELKO	L
EGBERT DAM	ELKO	L
EIGHT MILE CREEK DAM	ELKO	H
ELKO EFFLUENT NORTH STORAGE POND	ELKO	H
ELKO EFFLUENT SOUTH STORAGE POND	ELKO	H
ELKO EMERGENCY EFFLUENT STORAGE	ELKO	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
ELKO NORTH WASTE WATER PONDS	ELKO	L
ELKO PERCOLATION POND 1A	ELKO	L
ELKO PERCOLATION POND 1B	ELKO	L
ELKO PERCOLATION POND 2A	ELKO	L
ELKO PERCOLATION POND 2B	ELKO	L
ELKO PERCOLATION POND 3A	ELKO	L
ELKO PERCOLATION POND 3B	ELKO	L
ELKO PERCOLATION POND 4A	ELKO	L
ELKO PERCOLATION POND 4B	ELKO	L
ELKO SOUTH WASTE WATER POND	ELKO	L
EMIGRANT PROCESS PONDS DAM	ELKO	L
FIFTH STREET WASH DAM	ELKO	H
GIBBS RANCH DAM	ELKO	H
GROUNDHOG RES	ELKO	L
HEADGATE DAM	ELKO	L
INDEPENDENCE COOLING POND	ELKO	L
INDEPENDENCE NORTH DRAINAGE RETENTION DAM	ELKO	L
INDEPENDENCE OVERFLOW CATCHMENT DAM	ELKO	L
INDEPENDENCE SOUTH DRAINAGE RETENTION DAM	ELKO	L
JACKPOT LAGOON 1	ELKO	L
JACKPOT LAGOON 2	ELKO	L
JACKPOT LAGOON 3	ELKO	L
JACKPOT LAGOON 4	ELKO	L
JACKPOT LAGOON 5	ELKO	L
JACKPOT LAGOON 6	ELKO	L
JAYNES RESERVOIR	ELKO	L
JERRITT CANYON EVAPORATION POND	ELKO	L
JERRITT CANYON TAILINGS DAM	ELKO	S
JERRITT CANYON TSF 2	ELKO	L
JERRITT CANYON WATER STORAGE RESERVOIR	ELKO	L
JOHN DAY RESERVOIR	ELKO	L
JOSEPHINE RES	ELKO	L
LAMOILLE ROAD DETENTION DAM	ELKO	H
LONG CANYON PROCESS POND	ELKO	L
MAGGIE CREEK DAM	ELKO	H
MIDAS TAILINGS STORAGE FACILITY PH IV	ELKO	S
MIDAS TAILINGS STORAGE FACILITY PH V	ELKO	S
MILL #3 TAILINGS DAM	ELKO	S
NV NO NAME 1	ELKO	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
NV NO NAME 2	ELKO	L
PX RANCH RESERVOIR	ELKO	L
RAWHIDE DAM	ELKO	L
REED RESERVOIR DAM	ELKO	L
ROUND MOUNTAIN RESERVOIR	ELKO	L
RUBY LAKE EAST SUMP CROSS DIKE	ELKO	L
SALMON FALLS FISH	ELKO	L
SHEEP CREEK DAM	ELKO	L
SOUTH FORK	ELKO	H
SOUTH SIDE WASH	ELKO	H
SPENCER DAM	ELKO	L
SPRING CREEK DAM #1	ELKO	H
SUNFLOWER RESERVOIR	ELKO	S
TCR SPRING CREEK DAM	ELKO	L
WELCOME DAM	ELKO	L
WELLS WASTEWATER	ELKO	L
WILD HORSE DAM	ELKO	H
WILLOW CREEK DAM	ELKO	L
WILSON RESERVOIR	ELKO	L
WRF EFFLUENT REUSE RIB 8A	ELKO	L
WRF EFFLUENT REUSE RIB 8B	ELKO	L
WRF EFFLUENT REUSE RIB 8C	ELKO	L
ZUNINO RESERVOIR	ELKO	H
B AND B MINE DAM	ESMERALDA	L
BASALT PROJECT TAILINGS IMPOUNDMENT	ESMERALDA	L
CHIATOVICH CREEK DAM	ESMERALDA	L
FISH LAKE DAM	ESMERALDA	L
LOWER PERRY AIKEN CREEK DAM	ESMERALDA	L
MCAFEE CREEK DAM	ESMERALDA	L
MINERAL RIDGE FRESH WATER POND	ESMERALDA	L
ROCKWOOD LITHIUM SOUTH EVAP POND	ESMERALDA	L
A-A TAILS DAM	EUREKA	S
BARRICK GOLDSTRIKE TSF 3 DAM	EUREKA	S
BARRICK ROASTER POND	EUREKA	S
CARLIN GOLD TAILINGS DAM	EUREKA	L
EISENMAN TAILS #2	EUREKA	L
EUREKA MOLY STORM POND 1	EUREKA	S
EUREKA MOLY THICKENER EOP	EUREKA	S
EUREKA SEWAGE TREATMENT POND #1	EUREKA	L
EUREKA SEWAGE TREATMENT POND #2	EUREKA	L
EUREKA SEWAGE TREATMENT POND #5	EUREKA	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
EUREKA SEWAGE TREATMENT POND #6	EUREKA	L
FRENCHIE CREEK DAM	EUREKA	S
GOLD BAR PROCESS AND EVENT POND	EUREKA	L
GOLD QUARRY WATER TREATMENT PONDS	EUREKA	L
JAMES CREEK DIVERSION DAM	EUREKA	H
JD RESERVOIR	EUREKA	L
LOWER TONKIN RESERVOIR	EUREKA	L
MILL #4 TAILINGS DAM #1	EUREKA	S
MILL #4 TAILINGS DAM #2	EUREKA	S
MILL #5/#6 TAILINGS DAM	EUREKA	S
MILL #5/#6 WEST TAILS STORAGE FACILITY	EUREKA	L
MOUNT HOPE PHASE I STORM WATER DAM	EUREKA	L
MOUNT HOPE SECONDARY STORMWATER POND	EUREKA	L
MOUNT HOPE SOUTH TAILINGS STORAGE FACILITY	EUREKA	L
MOUNT HOPE STF UNDERDRAIN COLLECTION POND	EUREKA	L
NEWMONT MILL 5/6 TSF EAST	EUREKA	S
NEWMONT NORTH AREA LEACHATE PONDS	EUREKA	L
NEWMONT SOUTH AREA SOLUTION POND	EUREKA	L
NORTH AREA LEACH STORMWATER POND	EUREKA	S
NORTH AREA LEACHATE POND ADDITION	EUREKA	L
NORTH BLOCK TAILINGS IMPOUNDMENT	EUREKA	S
PALISADES 1	EUREKA	L
PALISADES 2	EUREKA	L
PALISADES 3	EUREKA	L
PALISADES 4	EUREKA	L
PALISADES 5	EUREKA	L
PALISADES 6	EUREKA	L
PETE WASTE ROCK DISPOSAL OVERFLOW POND	EUREKA	L
ROBERTS CREEK DAM	EUREKA	L
ROTP SPILL HOLDING POND	EUREKA	S
ROTP STORMWATER HOLDING POND	EUREKA	L
SAND DUNE EMBANKMENT - CENTER	EUREKA	L
SAND DUNE EMBANKMENT - NORTH	EUREKA	L
SAND DUNE EMBANKMENT - SOUTH	EUREKA	L
SOUTH LEACH NON-PROPERTY PONDS	EUREKA	L
SOUTH LEACH NON-PROPERTY PONDS #2	EUREKA	L
SOUTH LEACH PROPERTY PONDS	EUREKA	L
SOUTH LEACH PROPERTY STORMWATER POND	EUREKA	L
TONKIN RESERVOIR DAM	EUREKA	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
TONKIN SPRINGS TAILINGS	EUREKA	L
T-S RANCH DAM	EUREKA	S
TS RANCH POWER PLANT EVAP PONDS	EUREKA	L
ALDER CREEK RANCH DAM	HUMBOLDT	L
ALKALI RESERVOIR	HUMBOLDT	S
BIG SPRING RESERVIOR	HUMBOLDT	L
BILK CREEK RESERVOIR	HUMBOLDT	L
BOG HOT RESERVOIR	HUMBOLDT	S
BRIMSTONE LEACH AND EVENT PONDS	HUMBOLDT	S
CHIMNEY DAM	HUMBOLDT	S
CROFOOT LEACHATE PONDS	HUMBOLDT	L
DEER CREEK DAM	HUMBOLDT	L
DUFURRENA #12 DAM	HUMBOLDT	L
DUFURRENA POND #13	HUMBOLDT	S
DUFURRENA POND 19	HUMBOLDT	L
DUFURRENA POND 20	HUMBOLDT	L
DUFURRENA ROAD POND DAM	HUMBOLDT	L
FIVE MILE RESERVOIR	HUMBOLDT	L
GETCHELL MINE TAILINGS DAM	HUMBOLDT	L
HYCROFT NORTH LEACH AND EVENT PONDS	HUMBOLDT	L
HYCROFT SOUTH TAILS	HUMBOLDT	S
JACKSON DAM	HUMBOLDT	L
JUNIPER TAILINGS DAM	HUMBOLDT	S
KNOTT CREEK RES	HUMBOLDT	S
LITTLE ONION DAM	HUMBOLDT	S
LONE TREE SECTION 23 TAILS	HUMBOLDT	S
MARIGOLD TROUT CREEK DAM	HUMBOLDT	L
MUD MEADOWS DAM	HUMBOLDT	L
NEWMONT TRENTON CANYON OVERFLOW POND	HUMBOLDT	L
ONION DAM	HUMBOLDT	S
RABBIT CREEK SOLUTION	HUMBOLDT	L
REDHOUSE TAILINGS DAM	HUMBOLDT	L
ROCK SPRINGS TABLE	HUMBOLDT	L
SAGEBRUSH CREEK DAM	HUMBOLDT	S
SECTION 22 MIDAS TAILINGS STORAGE FACILITY	HUMBOLDT	L
SOLDIER MEADOW DAM	HUMBOLDT	H
STALL DAM	HUMBOLDT	L
THOUSAND CREEK	HUMBOLDT	L
TWIN CREEKS DISTRIBUTION POND	HUMBOLDT	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
VALMY EVAPORATION POND A	HUMBOLDT	L
VALMY EVAPORATION POND B	HUMBOLDT	L
VALMY EVAPORATION POND C	HUMBOLDT	L
VALMY EVAPORATION POND D	HUMBOLDT	L
VALMY EVAPORATION POND E	HUMBOLDT	L
VALMY EVAPORATION POND F	HUMBOLDT	L
WARM SPRINGS RESERVOIR	HUMBOLDT	L
WINNEMUCCA EFFLUENT DISPOSAL DIKE	HUMBOLDT	L
WINNEMUCCA LAGOON #1	HUMBOLDT	L
WINNEMUCCA LAGOON #10	HUMBOLDT	L
WINNEMUCCA LAGOON #2	HUMBOLDT	L
WINNEMUCCA LAGOON #3	HUMBOLDT	L
WINNEMUCCA LAGOON #4	HUMBOLDT	L
WINNEMUCCA LAGOON #5	HUMBOLDT	L
WINNEMUCCA LAGOON #6	HUMBOLDT	L
WINNEMUCCA LAGOON #7	HUMBOLDT	L
WINNEMUCCA LAGOON #8	HUMBOLDT	L
WINNEMUCCA LAGOON #9	HUMBOLDT	L
ARGENTA TAILINGS DAM	LANDER	S
AUSTIN EFFLUENT PONDS	LANDER	L
AUSTIN WASTEWATER TREATMENT POND 2	LANDER	L
BATTLE MOUNTAIN EMERGENCY EFFLUENT CELL 1	LANDER	L
BATTLE MOUNTAIN EMERGENCY EFFLUENT CELL 2	LANDER	L
BATTLE MOUNTAIN WASTEWATER TREATMENT PONDS	LANDER	L
BMG MINE WILLOW CREEK DAM	LANDER	S
CALLAGHAN CREEK DAM	LANDER	S
CARICO LAKE DAM	LANDER	L
COASTAL CHEMICAL EVAPORATION POND	LANDER	L
CORTEZ AREA 28 TSF CELL 4 DAM	LANDER	L
CORTEZ AREA 28 TSF DAM	LANDER	L
CORTEZ HILLS FRESH WATER RESERVOIR	LANDER	L
CORTEZ HILLS PROCESS POND	LANDER	L
CORTEZ HILLS STORM POND	LANDER	L
CORTEZ HILLS STORMWATER RETENTION POND #1	LANDER	L
CORTEZ HILLS STORMWATER RETENTION POND #2	LANDER	L
CORTEZ TAILS DAM #7	LANDER	L
CORTEZ WATER STORAGE DAM	LANDER	L
ELDER CREEK SOLUTION PONDS	LANDER	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
FILIPPINI RANCH DAM	LANDER	S
GREYSTONE TAILS	LANDER	L
IMCO TAILINGS DAM	LANDER	L
IOWA CREEK DAM	LANDER	S
IZZENHOOD DAM	LANDER	S
KINGSTON CANYON DAM	LANDER	H
MCCOY/COVE TAILINGS STORAGE FACILITY	LANDER	L
NELSON DAM	LANDER	L
OLD HAY RANCH RESERVOIR DAM	LANDER	L
PHOENIX TAILINGS DAM	LANDER	L
PIPELINE PROJECT EMERGENCY STORM POND	LANDER	L
REONA HEAP EXPANSION EVENT POND	LANDER	L
REONA LEACH EVENT POND	LANDER	L
SMITH CREEK DAM	LANDER	H
UPPER SLAVEN DAM	LANDER	L
CALIENTE WASTEWATER TREATMENT LAGOONS	LINCOLN	L
CASELTON LAST	LINCOLN	L
CASELTON MILL MIDDLE DAM	LINCOLN	L
CASELTON NO 4	LINCOLN	L
CASELTON NO 5	LINCOLN	L
CASELTON NO 8	LINCOLN	L
CASELTON NO 9	LINCOLN	L
CASELTON NO 10	LINCOLN	L
EAGLE VALLEY RES	LINCOLN	H
ECHO CANYON DAM LINCOLN	LINCOLN	H
HOLLINGER DEBRIS	LINCOLN	L
MATHEWS CANYON	LINCOLN	H
PAHRANAGAT UPPER CROSS DIKE	LINCOLN	L
PAHRANAGAT UPPER DAM	LINCOLN	L
PINE CANYON DAM	LINCOLN	H
ALKALI FLAT DAM	LYON	L
ELDORADO CANYON DAM	LYON	H
FERNLEY POND DAM #1	LYON	L
FERNLEY POND DAM #2	LYON	L
FERNLEY POND DAM #3	LYON	L
FORT CHURCHILL EVAPORATION POND #3	LYON	L
FORT CHURCHILL POWER PLANT COOLING POND	LYON	S
MASON VALLEY REFUGE NORTH POND	LYON	S
NUTI AND SON RESERVOIR	LYON	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
NUTI STORAGE DAM	LYON	L
PERRIN DAM	LYON	L
ROLLING A WWTP SLUDGE POND	LYON	L
SHEEP CAMP DETENTION DAM	LYON	H
STANLEY RANCH DAM	LYON	L
SUMMER SPREADER DIKE	LYON	L
YERINGTON BB	LYON	L
YERINGTON MILL	LYON	S
YERINGTON NO 2	LYON	S
YERINGTON WEIR	LYON	L
BLACK BEAUTY RESERVOIR	MINERAL	H
CAT CREEK DAM	MINERAL	H
ESMERALDA MINE TSF 2	MINERAL	L
ESMERALDA PROJECT TAILS	MINERAL	L
PAMLICO WASH DAM	MINERAL	L
RATTLESNAKE RESERVOIR DAM	MINERAL	S
RAWHIDE NW PREGNANT POND	MINERAL	L
RAWHIDE PHASE IV SOLUTION PONDS	MINERAL	L
RAWHIDE SOLUTION PONDS	MINERAL	L
ROSE CREEK RESERVOIR	MINERAL	S
SCHURZ LAGOONS	MINERAL	L
WEBER DAM	MINERAL	H
ANGLEWORM RANCH	NYE	S
ANGLEWORM WEST DAM	NYE	L
BULLFROG EVAP POND	NYE	L
COLD SPRINGS	NYE	L
CRYSTAL MARSH LOWER DAM	NYE	L
CRYSTAL MARSH UPPER DAM	NYE	L
CRYSTAL SPRINGS DAM	NYE	L
DACEY DAM	NYE	L
ECHO CANYON DAM NYE	NYE	L
EQUATORIAL TONOPAH PHASE I LEACH EVENT POND	NYE	L
HAY MEADOW DAM	NYE	L
IMVITE RES	NYE	L
LAKE NO 4	NYE	L
LAKE NO 6	NYE	L
MANZONIE DAM	NYE	L
OLD PLACE DIKE #3	NYE	L
PARADISE PEAK TAILS	NYE	L
REWARD EVENT POND	NYE	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
RMG CELL B TSF	NYE	L
RMG GOLDHILL EVENT POND	NYE	L
RMG GOLDHILL PROCESS POND	NYE	L
RMG GRAVITY PLANT SEDIMENT DECANT POND	NYE	L
RMG LOWER STORAGE POND	NYE	L
RMG SOUTH 48 HOUR EVENT POND	NYE	L
RMG SOUTH DEDICATED EVENT POND 5	NYE	L
RMG SOUTH LEACH PAD EVENT POND 4	NYE	L
RMG SOUTH PROCESS POND	NYE	L
RMG SOUTH PROCESS POND #2	NYE	L
RMG SOUTH STORM EVENT POND #1	NYE	L
RMG SOUTH STORM EVENT POND #2	NYE	L
RMG SOUTH STORM EVENT POND #3	NYE	L
RMG UPPER FIRE POND	NYE	L
RMG WEST DED EVENT POND	NYE	L
RMG WEST DEDICATED LEACH EVENT POND	NYE	L
RMG WEST DEDICATED PAD PHASE II PROCESS POND	NYE	L
RMG WEST DEDICATED PAD PHASE II STORM POND	NYE	L
RMG WEST DEDICATED PAD PROCESS POND	NYE	L
RMG WEST DEDICATED PAD STORM POND	NYE	L
RMG WEST STORM POND #3	NYE	L
RMG WEST TAILINGS DAM	NYE	S
RMG WEST TAILS STORM POND	NYE	L
RMGC North Dedicated Plant Ponds	NYE	L
RMGC NORTH RIB	NYE	L
RMGC SOUTH RIB	NYE	L
SEGURA DAM	NYE	L
SEYLER RESERVOIR	NYE	L
SIERRA TAILS	NYE	L
SUNNYSIDE DAM	NYE	L
TENNECO MILL POND	NYE	L
TULE FIELD DAM	NYE	L
WHIPPLE RESERVOIR	NYE	L
BIG FIVE DAM	PERSHING	L
BUSHEE CREEK DAM	PERSHING	L
COEUR ROCHESTER STAGE III CONTINGENCY POND DAM	PERSHING	L
COEUR ROCHESTER STAGE V HLP CONTINGENCY POND	PERSHING	L
FLORIDA CANYON EXPANSION POND	PERSHING	L

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
FLORIDA CANYON SEDIMENT POND 9	PERSHING	L
FLORIDA CANYON UTILITY POND #1	PERSHING	L
HUMBOLDT MODULAR MILL LOWER TSF	PERSHING	L
HUMBOLDT MODULAR MILL UPPER TSF	PERSHING	L
PITT DAM	PERSHING	L
PITT TAYLOR LOWER DAM	PERSHING	L
PITT TAYLOR UPPER DAM	PERSHING	L
RODGERS DAM	PERSHING	L
RYE PATCH	PERSHING	H
SILVEY IRRIGATION DAM	PERSHING	L
SOUTH PROCESS POND	PERSHING	L
SPRINGER IWT DAM	PERSHING	L
SPRINGER TUNGSTEN	PERSHING	L
STANDARD GOLD EVENT POND	PERSHING	L
STANDARD GOLD PREGNANT POND #1	PERSHING	L
STANDARD GOLD PREGNANT POND #2	PERSHING	L
THACKER DAM	PERSHING	L
ASAMERA EFFLUENT STORAGE DAM	STOREY	H
DERBY DIVERSION	STOREY	S
GOOSEBERRY TAILS	STOREY	L
PINON PINE EVAPORATION POND	STOREY	L
TRACY DIVERSION DAM	STOREY	L
TRACY EVAPORATION POND #3	STOREY	L
WEST TRACY SECONDARY EVAPORATION POND	STOREY	L
5-MILE RESERVOIR	WASHOE	L
ALEXANDER LAKE DAM	WASHOE	S
BURNT LAKE DAM	WASHOE	L
CAPTAIN JOHNSON RESERVOIR	WASHOE	L
CARTER RESERVOIR	WASHOE	L
CATNIP	WASHOE	L
CHALK BLUFF SOLIDS STORAGE POND	WASHOE	S
CHALK BLUFF TREATMENT PLANT PHASE I	WASHOE	S
CHALK BLUFF TREATMENT PLANT PHASE II	WASHOE	S
CLIFF BROTHERS RESERVOIR	WASHOE	L
COLEMAN RES	WASHOE	L
COTTONWOOD DAM NO 2	WASHOE	L
DAMONTE RANCH DETENTION POND #4	WASHOE	H
DAMONTE RANCH FLOOD CONTROL DIVERSION	WASHOE	H
DAMONTE RANCH FLOOD DETENTION BASIN	WASHOE	H
DAMONTE RANCH WETLANDS DETENTION BASIN	WASHOE	H

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
D'ANDREA DETENSION BASIN #3	WASHOE	H
D'ANDREA DETENTION BASIN #1	WASHOE	H
D'ANDREA RANCH HOLE #6 POND	WASHOE	H
DANT BLVD DETENTION	WASHOE	H
DAVIS PARK LAKE	WASHOE	L
DEWEY PARKER NO 2	WASHOE	L
DISABET RESERVOIR DAM	WASHOE	L
DOUBLE DIAMOND	WASHOE	S
EAST LOGAN RIDGE TRAIL DAM	WASHOE	H
EAST WASH DIVERSION	WASHOE	H
FLY RANCH DAM	WASHOE	L
FLY RESERVOIR	WASHOE	L
FROG POND	WASHOE	L
GERLACH EFFLUENT PONDS	WASHOE	L
GRASS VALLEY DAM	WASHOE	S
HAY CANYON DAM	WASHOE	L
HERMAN DAM	WASHOE	H
HIDDEN LAKE DAM	WASHOE	L
HIDDEN LAKE RANCH	WASHOE	L
HIGHLAND RESERVOIR	WASHOE	H
HILL DAM NUMBER 1	WASHOE	L
HILL DAM NUMBER 2	WASHOE	L
HOBART CREEK RESERVOIR DAM	WASHOE	S
HOME RANCH CANYON DAM	WASHOE	H
HOWARD C. DAVIS	WASHOE	S
HUFFAKER EFFLUENT STORAGE RESERVOIR	WASHOE	H
HUNGRY-BACON DAM	WASHOE	L
HUNTER CREEK RESERVOIR	WASHOE	H
INCLINE LAKE DAM	WASHOE	H
IXL RANCH DAM LOWER	WASHOE	L
JONES CANYON DAM	WASHOE	L
LIGHTNING W RANCH DAMS	WASHOE	S
LITTLE HIGH ROCK	WASHOE	L
LITTLE VALLEY DAM	WASHOE	L
LORRIE'S RESERVOIR DAM	WASHOE	L
MARBLE BLUFF DAM	WASHOE	L
MARLETTE LAKE DAM	WASHOE	H
MIDDLE DAM	WASHOE	S
MILL CREEK NO 1	WASHOE	H
MILL CREEK NO 2	WASHOE	H
NEGRO CREEK DAM	WASHOE	S

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
NORTH SPANISH SPRINGS FLOOD DETENTION FACILITY	WASHOE	H
NORTH SPANISH SPRINGS FLOOD SEDIMENT BASIN	WASHOE	H
NORTH VIRGINIA DETENTION	WASHOE	H
NORTHGATE GOLF COURSE DAM	WASHOE	H
PAGNI DAM	WASHOE	H
PEAVINE CREEK LOWER DAM	WASHOE	H
PEAVINE CREEK UPPER DAM	WASHOE	H
PILGRIM FLAT DAM	WASHOE	L
PRADARE SPRING DAM	WASHOE	L
RACETRACK RES DAM	WASHOE	L
RANCHO HAVEN DAM #2	WASHOE	S
RANCHO HAVEN DAM #4	WASHOE	S
RED HOUSE DIVERSION DAM	WASHOE	L
RYE CREEK RESERVOIR	WASHOE	L
SEVIER LAKE	WASHOE	H
SIDEHILL DETENTION BASIN	WASHOE	S
SIERRA SAGE PONDS	WASHOE	S
SOB LAKE DAM	WASHOE	L
SOB LAKE DAM	WASHOE	L
SPANISH FLAT DAM	WASHOE	L
SPANISH SPRINGS STORMWATER DETENTION FACILITY	WASHOE	H
SQUAW CREEK DAM	WASHOE	H
SUGAR CANE SPRINGS DAM	WASHOE	L
SUN VALLEY DETENTION DAM	WASHOE	H
SWAN LAKE RESERVOIR	WASHOE	L
SWINGLE RANCH DAM	WASHOE	L
TONEY RESERVOIR DAM	WASHOE	L
UPPER HOLY LAKE RESERVOIR	WASHOE	L
VERDI MEADOWS WASTEWATER DISPOSAL DAM	WASHOE	H
VICKIE'S RESERVOIR DAM	WASHOE	L
VIRGINIA LAKE	WASHOE	H
WALL CREEK DAM LOWER	WASHOE	S
WALL CREEK DAM UPPER	WASHOE	L
WASHOE LAKE DAM	WASHOE	H
WEST LOGAN RIDGE TRAIL DAM	WASHOE	H
WEST WASH DAM	WASHOE	H
WET RAVINE DAM	WASHOE	S
WETLANDS AT KILEY RANCH	WASHOE	S

Table G-1. List of Dams by County		
NAME OF DAM	**COUNTY**	**HAZARD RANKING**
WHEELER RESERVOIR DAM	WASHOE	H
WILCOX CANYON DAM #1	WASHOE	H
WILCOX CANYON DAM #2	WASHOE	L
WILCOX CANYON DAM #3	WASHOE	S
171 AC MCGILL	WHITE PINE	L
78 AC MCGILL	WHITE PINE	L
BAKER GID WASTEWATER POND	WHITE PINE	L
BALD MOUNTAIN PREG POND 4	WHITE PINE	L
BALD MOUNTAIN PREGNANT POND #5	WHITE PINE	L
BALD MOUNTAIN PROCESS POND #7	WHITE PINE	L
BASSETT LAKE	WHITE PINE	L
BLACKJACK DAM	WHITE PINE	S
BULL CREEK NO 1	WHITE PINE	L
BULL CREEK NO 3	WHITE PINE	L
CAVE CREEK DAM	WHITE PINE	H
COLD CREEK DAM	WHITE PINE	S
COMINS LAKE	WHITE PINE	S
DUCK CREEK EAST	WHITE PINE	H
DUCK CREEK WEST	WHITE PINE	L
ELDERBERRY NO 2	WHITE PINE	H
GARDNER DAM	WHITE PINE	S
GEYSER DAM NO 2	WHITE PINE	L
GEYSER DAM NO 3	WHITE PINE	L
GEYSER DAM NO 5	WHITE PINE	L
GIROUX WASH TSF	WHITE PINE	S
ILLIPAH POND	WHITE PINE	H
MCGILL CONCENTRATOR TAILS	WHITE PINE	L
MOONEY BASIN EVENT POND	WHITE PINE	L
MOONEY BASIN LEACH PAD 5 SOLUTION POND	WHITE PINE	L
MOONEY BASIN LEACH PAD 5 STORM POND	WHITE PINE	L
MOONEY BASIN LEACH POND	WHITE PINE	L
PAN PROCESS POND	WHITE PINE	L
PRESTON LOWER DAM	WHITE PINE	S
SILVER CREEK DAM	WHITE PINE	H
SPRING VALLEY WASH	WHITE PINE	L
XNV - ICE PLANT NO 3	WHITE PINE	H

Table G-2. Summary of Dams by County				
COUNTY	HIGH	SIGNIFICANT	LOW	TOTAL
CARSON CITY	2	1	3	6
CHURCHILL	1	2	10	13
CLARK	71	14	47	132
DOUGLAS	10	7	12	29
ELKO	14	8	70	92
ESMERALDA	0	0	8	8
EUREKA	1	14	37	52
HUMBOLDT	1	12	41	54
LANDER	2	6	27	35
LINCOLN	4	0	11	15
LYON	2	4	13	19
MINERAL	3	2	7	12
NYE	0	2	49	51
PERSHING	1	0	21	22
STOREY	1	1	5	7
WASHOE	37	19	43	99
WHITE PINE	6	6	20	32
Total	**156**	**98**	**424**	**678**

Figure G-1.

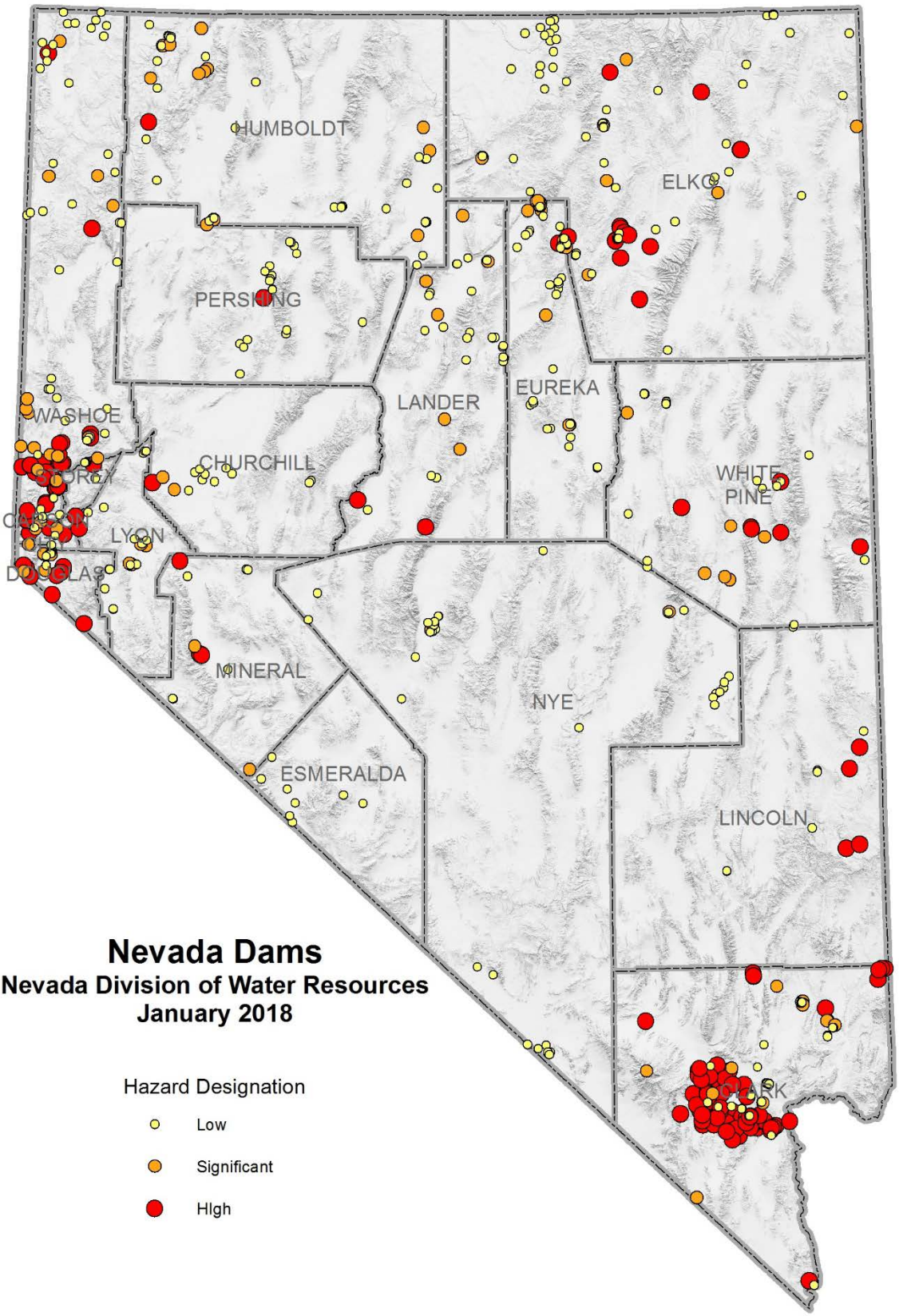

HUMBOLDT
ELKO
PERSHING
EUREKA
LANDER
WASHOE
CHURCHILL
WHITE PINE
LYON
MINERAL
NYE
ESMERALDA
LINCOLN
Nevada Dams
Nevada Division of Water Resources
January 2018
Hazard Designation
Low
Significant
High

Figure H-1.

HAZUS Scenarios of Major Rivers in Nevada

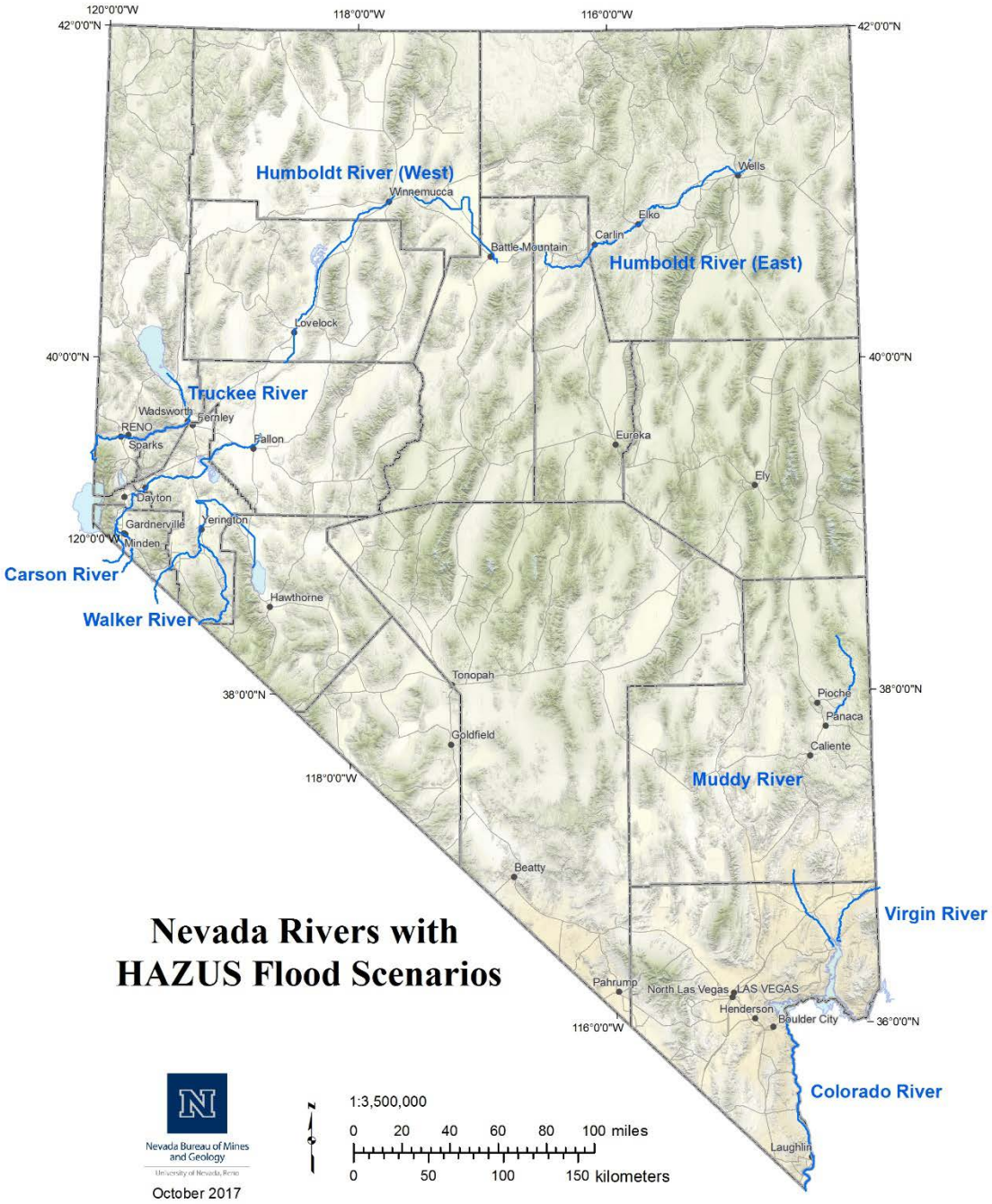


Figure H-2.

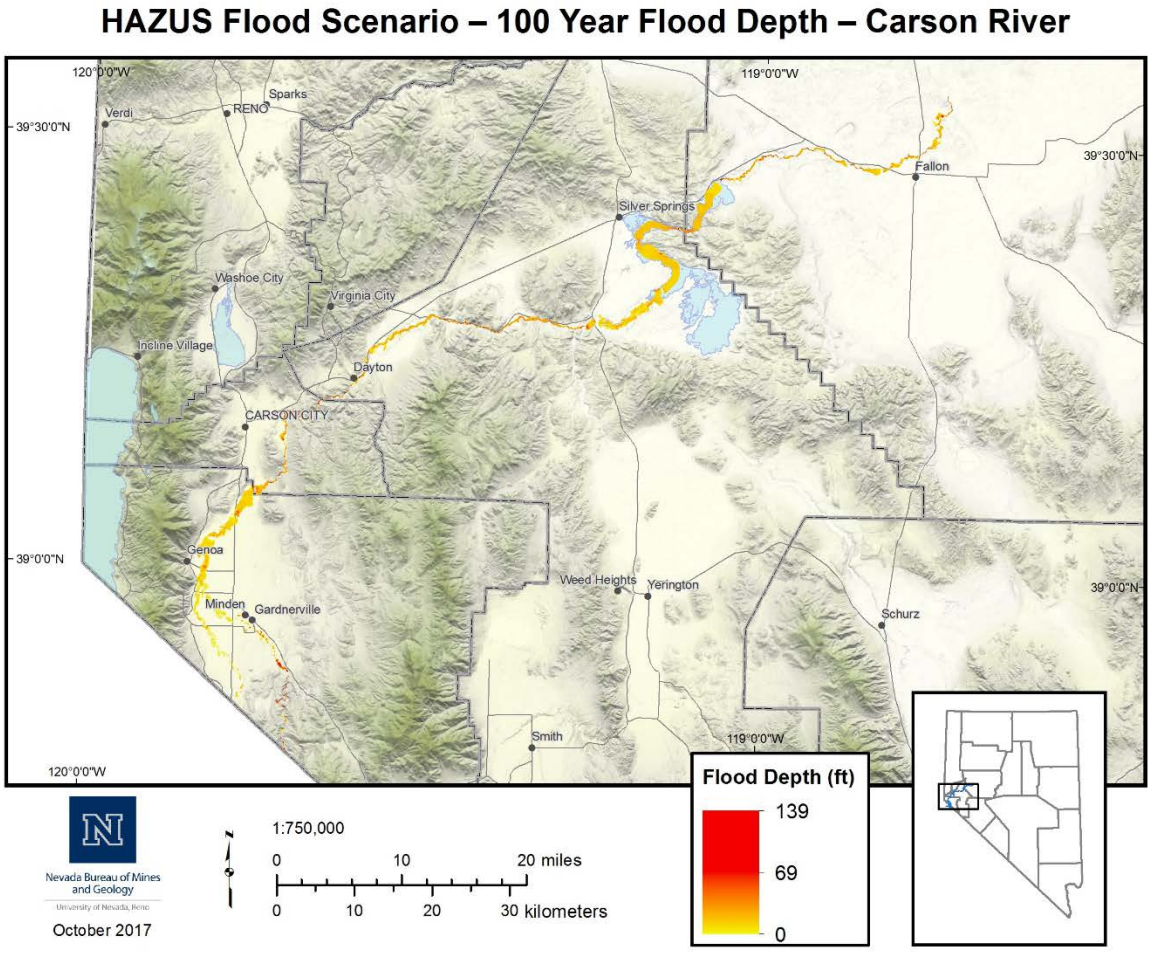

HAZUS Flood Scenario – 100 Year Flood Depth – Carson River
120°0'0"W
119°0'0"W
39°30'0"N
39°0'0"N
Sparks
RENO
Verdi
Fallon
Silver Springs
Washoe City
Virginia City
Incline Village
Dayton
CARSON CITY
Genoa
Minden
Gardnerville
Weed Heights
Yerington
Schurz
Smith
Flood Depth (ft)
139
69
0
1:750,000
0 10 20 miles
0 10 20 30 kilometers
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure H-3.

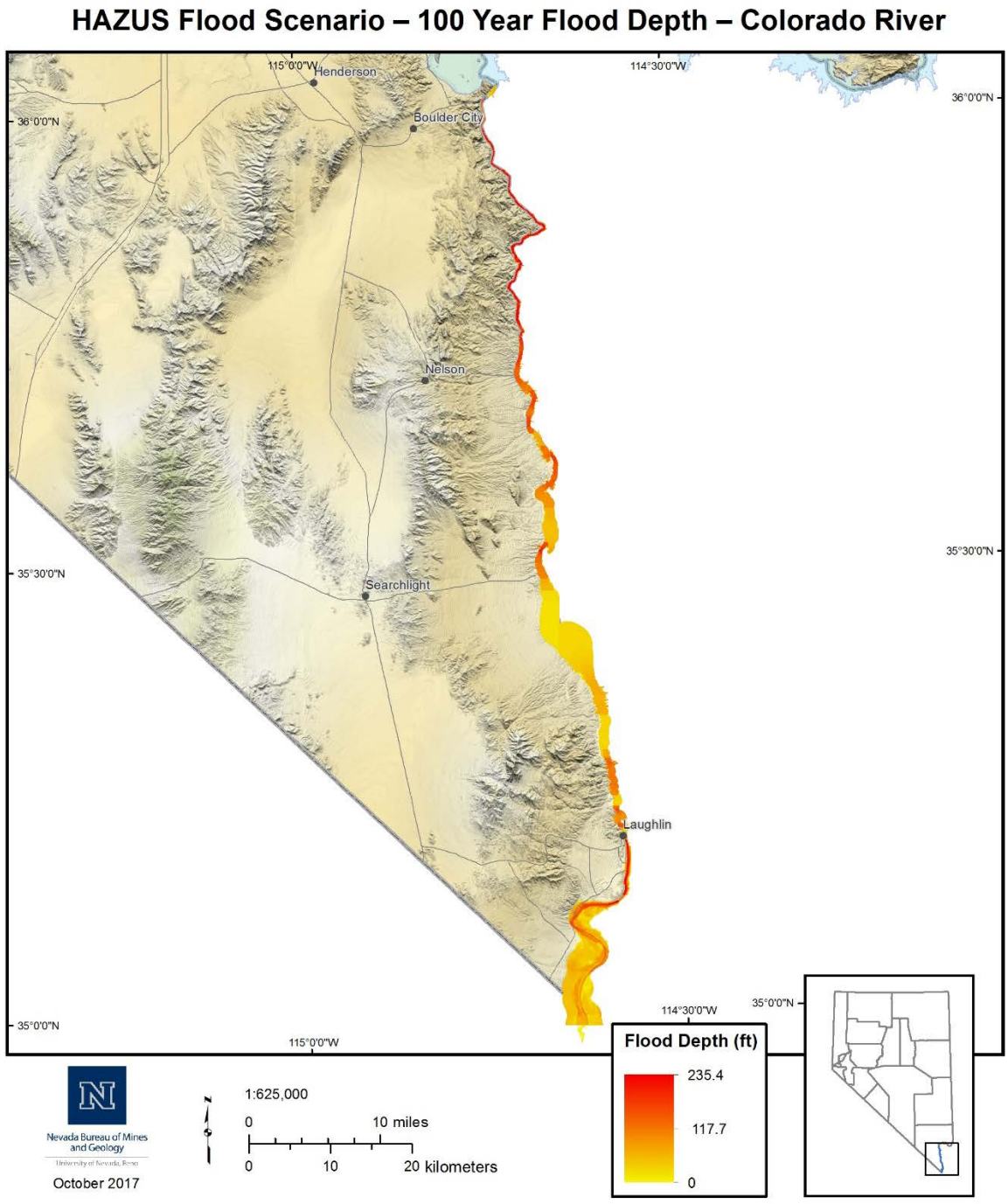

HAZUS Flood Scenario – 100 Year Flood Depth – Colorado River
115°0'0"W
Henderson
114°30'0"W
36°0'0"N
Boulder City
Nelson
35°30'0"N
Searchlight
Laughlin
35°0'0"N
Flood Depth (ft)
235.4
117.7
0
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:625,000
0
10 miles
0
10
20 kilometers

Figure H-4.

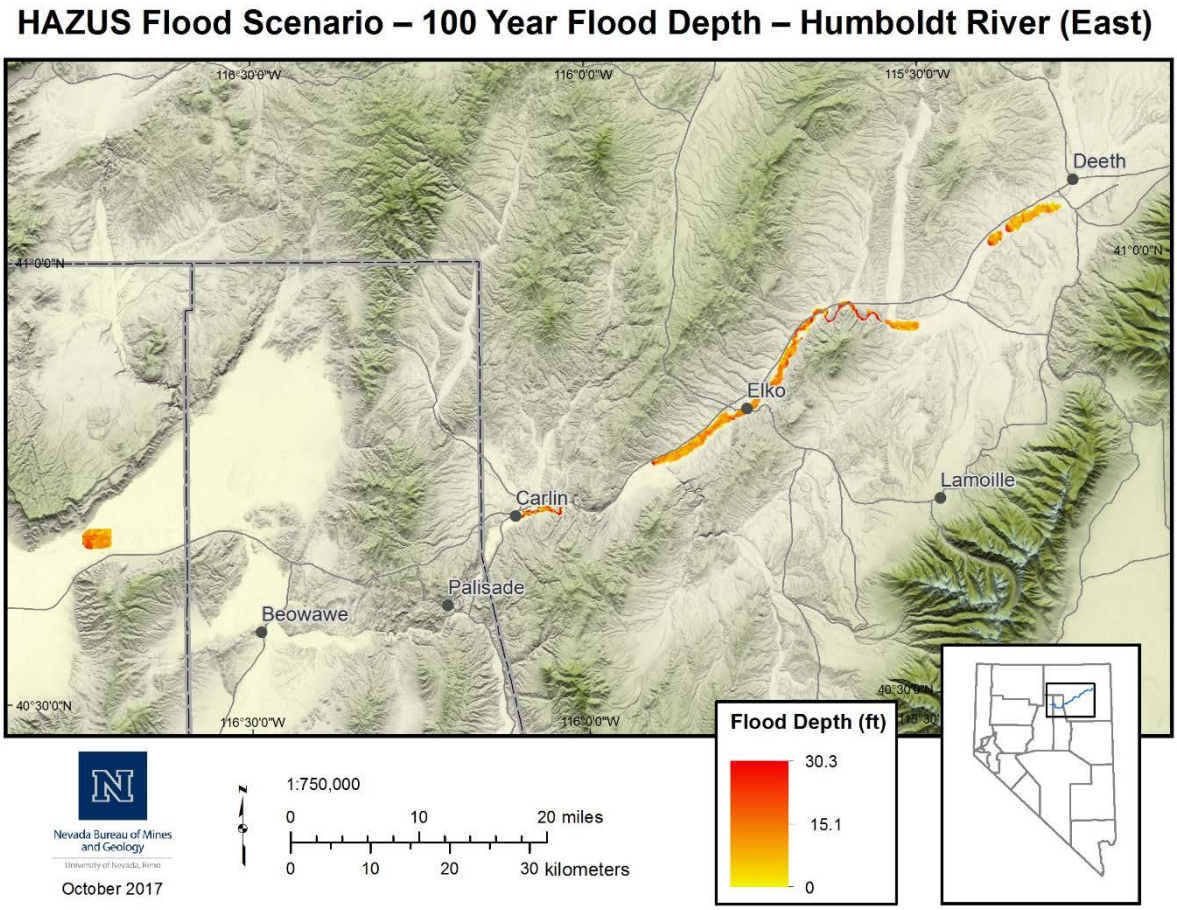

HAZUS Flood Scenario – 100 Year Flood Depth – Humboldt River (East)
118°30'0"W
116°0'0"W
115°30'0"W
41°0'0"N
40°30'0"N
116°30'0"W
Deeth
Elko
Carlin
Lamoille
Palisade
Beowawe
Flood Depth (ft)
30.3
15.1
0
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:750,000
0 10 20 miles
0 10 20 30 kilometers

Figure H-5.

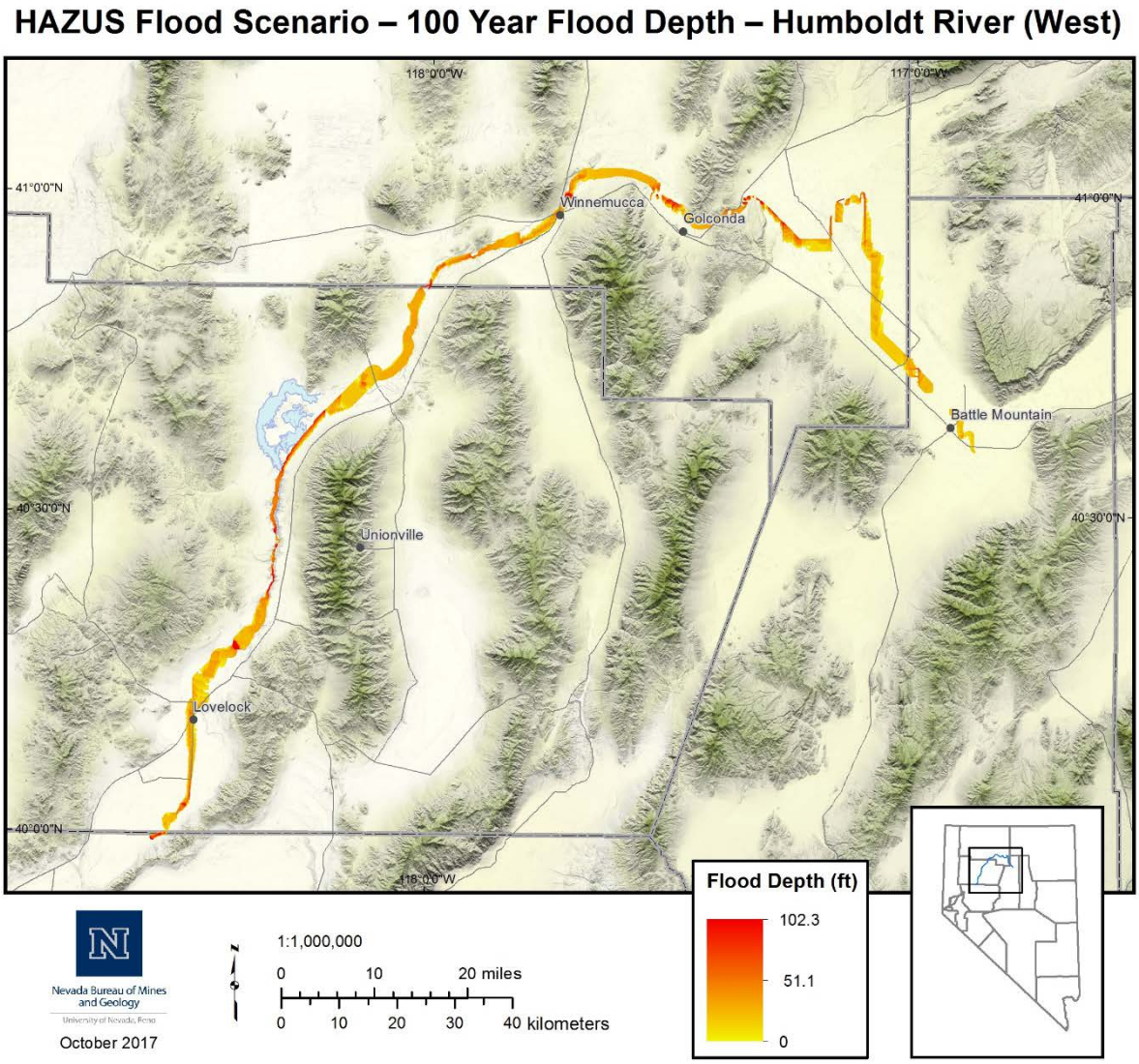

HAZUS Flood Scenario – 100 Year Flood Depth – Humboldt River (West)
118°0'0"W
117°0'0"W
41°0'0"N
40°30'0"N
40°0'0"N
Winnemucca
Golconda
Battle Mountain
Unionville
Lovelock
Flood Depth (ft)
102.3
51.1
0
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:1,000,000
0 10 20 miles
0 10 20 30 40 kilometers

Figure H-6.

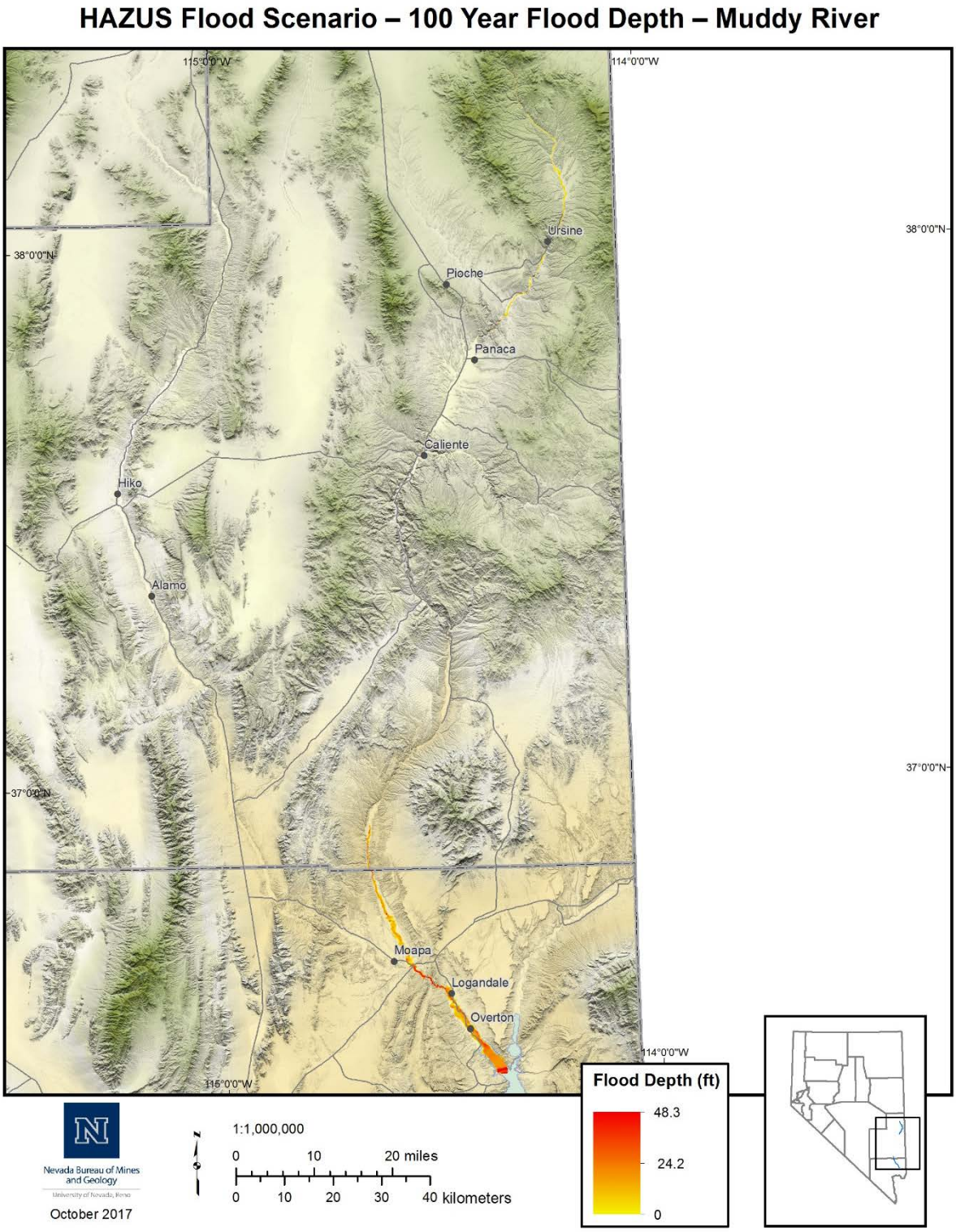

HAZUS Flood Scenario – 100 Year Flood Depth – Muddy River
115°0'0"W
114°0'0"W
38°0'0"N
37°0'0"N
Ursine
Pioche
Panaca
Caliente
Hiko
Alamo
Moapa
Logandale
Overton
Flood Depth (ft)
48.3
24.2
0
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:1,000,000
0 10 20 miles
0 10 20 30 40 kilometers

Figure H-7.

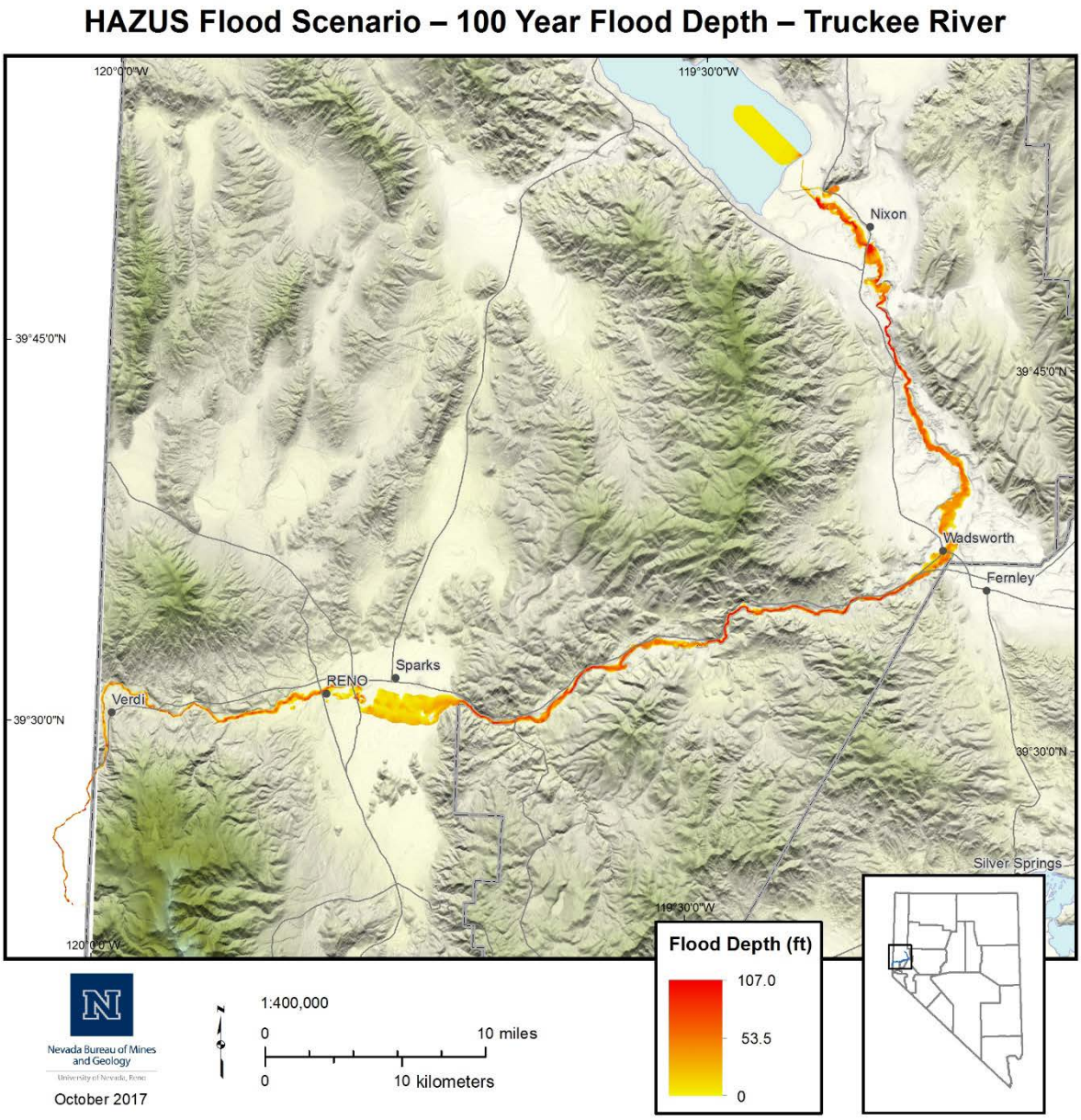

HAZUS Flood Scenario – 100 Year Flood Depth – Truckee River
120°0'0"W
119°30'0"W
39°45'0"N
39°30'0"N
Nixon
Wadsworth
Fernley
Sparks
RENO
Verdi
Silver Springs
Flood Depth (ft)
107.0
53.5
0
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:400,000
0
10 miles
0
10 kilometers

Figure H-8.

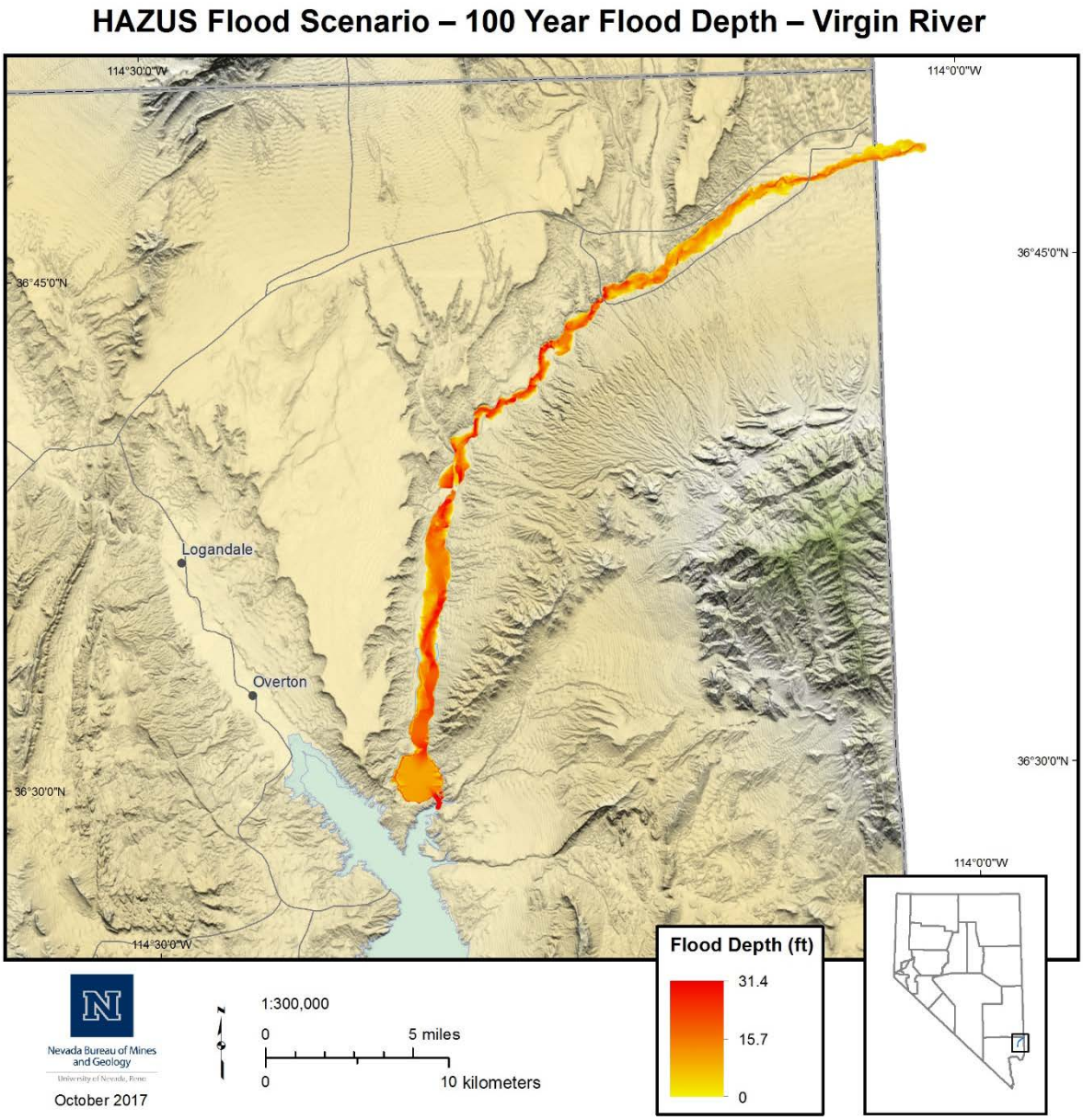
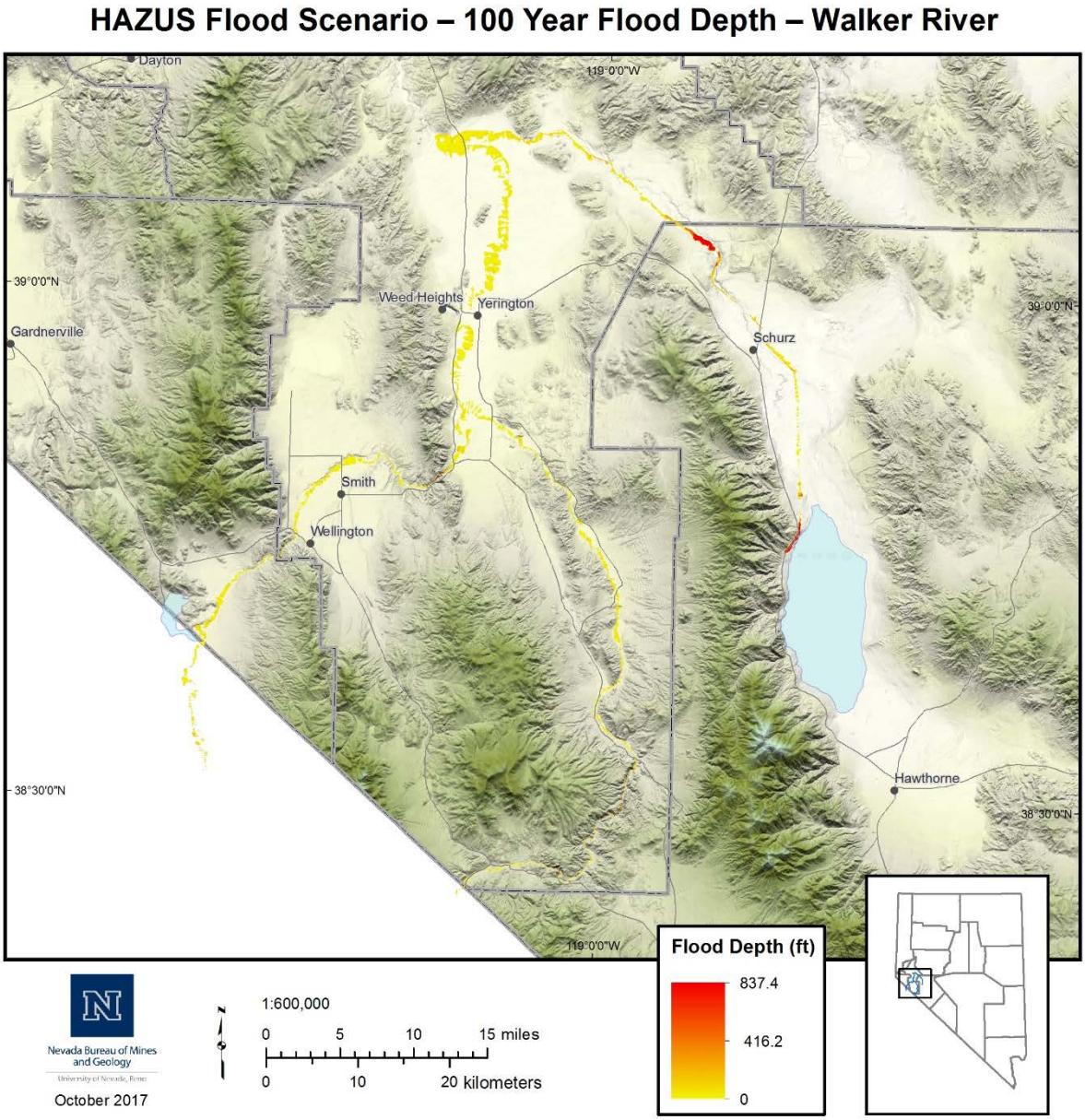

HAZUS Flood Scenario – 100 Year Flood Depth – Virgin River
114°30'0"W
114°0'0"W
36°45'0"N
36°30'0"N
Logandale
Overton
Flood Depth (ft)
31.4
15.7
0
1:300,000
0
5 miles
0
10 kilometers
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017

Figure H-9.


HAZUS Flood Scenario – 100 Year Flood Depth – Walker River
Dayton
119°0'0"W
39°0'0"N
Gardnerville
Weed Heights
Yerington
Schurz
Smith
Wellington
38°30'0"N
Hawthorne
Nevada Bureau of Mines and Geology
University of Nevada, Reno
October 2017
1:600,000
0 5 10 15 miles
0 10 20 kilometers
Flood Depth (ft)
837.4
416.2
0

FEDERAL ASSURANCES

The applicant hereby assures and certifies compliance with all Federal statutes, regulations, policies, guidelines and requirements, including OMB Circulars, 2 CFR PART 220, 2 CFR PART 215, 2 CFR PART 230, A-128, A-133, 2 CFR PART 225; E.O. 12372 and Uniform Administrative Requirements for Grants and Cooperative Agreements 28 CFR PART 66, Common Rule, that govern the application, acceptance and use of Federal funds for this Federally-assisted project. Administrative Requirements 2 CFR PART 200, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments, 2 CFR PART 215, Institutions of Higher Education, Hospital and other Non-Profit Organizations. Cost Principles, 2 CFR PART 225, State and Local Governments, 2 CFR PART 220, Educational Institutions, 2 CFR PART 230 Non-Profit Organizations and Federal Acquisitions Regulations Sub-Part 31.2, Contracts with Commercial Organizations. In addition, the applicant assures and certifies that:

I. It possesses legal authority to apply for the grant; that a resolution, motion or similar action has been duly adopted or passed as an official act of the applicant's governing body, authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of the applicant to act in connection with the application and to provide such additional information as may be required.

II. It will comply with requirements of the provisions of the Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (P.L. 91-646) which provides for fair and equitable treatment of persons displaced as a result of Federal and Federally-assisted programs.

III. It will comply with provisions of Federal law, which limit certain political activities of employees of a state or local unit of government whose principal employment is in connection with an activity financed in whole or in part by Federal grants. (5 USC 1501, et seq.)

IV. It will comply with the minimum wage and maximum hour's provisions of the Federal Fair Labor Standards Act.

V. It will establish safeguards to prohibit employees from using their positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have family, business, or other ties.

VI. It will give the sponsoring agency or the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the grant.

VII. It will comply with all requirements imposed by the Federal sponsoring agency concerning special requirements of law, program requirements, and other administrative requirements.

VIII. It will insure that the facilities under its ownership, lease or supervision which shall be utilized in the accomplishment of the project are not listed on the Environmental Protection Agency's (EPA) list of Violating Facilities and that it will notify the Federal grantor agency of the receipt of any communication from the Director of the EPA Office of Federal Activities indicating that a facility to be used in the project is under consideration for listing by the EPA.

IX. It will comply with the flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973, Public Law 93-234, 87 Stat. 975, approved December 31, 1976, Section 102(a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any Federal financial assistance for construction or acquisition purposes for use in any area that has been identified by the Secretary of the Department of Housing and Urban Development as an area having special flood hazards. The phrase "Federal financial assistance" includes any form of loan, grant, guaranty, insurance payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect Federal assistance.

X. Environmental and Historic Preservation Compliance. FEMA is required to consider the potential impacts to the human and natural environment of projects proposed for FEMA funding. FEMA, through its Environmental and Historic Preservation (EHP) Program, engages in a review process to ensure that FEMA-funded activities comply with various Federal laws including National Environmental Policy Act, National Historic Preservation Act, Endangered Species Act, and Executive Orders on Floodplains (11988), Wetlands (11990) and Environmental Justice (12898).

a. Any project with the potential to impact EHP resources (see Section E.8) cannot be initiated until FEMA has completed its review. The sub-grantees shall provide any information requested by FEMA to ensure compliance with applicable Federal EHP requirements.
b. Grantees may be required to provide detailed information about the project, including the following: location (street address or map coordinates); description of the project including any associated ground disturbance work, extent of modification of existing structures, construction equipment to be used, staging areas, access roads, etc.; year the existing facility was built; natural, biological, and/or cultural resources present in the project vicinity; visual documentation such as site and facility photographs, project plans, maps, etc.; and possible project alternatives. For certain, types of projects, FEMA must consult with other Federal, state and local agencies such as the U.S. Fish and Wildlife Service, State Historic Preservation Offices, and the U.S. Army Corps of Engineers, as well as other Federal, State, Local and Tribal Nations agencies and organizations responsible for protecting natural and cultural resources.
c. For projects with the potential to have significant adverse effects on the environment and/or historic properties, FEMA's EHP review and consultation may result in a substantive agreement between the involved parties outlining how the sub-grantee will avoid the effects, minimize the effects, or, if necessary, compensate for the effects. Because of the potential for significant adverse effects to EHP resources or public controversy, some projects may require an additional assessment or report, such as an Environmental Assessment, Biological Assessment, archaeological survey, cultural resources report, wetlands delineation, or other document, as well as a public comment period.
d. Sub-grantees are responsible for the preparation of such documents, as well as for the implementation of any treatment or mitigation measures identified during the EHP review that are necessary to address potential adverse impacts.
e. Failure of the sub-grantee to meet Federal, State, and local EHP requirements, obtain applicable permits, and comply with any conditions that may be placed on the project as the result of FEMA's EHP review may jeopardize Federal funding.

XI. It will comply, and assure the compliance of all its sub-sub-grantees and contractors, with the applicable provisions of Title I of the Omnibus Crime Control and Safe Streets Act of 1968, as amended, the Juvenile Justice and Delinquency Prevention Act, or the Victims of Crime Act, as appropriate; the provisions of the current edition of the Office of Justice Programs Financial and Administrative Guide for Grants, M7100.1; and all other applicable Federal laws, orders circulars, or regulations.

XII. It will comply with the provisions of 28 CFR applicable to grants and cooperative agreements including PART 18, Administrative Review Procedure; PART 20, Criminal Justice Information Systems; PART 22, Confidentiality of Identifiable Research and Statistical Information; Part 23, Criminal Intelligence Systems Operating Policies; PART 30, Intergovernmental Review of Department of Justice Programs and Activities; PART 42, Nondiscrimination/Equal Employment Opportunity Policies and Procedures; PART 61, Procedures for Implementing the National Environmental Policy Act; PART 63, Floodplain Management and Wetland Protection Procedures; and Federal laws or regulations applicable to Federal Assistance Programs.

XIII. It will comply, and all its sub-grantee and contractors will comply, with the non-discrimination requirements of the Omnibus Crime Control and Safe Streets Act of 1968, as amended, 42 USC 3789(d), or Victims of Crime Act (as appropriate); Title VII of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973, as amended; Subtitle A, Title II of the Americans with Disabilities Act (ADA) (1990); Title IX of the Education Amendments of 1972; the Age Discrimination Act of 1975; Department of Justice Non-Discrimination Regulations, 28 CFR PART 42, Subparts C, D, E, and G; and Department of Justice regulations on disability discrimination, 28 CFR PART 35 and PART 39.

XIV. Services to limited English proficient (LEP) persons. Recipients of FEMA financial assistance are required to comply with several Federal civil rights laws, including Title VII of the Civil Rights Act of 1964, as amended. These laws prohibit discrimination on the basis of race, color, religion, natural origin, and sex in the delivery of services. National origin discrimination includes discrimination on the basis of limited English proficiency.
a. To ensure compliance with Title VII, recipients are required to take reasonable steps to ensure that

LEP persons have meaningful access to their programs. Meaningful access may entail providing language assistance services, including oral and written translation, where necessary.

b. The sub-grantee is encouraged to consider the need for language services for LEP persons served or encountered both in developing their proposals and budgets and in conducting their programs and activities. For additional information, see http://www.lep.gov. Integrating individuals with disabilities into emergency planning. Section 504 of the Rehabilitation Act of 1973, as amended, prohibits discrimination against people with disabilities in all aspects of emergency mitigation, planning, response, and recovery by entities receiving financial funding from FEMA.

c. Executive Order 13347, entitled "Individuals with Disabilities in Emergency Preparedness" signed in July 2004, requires the Federal Government to support safety and security for individuals with disabilities in situations involving disasters, including earthquakes, tornadoes, fires, floods, hurricanes, and acts of terrorism.

d. Executive Order 13347 requires the Federal government to, among other things, encourage consideration of the needs of individuals with disabilities served by State, local, and tribal governments in emergency preparedness planning.

e. FEMA has several resources available to assist emergency managers in planning and response efforts related to people with disabilities and to ensure compliance with Federal civil rights laws: Guidelines for Accommodating Individuals with Disabilities in Disaster: The Guidelines synthesize the array of existing accessibility requirements into a user friendly tool for use by response and recovery personnel in the field.

   i. Guidelines are available at, https://www.fema.gov/news-release/2007/08/21/accommodating-people-disabilities-disasters-reference-guide-federal-law

   ii. Disability and Emergency Preparedness Resource Center: A web based "Resource Center" that includes dozens of technical assistance materials to assist emergency managers in planning and response efforts related to people with disabilities can be found at, https://www.hhs.gov/civil-rights/for-individuals/special-topics/emergency-preparedness/resources-persons-disabilities/index.html

   iii. Emergency Planning for Persons with Disabilities and Special Needs: https://www.fema.gov/media-library/assets/documents/897

XV. In the event a Federal or state court or Federal or state administrative agency makes a finding of discrimination after a due process hearing on the grounds of race, color, religion, national origin, sex, or disability against a recipient of funds, the recipient will forward a copy of the finding to the Office for Civil Rights, Office of Justice Programs.

XVI. It will provide an Equal Employment Opportunity Program if required to maintain one, where the application is for $500,000 or more.

XVII. It will comply with the provisions of the Coastal Barrier Resources Act (P.L. 97-348) dated October 19, 1982 (16 USC 3501 et seq.) which prohibits the expenditure of most new Federal funds within the units of the Coastal Barrier Resources System.

XVIII. Compliance with the National Energy Conservation Policy and Energy Policy Acts. In accordance with the 2008 DHS Appropriations Act, all FY 2008 grant funds must comply with the following two requirements:

a. None of the funds made available through shall be used in contravention of the Federal buildings performance and reporting requirements of Executive Order No. 13123, PART 3 of title V of the National Energy Conservation Policy Act (42 USC 8251 et. Seq.), or subtitle A of title I of the Energy Policy Act of 2005 (including the amendments made thereby).

b. None of the funds made available shall be used in contravention of section 303 of the Energy Policy Act of 1992 (42 USC13212).

XIX. HSPD-5 requires that Federal agencies tie Federal preparedness funding eligibility directly to progress on **NIMS implementation**. Inability to demonstrate compliance with required NIMS implementation activities could affect Federal preparedness funding at any level of government – state agency, county, local jurisdiction or department. Those receiving, or planning to receive, Federal preparedness funding from any Federal

sources should examine the applicable grant guidance to determine eligibility requirements.

XX. **VICTIMS PROTECTION ACT OF 2000**

Implements section 106(g) of the trafficking Victims Protection Act of 2000 (TVPA) as amended (22 U.SC. 7104 (g).

XXI. **CLASSIFIED NATIONAL SECURITY INFORMATION**

"Classified national security information" as defined in the Executive Order (EO) 12958, as amended, means information that has been determined pursuant to EO 12958 or any predecessor order to require protection against unauthorized disclosure and is marked to indicate its classified status when in documentary form.

XXII. **TRANSPARENCY ACT**

As of October 1, 2010, all Federal agencies are to initiate sub-award reporting pursuant to P.L. 109-282 of the Federal Funding Accountability and Transparency Act. This includes an implementation policy to require the collection and reporting on sub-award data, improvement to the data quality of Federal Awards and enhancement of technological capabilities of the **USAspending.gov.**

As the duly authorized representative of the applicant for Place Jurisdiction name here, I hereby certify that the applicant will comply with the above assurances and certifications.

NAME:_____ TITLE:_____

SIGNATURE:_____ DATE:_____

*Must be signed by the County Manager/Chief Financial Officer, the Tribal Chairman/designee or the state agency director as appropriate

FEDERAL CERTIFICATIONS NEW

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Signature of this form provides for compliance with certification requirements under 28 CFR PART 69, "New Restrictions on Lobbying" and 28 CFR PART 67, "Government-wide Debarment and Suspension (Non-procurement) and Government-wide Requirements for Drug- Free Workplace (Grants)." The certifications shall be treated as a material representation of fact upon which reliance will be placed when determination is made to award the covered transaction, grant, or cooperative agreement.

Article I - Assurances, Administrative Requirements, Cost Principles, and Audit Requirements
DHS financial assistance recipients must complete either the OMB Standard Form 424B Assurances - Non-Construction Programs or OMB Standard Form 424D Assurances - Construction Programs as applicable. Certain assurances in these documents may not be applicable to your program, and the DHS financial assistance office may require applicants to certify additional assurances. Applicants are required to fill out the assurances applicable to their program as instructed by the awarding agency. Please contact the financial assistance office if you have any questions. DHS financial assistance recipients are required to follow the applicable provisions of the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards located at 2 C.F.R. Part 200, and adopted by DHS at 2 C.F.R. Part 3002.

Article II - DHS Specific Acknowledgements and Assurances
All recipients, sub-recipients, successors, transferees, and assignees must acknowledge and agree to comply with applicable provisions governing DHS access to records, accounts, documents, information, facilities, and staff.

1. Recipients must cooperate with any compliance reviews or compliance investigations conducted by DHS.
2. Recipients must give DHS access to, and the right to examine and copy, records, accounts, and other documents and sources of information related to the award and permit access to facilities, personnel, and other individuals and information as may be necessary, as required by DHS regulations *and* other applicable laws or program guidance.
3. Recipients must submit timely, complete, and accurate reports to the appropriate DHS officials and maintain appropriate backup documentation to support the reports.
4. Recipients must comply with all other special reporting, data collection, and evaluation requirements, as prescribed by law or detailed in program guidance.
5. If, during the past three years, the recipient has been accused of discrimination on the grounds of race, color, national origin (including limited English proficiency), sex, age, disability, religion, or familial status, the recipient must provide a list of all such proceedings, pending or completed, including outcome and copies of settlement agreements to the DHS financial assistance office and the DHS Office of Civil Rights and Civil Liberties (CRCL) by e-mail at crcl@hq.dhs.gov or by mail at U.S. Department of Homeland Security Office for Civil Rights and Civil Liberties Building 410, Mail Stop #0190 Washington, D.C.20528.
6. In the event any court or administrative agency makes a finding of discrimination on grounds of race, color, national origin (including limited English proficiency), sex, age, disability, religion, or familial status against the recipient, or the recipient settles a case or matter alleging such discrimination, recipients must forward a copy of the complaint and findings to the DHS financial assistance office and the CRCL office by e-mail or mail at the addresses listed above. The United States has the right to seek judicial enforcement of these obligations.

Article III - Whistleblower Protection Act
All recipients must comply with the statutory requirements for whistleblower protections (if applicable) at 10 U.S.C section 2409, 41 U.S.C. 4712, and 10 U.S.C. section 2324, 41 U.S.C. sections 4304 and 4310.

Article IV - Use of DHS Seal, Logo and Flags

All recipients must obtain permission from their financial assistance office, prior to using the DHS seal(s), logos, crests or reproductions of flags or likenesses of DHS agency officials, including use of the United States Coast Guard seal, logo, crests or reproductions of flags or likenesses of Coast Guard officials.

Article V - USA Patriot Act of 2001
All recipients must comply with requirements of the Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act (USA PATRIOT Act), which amends 18 U.S.C. sections175 175c

Article VI - Universal Identifier and System of Award Management (SAM)
All recipients are required to comply with the requirements set forth in the government-wide Award Term regarding the System for Award Management and Universal Identifier Requirements located at 2 C.F.R. Part 25, Appendix A, the full text of which is incorporated here by reference in the terms and conditions of your award.

Article VII - Reporting of Matters Related to Recipient Integrity and Performance
If the total value of your currently active grants, cooperative agreements, and procurement contracts from all Federal assistance office exceeds $10,000,000 for any period of time during the period of performance of this Federal award, you must comply with the requirements set forth in the government-wide Award Term and Condition for Recipient Integrity and Performance Matters located at 2 C.F.R. Part 200, Appendix XII, the full text of which is incorporated here by reference in the terms and conditions of your award.

Article VIII - Rehabilitation Act of 1973
All recipients must comply with the requirements of Section 504 of the *Rehabilitation Act of 1973*, 29 U.S.C. section 794, as amended, which provides that no otherwise qualified handicapped individual in the United States will, solely by reason of the handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

Article IX - Trafficking Victims Protection Act of 2000
All recipients must comply with the requirements of the government-wide award term which implements Section 106(g) of the *Trafficking Victims Protection Act of 2000*, (TVPA) as amended (22 U.S.C. section 7104). The award term is located at 2 CFR section 175.15, the full text of which is incorporated here by reference in the terms and conditions of your award.

Article X - Terrorist Financing
All recipients must comply with E.O. 13224 and U.S. law that prohibit transactions with, and the provisions of resources and support to, individuals and organizations associated with terrorism. It is the legal responsibility of recipients to ensure compliance with the Order and laws.

Article XI - SAFECOM
All recipients who receive awards made under programs that provide emergency communication equipment and its related activities must comply with the SAFECOM Guidance for Emergency Communication Grants, including provisions on technical standards that ensure and enhance interoperable communications.

Article XII - Reporting Subawards and Executive Compensation
All recipients are required to comply with the requirements set forth in the government-wide Award Term on Reporting Subawards and Executive Compensation located at 2 C.F.R. Part 170, Appendix A, the full text of which is incorporated here by reference in the terms and conditions of your award.

Article XIII - Procurement of Recovered Materials
All recipients must comply with Section 6002 of the *Solid Waste Disposal Act*, as amended by the *Resource Conservation and Recovery Act*. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

Article XIV - Patents and Intellectual Property Rights
Unless otherwise provided by law, recipients are subject to the Bayh-Dole Act, Pub. L. No. 96-517, as amended, and codified in 35 U.S.C. section 200 et seq. All recipients are subject to the specific requirements governing the development, reporting, and disposition of rights to inventions and patents resulting from financial assistance awards located at 37 C.F.R. Part 401 and the standard patent rights clause located at 37 C.F.R. section 401.14.

Article XV - Notice of Funding Opportunity Requirements
All of the instructions, guidance, limitations, and other conditions set forth in the Notice of Funding Opportunity (NOFO) for this program are incorporated here by reference in the terms and conditions of your award. All recipients must comply with any such requirements set forth in the program NOFO.

Article XVI - Non-supplanting Requirement
All recipients who receive awards made under programs that prohibit supplanting by law must ensure that Federal funds do not replace (supplant) funds that have been budgeted for the same purpose through non-Federal sources.

Article XVII - Lobbying Prohibitions
All recipients must comply with 31 U.S.C. section 1352, which provides that none of the funds provided under an award may be expended by the recipient to pay any person to influence, or attempt to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any Federal action concerning the award or renewal.

Article XVIII - Limited English Proficiency (Civil Rights Act of 1964, Title VI)
All recipients must comply with the *Title VI of the Civil Rights Act of 1964* (Title VI) prohibition against discrimination on
the basis of national origin, which requires that recipients of federal financial assistance take reasonable steps to provide meaningful access to persons with limited English proficiency (LEP) to their programs and services. For additional assistance and information regarding language access obligations, please refer to the DHS Recipient Guidance https://www.dhs.gov/ guidance-published-help-department-supported-organizations-provide-meaningful-access-people-limited and additional resources on http://www.lep.gov.

Article XIX - Hotel and Motel Fire Safety Act of 1990
In accordance with Section 6 of the *Hotel and Motel Fire Safety Act of 1990*, 15 U.S.C. section 2225a, all recipients must ensure that all conference, meeting, convention, or training space funded in whole or in part with Federal funds complies with the fire prevention and control guidelines of the *Federal Fire Prevention and Control Act of 1974*, as amended, 15 U.S.C. section 2225.

Article XX - Fly America Act of 1974
All recipients must comply with Preference for U.S. Flag Air Carriers: (air carriers holding certificates under 49 U.S.C. section 41102) for international air transportation of people and property to the extent that such service is available, in
accordance with the *International Air Transportation Fair Competitive Practices Act of 1974* (49 U.S.C. section 40118) and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B-138942.

Article XXI - Best Practices for Collection and Use of Personally Identifiable Information (PII)
DHS defines personally identifiable information (PII) as any information that permits the identity of an individual to be directly or indirectly inferred, including any information that is linked or linkable to that individual. All recipients who collect PII are required to have a publically-available privacy policy that describes standards on the usage and maintenance of PII they collect. Award recipients may also find as a useful resource the DHS Privacy Impact Assessments: Privacy Guidance and Privacy template respectively.

Article XXII - Americans with Disabilities Act of 1990
All recipients must comply with the requirements of Titles I, II, and III of the *Americans with Disabilities Act*, which prohibits recipients from discriminating on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities. (42 U.S.C. sections 12101 12213).

Article XXIII - Age Discrimination Act of 1975
All recipients must comply with the requirements of the *Age Discrimination Act of 1975* (Title 42 U.S. Code, section 6101 *et seq.)*,which prohibits discrimination on the basis of age in any program or activity receiving Federal financial assistance

Article XXIV - Activities Conducted Abroad
All recipients must ensure that project activities carried on outside the United States are coordinated as necessary with appropriate government authorities and that appropriate licenses, permits, or approvals are obtained.

Article XXV - Acknowledgment of Federal Funding from DHS
All recipients must acknowledge their use of federal funding when issuing statements, press releases, requests for proposals, bid invitations, and other documents describing projects or programs funded in whole or in part with Federal funds

Article XXVI - Federal Leadership on Reducing Text Messaging while Driving
All recipients are encouraged to adopt and enforce policies that ban text messaging while driving as described in E.O. 13513, including conducting initiatives described in Section 3(a) of the Order when on official Government business or when performing any work for or on behalf of the federal government.

Article XXVII - Federal Debt Status
All recipients are required to be non-delinquent in their repayment of any Federal debt. Examples of relevant debt include delinquent payroll and other taxes, audit disallowances, and benefit overpayments. See OMB Circular A-129.

Article XXVIII - False Claims Act and Program Fraud Civil Remedies
All recipients must comply with the requirements of 31 U.S.C. section 3729 - 3733 which prohibits the submission of false or fraudulent claims for payment to the Federal Government. See 31 U.S.C. section 3801-3812 which details the administrative remedies for false claims and statements made.

Article XXIX - Energy Policy and Conservation Act
All recipients must comply with the requirements of 42 U.S.C. section 6201 which contain policies relating to energy efficiency that are defined in the state energy conservation plan issued in compliance with this Act.

Article XXX - Education Amendments of 1972 (Equal Opportunity in Education Act) - Title IX
All recipients must comply with the requirements of Title IX of the Education Amendments of 1972 (20 U.S.C. section 1681*et seq*.), which provide that no person in the United States will, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving Federal financial assistance. DHS implementing regulations are codified at 6 C.F.R. Part 17 and 44 C.F.R. Part 19

Article XXXI - Duplication of Benefits
Any cost allocable to a particular Federal award provided for in 2 C.F.R. Part 200, Subpart E may not be charged to other Federal awards to overcome fund deficiencies, to avoid restrictions imposed by Federal statutes, regulations, or terms and conditions of the Federal awards, or for other reasons. However, this prohibition would not preclude a recipient form shifting costs that are allowable under two or more Federal awards in accordance with existing Federal statutes, regulations, or the terms and conditions of the Federal award.

Article XXXII - Drug-Free Workplace Regulations
All recipients must comply with the *Drug-Free Workplace Act of 1988* (41 U.S.C. section 701 *et seq*.), which requires all organizations receiving grants from any Federal agency agree to maintain a drug-free workplace. DHS has adopted the Act's implementing regulations at 2 C.F.R Part 3001.

Article XXXIII - Debarment and Suspension
All recipients are subject to the non-procurement debarment and suspension regulations implementing Executive Orders 12549 and 12689, and 2 C.F.R. Part 180. These regulations restrict awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in federal assistance programs or activities.

Article XXXIV - Copyright
All recipients must affix the applicable copyright notices of 17 U.S.C. sections 401 or 402 and an acknowledgement of Government sponsorship (including award number) to any work first produced under Federal financial assistance awards.

Article XXXV - Civil Rights Act of 1968
All recipients must comply with Title VIII of the *Civil Rights Act of 1968*, which prohibits recipients from discriminating in the sale, rental, financing, and advertising of dwellings, or in the provision of services in connection therewith, on the basis of race, color, national origin, religion, disability, familial status, and sex (42 U.S.C. section 3601 et seq.), as implemented by the Department of Housing and Urban Development at 24 C.F.R. Part 100. The prohibition on disability discrimination includes the requirement that new multifamily housing with four or more dwelling units i.e., the public and common use areas and individual apartment units (all units in buildings with elevators and ground-floor units in buildings without elevators) be designed and constructed with certain accessible features (See 24 C.F.R. section 100.201).

Article XXXVI - Civil Rights Act of 1964 - Title VI
All recipients must comply with the requirements of Title VI of the *Civil Rights Act of 1964* (42 U.S.C. section 2000d *et seq*.),which provides that no person in the United States will, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. DHS implementing regulations for the Act are found at 6 C.F. R., Part 21 and 44 C.F.R. Part 7.

Article XXXVII - Acceptance of Post Award Changes for the State of Nevada
In the event FEMA determines that changes are necessary to the award document after an award has been made, including changes to period of performance or terms and conditions, recipients will be notified of the changes in writing. Once notification has been made, any subsequent request for funds will indicate recipient acceptance of the changes to the award. Please call the FEMA/GMD Call Center at (866) 927-5646 or via e-mail to ASK-GMD@dhs.gov if you have any questions.

Article XXXVIII - Prior Approval Modification of Approved Budget (for the State of Nevada only)
Before making any change to the DHS/FEMA approved budget for this award, you must request prior written approval from DHS/FEMA where required by 2 C.F.R. Section 200.308. For awards with an approved budget greater than $150,000, you may not transfer funds among direct cost categories, programs, functions, or activities without prior

written approval from DHS/FEMA where the cumulative amount of such transfers exceeds or is expected to exceed ten percent (10%) of the total budget DHS/FEMA last approved. You must report any deviations from your DHS/ FEMA approved budget in the first Federal Financial Report (SF-425) you submit following any budget deviation, regardless of whether the budget deviation requires prior written approval.

Article XXXIX Nondiscrimination in Matters Pertaining to Faith-Based Organizations
It is DHS policy to ensure the equal treatment of faith-based organizations in social service programs administered or supported by DHS or its component agencies, enabling those organizations to participate in providing important social services to beneficiaries. All recipients must comply with the equal treatment policies and requirements contained in 6 C.F.R Part 19 and other applicable statues, regulations, and guidance governing the participations of faith-based organizations in individual DHS programs.

As the duly authorized representative of the applicant for Place Jurisdiction name here, I hereby certify that the applicant will comply with the above assurances and certifications.

NAME:_____ TITLE:_____

SIGNATURE:_____ DATE:_____

* Must be signed by the County Manager/Chief Financial Officer, the Tribal Chairman/designee or the state agency director as appropriate

NEVADA DEPARTMENT OF PUBLIC SAFETY
DIVISION OF EMERGENCY MANAGEMENT
GRANT FINANCIAL AND PROGRAM ASSURANCES

These assurances are to specify the requirements for State, Local, Indian Tribal Governments, higher education, hospitals, and other non-profit organizations while performing the administrative functions for any Federal grant funds. The applicant hereby assures compliance with the following conditions as part of the Notice of Grant Award:

I. **FEDERAL SINGLE AUDIT**

1. Sub-grantees shall comply with the Federal Single Audit Act (31 U.S.C. par., 7501-7507), as amended by the Single Audit Act Amendments of 1996 (P.L. 104 to 156), the sub-grantee must have an annual audit conducted in accordance with OMB Circular A-133 if the sub-grantee expends more than $750,000 from Federal Awards. If the sub-grantee has expended more than $750,000 in Federal dollars, a copy of the sub recipient's audit report for the previous fiscal year must be submitted to the Nevada Department of Public Safety for review within the earlier of 30 days after receipt of the auditor's report(s), or 13 months after the end of the audit period, unless a different period is specified in a program-specific audit guide. Unless restricted by law or regulation, the auditee shall make report copies available for public inspection.
    a. Required documentation for the performance of internal audits must be provided to the Division of Emergency Management (DEM) upon request within 30 days. Grant closeout is contingent upon the DEM audit and resolution of any discrepancies. Any non-submission of required internal audit documentation could result in the delay or non-payment of reimbursement requests, the deobligation of remaining Federal funds and/or jeopardize your eligibility to receive further Federal funding through DEM.
2. Sub-grantees who expend less than the required $750,000 under the Federal Single Audit Act (31 U.S.C. paragraph, 7501-7507), as amended by the Single Audit Act Amendments of 1996 (P.L. 104 to 156), which is incorporated into this agreement by reference, will provide to the State of Nevada Department of Public Safety uncertified financial statements, (financial statements without the opinion of an independent external auditor) including notes and a schedule of expenditures of Federal awards for sub-grantees fiscal year end, signed by the Sub-grantees executive management within the earlier of 30 days after receipt of the financial

report(s), or nine months after the end of the reporting period.

3. Grant revenue and expenditure records and supporting documentation must be maintained and made available upon request by the State Division Internal Audit, Legislative Council Bureau and the DEM or any other entity as required by law to audit the sub-grantee. The sub-grantees are required if requested to respond to auditors inquiries, as required by the State of Nevada Administrative Manual (SAM) 3000, http://budget.nv.gov/uploadedFiles/budgetnvgov/content/Governance/SAM.pdf

II. **FISCAL RESPONSIBILITY**

1. Financial management must comply with the requirements of OMB Circular A-102 or 2 CFR PART 215, whichever is applicable to sub-grantees organization, and which are incorporated into these assurances by reference.
2. All grant expenditures are to be reasonable and allowable in accordance with 2 CFR, PART 220, 2 CFR PART 225, 2 CFR PART 230, whichever is applicable to your organization, and which are incorporated into these assurances by reference.
3. **Sub-Grantees are required to adhere to the Department of Public Safety, Division of Emergency Management, and Office of Homeland Grant Management Guide.**
4. Payment made by the DEM to the sub-grantee shall be on a reimbursement basis only and is conditioned upon receipt of applicable, accurate and complete reimbursement and match supporting documentation to be submitted by the sub-grantee. All payments will be contingent upon receipt of all fiscal and programmatic reports required of the sub-grantee under these assurances.
   a. Supporting documentation shall include, but is not limited to, invoices, documented program/project deliverables, travel claims, payment vouchers, proof of payment (clearing documents), payroll reports, staffing/volunteer timesheets, contracts, bid/procurement process documentation, lease agreements, agendas, meeting attendance documentation, training documentation, After Action Reports (AAR), Authorized Equipment Lists (*AEL*) (if applicable), Central Contractor Registry (CCR), Excluded Parties Listing (*EPLS*) and must be cross-referenced to approved budgets.
   b. All equipment requested must be on the approved equipment list (*AEL*) (using the most current AEL from grant year and grant program that you are requesting/expending grant funds, please see www.rkb.us). The DEM will not reimburse for any equipment purchased which is not identified on the AEL list and/or not on the approved Budget Detail Matrix.
5. The sub-grantee is aware of and shall comply with the cost-sharing requirements of the Federal grant program (if applicable).
   a. Match supporting documentation must be kept in the same manner as reimbursement supporting documentation for grant funds and meet the following criteria for costs to be eligible as match:
      1. The costs must be allowable under the grant program.
      2. The costs must be in compliance with all Federal requirements and regulations (*i.e., 2 CFR PART 200 and 2 CFR PART 215, PART 225, PART 230 and OMB Circular A-102 as applicable to your organization*).
      3. The costs must be reasonable, allowable, allocable, and necessary.
      4. The following documentation is required for third-party cash and in-kind contributions, but is not limited to: Record of donor; Dates of donation; Rates for staffing, equipment or usage, supplies, etc.; Amounts of donation; and Deposit slips for cash contributions. According to 2 CFR PART 200, this documentation is to be held at the applicant and sub-applicant level.
      5. Except as provided by Federal statute, a cost sharing or matching requirement may not be met by costs borne by another Federal grant or Federal funding.
      6. The source of the match funds must be identified in the grant application.
      7. Every item must be verifiable, i.e., tracked and documented.
      8. Any claimed cost share expense can only be counted once.
6. Indirect cost rates (IDC) included in the budget and application process are subject to the

requirements of Appendix E (Indirect Cost Proposal Rates) in the CFR applicable to the sub-grantee agency (i.e., *2 CFR PART 215, PART 225, PART 230, as applicable*). All DEM approved indirect cost rates are determined by the specific grant program.

7. FY2016 Notice of Funding Opportunity, the section titled, Indirect (Facilities & Administrative (F&A) Cost states: A copy of the approved rate (a fully executed, agreement negotiated with the applicant's cognizant federal agency) is required at the time of application, and must be provided to FEMA before indirect cost may be charged to the award. If a subgrantee does not have a current negotiated Indirect Cost Rate agreement at the time of application is submitted, they may not allocate or charge indirect cost to the award. However, if a subgrantee obtains an Indirect Cost agreement during the award performance period, the State of Nevada SAA could submit a budget revision request as indirect costs are allowable. The subgrantee would need to specify what cost categories the cost "savings" comes from and how the reallocation of funds would impact the work plan. (EMPG Only)
8. All IDC rates for sub-grantee applications and change requests for grant Federal fiscal year 2014, 2015 and 2016 will be subject to the specific grant program language. No project change requests will be approved to change an indirect cost rate unless pre-approved by FEMA.
9. Sub-grantees will comply with the Federal Granting Agency policy regarding the use of preparedness grant funding for sustainment costs. Grant funds may be used to cover only those maintenance agreements, user fees, and other sustainment costs provided during the grant performance period in which the device was purchased.
10. Sub-grantees are subject to compliance with Information Bulletin (IB) 407, dated March 9, 2016, Use of Grant Funds for Controlled Equipment under the Presidential Executive Order (EO) 13688, Federal Support for Local Law Enforcement Equipment Acquisition issued January 16, 2015, and the recommendations pursuant to the EO 13688, which collectively establishes a Prohibited Equipment List and Controlled Equipment List and identified actions necessary to improve Federal support for the appropriate acquisition, use, and transfer of controlled equipment by state, local, tribal, territorial, and private grant recipients. All sub-grantees must adhere to IB 407 and must follow the established pre-approval processes in place per this guidance.
11. Sub-grantees may not use future year preparedness grant funding to pay for additional agreements and user fees, please refer to Information Bulletin (IB) 336. All ongoing expenses after the performance period has expired are the responsibility of the grantee/sub-grantee and will not be paid for with FEMA preparedness grant funding. (if applicable)
    a. Sub-grantees may use FEMA preparedness grant funding to pay for maintenance agreements, user fees, and other sustainment costs as long as:
        1. The equipment was purchased with FEMA preparedness grant funding. (if applicable)
        2. The sustainment costs fall within the performance period of the grant that was used to purchase the equipment.
    b. Sustainment costs are eligible under the equipment category unless the equipment is Management & Administration (M&A) related (grants management equipment).

III. **FISCAL REPORTING RESPONSIBILITY**

1. Quarterly financial reports (QFR) with supporting documentation shall be submitted to the DEM within 30 days following the close of each quarter of the sub-grant period**.** A QFR is required every quarter regardless if the QFR equals a zero dollar amount**.** The final financial report must be submitted to the DEM no later than 30 days following the end of the grant performance period. If the sub-grantee has requested an extension the report must be submitted no later than 15 days after the last day of the approved extension. Sub-grantees may not obligate funds at the end of extension and use the State Administrative Agent's (SAA) close out period to submit reports/expenditures unless extenuation circumstances exist and the approval is issued in writing to the sub-grantee. Late reports, unless approved by the DEM, could delay reimbursement or result in non-payment of the claim. All forms used for reporting are provided by the DEM. Reimbursement will be made by the DEM in a first come first serve basis. Every effort will be made by the

DEM to ensure reimbursements will be made timely. The submission of inaccurate or incomplete information with unapproved reporting documentation and/or templates will result in the rejection of the quarterly report.

As applicable for grant programs, reports consist of, but are not limited to:

a. Division of Emergency Management Quarterly Financial Report (all grants)
b. Quarterly Progress Summary (all grants)
c. Program Narrative
d. Approved Detailed Budget (or approved Vulnerability Reduction Purchase Plan, VRPP)
e. Quarterly Project Plan/Work Plan (*EMPG*)
f. DEM reserves the right to deny any reimbursement as we are the fiduciary agency responsible for the management and administration of the federal grant funds
g. Compliance with HSGP Reobligation Guidelines (effective August 18, 2011). Please see attached for the complete copy of the Guidelines. (HSGP only)

2. Sub-grantee understands that, except for extraordinary circumstances that will be handled on a case-by-case basis, requests to transfer funds between budget categories or requests to purchase items not previously authorized will not be approved. Written approval must be obtained from the DEM prior to the transfer of funds between budget categories or the expenditure of funds for newly identified items. All requests must be submitted to the DEM on the approved Project Change Request form. The Project Change Request form must be accompanied by, but is not limited to, a Revised Budget Detail Matrix and written justification.
3. It is the responsibility of all sub-grantees to know and adhere to the Nevada Revised Statue (NRS) and the United States General Services Administration (GSA) or their own established policies whichever is more restrictive regarding travel and per diem rates. The submission of travel must include the following and must adhere to the following.
   a. Travel claim signed by the traveler with all receipts such as, hotel, parking, shuttle, taxi, rental car to include additional fuel cost, conference fee invoice, flight invoice, internet search map for mileage reimbursement, formal or informal agenda from the inviting agency.
   b. Travel will not be reimbursed if the request exceeds the GSA rate found on www.gsa.gov DEM will reimburse the maximum lodging rates with a receipt and the prorated taxes on that amount only.
   c. Rental cars will only be considered if necessary with documented justification. For example the venue is located offsite and it would cost more for taxi, shuttle etc., a rental car is allowable. Rental cars are to be used solely for business travel. Mileage on rental cars will be reviewed.
   d. Travel must be accomplished by the least expensive mode practicable; DEM may request additional information if not provided at the time of submission for reimbursement.
   e. Meals provide by conference fees or other means such as invitational travel must deduct meals provided from the per diem rate. This includes Emergency Management Institute (EMI), DEM will only reimburse for the Meal Ticket cost and travel days to and from EMI.
   f. Traveler will only be allowed 75% of the per diem for the first and last day of travel unless the sub grantee submits a more practical and approved process.
   g. Travelers must travel at a minimum of a 50 mile radius outside of their duty station or their home/departure whichever is closer to their destination to be reimbursed for per diem and lodging. Travelers may request mileage and parking if they are within the 50 mile radius of their duty station.
   h. Cancelation fees will not be reimbursed unless a justification is submitted to DEM for review and approval.
   i. Food may be provided by the sub-grantee only when necessary for the continuity of a training, exercise or meeting. Trainings, exercises or meetings must be over 6 hours in length, must stay within the per diem set forth by GSA, must be stated on the agenda "working lunch", must notify the stakeholders that they may not claim the per diem elsewhere. Must submit justification for each request outside the line item detail budget approval and must have prior written approval by the SAA to provide food. The pre-approval must be submitted with each monthly or quarterly report for reimbursement.
   j. Travel as well as all grant expenditures must adhere to the following:
      Reasonable - A prudent person would have purchased this item and paid this price. A cost may be

considered reasonable if the nature of the goods or services, and the price paid for the goods or services, reflects the action that a prudent person would have taken given the prevailing circumstances at the time the decision to incur the cost was made.

Allocable - Expenses can be allocated to the federal grant or contract activity based on benefit derived, cause and effect, or other equitable relationship.

Consistently Treated - Like expenses must be treated the same in like circumstances.

Allowable - Permitted as a direct cost under the terms of a specific grant or contract.

k. DEM reserves the right to deny any reimbursement as we are the fiduciary agency responsible for the management and administration of the federal grant funds.

IV. **FUNDS MANAGEMENT**

1. The sub-grantee must maintain funds received under these assurances in separate ledger accounts and cannot mix these funds with other sources. The sub-grantee must manage funds according to applicable Federal regulations for administrative requirements, costs principles and audits.
2. The sub-grantee must maintain adequate business systems to comply with Federal requirements. The business systems that must be maintained include, but are not limited to: Financial Management, Procurement, Personnel, Equipment, Property and Travel.
3. A system is adequate if it is 1) written; 2) consistently followed – it applies in all similar circumstances; and 3) consistently applied – it applies to all sources of funds.
4. The sub-grantee must follow the Department of Public Safety, Division of Emergency Management Contracting and Procurement Grant Guidance dated April 19, 2011. The sub-grantee must follow 2 CFR PART 200, regarding sole source procurement. All sole sourcing requests over $100,000 must be approved prior to procurement or a sub-grantee contractual agreement. The approval must be issued by the SAA and FEMA/DHS.
5. Compliance with HSGP Reobligation Guidelines (effective August 18, 2011). Please see attached for the complete copy of the Guidelines
6. **Sub-Grantees are required to adhere to the Department of Public Safety, Division of Emergency Management, and Office of Homeland Grant Management Guide.**
7. DEM reserves the right to deny any reimbursement as we are the fiduciary agency responsible for the management and administration of the federal grant funds.

V. **PROGRAM RESPONSIBILITY**

1. Quarterly program reports with supporting documentation shall be submitted to the DEM within 30 days following the close of each quarter of the grant performance period. The final Program Report must be submitted to the DEM no later than 30 days following the end of the grant period. Late reports, unless approved by the DEM, could delay reimbursement. Late reports, unless approved by the DEM, could result in non-payment of the claim. All forms used for reporting are provided by the DEM. The submission of inaccurate or incomplete information and unapproved documentation will result in the rejection of the Quarterly final report.

   As applicable for grant programs, reports consist of, but are not limited to:

   a. Division of Emergency Management Quarterly Financial Report (all grants)
   b. Quarterly Progress Summary (all grants)
   c. Program Narrative
   d. Approved Detailed Budget
   e. Quarterly Project Plan
2. A completed Project Plan form shall be submitted to DEM prior to issuance of any sub-grant.
   a. The project plan must clearly document all individual projects, milestones, tasks, deliverables and timelines and must support and be traceable to the approved Budget Detail Matrix and the federally approved Investment Justification.
   b. Late submission could result in delay of reimbursement, and failure to comply could result in non-payment of reimbursement claims.
3. The Program Narrative for exercises shall address the following required elements of the Nevada Exercise Program (*contact the DEM for the Nevada Exercise Program instructions if applicable to your program*):

All training funded by DHS grants must be pre-approved by the State DEM Training Officer. Requests for the use of Homeland Security Grant Program (HSGP) funding in support of training programs/and or individual requests must be coordinated and approved by: Your local jurisdiction, your county (Emergency Manager) or designated Training Coordinator, the State Administrative Agency(SAA) Nevada Division of Emergency Management and the SAA Training Point of Contact (TPOC). The jurisdiction/ or individuals must obtain this approval prior to any commitment for any requested training utilizing Homeland Security funds. Detailed instruction and forms are attached.

a. Annual participation in the Training and Exercise Plan Workshop (TEPW) to collaborate with all agencies in the development, planning and implementation of the Multi-Year Exercise and Training Plan (MYTEP) regarding training and exercise types, dates, locations, target capabilities, and/or Federal funding.
b. Each county-level jurisdiction will identify a National Exercise Schedule (NEXS) point of contact that will serve as the Exercise Scheduler. The county-level Scheduler will be responsible for the submission of all required exercise information to the NEXS website. This requires approval by the State Exercise Officer.
c. Electronic submission of the AAR/IP to the DEM within 60 days of the conduct of the exercise utilizing the DHS-approved format and process.
    1. One hard copy of the AAR/IP shall be submitted to the DEM Exercise Training Officer and one electronic copy of AAR/IP shall be submitted via the DHS Secure Portal in the Nevada Folder with an email notifying in writing the State of Nevada Exercise Training Officer of the submission.

VI. **EQUIPMENT MANAGEMENT**

Effective control and accountability must be maintained for all equipment acquired with Federal funds. The sub-grantee must adequately safeguard all such equipment and must assure that it is used solely for authorized purposes as described in the guidance. The sub-grantee will use, manage, and dispose of such property in accordance with 2 CFR PART 200

1. As required by 2 CFR PART 200 equipment, the DEM, for compliance monitoring purposes as policy for all state agency sub-grantees equipment/asset management internal controls/policies and procedures will follow the regulatory compliance of the Nevada State Administrative Manual 1544.0, NRS 354.625 and NRS 333.220, which applies a state mandated $5,000.00 per unit threshold.
2. **It is important to safe guard all equipment, therefore this is a new requirement starting in Federal Fiscal Year 2014 that all sub-grantees have a policy to safeguard items that cost below $5,000 which would be considered "high risk" for personnel use or theft. These items may include computer equipment, cell phones, iPad or items that may be assigned to an employee.**
3. As required by 2 CFR PART 200, equipment, all other Local, Indian Tribal Governments, higher education, hospitals, and other non-profit sub-grantees for compliance monitoring purposes as policy will follow the regulatory compliance of 2 CFR PART 200, which applies a federally mandated $5,000.00 per unit threshold.
4. Accurate records maintained on all acquisitions and dispositions of property acquired with Federal awards.
5. Federally funded equipment records must contain description (including serial number or other identification number), source, who holds title, acquisition date and cost, percentage of Federal participation in the cost, location, condition, and disposition data.
6. Property tags are placed on equipment.
7. At a minimum, a physical inventory of the federally funded property must be taken and reconciled with the property records at least once every two years in accordance with 2 CFR PART 200 or by jurisdictional regulation or guidance. The certified inventory is required to be sent to DEM electronically for review. DEM may desk audit the inventory or may elect to complete a site visit.
8. Procedures established to ensure that the Federal awarding agency is appropriately reimbursed for dispositions of property acquired with Federal awards.
    a. When the equipment is no longer needed, the grantee or sub-grantee will request disposition instructions from the Federal agency through the SAA

b. Items of equipment with a current per-unit fair market value of less than $5,000 may be retained, sold or otherwise disposed of with no further obligation to the Federal awarding agency, however whenever possible the equipment should be retained and used or transferred to be used within the same general scope of work which it was originally paid under.
c. Items of equipment with a current per unit fair market value in excess of $5,000 may be retained or sold and the Federal awarding agency shall have a right to an amount calculated by multiplying the current market value or proceeds from sale by the Federal awarding agency's share (*the Federal percentage of participation*) of the equipment.

9. Policies and procedures in place for responsibilities of recordkeeping and authorities for disposition.

VII. **SUB-GRANTEE MONITORING**

The sub-grantee agrees to participate in DEM's annual monitoring visits and to follow up and take corrective action on all identified non-conformances and observations with action, which includes, but is not limited to, the submission and implementation of corrective action plans to the DEM.

1. The sub-grantee is responsible for follow-up and corrective action on all non-conformances and observations with action from the DEM.
2. The sub-grantee shall prepare a corrective action plan(s) for identified non-conformances and observations with action.
3. The sub-grantee will implement the approved corrective action plan(s) for non-conformances and observations with action.

VIII. **OWNERSHIP OF INFORMATION, PRINTED AND PUBLISHED MATERIAL**

1. Any publication, invention, patent, photograph, negative, book, drawing, record, document, or other material prepared by the sub-grantee in the performance of its obligations under this grant shall follow 2 CFR Appendix A Part 220 and 2 CFR 200.315. All publication, invention, patent, photograph, negative, book, drawing, record, document, or other material prepared by the sub-grantee in the performance of its obligations under this grant shall be provided to the State of Nevada for review and archival in the grant file.
2. Whenever possible equipment, real property, public service announcements, etc., should reflect, "made possible by the Nevada Department of Public Safety Division of Emergency Management and paid for by FEMA/DHS." (example only for HSGP grants- other grants please see DEM) All items above must be prior approved before procuring.
3. Under Section I. 1 and 2. above all items must be pre-approved in advance by DEM in order to be reimbursable. Federal granting agency retains ownership of all publications, inventions, patents, photographs, negatives, books, drawings, records, documents or other material prepared by the sub-grantee in the performance of its obligations to the grant.

IX. **IDEMNIFICATION**

To the extent limited in accordance with NRS 41.0305 to NRS 41.039, if applicable, sub-grantee agrees to indemnify, save and hold the state, its agents and employees harmless from any and all liability, claims, actions, damages, losses, and expenses, including without limitation, reasonable attorneys' fees and costs, arising out of any alleged negligent or willful acts *or* omissions of this agreement by sub-grantee, its agents or employees.

X. **CONFIDENTIALITY OF RECORDS**

1. If this grant funds any form of written or visual material that identifies employees of the DEM, prior approval must be obtained from the DEM before publishing or finalization.

XI. **ASSIGNMENT AND DELEGATION**

1. The sub-grantee shall neither assign, transfer nor delegate any rights, obligations or duties under this Notice of Grant Award without prior approval of the DEM, which includes sub-sub granting funds without prior knowledge or approval of DEM.

XII. **DEBARMENT CERTIFICATION**

1. The sub-grantee agrees to comply with the Federal Debarment and Suspension regulations as outlined in the "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier

Covered Transactions". Proof of debarment search must be provided to DEM for our records.

XIII. **CONTRACTORS**

1. The sub-grantee may enter into a written contract(s) for products and/or services pertaining to its functions under the grant award in accordance with terms established in the State of Nevada procurement policy, OMB Circulars, the DHS Financial Management Guide, and the DHS Program Guides or specific DHS, FEMA, DOE federal grant guidance. All contract scope of work must be reviewed and approved by DEM. All contracts must be submitted for the grant file and debarment searches must be provided in hard copy for DEM records.
2. The sub-grantee agrees and understands that no contract or agreement that the sub-grantee enters into with respect to performance under the grant award shall in any way relieve the sub-grantee of any responsibilities for performance if its duties.
3. The sub-grantee must follow the Department of Public Safety, Division of Emergency Management Contracting and Procurement Grant Guidance dated April 19, 2011. The sub-grantee must follow the 2 CFR PART 200, regarding sole source procurement. All sole sourcing requests over $100,000 must be approved prior to procurement or a sub-grantee contractual agreement. The approval must be issued by the SAA and FEMA/DHS.
4. All contracts and or procurement will follow the open and free competitive bid process.

XIV. **NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS)**

1. The Department of Homeland Security released the National Incident Management System (NIMS) as required by Homeland Security Presidential Directive (HSPD) 8 Management of Domestic Incidents and Preparedness. HSPD-5 established and designated the National Integration Center (NIC) Incident Management Systems Division as the lead Federal entity to coordinate NIMS compliance.
2. To be eligible to receive grant funding, applicants must meet NIMS compliance requirements. State, Territory, Tribal, and local governments are considered to be in full NIMS compliance if they have adopted and/or implemented compliance activities, as determined by the National Incident Management System Capability Assessment Support Tool (NIMSCAST) or other accepted means. Additional information on achieving compliance is available at https://training.fema.gov/nims/

XV. **APPLICABLE FEDERAL REGULATIONS**

The sub-grantee must comply with the Office of Management and Budget (*OMB)* Circulars and other Federal guidance including but not limited to:

1. Grant Program Guidance issued by the U.S. Department of Homeland Security, at https://www.fema.gov/homeland-security-grant-program
2. OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations, at https://www.federalregister.gov/documents/2015/07/14/2015-17236/audits-of-states-local-governments-and-non-profit-organizations-omb-circular-a-133-compliance
3. OMB Circular A-102, Grants and Cooperative Agreements with State and Local Governments, at http://www.whitehouse.gov/omb/circulars_a102/
4. 2 CFR PART 215, Uniform administrative requirements for grants and agreements with institutions of higher education, hospitals, and other non-profit organizations (*OMB A–110*), at http://www.whitehouse.gov/omb/assets/omb/circulars/a110/2cfr215-0.pdf
5. 2 CFR PART 220, Cost Principles for Educational Institutions (*OMB 2 CFR, PART 220*), at https://www.whitehouse.gov/wp-content/uploads/2017/11/Cost-Principles-for-Educational-Institutions-June1-1998.pdf
6. 2 CFR PART 225, Cost Principles for State, Local, and Indian Tribal Governments (*OMB A–87*), at http://www.whitehouse.gov/omb/assets/omb/fedreg/2005/083105_a87.pdf
7. 2 CFR PART 230, Cost Principles for Non-Profit Organizations (*OMB A–122*), at https://www.whitehouse.gov/wp-content/uploads/2017/11/Cost-Principles-for-Educational-Institutions-June1-1998.pdf
8. 2 CFR PART 200, Emergency Management and Assistance, at https://www.gpo.gov/fdsys/pkg/CFR-2007-title44-vol1/content-detail.html
9. U.S. Department of Homeland Security Authorized Equipment List (AEL) available at

https://www.fema.gov/authorized-equipment-list

XVI. **Environmental Historical Preservation (EHP)**

The all sub-grantees will follow the EHP requirements set forth by the Federal granting agency. The sub-grantee will not undertake any project having the potential to impact Environment and Historical Preservation (EHP) resources without the prior written approval of the Federal granting agency, including but not limited to ground disturbance, construction, modification of structures, and purchase and use of sonar equipment. Sub-grantees must comply with all conditions placed on the project as a result of the EHP review. Any change to the approved project scope of work will require a re-evaluation for compliance with these EHP requirements.

Any construction or renovation activities defined by the SAA's office that have been initiated without the necessary EHP review and approval will result in a non-compliance funding and will not be eligible for Federal funding.

Construction includes the following and requires EHP approval:

1. Training and Exercises
2. Purchase of Equipment
3. Physical Security Enhancements
4. Renovation/Upgrades, Modifications to existing structures (which include drywall, paint, carpet or any modifications to existing structure etc.)
5. New Construction or New Additions
6. Communication Towers and related equipment, equipment shelters
7. Other activities that may apply under the EHP section

Please see the link provided for Information Bulletin (IB) 371 Environmental Historical Review Process http://www.fema.gov/doc/government/grant/bulletins/info329_final_screening_memo.docx

XVII. **TERMINATION**

The DEM retains the right to terminate this sub-grant, for cause, at any time before completion of the grant period when it has determined that the sub-grantee has failed to comply with the conditions of these assurances.

1. The DEM reserves the right to terminate the grant in whole or in part due to the failure of the sub-grantee to comply with any term or condition of the signed and agreed upon assurances, failure to implement audit/monitoring recommendations within the prescribed period of time, failure to communicate with or respond to any State Administrative Agency (SAA) request or communication, to acquire and maintain all required insurance policies, bonds, licenses, permits and certifications or to make satisfactory progress in performing the program, financial and administrative requirements of the grant.
2. The DEM staff shall provide written notice of the termination and the reasons for such actions to the sub-grantee.
3. *The DEM may, upon termination of the award, procure, on terms and in the manner that it deems appropriate, materials or services to replace those described in the project description of the grant award. The sub-grantee shall be liable to the DEM for any excess costs incurred by the DEM in procuring equivalent materials or services in substitution for materials or services described in the project description of the grant award.*

As the duly authorized representative of the applicant for Place Jurisdiction name here, I hereby certify that the applicant will comply with the above assurances and certifications.

NAME:_____ TITLE:_____

SIGNATURE:_____ DATE:_____

*Must be signed by the County Manager/Chief Financial Officer, the Tribal Chairman/designee or the state agency director as appropriate

Figure J-1.

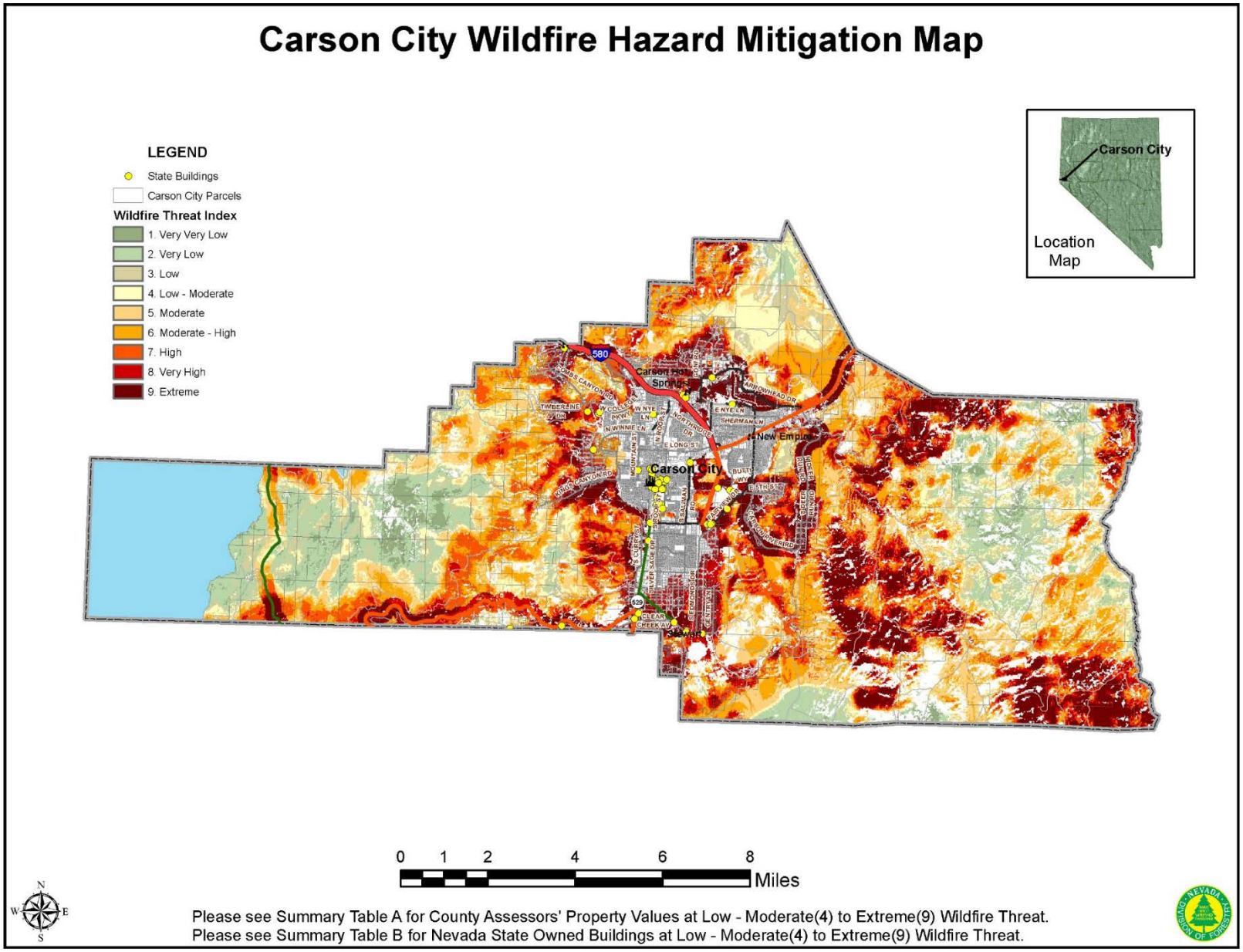

Carson City Wildfire Hazard Mitigation Map
LEGEND
State Buildings
Carson City Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Carson City
Location Map
Carson City
New Empire
0 1 2 4 6 8
Miles
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.

Figure J-2.

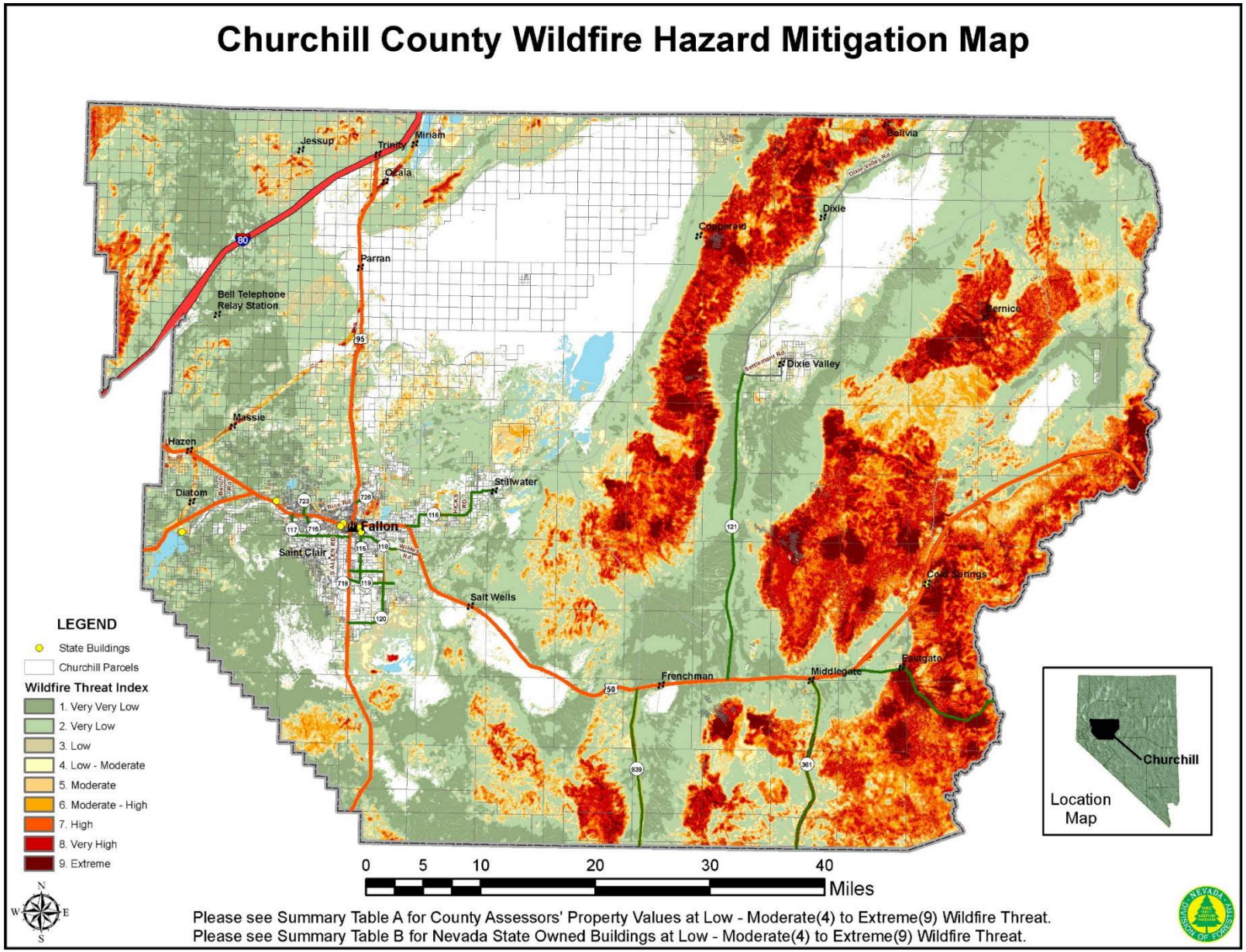

Churchill County Wildfire Hazard Mitigation Map
Jessup
Trinity
Miriam
Ocala
Parran
Bell Telephone Relay Station
Massie
Hazen
Diatom
Stillwater
Fallon
Saint Clair
Salt Wells
Bolivia
Copper Gold
Dixie
Bernice
Dixie Valley
Cow Springs
Frenchman
Middlegate
Eastgate
LEGEND
State Buildings
Churchill Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
0 5 10 20 30 40
Miles
Churchill
Location Map
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.

Figure J-3.

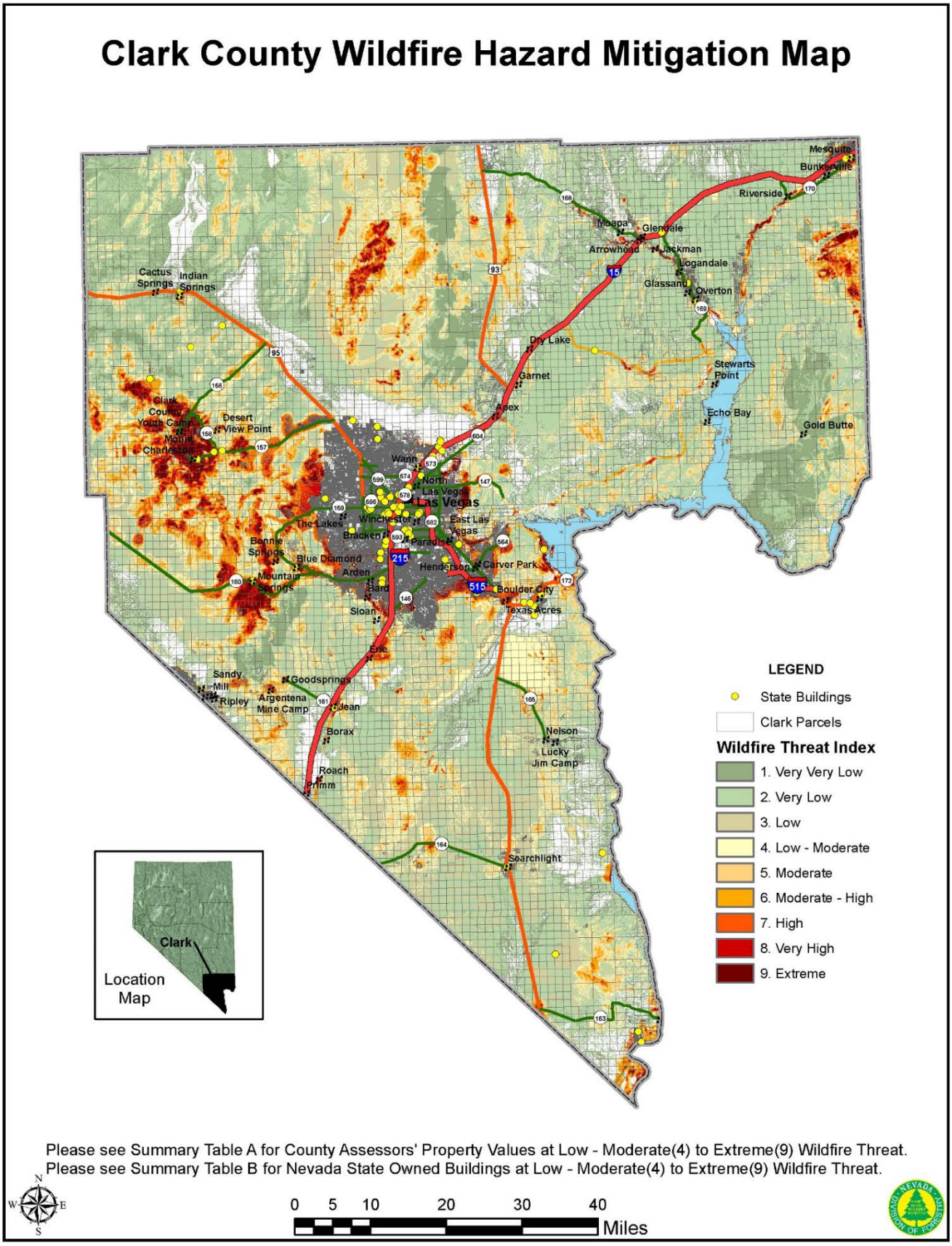

Clark County Wildfire Hazard Mitigation Map
Mesquite
Bunkerville
Riverside
Moapa
Glendale
Arrowhead
Jackman
Logandale
Glassand
Overton
Cactus Springs
Indian Springs
Dry Lake
Garnet
Stewarts Point
Apex
Echo Bay
Gold Butte
Clark County Youth Camp
Desert View Point
Mount Charleston
Wann
North Las Vegas
Las Vegas
East Las Vegas
The Lakes
Winchester
Bracken
Paradise
Bonnie Springs
Blue Diamond
Arden
Mountain Springs
Henderson
Carver Park
Boulder City
Bard
Sloan
Texas Acres
Erie
Sandy
Mill
Ripley
Goodsprings
Argentena Mine Camp
Jean
Borax
Nelson
Lucky Jim Camp
Roach
Primm
Searchlight
LEGEND
State Buildings
Clark Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Clark
Location Map
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-4.

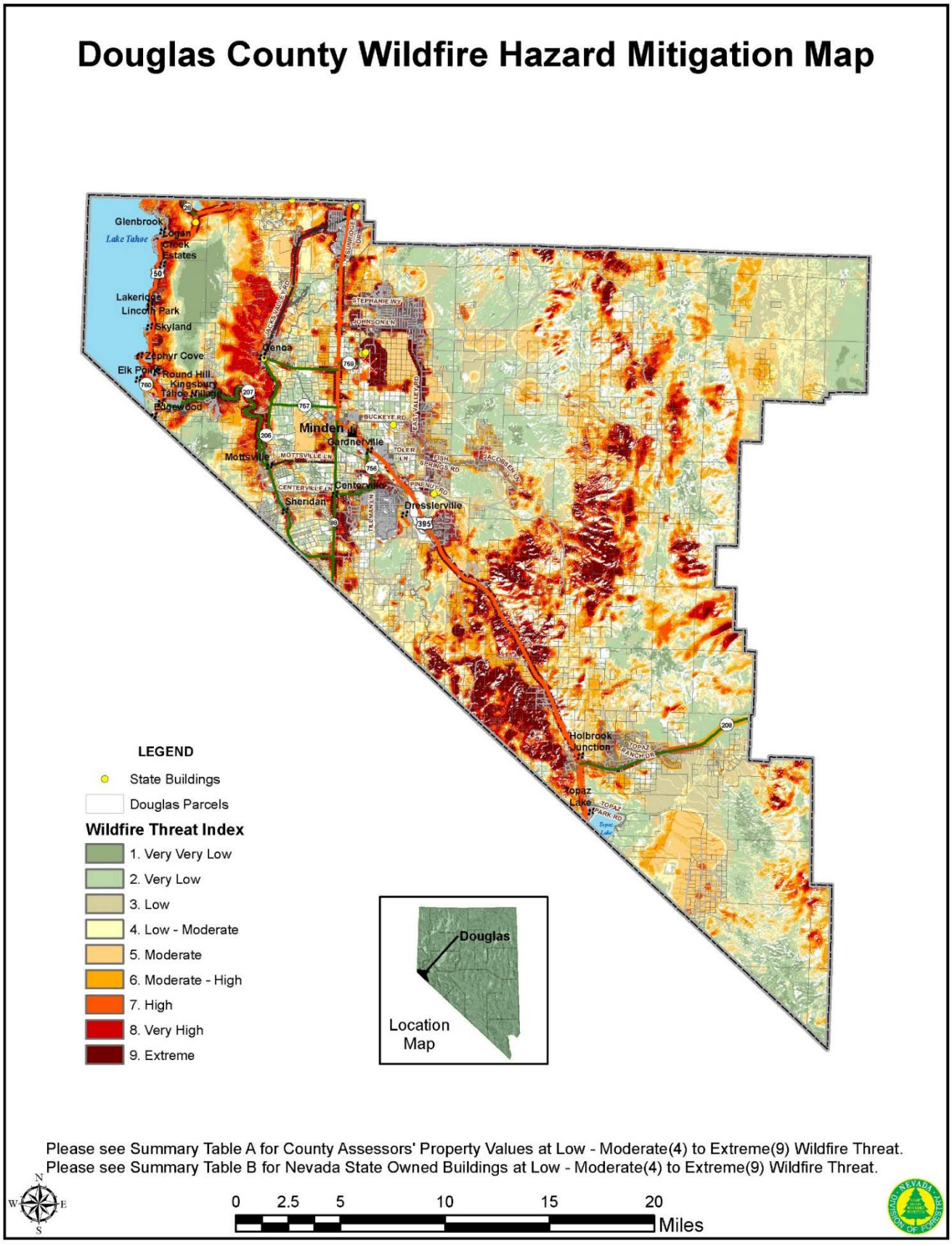

Douglas County Wildfire Hazard Mitigation Map
Glenbrook
Lake Tahoe
Logan Creek Estates
Lakeridge
Lincoln Park
Skyland
Zephyr Cove
Elk Point
Round Hill
Kingsbury
Tahoe Village
Ridgewood
Genoa
Minden
Gardnerville
Mottsville
Centerville
Sheridan
Dresslerville
Holbrook Junction
Topaz Lake
LEGEND
State Buildings
Douglas Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Douglas
Location Map
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
N
W
E
S
0 2.5 5 10 15 20
Miles

Figure J-5.

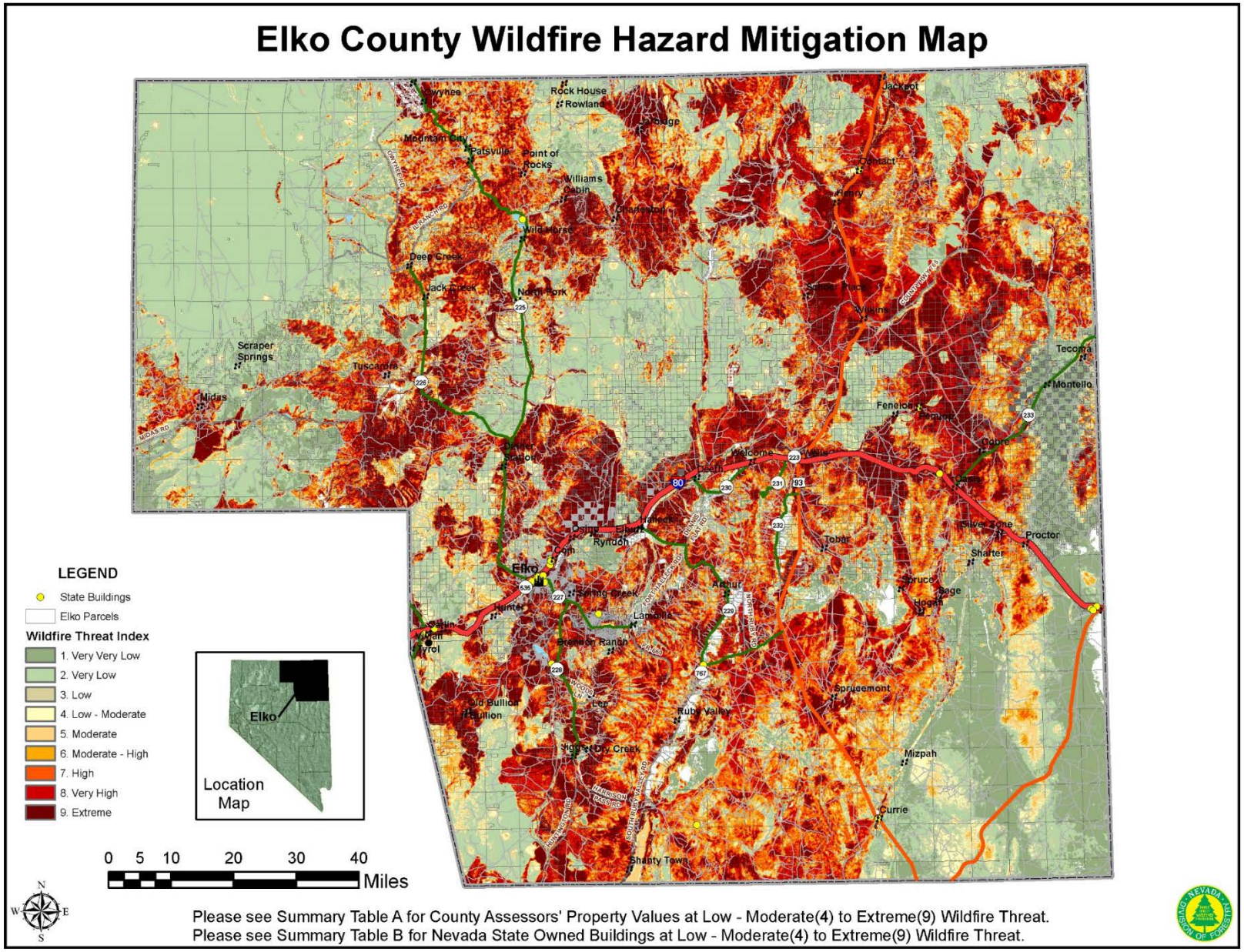

Elko County Wildfire Hazard Mitigation Map
LEGEND
State Buildings
Elko Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Location Map
Elko
0 5 10 20 30 40
Miles
N
W
E
S
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.

Figure J-6.

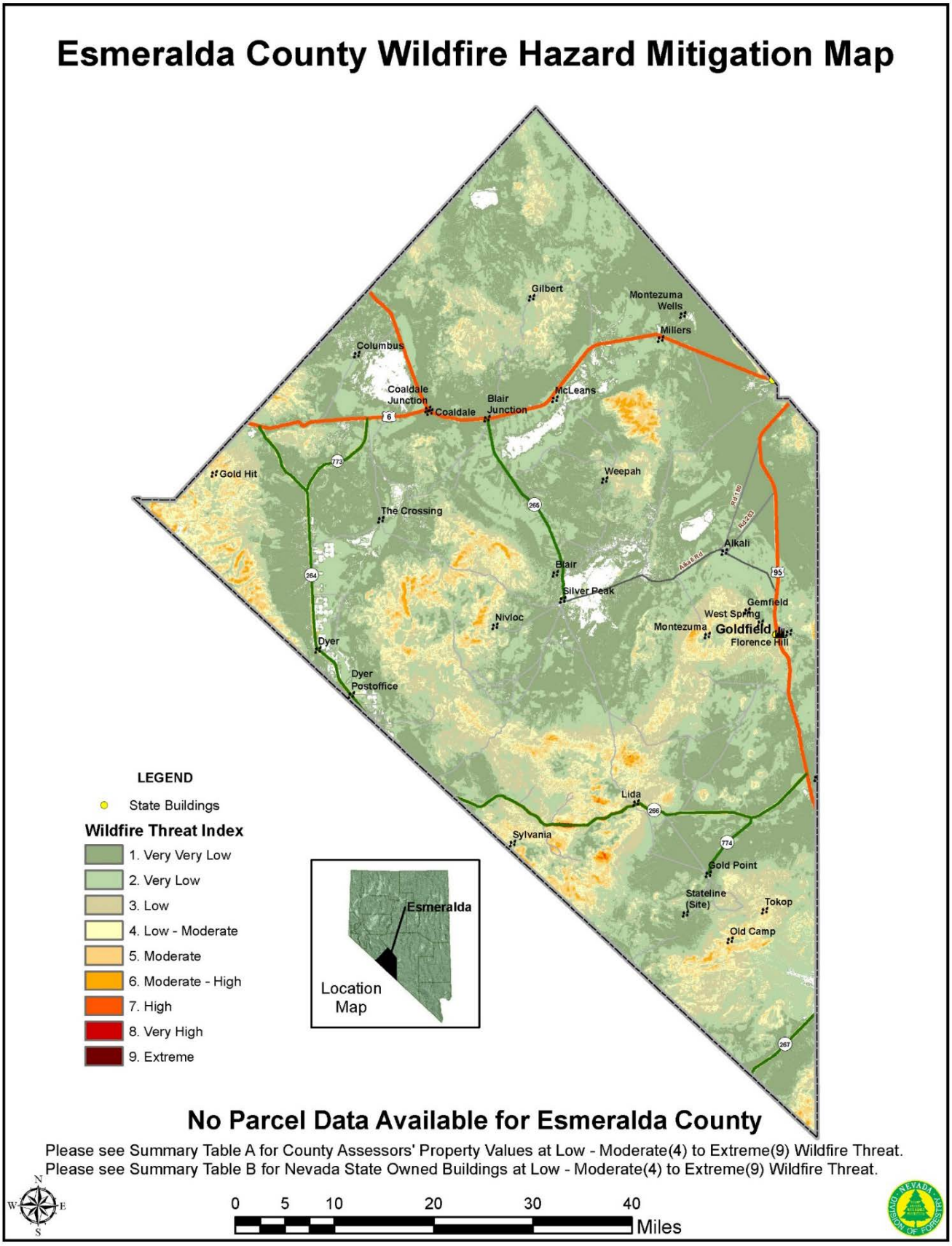

Esmeralda County Wildfire Hazard Mitigation Map
Gilbert
Montezuma Wells
Millers
Columbus
Coaldale Junction
Coaldale
Blair Junction
McLeans
Gold Hit
Weepah
The Crossing
Alkali
Blair
Silver Peak
Gemfield
West Spring
Montezuma
Goldfield
Florence Hill
Nivloc
Dyer
Dyer Postoffice
Lida
Sylvania
Gold Point
Stateline (Site)
Tokop
Old Camp
LEGEND
State Buildings
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Esmeralda
Location Map
No Parcel Data Available for Esmeralda County
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-7.

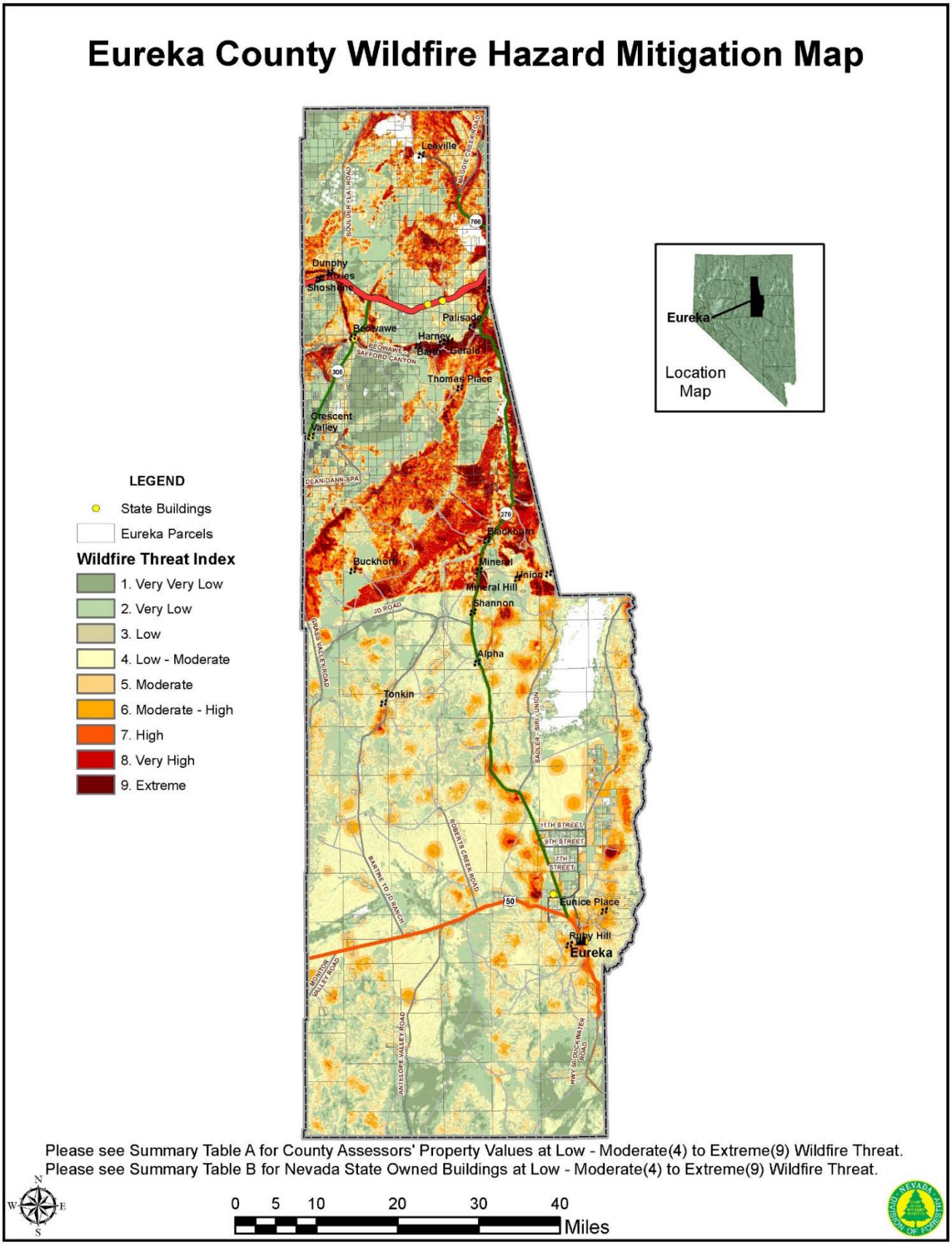

Eureka County Wildfire Hazard Mitigation Map
Leeville
Dunphy
Ikes
Shoshone
Palisade
Beowawe
Harney
Gerald
Thomas Place
Crescent Valley
Blackburn
Buckhorn
Mineral
Union
Mineral Hill
Shannon
Alpha
Tonkin
Eunice Place
Ruby Hill
Eureka
Location Map
LEGEND
State Buildings
Eureka Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-8.

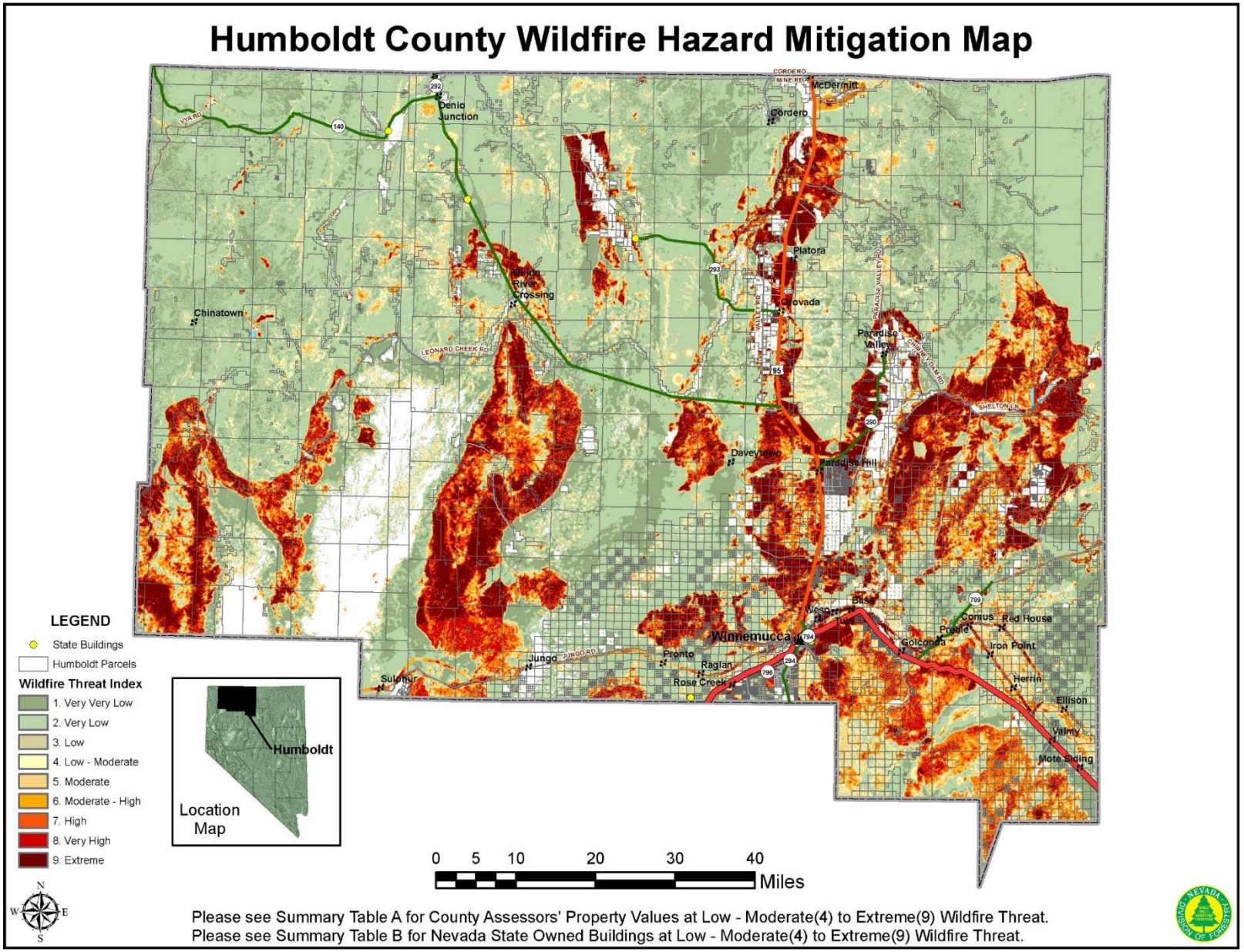

Humboldt County Wildfire Hazard Mitigation Map
McDermitt
Cordero
Denio Junction
Platora
Union River Crossing
Chinatown
Orevada
Paradise Valley
Daveytown
Paradise Hill
Winnemucca
Weso
Bilse
Comus
Red House
Pueblo
Golconda
Iron Point
Jungo
Pronto
Raglan
Rose Creek
Sulphur
Herrin
Ellison
Valmy
Mote Siding
LEGEND
State Buildings
Humboldt Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Humboldt
Location Map
0 5 10 20 30 40
Miles
N
W
E
S
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.

Figure J-9.

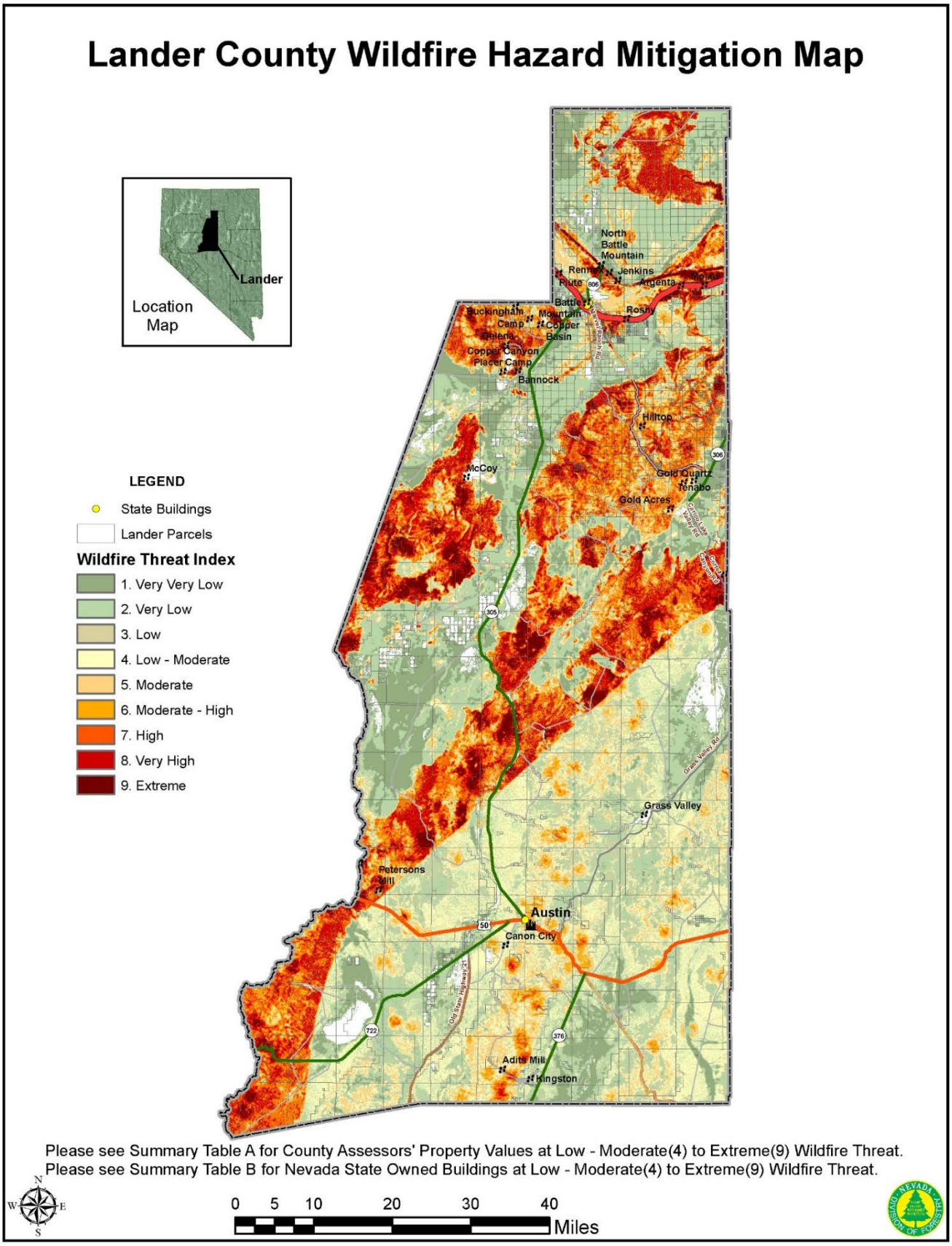

Lander County Wildfire Hazard Mitigation Map
Lander
Location Map
LEGEND
State Buildings
Lander Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
North Battle Mountain
Renno
Jenkins
Argenta
Battle Mountain
Roshy
Buckingham
Camp
Mountain Copper
Basin
Telena
Copper Canyon
Placer Camp
Bannock
Hilltop
McCoy
Gold Quartz
Tenabo
Gold Acres
Grass Valley
Petersons Mill
Austin
Canon City
Adits Mill
Kingston
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-10.

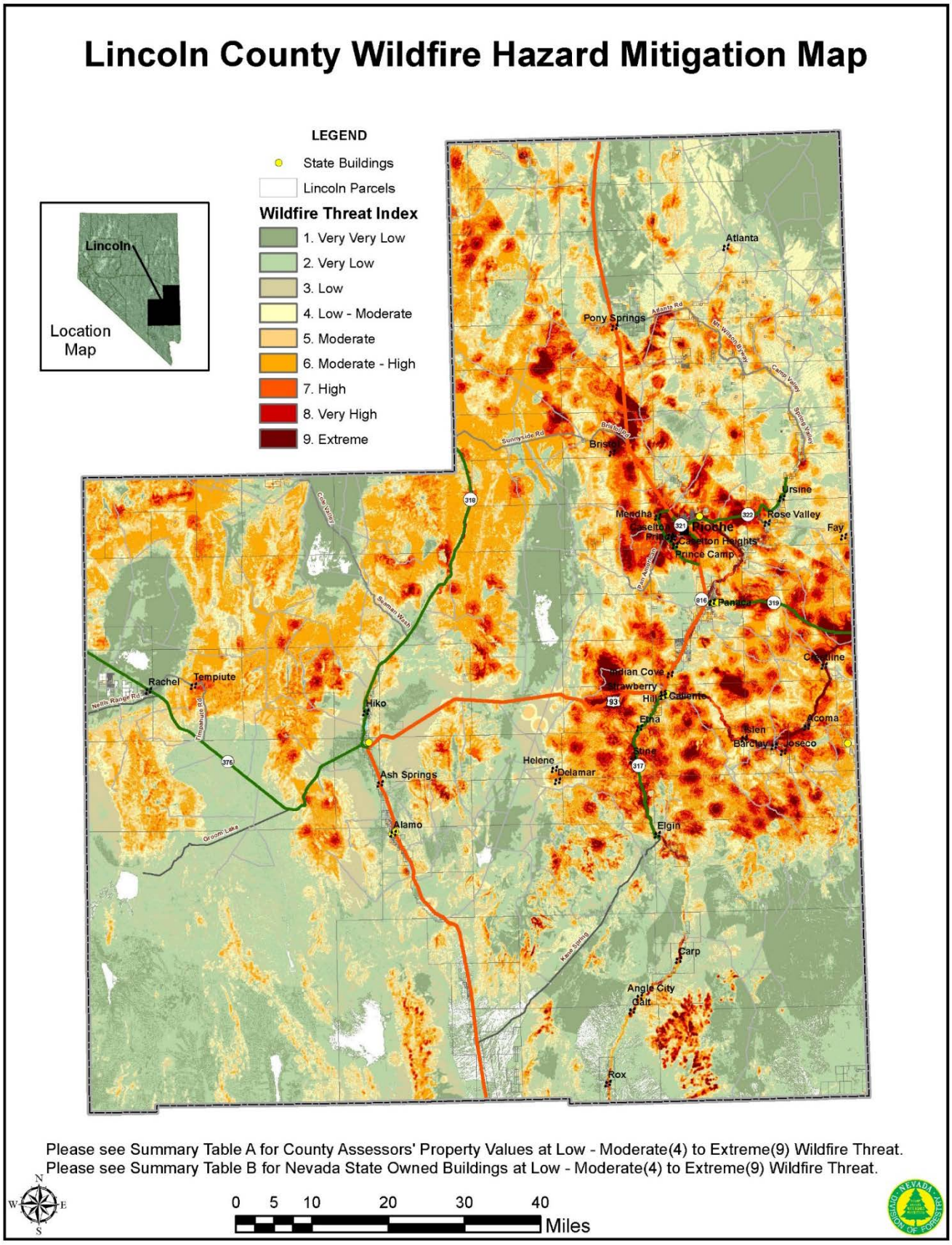

Lincoln County Wildfire Hazard Mitigation Map
LEGEND
State Buildings
Lincoln Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Lincoln
Location Map
Atlanta
Pony Springs
Bristol
Ursine
Meadha
Rose Valley
Fay
Pioche
Caselton Heights
Prince Camp
Panaca
Crestline
Rachel
Tempiute
Hiko
Indian Cove
Strawberry Hill
Caliente
Elna
Acoma
Helen
Barclay
Joseco
Stine
Helene
Delamar
Ash Springs
Alamo
Elgin
Carp
Angle City
Galt
Rox
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-11.

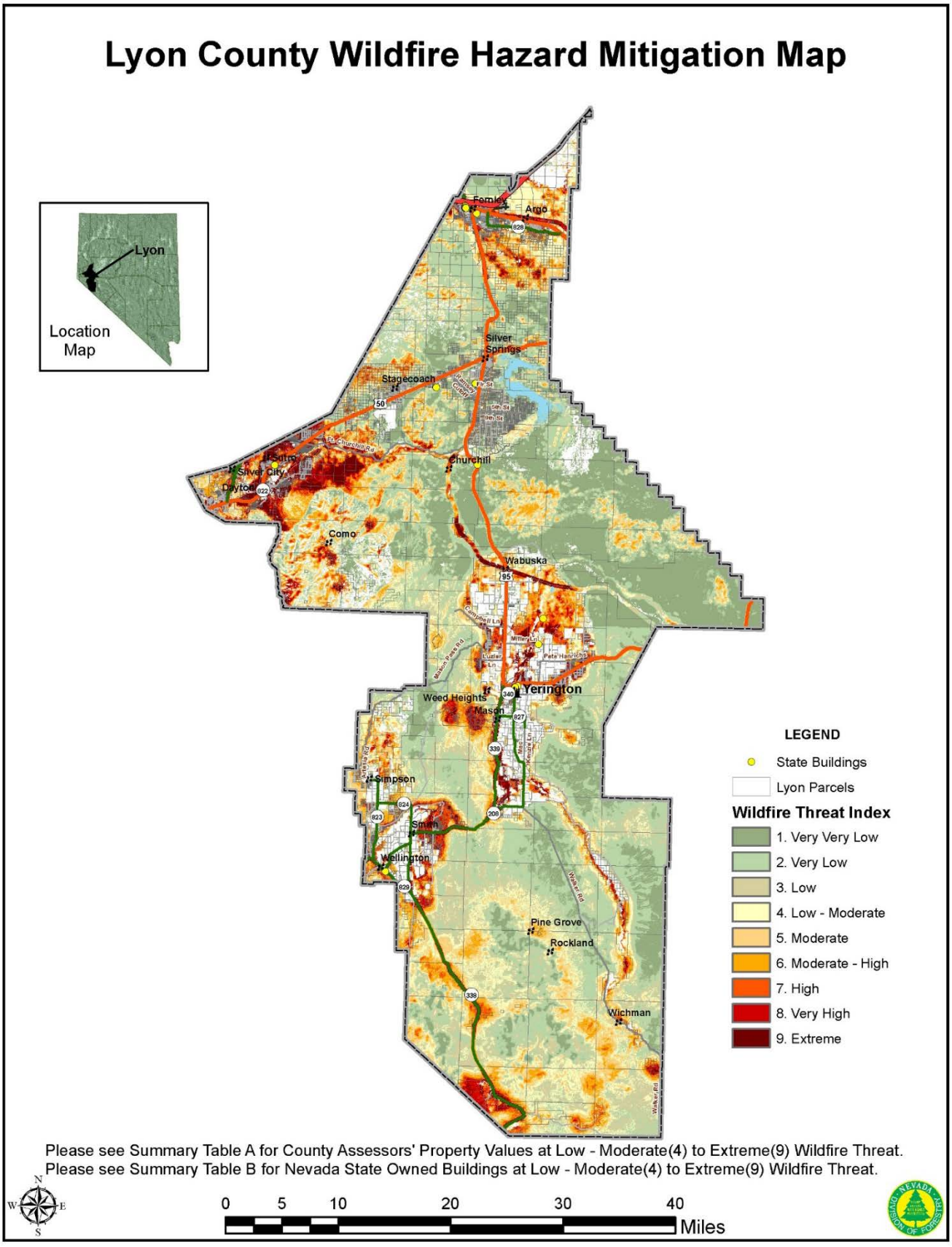

Lyon County Wildfire Hazard Mitigation Map
Location Map
Lyon
Fernley
Argo
Silver Springs
Stagecoach
Churchill
Carson City
Silver City
Dayton
Como
Wabuska
Yerington
Weed Heights
Mason
Simpson
Smith
Wellington
Pine Grove
Rockland
Wichman
LEGEND
State Buildings
Lyon Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-12.

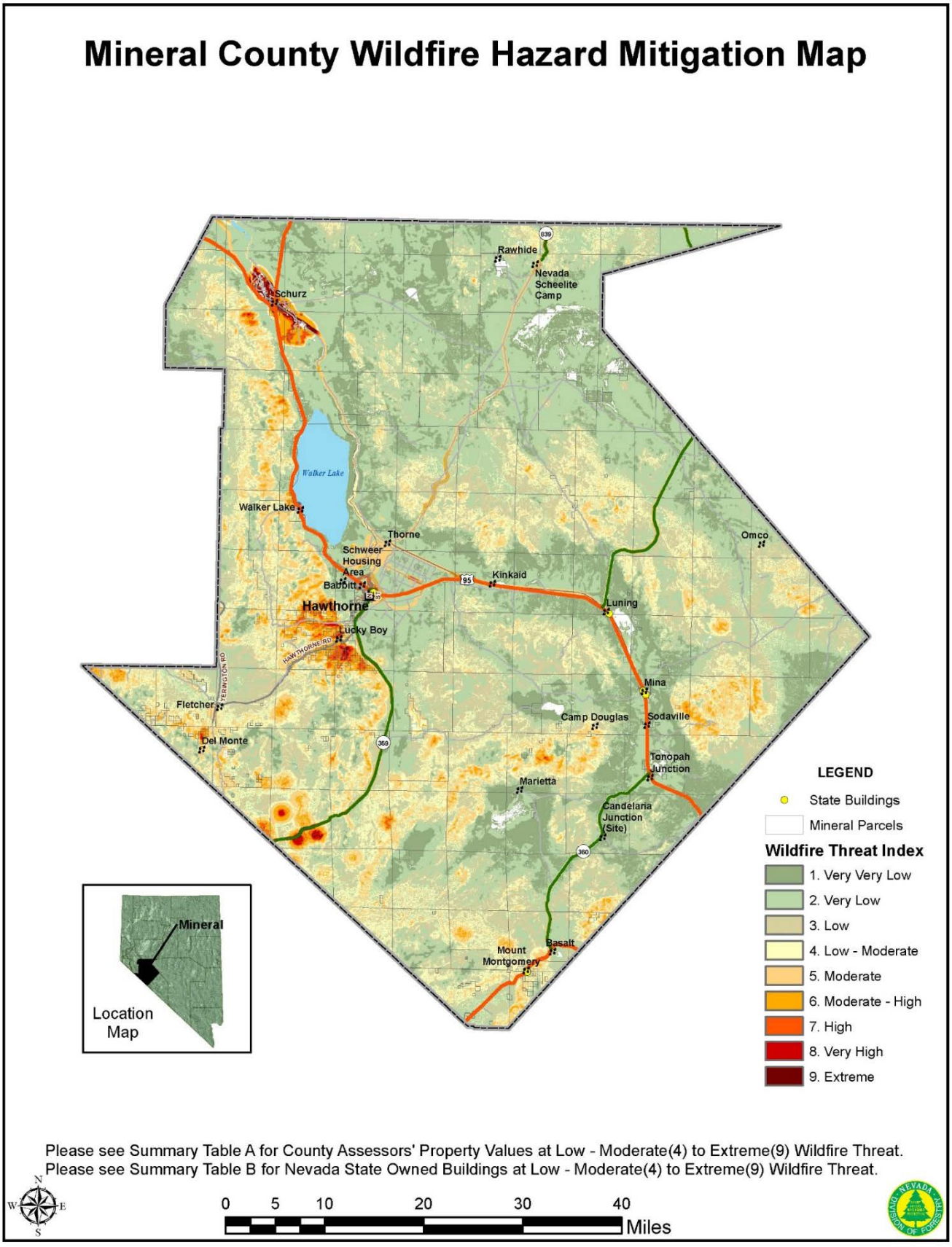

Mineral County Wildfire Hazard Mitigation Map
Rawhide
Nevada Scheelite Camp
Schurz
Walker Lake
Walker Lake
Thorne
Schweer Housing Area
Babbitt
Kinkaid
Hawthorne
Lucky Boy
Omco
Luning
Mina
Fletcher
Camp Douglas
Sodaville
Del Monte
Tonopah Junction
Marietta
Candelaria Junction (Site)
Basalt
Mount Montgomery
Mineral
Location Map
LEGEND
State Buildings
Mineral Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Figure J-13.

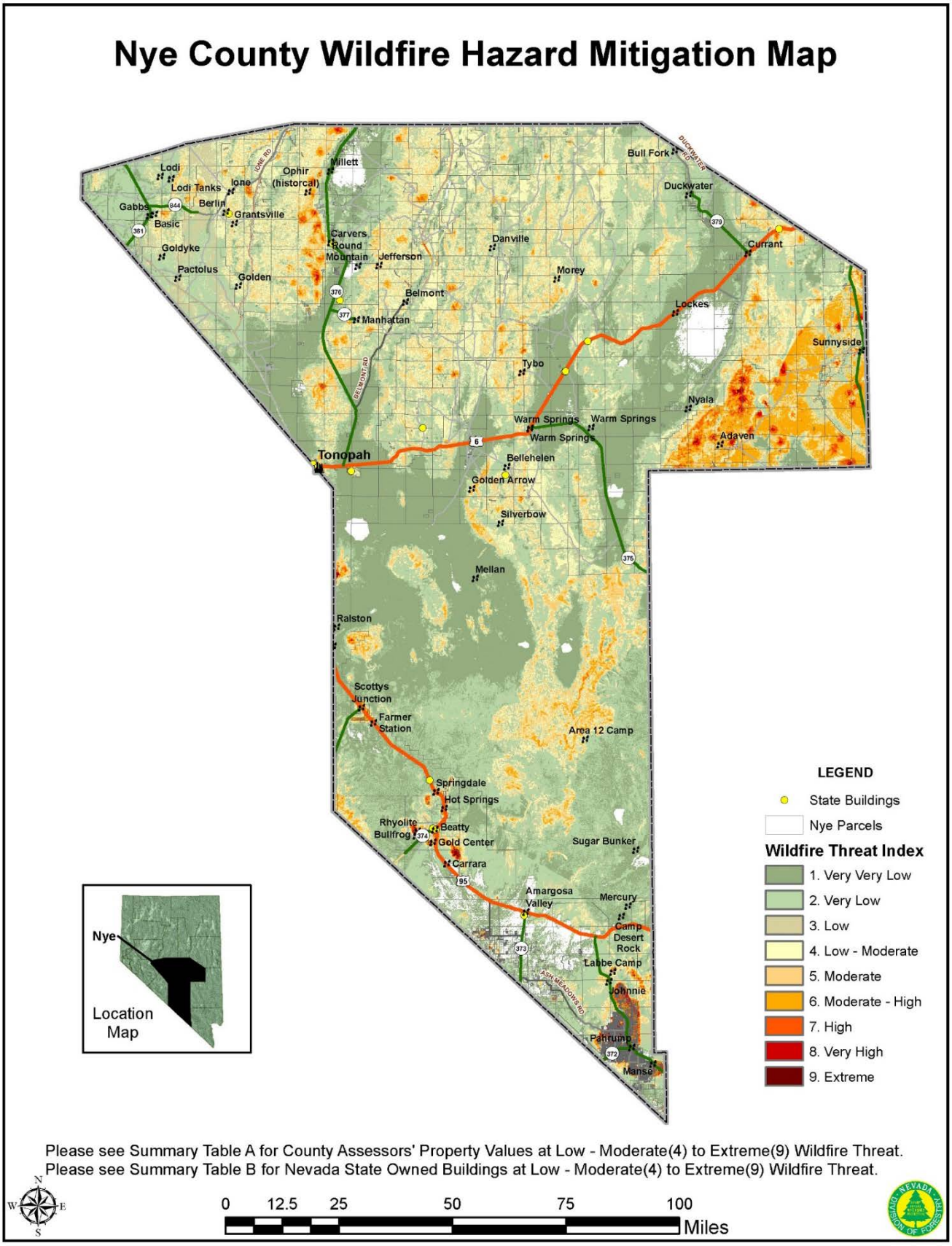

Nye County Wildfire Hazard Mitigation Map
Lodi
Lodi Tanks
Ione
Ophir (historcal)
Millett
Gabbs
Berlin
Grantsville
Basic
Carvers
Round Mountain
Jefferson
Danville
Goldyke
Pactolus
Golden
Belmont
Manhattan
Morey
Bull Fork
Duckwater
Currant
Lockes
Sunnyside
Tybo
Nyala
Warm Springs
Adaven
Tonopah
Bellehelen
Golden Arrow
Silverbow
Mellan
Ralston
Scottys Junction
Farmer Station
Area 12 Camp
Springdale
Hot Springs
Rhyolite
Beatty
Bullfrog
Gold Center
Carrara
Sugar Bunker
Amargosa Valley
Mercury
Camp Desert Rock
Lathe Camp
Johnnie
Pahrump
Manse
LEGEND
State Buildings
Nye Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Nye
Location Map
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 12.5 25 50 75 100
Miles

Figure J-14.

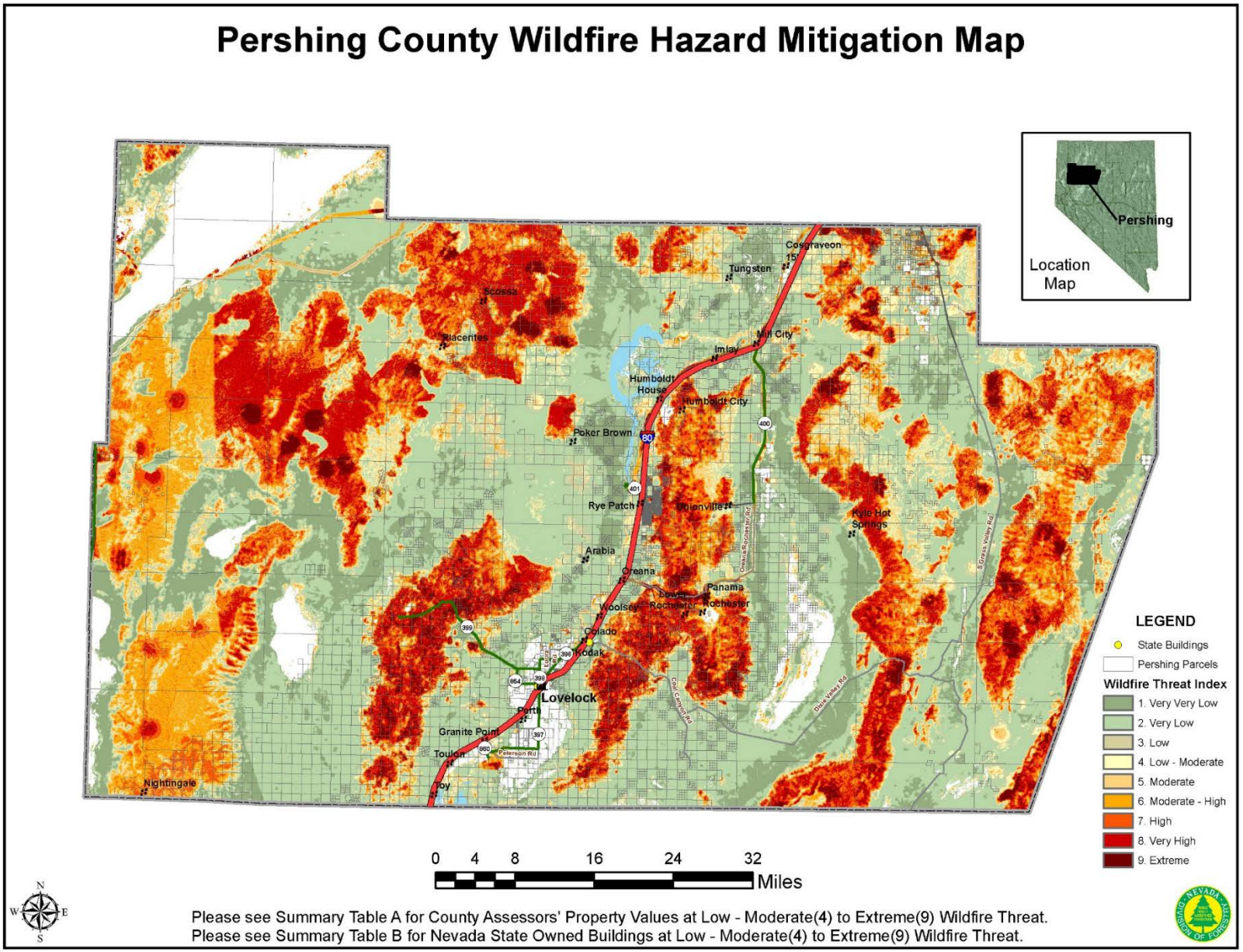

Pershing County Wildfire Hazard Mitigation Map
Location Map
Pershing
Cosgraveon
Tungsten
Scossa
Placerites
Mill City
Imlay
Humboldt House
Humboldt City
Poker Brown
Rye Patch
Unionville
Kyle Hot Springs
Arabia
Oreana
Panama
Lower Rochester
Rochester
Woolsey
Colado
Kodak
Lovelock
Portia
Granite Point
Toulon
Nightingale
Toy
Oreana Rochester Rd
S Grass Valley Rd
Coal Canyon Rd
Derby Valley Rd
Peterson Rd
LEGEND
State Buildings
Pershing Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
0 4 8 16 24 32
Miles
N
W
E
S
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.

Figure J-15.

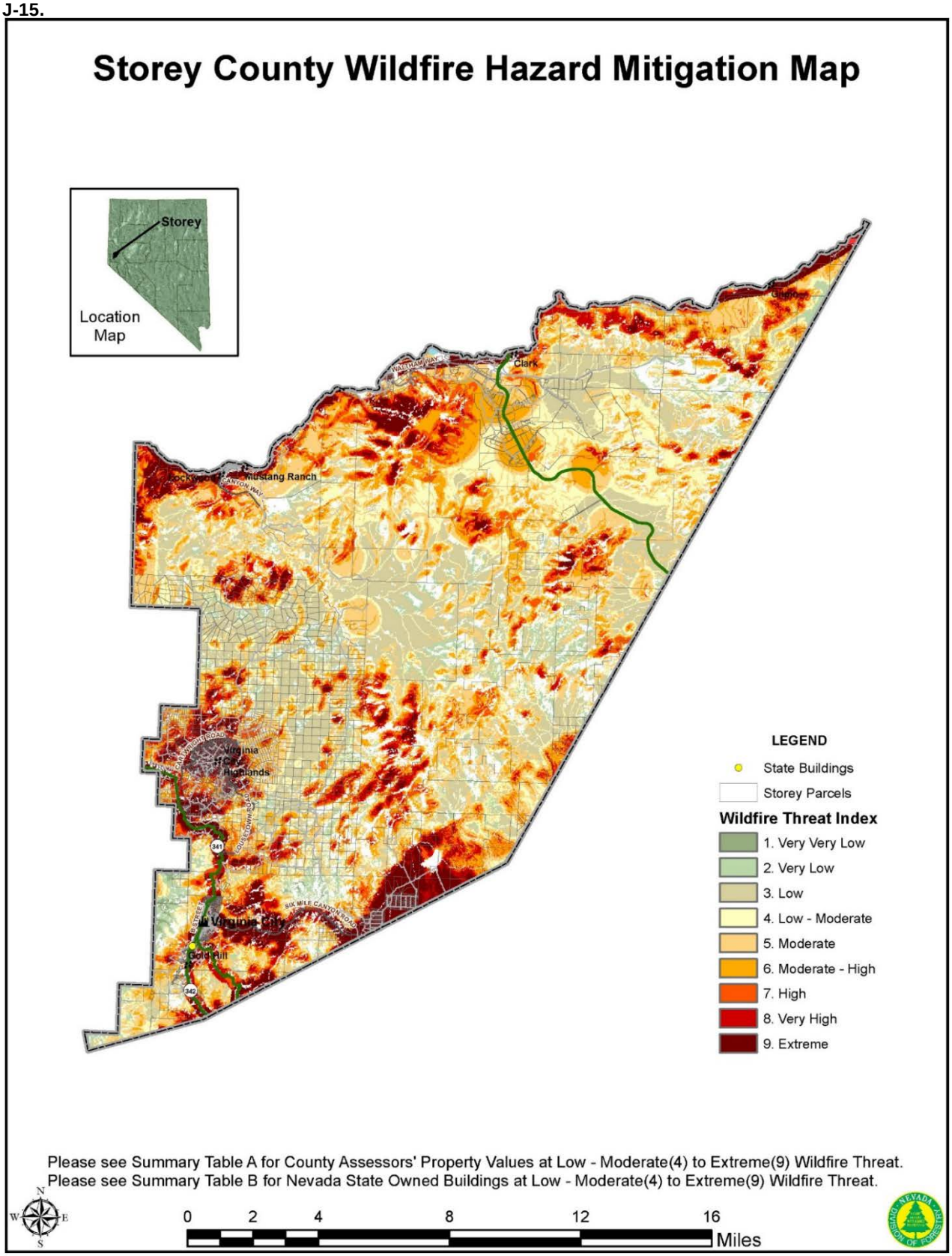

Storey County Wildfire Hazard Mitigation Map
Storey
Location Map
Clark
Mustang Ranch
Virginia City
Gold Hill
LEGEND
State Buildings
Storey Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 2 4 8 12 16
Miles

Figure J-16.

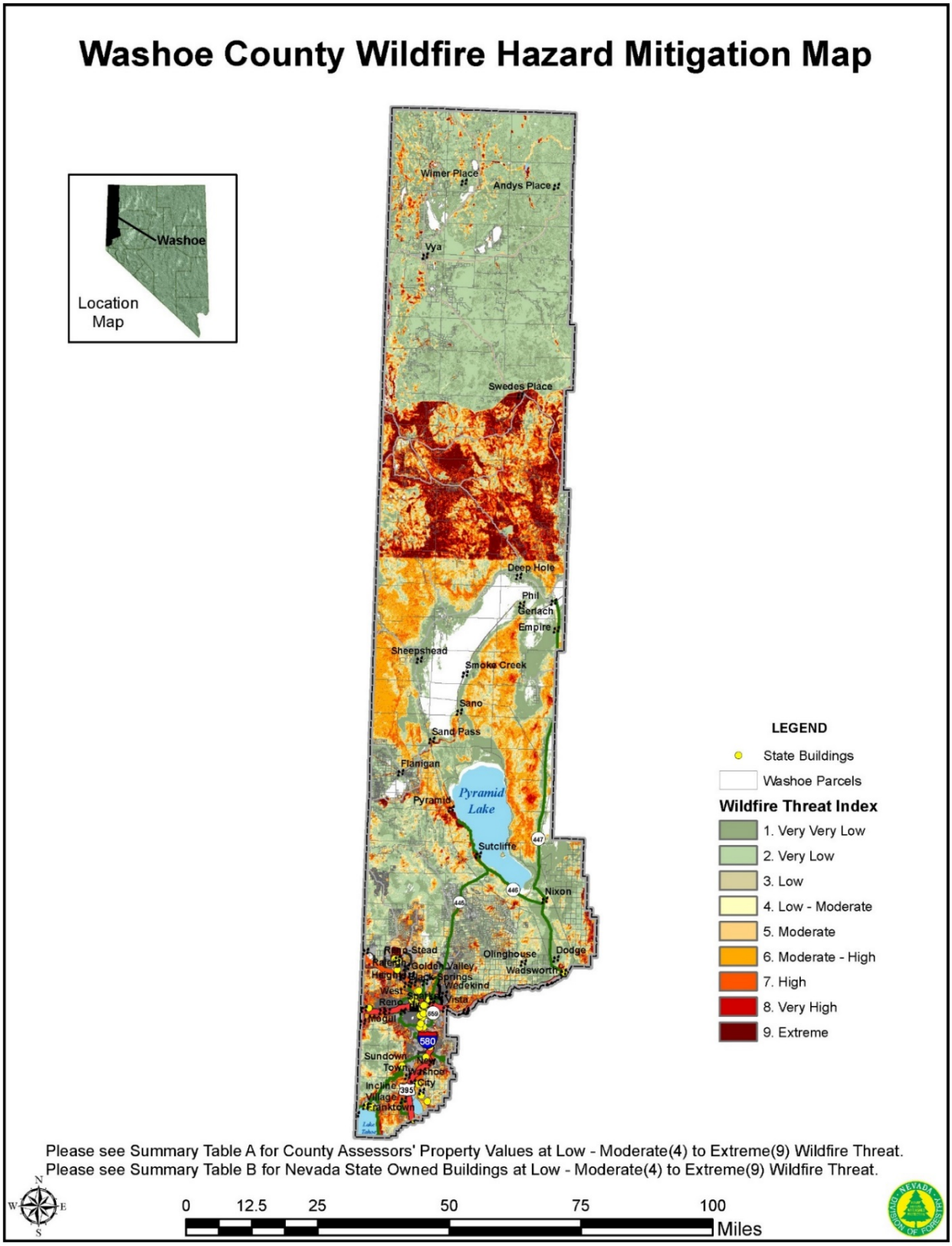

Washoe County Wildfire Hazard Mitigation Map
Washoe
Location Map
Wimer Place
Andys Place
Vya
Swedes Place
Deep Hole
Phil Gerlach
Empire
Sheepshead
Smoke Creek
Sano
Sand Pass
Flanigan
Pyramid
Pyramid Lake
Sutcliffe
Nixon
Olinghouse
Dodge
Wadsworth
Golden Valley
Widekind
Vista
Reno-Stead
Black Springs
West Reno
Verdi
Incline Village
Crystal Bay
Sundown
New Town
Washoe City
Franktown
LEGEND
State Buildings
Washoe Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
N
W
E
S
0
12.5
25
50
75
100
Miles

Figure J-17.

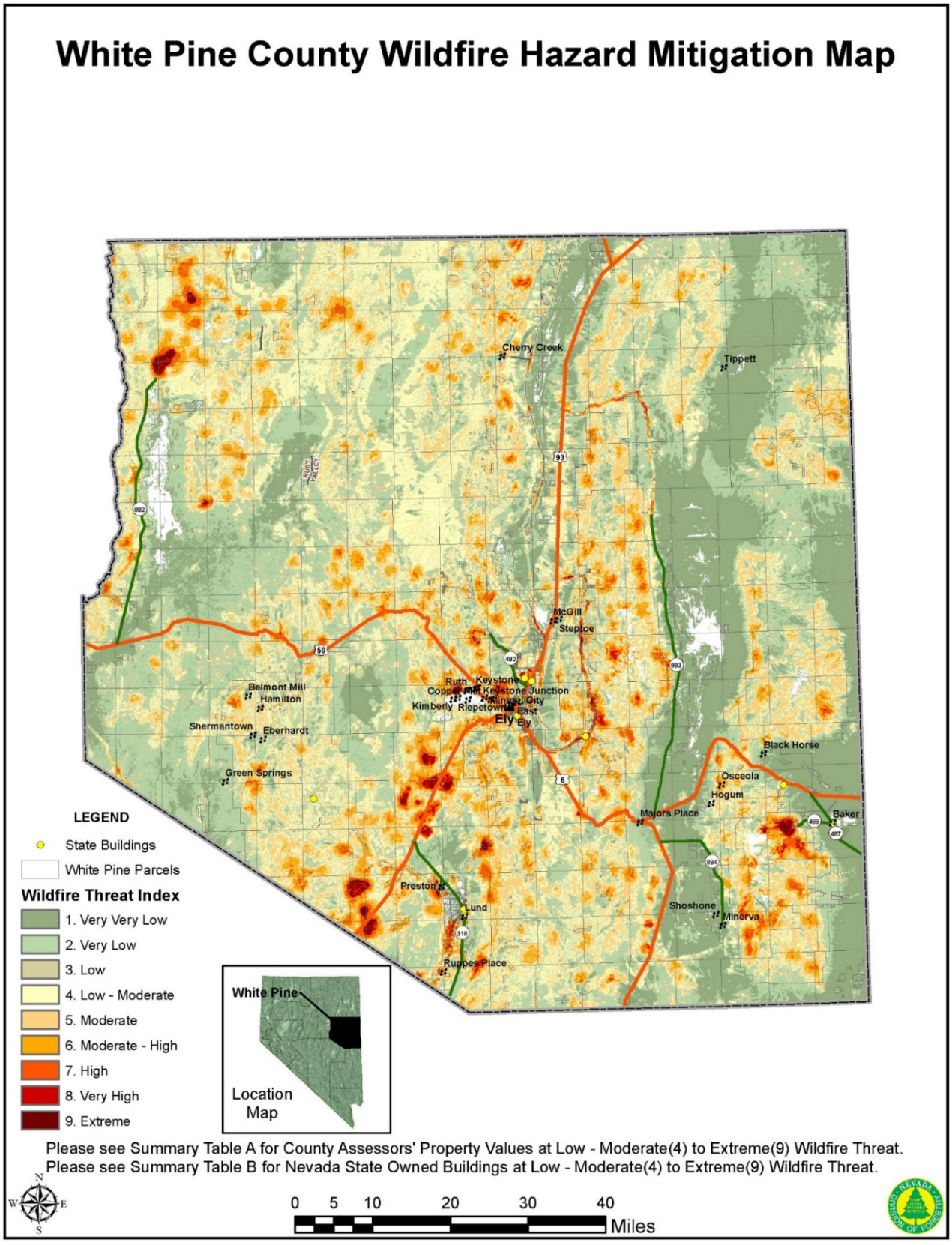

White Pine County Wildfire Hazard Mitigation Map
Cherry Creek
Tippett
McGill
Steptoe
Ruth
Keystone
Copper Mtn
Keystone Junction
Kimberly
Riepetown
Mineral City
Ely
East Ely
Belmont Mill
Hamilton
Shermantown
Eberhardt
Green Springs
Black Horse
Osceola
Hogum
Majors Place
Baker
Preston
Lund
Shoshone
Minerva
Ruppes Place
LEGEND
State Buildings
White Pine Parcels
Wildfire Threat Index
1. Very Very Low
2. Very Low
3. Low
4. Low - Moderate
5. Moderate
6. Moderate - High
7. High
8. Very High
9. Extreme
White Pine
Location Map
Please see Summary Table A for County Assessors' Property Values at Low - Moderate(4) to Extreme(9) Wildfire Threat.
Please see Summary Table B for Nevada State Owned Buildings at Low - Moderate(4) to Extreme(9) Wildfire Threat.
0 5 10 20 30 40
Miles

Table J-1.

SUMMARY TABLE A

Summary of County Assessors' Property Values used in GIS Wildfire Index Catagory Analysis

County	Land Value	Value of Improvements	Total Assessed Parcel Value
Carson City	$352,307,825	$496,563,110	$848,870,935
Churchill	$94,640,965	$240,412,110	$335,053,075
Clark	$7,612,696,132	$6,609,037,887	$14,221,734,019
Douglas	$634,986,237	$600,744,669	$1,235,730,906
Elko	$206,971,674	$656,123,644	$863,095,318
Esmeralda	No Parcel Data Available		$0
Eureka	$22,123,567	$75,583,195	$97,706,762
Humboldt	$90,049,690	$392,280,429	$482,330,119
Lander	$69,419,831	$50,088,060	$119,507,891
Lincoln	$509,160,677	$83,064,143	$592,224,820
Lyon	$276,298,041	$881,114,952	$1,157,412,993
Mineral	$93,951,988	$17,298,489	$111,250,477
Nye	$1,848,901,684	$738,729,977	$2,587,631,661
Pershing	$119,014,035	$62,031,267	$181,045,302
Storey	$99,804,495	$185,393,811	$285,198,306
Washoe	$2,535,594,078	$4,458,283,022	$6,993,877,100
White Pine	$565,302,005	$112,735,982	$678,037,987
TOTAL			$30,790,707,671

Table J-2.

Number of Nevada State Owned Buildings[1] by County and Fire Risk Index Category[2]

County	Fire Risk Index Categories						County Totals
	Low-Moderate → Extreme						
	4	5	6	7	8	9	
Carson City	0	0	8	14	46	238	306
Churchill	3	70	1	0	0	1	75
Clark	49	23	160	13	34	105	384
Douglas	0	0	4	1	27	23	55
Elko	0	0	0	71	1	252	324
Esmeralda	0	1	2	0	0	0	3
Eureka	0	0	1	2	1	2	6
Humboldt	0	18	8	14	0	18	58
Lander	0	0	0	3	1	5	9
Lincoln	0	11	8	79	11	202	311
Lyon	52	0	11	2	50	23	138
Mineral	0	0	5	2	0	0	7
Nye	11	56	3	4	1	2	77
Pershing	46	1	25	0	0	0	72
Storey	0	0	0	2	4	0	6
Washoe	0	0	0	1	105	69	175
White Pine	6	51	28	1	8	23	117
Risk Category Totals	167	231	264	209	289	963	2,123

Total State Owned Buildings in Nevada - 2,952
State Owned Buildings located in No(0), Very Very Low(1), Very Low(2) or Low Risk(3) Categories - 829

[1]Facility Information obtained from Department of Administration, State Public Works Division
http://publicworks.nv.gov/Buildings/List_of_State_Owned_Buildings/

[2]Fire Risk data obtained from West Wide Wildfire Risk Assessment
http://www.westwideriskassessment.com/

This appendix includes updated charts showing the number of weather related incidents and reported deaths or damages by county from 1995 – 2016. These charts were compiled by Chris Smallcomb of the NWS office in Reno.

A detailed study was conducted in 2007 by the former State Climatologist. The details of this report are included in this appendix.

K.1 WEATHER RELATED EVENTS INCIDENTS BY COUNTY

Important Notes: *These numbers may include events from nearby areas not in the county due to how NWS groups some hazards such as winter storms and river floods into zones. The Number of Incidents is simply the raw tally of reports taken by the National Weather Service, not necessarily the number of storms. Deaths and damages are limited to what is reported to the NWS or what NWS can glean from media or emergency response reports.

Table K-1. Carson City Weather Related Incidents by County

Hazard	Number of Incidents (1995-2016)	Reported Deaths/Damages
Dust Storm*	4	0
Excessive Heat*	0	0
Extreme Cold*	1	0
Flash Flood	2	0/60K
River Flood*	5	2/4.6M
Hail – Large	3	0
Heavy Rainfall	4	0/100K
Heavy Snowfall*	259	2/118K
High Wind – Winter*	500+	1+/5.7M+
Ice Storm*	2	2/0K
Lightning – Reported	0	0
Thunderstorm Winds	4	0/6K
Tornado	1	0
Winter Storm*	20	1/450K

Table K-2. Churchill County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	21	0/240K (19 injuries)
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	2	0
River Flood*	4	0/125K
Hail – Large	9	0
Heavy Rainfall	0	0
Heavy Snowfall*	17	0
High Wind – Winter*	59	1/1.1M
Ice Storm*	2	1/30K
Lightning – Reported	0	0
Thunderstorm Winds	28	0/21.5K
Tornado	1	0
Winter Storm*	2	2/150K

Table K-3. Clark County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	7	0/10K
Excessive Heat*	22	65/25K
Extreme Cold*	0	0
Flash Flood	251	7/83M
River Flood*	21	0/5M
Hail – Large	68	0/100M
Heavy Rainfall	18	0/13M
Heavy Snowfall*	82	0/1M
High Wind – Winter*	225	2/3.4M
Ice Storm*	0	0
Lightning – Reported	43	0/4.9M
Thunderstorm Winds	126	0/6.3M
Tornado	3	0/30K
Winter Storm*	2	0

Table K-4. Douglas County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	4	0
Excessive Heat*	0	0
Extreme Cold*	1	0
Flash Flood	14	0/2.3M
River Flood*	5	2/1.5M
Hail – Large	6	0
Heavy Rainfall	4	0
Heavy Snowfall*	259	0/118K
High Wind – Winter*	500+	1+/5.7M+
Ice Storm*	2	2/0K
Lightning – Reported	5	0/27K
Thunderstorm Winds	4	0
Tornado	0	0
Winter Storm*	20	1/450K

Table K-5. Elko County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	2	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	45	0/114K
River Flood*	12	0/154K
Hail – Large	38	0/12K
Heavy Rainfall	0	0
Heavy Snowfall*	143	0/50K
High Wind – Winter*	62	0/13K
Ice Storm*	0	0
Lightning – Reported	1	0/5K
Thunderstorm Winds	88	0/139K
Tornado	8	0/2K
Winter Storm*	20	0

Table K-6. Esmeralda County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	1	0/25K
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	17	0/145K
River Flood*	0	0
Hail – Large	0	0
Heavy Rainfall	0	0
Heavy Snowfall*	16	0
High Wind – Winter*	87	0/386K
Ice Storm*	0	0
Lightning – Reported	4	0/86K
Thunderstorm Winds	0	0/5K
Tornado	0	0
Winter Storm*	2	1/0K

Table K-7. Eureka County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	2	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	22	324K
River Flood*	4	0/5K
Hail – Large	8	0/105K
Heavy Rainfall	0	0
Heavy Snowfall*	73	0/15K
High Wind – Winter*	15	0/30K
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	16	0/2K
Tornado	2	0
Winter Storm*	16	0

Table K-8. Humboldt County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	4	1/1.5M
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	6	0/38K
River Flood*	2	0
Hail – Large	5	0
Heavy Rainfall	0	0
Heavy Snowfall*	21	0
High Wind – Winter*	21	0/47K
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	32	0/77K
Tornado	5	0
Winter Storm*	5	0

Table K-9. Lander County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	2	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	6	0/15K
River Flood*	4	0/3K
Hail – Large	8	0
Heavy Rainfall	0	0
Heavy Snowfall*	73	0/15K
High Wind – Winter*	15	0/30K
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	19	0/52K
Tornado	1	0
Winter Storm*	16	0

Table K-10. Lincoln County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	1	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	55	0/1.1M
River Flood*	1	0/20M
Hail – Large	11	0
Heavy Rainfall	0	0
Heavy Snowfall*	41	0/50K
High Wind – Winter*	54	0/303K
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	11	0/25K
Tornado	3	0
Winter Storm*	1	0/10K

Table K-11. Lyon County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	27	0/240K (19 injuries)
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	16	0/6.7M
River Flood*	11	2/641M
Hail – Large	7	1/5K
Heavy Rainfall	2	0
Heavy Snowfall*	143	0/103K
High Wind – Winter*	500+	2+/7.2M+
Ice Storm*	4	3/30K
Lightning – Reported	2	0/42K
Thunderstorm Winds	18	0/71K
Tornado	3	0
Winter Storm*	10	3/600K

Table K-12. Mineral County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	2	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	8	0/1K
River Flood*	1	0/640M
Hail – Large	3	0
Heavy Rainfall	2	0
Heavy Snowfall*	19	0
High Wind – Winter*	86	0/1.0M
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	4	0/10K
Tornado	1	0
Winter Storm*	2	0

Table K-13. Nye County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	4	0/35K
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	45	0/3.9M
River Flood*	2	0
Hail – Large	6	0
Heavy Rainfall	0	0
Heavy Snowfall*	106	0/510K
High Wind – Winter*	239	0/1.3M
Ice Storm*	0	0
Lightning – Reported	7	1/77K
Thunderstorm Winds	40	0/55K
Tornado	1	0
Winter Storm*	8	1/0K

Table K-14. Pershing County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	21	0/240K (19 injuries)
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	0	0
River Flood*	4	0/150K
Hail – Large	0	0
Heavy Rainfall	0	0
Heavy Snowfall*	17	0
High Wind – Winter*	59	1/1.1M
Ice Storm*	2	1/30K
Lightning – Reported	0	0
Thunderstorm Winds	7	0/100K
Tornado	0	0
Winter Storm*	2	2/150K

Table K-15. Storey County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	4	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	7	0/25K
River Flood*	4	2/967K
Hail – Large	2	0
Heavy Rainfall	0	0
Heavy Snowfall*	107	0/103K
High Wind – Winter*	500+	1+/5.5M+
Ice Storm*	2	2/0K
Lightning – Reported	0	0
Thunderstorm Winds	1	0
Tornado	0	0
Winter Storm*	6	1/450K

Table K-16. Washoe County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	25	0/240K (19 injuries)
Excessive Heat*	0	0
Extreme Cold*	1	0
Flash Flood	18	0/2.1M
River Flood*	14	2/6.3M
Hail – Large	25	0
Heavy Rainfall	20	0
Heavy Snowfall*	279	0/128K
High Wind – Winter*	500+	2+/7.0M+
Ice Storm*	4	3/30K
Lightning – Reported	5	0/300K (6 injuries)
Thunderstorm Winds	51	0/16K
Tornado	7	0
Winter Storm*	22	3/600K

Table K-17. White Pine County Weather Related Incidents by County		
Hazard	**Number of Incidents (1995-2016)**	**Reported Deaths/Damages**
Dust Storm*	0	0
Excessive Heat*	0	0
Extreme Cold*	0	0
Flash Flood	19	0/16K
River Flood*	3	0
Hail – Large	5	0
Heavy Rainfall	0	0
Heavy Snowfall*	117	0/10K
High Wind – Winter*	38	0/37K
Ice Storm*	0	0
Lightning – Reported	0	0
Thunderstorm Winds	18	0
Tornado	2	0
Winter Storm*	18	0

K.2 EXTREME WEATHER SUMMARY BY COUNTY, 2007 REPORT

Extreme weather has relevance to various other hazard types that include avalanche, flooding, and landslide. In 2007, the State Climatologist prepared summary data on extreme weather for each county from records of the National Climatic Data Center (NCDC). These data are made available below to local and county jurisdictions and tribal entities to assist in preparedness and response planning. These data include historical summaries of the following severe weather events:

- Damage-causing storm events
- Drought
- Extreme Temperatures (Heat)
- Precipitation Extremes (snow)
- Severe wind events
- Thunderstorm

An online map of the weather stations across the state from which these data were compiled is available at this link:

http://www.wrcc.dri.edu/summary/climsmnv.html

It includes a clickable function to view climate summaries for each station.

K.2.1 Damage-causing storm events by County

The Nevada Climate Office under the direction of Dr. Jeff Underwood provided the following summary of information derived from the National Climate Data Center's website. The information, although not relevant to a state declaration, is valuable to Nevada's counties in their planning for response.

Damage-causing storm events reported by the National Climate Data (1959-2006).

Carson City
Total damage reported as $4,701,000 with 2 people being injured.
By Type
Hail: 1
Tornado: 1
Flood: 2
Heavy Rain: 4
Thunderstorm Wind: 3

Churchill County
Total damage reported as $11,000 with 1 person being injured.
By Type
Dust Devil: 1
Hail: 4
Thunderstorm Wind: 8
Funnel Cloud: 1
Tornado: 4
Lightning: 1-

Clark County
Total damage reported as $103,964,000 with 10 deaths, and 30 people injured.
By Type
- Flash Flood: 67
- Hail: 46
- Heat: 1
- High Wind: 6
- Tornado: 11
- Urban/Small Stream Flood: 8
- Wildfire: 1
- Dust Storm: 1
- Funnel Cloud: 3
- Heavy Rain: 3
- Heavy Snow: 1
- Lightning: 13
- Thunderstorm Wind: 37
- Whirlwind:
- Winter Storm: 2

Douglas County
Total damage reported as $2,014,000 with 2 people being injured.
By Type
- Flash Flood: 3
- Heavy Rain: 4
- Lightning: 4
- Thunderstorm Wind: 3
- Dust Devil: 1
- Hail: 3
- High Wind: 5
- Tornado: 13

Elko County
Total damage reported as $663,000 with 30 people being injured.
By Type
- Dry Microburst: 2
- Flash Flood: 14
- Funnel Cloud: 4
- Heavy Snow: 49
- Tornado: 13
- Urban/Small Stream Flood: 2
- Winter Storm: 4
- Blizzards: 2
- Dust Storm: 1
- Flood: 5
- Hail: 22
- High Wind: 14
- Thunderstorm Wind: 59
- Wildfire: 1
- Winter Weather/Mix: 1

Esmeralda County
Total damage reported as $40,000 with 0 injuries.
By Type
- Tornado: 1
- Flash Flood: 3

Eureka County
Total damage reported as $100,000 with 0 injuries.
By Type

Hail: 6
High Wind: 1
Thunderstorm Wind: 7
Flash Flood: 6
Heavy Snow: 1
Tornado: 3
Winter Storm: 1

Humboldt County
Total damage reported as $123,000 with 0 injuries.
By Type

Dust Storm: 1
Hail: 6
High Wind: 8
Thunderstorm Wind: 19
Winter Storm: 2
Flash Flood: 1
Heavy Snow: 9
Tornado: 5
Wildfire: 1
Winter Weather/Mix: 1

Lander County
Total damage reported as $9,000 with 1 person being injured.
By Type

Dust Storm: 1
Flood: 5
Heavy Snow: 39
Tornado: 1
Flash Flood: 2
Hail: 14
High Wind: 4
Thunderstorm Wind: 21
Winter Storm: 6
Winter Weather/Mix: 1

Lincoln County
Total damage reported as $20,990,000 with 0 injuries.
By Type

Flood: 1
Heavy Snow: 12
Tornado: 6
Flash Flood: 15
Hail: 6
High Wind: 4
Thunderstorm Wind: 2
Winter Storm: 1

Lyon County
Total damage reported as $593,000 with 1 death, and 1 person injured.

By Type

Flash Flood: 4
Flood: 3
Funnel Cloud: 1
Hail: 5
High Wind: 1
Ice on Road: 1
Tornado: 4
Thunderstorm Wind: 16

Mineral County
Total damage reported as $649,819,000 with 8 deaths, and 63 people injured.

By Type

Blizzards: 1

Dense Fog: 2
Dust Storm: 2
Extreme Cold: 1
Flash Flood: 6
Flood: 2
Fog: 2
Hail: 4
Heat: 1
Heavy Rain: 2
Heavy Snow: 46
High Wind: 63
Thunderstorm Wind: 1
Urban/Small Stream Flood: 1
Winter Storm: 1

Nye County

Total damage reported as $3,563,000 with 1 death, and 2 people injured.

By Type

Flash Flood: 11
Hail: 2
Heavy Snow: 12
High Wind: 13
Lightning: 2
Tornado: 4
Thunderstorm Wind: 18
Urban/Small Stream Flood: 1

Pershing County

Total damage reported as $150,000 with 0 injuries.

By Type

Flash Flood: 1
Flood: 1
Hail: 1
Thunderstorm Wind: 14

Storey County

Total damage reported as $3,477,000 with 0 injuries.

By Type

Flash Flood: 5
Flood: 1
Hail: 2

White Pine County

Total damage reported as $145,000 with 1 person injured.

By Type

Dust Storm: 1
Flash Flood: 7
Flood: 1
Fog: 1
Funnel Cloud: 1
Hail: 5
Heavy Snow: 38
High Wind: 7
Tornado: 7
Thunderstorm Wind: 11
Winter Storm: 2
Winter Weather/Mix: 1

Washoe County

Total damage reported as $654,446,000 with 5 deaths, and 56 people injured.

By Type

Dense Fog: 4
Dust Devil: 1
Extreme Cold: 1
Flash Flood: 12
Flood: 7
Funnel Cloud: 4
Hail: 23
Heat: 1
Heavy Rain: 16
Heavy Snow: 4
High Wind: 20
Lightning: 2
Other: 2
Tornado: 11
Thunderstorm Wind: 42
Urban/Small Stream Flood: 4
Wildfire: 1
Winter Storm: 4
Winter Weather/Mix: 1

K.2.2 Drought

The State Climatologist prepared the following historical data on drought for each county from National Climatic Data Center (NCDC) records from 1895 to the present. The index used in these analyses was the Palmer Drought Severity Index (PDSI). The PDSI indicates the prolonged and abnormal moisture deficiency or excess. The index normally runs between –7 and 7. The scale for this index is defined in the following table.

Table K-18. Palmer Drought Severity Index Scale		
	Drought intensity	**Wetness**
Extreme	-4 or less	4 or greater
Severe	-3.9 – -3.0	3.9 – 3.0
Moderate	-2.9 – -2.0	2.9 – 2.0
Mild	-1.9 – -1.0	1.9 – 1.0
Incipient	-0.99 – -0.51	0.99- 0.51
Normal	0.0 – 0.5	0.0 – 0.5

Historical Drought Data by County

Carson City:
Carson City County lies within Nevada's Northwestern climate division 1. The data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst drought years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 being the most severe, peaking out at –6.12.

Churchill County:
Churchill County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4 with July 1992 being the most severe, peaking out at –6.12.

Clark County:
Clark County lies within Nevada's Extreme Southern climate division. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Extreme Southern division there were 23 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1996, 1997, and 2002. The worst year was 2002, in which nine out of twelve months were below –4, with August peaking out at –5.19.

Douglas County:
Douglas County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 being the most severe peaking out at –6.12.

Elko County:
Elko County lies within Nevada's Northeastern climate division 2. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northeastern division there were 93 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1929, 1931, 1934, 1954, 1992, and 2001. The worst year was 1934, in which every month was far below –4 with August peaking out at –8.53.

Esmeralda County:
Esmeralda County lies within Nevada's South Central climate division 3. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the South Central division there were 31 observed months in the time span from 1895—2006 that were rated as Extreme Drought -4 or less. The major drought years in this division were 1928, 1934, 1959, 1960, and 2002. The worst years were 1928 and 1934, in which seven out of twelve months were below –4, with May 1934 peaking out at –6.3.

Eureka County:
Eureka County lies within Nevada's Northeastern climate division 2. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northeastern division there were 93 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1929, 1931, 1934, 1954, 1992, and 2001. The worst year was 1934, in which every month was far below –4, with August peaking out at –8.53.

Humboldt County:
Humboldt County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003. In these years, 11 out of 12 months were below –4 with July 1992 being the most severe, peaking out at –6.12.

Lander County:
Lander County lies within Nevada's Northeastern climate division; division 2. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northeastern division there were 93 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1929, 1931, 1934, 1954, 1992, and 2001. The worst year was 1934, in which every month was far below –4, with August peaking out at –8.53.

Lincoln County:
Lincoln County lies mostly within Nevada's South Central climate division 3. The very southern portion of the county is in division four. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the South Central division there were 31 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1928, 1934, 1959, 1960, and

2002. The worst years were 1928 and 1934, in which seven out of twelve months were below –4, with May 1934 peaking out at –6.3.

Lyon County:
Lyon County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC).
In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 being the most severe, peaking out at –6.12.

Mineral County:
Mineral County lies within Nevada's South Central climate division 3. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the South Central division there were 31 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1928, 1934, 1959, 1960, and 2002. The worst years were 1928 and 1934, in which seven out of twelve months were below –4, with May 1934 peaking out at –6.3.

Nye County:
Nye County lies mostly within Nevada's South Central climate division 3. The very southern portion of the county is in division four. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the South Central division there were 31 observed months in the time span from 1895—2006 that were rated as Extreme Drought, -4 or less. The major drought years in this division were 1928, 1934, 1959, 1960, and 2002. The worst years were 1928 and 1934, in which seven out of twelve months were below –4, with May 1934 peaking out at –6.3.

Pershing County:
Pershing County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 the most severe, peaking out at –6.12.

Storey County:
Storey County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC).
In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 the most severe, peaking out at –6.12.

Washoe County:
Washoe County lies within Nevada's Northwestern climate division 1. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northwestern division there were 110 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1931, 1934, 1947, 1954, 1955, 1959, 1988, 1992, 1994, and 2001-2004. The worst years were 1992, 2002, and 2003, in which 11 out of 12 months were below –4, with July 1992 the most severe, peaking out at –6.12.

White Pine County:
White Pine County lies within Nevada's Northeastern climate division 2. The drought data are reported from 1895 to the present by the National Climatic Data Center (NCDC). In the Northeastern division there were 93 observed months in the time span from 1895—2006 that were rated as Extreme Drought; -4 or less. The major drought years in this division were 1924, 1926, 1928, 1928, 1929, 1931,1934, 1954, 1992, and 2001. The worst year was 1934, in which every month was considerably below –4, with August peaking out at –8.53.

K.2.3 Extreme Temperatures (Heat) by County

The State Climatologist data on extreme temperatures compiled in 2007 for representative sites within each county are presented below:

Carson City:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Carson City County one station was available; Carson City. At Carson City 127 days were observed to have a temperature of 100° or higher within the time span from 1893 to 2006. This equates to a frequency of just more than 1 day per year (1.34), leading to the conclusion that Carson City County historically is not at threat to suffering from heat above 100° F. A summary of the station follows:

- Carson City - Days of 100° or higher = 127, frequency = 1.34 days/year

Churchill County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Churchill County two representative stations were selected; Fallon NAS and Hawthorne AP. On average Churchill County can expect about **10** days a year at or above 100°. A summary of the two stations follows:

- Fallon NAS - Days of 100° or higher = 540, frequency = 10.65 days/year
- Hawthorne AP - Days of 100° or higher = 571, frequency = 8.98 days/year

Clark County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Clark County five representative stations were selected; Mesquite, Searchlight, Las Vegas AP, Indian Springs, and Valley of Fire SP. Searchlight had an abnormally lower frequency of events than the rest

of the stations in Clark County. The other stations had much higher numbers, averaging **80.69** days a year at 100° or higher, leading to the conclusion that Clark County historically is at threat to suffering from heat above 100° F. A summary of the five stations follows:

- Searchlight - Days of 100° or higher = 2193, frequency = 24.87 days/year
- Las Vegas AP - Days of 100° or higher = 4279, frequency = 74.48 days/year
- Indian Springs - Days of 100° or higher = 1899, frequency = 68.15 days/year
- Valley of Fire SP - Days of 100° or higher = 2787, frequency = 83.31 days/year
- Mesquite - Days of 100° or higher = 1784, frequency = 96.80 days/year

Douglas County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Douglas County three representative stations were selected; Minden, Glenbrook, and Topaz Lake. A summary of the three stations follows:

- Minden - Days of 100° or higher = 267, frequency = 2.79 days/year
- Glenbrook - Days of 100° or higher = 0, frequency = 0.00 days/year
- Topaz Lake - Days of 100° or higher = 55, frequency = 1.92 days/year

Elko County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Elko County five representative stations were selected; Elko AP, Jiggs, San Jacinto, Clover Valley, and Tuscarora. Only at the Elko AP station did 100° weather appear more than once a year. The other stations had much lower numbers, leading to the conclusion that Elko County historically is not at threat to suffering from heat above 100° F. A summary of the five stations follows:

- Elko AP - Days of 100° or higher = 326, frequency = 3.01 days/year
- Jiggs - Days of 100° or higher = 7, frequency = 0.46 days/year
- Tuscarora - Days of 100° or higher = 0, frequency = 0.00 days/year
- Clover Valley - Days of 100° or higher = 0, frequency = 0.00 days/year
- San Jacinto - Days of 100° or higher = 24, frequency = 0.60 days/year

Esmeralda County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Esmeralda County three representative stations were selected; Silverpeak, Coaldale Junction and Goldfield. The longest period of record was from the Goldfield station. At Goldfield the frequency was much lower than the other stations, averaging less than 1 day per year. The other stations had higher numbers, perhaps Goldfield being over 1000 feet higher in elevation than the other two may be the reasoning for this. A summary of the three stations follows:

- Coaldale Junction - Days of 100° or higher = 401, frequency = 32.10 days/year
- Goldfield- Days of 100° or higher = 68, frequency = 0.73 days/year
- Silverpeak - Days of 100° or higher = 912, frequency = 23.45 days/year

Eureka County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Eureka County two

representative stations were selected; Eureka and Beowawe. The longest period of record was from the Eureka station. At Eureka 30 days were observed to have a temperature of 100° or higher within the time span from 1888 to 2006. This equates to a frequency of less than one day per year. The other station had higher numbers, but nothing out of the ordinary. A summary of the two stations follows:

- Eureka- Days of 100° or higher = 30, frequency = 0.35 days/year
- Beowawe - Days of 100° or higher = 468, frequency = 5.06 days/year

Humboldt County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated, averaging **4.80** days/year. Within Humboldt County two representative stations were selected; Winnemucca AP and Quinn River Crossing. A summary of the two stations follows:

- Winnemucca AP - Days of 100° or higher = 521, frequency = 5.86 days/year
- Quinn River Crossing - Days of 100° or higher = 99, frequency = 3.73 days/year

Lander County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Lander County two representative stations were selected; Austin and Battle Mountain. There was a wide range of observations at the two stations. Austin only had a 100° plus day once every five years where as Battle Mountain averages nearly 10 days a year. Austin is located over 2000ft higher in elevation than Battle Mountain so that could be the reason. A summary of the two stations follows:

- Battle Mountain - Days of 100° or higher = 578, frequency = 9.55 days/year
- Austin - Days of 100° or higher = 20, frequency = 0.18 days/year

Lincoln County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Lincoln County four representative stations were selected; Elgin, Caliente, Pioche, and Pahranaghat Wildlife Refuge. The Pioche station had abnormally low numbers when compared to the other stations, but it is also at a much higher elevation than the others. With the Pioche frequency removed Lincoln County could expect about **24** days per year at or above 100°. A summary of the four stations follows:

- Elgin - Days of 100° or higher = 638, frequency = 29.81 days/year
- Caliente - Days of 100° or higher = 389, frequency = 13.84 days/year
- Pioche - Days of 100° or higher = 116, frequency = 1.49 days/year
- Pahranaghat - Days of 100° or higher = 1173, frequency = 28.36 days/year

Lyon County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Lyon County three representative stations were selected; Yerington, Wellington Ranger Station, and Fernley. A summary of the three stations follows:

- Wellington Ranger Station - Days of 100° or higher = 10, frequency = 0.33 days/year

- Yerington - Days of 100° or higher = 329, frequency = 3.62 days/year
- Fernley - Days of 100° or higher = 311, frequency = 10.28 days/year

Mineral County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Mineral County two representative stations were selected; Mina and Thorne. The longest period of record was from the Mina station. At Mina 1317 days were observed to have a temperature of 100° or higher within the time span from 1896 to 2006. This equates to a frequency of more than 12 days a year (12.65). The other station had lower numbers. County average: **10.67** days per year. A summary of the two stations follows:

- Mina - Days of 100° or higher = 1317, frequency = 12.65 days/year
- Thorne - Days of 100° or higher = 293, frequency = 8.69 days/year

Nye County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Nye County five representative stations were selected; Tonopah, Pahrump, Sarcobatus, Duckwater, and Smokey Valley. The longest period of record was from the Pahrump station. At Pahrump 2,972 days were observed to have a temperature of 100° or higher within the time span from 1914 to 2006. This equates to a frequency of nearly 51 days per year (50.71). The other stations had lower numbers, but Nye County is a very large county that spans numerous climate types. A summary of the five stations follows:

- Tonopah - Days of 100° or higher = 108, frequency = 2.03 days/year
- Pahrump - Days of 100° or higher = 2972, frequency = 50.71 days per year
- Sarcobatus - Days of 100° or higher = 515, frequency = 28.10 days/year
- Duckwater - Days of 100° or higher = 35, frequency = 1.12 days/year
- Smoky Valley - Days of 100° or higher = 46, frequency = 0.84 days/year

Pershing County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Pershing county four representative stations were selected; Lovelock Derby Field, Imlay, Paris Ranch and Gerlach. The longest period of record was from the Imlay station. At Imlay 647 days were observed to have a temperature of 100° or higher within the time span from 1914 to 2006. This equates to a frequency of nearly 8 days a year (7.64). Two of the three stations had higher numbers, averaging out at 11.26 days per year, leading to the conclusion that Pershing County historically is prone to receiving heat above 100° F. A summary of the four stations follows:

- Imlay - Days of 100° or higher = 647, frequency = 7.64 days/year
- Lovelock Derby Field - Days of 100° or higher = 614, frequency = 11.11 days/year
- Paris Ranch - Days of 100° or higher = 503, frequency = 20.26 days/year
- Gerlach - Days of 100° or higher = 201, frequency = 6.02 days/year

Storey County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Storey County, one

station was available; Virginia City. At Virginia City only 1 day was observed to have a temperature of 100° or higher within the time span from 1951 to 2006. The conclusion is that Storey County historically is not at threat to suffering from heat above 100° F. A summary of the station follows:

- Virginia City - Days of 100° or higher = 1, frequency = 0.02 days/year

Washoe County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within Elko County four representative stations were selected; Reno AP, Vya, Nixon and Sand Pass. The average in Washoe County is **6.44** days per year. A summary of the three stations follows:

- Reno AP - Days of 100° or higher = 1061, frequency = 15.42 days/year
- Vya - Days of 100° or higher = 1, frequency = 0.06 days/year
- Sand Pass - Days of 100° or higher = 288, frequency = 5.57 days/year
- Nixon - Days of 100° or higher = 172, frequency = 4.72 days/year

White Pine County:
Daytime maximum temperatures were analyzed to determine the threat heat can pose. The number of days that reached or exceeded 100° were also calculated. Within White Pine County three representative stations were selected; Ely Yelland Field, Lund, and McGill. The average in White Pine County was one day in five years (**0.20**) would be at or above 100°. A summary of the three stations follows:

- Ely, Yelland Field - Days of 100° or higher = 3, frequency = 0.04 days/year
- Lund - Days of 100° or higher = 17, frequency = 0.35 days/year
- McGill - Days of 100° or higher = 19, frequency = 0.20 days/year

K.2.4 Precipitation Extremes (Snow) by County

The State Climatologist prepared the following data about extreme snow fall in each county. The data is not relevant to state declarations but will assist each county in its preparedness and response planning.

Carson City:
Snow occurs more frequently in Carson City County than high temperatures. The same station was used in this county; Carson City. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 1.26 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Carson City: Days above 15th percentile = 232; Frequency = 2.61 days/year

Churchill County:
Snow occurs in smaller amounts in Churchill County than some other northern counties in Nevada. Four stations were used as representatives within the county; Lahontan Dam, Hawthorne, and Fallon NAS. All the stations had low levels of snow. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular

station. The average value at the 15th percentile was any amount over **0.26** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Lahontan Dam - Days > 15th = 209; Freq = 2.96 days/year
- Hawthorne - Days > 15th = 99; Freq = 1.90 days/year
- Fallon NAS - Days > 15th = 128; Freq = 2.47 days/year

Clark County:

Snow occurs much less frequently in Clark County than high temperatures. The same five stations were used as representatives within the county; Mesquite, Searchlight, Las Vegas AP, Indian Springs, and Valley of Fire SP. Not surprisingly at all the stations any snowfall above 0.00 qualified as extreme. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was any over **0.00** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Searchlight - Days > 15th = 70; Freq = 0.96 days/year
- Las Vegas AP - Days > 15th = 26; Freq = 0.54 days/year
- Indian Springs - Days > 15th = 22; Freq = 0.86 days/year
- Valley of Fire SP - Days > 15th = 7; Freq = 0.21 days/year
- Mesquite - Days > 15th = 0; Freq = 0.00 days/year

Douglas County:

Four stations within Douglas county were used to access snowfall; Glenbrook, Minden, Spooners Station, and Topaz Lake. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The 15th percentile varied from 0.59 inches at Topaz Lake 3N to 3.35 inches at Spooners Station. The average value at the 15th percentile was 2.17 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Glenbrook - Days > 15th = 169; Freq = 2.69 days/year
- Minden - Days > 15th = 251; Freq = 2.81
- Spooners Station - Days > 15th = 30; Freq = 3.64
- Topaz Lake 3N - Days > 15th = 79; Freq = 2.92 days/year

Elko County:

Snow occurs more frequently in Elko County than high temperatures. The same five stations were used as representatives within the county; Elko AP, Jiggs, San Jacinto, Clover Valley, and Tuscarora. Elko AP had the longest record but most of the stations had a similar frequency of snow events. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was **1.67** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Elko AP - Days > 15th = 245; Freq = 2.59 days/year
- Jiggs - Days > 15th = 65; Freq = 1.24 days/year
- Tuscarora - Days > 15th = 128; Freq = 3.12 days/year
- Clover Valley - Days > 15th = 127; Freq = 2.41 days/year
- San Jacinto - Days > 15th = 49; Freq = 1.69 days/year

Esmeralda County:
Snowfall was accessed in Esmeralda County. Four stations were used as representatives within the county; Coaldale Junction, Dyer, Silverpeak and Goldfield. The 15th percentile varied from 1.10 inches at Goldfield to anything above 0.00 inches at Silverpeak. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 0.57 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Coaldale Junction - Days > 15th = 42; Freq = 2.76 days/year
- Dyer - Days > 15th = 182; Freq = 2.72 days/year
- Goldfield - Days > 15th = 195; Freq = 2.64 days/year
- Silverpeak- Days > 15th = 60; Freq = 1.65 days/year

Eureka County:
Three stations were used as representatives within the county; Eureka, Beowawe, and Emigrant Pass. Eureka had the longest and highest records but most of the other stations had similar frequencies of snow events. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 1.63 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Eureka - Days > 15th = 133; Freq = 1.77 days/year
- Beowawe - Days > 15th = 42; Freq = 2.76 days/year
- Emigrant Pass - Days > 15th = 98; Freq = 2.27 days/year

Humboldt County:
Two stations were used in Humboldt County to access snowfall extremes; Quinn River Crossing and Winnemucca AP. To qualify as an extreme value the snowfall had to fall into the 15th percentile or above. The average value in Humboldt County at the 15th percentile was **0.89** inches. The values are reported as daily totals so the frequency is reported as days per year that can be expected to reach or exceed the 15th percentile. A summary of the stations follows:

- Quinn River Crossing: Days above 15th percentile = 63; Frequency = 3.56 days/year
- Winnemucca AP : Days above 15th percentile = 149; Frequency = 2.45 days/year

Lander County:
Four stations were used as representatives within the county; Central NV Field Lab, Battle Mountain, Austin, and Antelope Valley. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was **1.43** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Central NV Field Lab - Days > 15th = 38; Freq = 2.03 days/year
- Battle Mountain - Days > 15th = 77; Freq = 1.94 days/year
- Antelope Valley - Days > 15th = 41; Freq = 3.13 day/year
- Austin - Days > 15th = 174; Freq = 2.00 days/year

Lincoln County:
Snow occurs less frequently in Lincoln County than high temperatures. The same four stations were used as representatives within the county; Elgin, Caliente, Pioche, and Pahranaghat Wildlife Refuge. Pioche had the longest record of the stations, but also had higher readings than the rest. Two of the stations snow fall extreme fell into any measurement above 0.00 (Elgin and Pahranaghat). To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 0.49 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Pioche - Days > 15th = 160; Freq = 2.40 days/year
- Caliente - Days > 15th = 70; Freq = 2.65 days/year
- Elgin - Days > 15th = 5; Freq = 0.23 days/year
- Pahranaghat - Days > 15th = 30; Freq = 0.73 days/year

Lyon County:
The four stations used as representatives within the county; Wellington Ranger Station, Yerington, Smith, and Fernley. Yerington had the longest record but most of the stations had a similar frequency of snow events. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 0.57 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Wellington Ranger Station- Days > 15th = 90; Freq = 3.26 days/year
- Yerington - Days > 15th = 202; Freq = 2.35 days/year
- Smith - Days > 15th = 98; Freq = 2.20 days/year
- Fernley - Days > 15th = 71; Freq = 2.49 days/year

Mineral County:
The same two stations were used as representatives for snow within the county; Mina and Thorne. Mina had the longest record but the other station had a low frequency of extreme snow events as well. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was 0.34 inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Mina - Days > 15th = 237; Freq = 2.41 days/year
- Thorne - Days > 15th = 41; Freq = 2.29 days/year

Nye County:
The same five stations were used as representatives within Nye County to access snow extremes; Tonopah, Pahrump, Sarcobatus, Duckwater, and Smokey Valley. At three of the stations any snow over 0.00 fell in the extreme snow event category; Pahrump, Sarcobatus, and Smokey Valley. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was **0.37** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Tonopah - Days > 15th = 121; Freq = 2.31 days/year
- Pahrump - Days > 15th = 22; Freq = 0.42 days/year
- Sarcobatus - Days > 15th = 31; Freq = 1.72 days/year
- Smokey Valley - Days > 15th = 107; Freq = 2.09 days/year

- Duckwater - Days > 15th = 86; Freq = 2.80 days/year

Pershing County:
Four stations were used as representatives within Pershing County to access snowfall extremes. Snowfall levels that measured as extreme varied from a low value of 0.20 inches at Lovelock to a high of 1.18 inches at Buffalo Ranch. The average value at the 15th percentile was **0.54** inches in one day. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The summary of the snowfall events above the 15th percentile follow:

- Rye Patch Dam - Days > 15th = 171; Freq = 2.71 days/year
- Buffalo Ranch - Days > 15th = 36, Freq = 2.96 days/year
- Gerlach - Days > 15th = 74, Freq = 2.37 days/year
- Lovelock Derby Field - Days > 15th = 150, Freq = 3.12 days/year

Storey County:
Snow occurs more frequently in Storey County than high temperatures. The same station was used; Virginia City. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was over **2.09** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Virginia City - Days > 15th = 146; Freq = 2.81 days/year

Washoe County:
To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. Washoe County is a thin, long county stretching from Lake Tahoe to Oregon. The range of extreme snowfall events was wide, from a high of **5.91** inches at **Marlette Lake** to a low of **0.20** inches in **Empire**. The average value at the 15th percentile was **1.98** inches in one day The summary of the snowfall events above the 15th percentile follow:

- Stead - Days > 15th = 60; Freq = 2.85 days/year
- Reno AP- Days > 15th = 189; Freq = 2.82 days/year
- Marlette Lake - Days > 15th = 55; Freq = 2.35 days/year
- Empire - Days > 15th = 36; Freq = 4.24 days/year

White Pine County:
Snow occurs more frequently in White Pine County than high temperatures. The six stations used as representatives within the county were; Ruth, Shoshone 5N, McGill, Lund, Great Basin NP, and Ely Yelland. To qualify as an 'extreme' event the snowfall had to be above the 15th percentile of overall snowfall at that particular station. The average value at the 15th percentile was **1.58** inches in one day. The summary of the snowfall events above the 15th percentile follow:

- Ruth - Days > 15th = 90; Freq = 2.38 days/year
- Shoshone 5N - Days > 15th = 55; Freq = 3.01 days/year
- McGill - Days > 15th = 208; Freq = 2.36 days/year

- Lund - Days > 15th = 120; Freq = 2.56 days/year
- Great Basin NP - Days > 15th = 45; Freq = 2.45 days/year
- Ely Yelland - Days > 15th = 154; Freq = 2.13 days/year

The State Climatologist prepared the following report on extreme snowfall averages in each county based on historical records. The data is will assist each county in its preparedness and response planning for extreme snowfall events. The table below summarizes the data showing the average number of days per year with extreme snowfall for representative sites in each county. Extreme snowfall is defined as that above the 15th percentile for that county.

Table K-19. Average Number of Days per Year with Extreme Snowfall for Sites in each County

County	Site	15th percentile = extreme snowfall in inches/day	Average number of days per year over 15th percentile
Carson City	Carson City	1.26	2.61
Churchill	Lahontan Dam	0.26	2.96
Churchill	Fallon NAS	0.26	2.47
Churchill	Hawthorne	0.26	1.90
Clark	Searchlight	0.00	0.96
Clark	Las Vegas Airport	0.00	0.54
Clark	Indian Springs	0.00	0.86
Clark	Valley of Fire	0.00	0.21
Clark	Mesquite	0.00	0.00
Douglas	Minden	2.17	2.81
Douglas	Glenbrook	2.17	2.69
Douglas	Spooner's Station	2.17	3.64
Douglas	Topaz Lake	2.17	2.92
Elko	Elko Airport	1.67	2.59
Elko	Jiggs	1.67	1.24
Elko	Tuscarora	1.67	3.12
Elko	Clover Valley	1.67	2.41
Elko	San Jacinto	1.67	1.69
Esmeralda	Coaldale Junction	0.57	2.76
Esmeralda	Dyer	0.57	2.72
Esmeralda	Goldfield	0.57	2.64
Esmeralda	Silver Peak	0.57	1.65
Eureka	Eureka	1.63	1.77
Eureka	Beowawe	1.63	2.76
Eureka	Emigrant Pass	1.63	2.27
Humboldt	Winnemucca Airport	0.89	3.56
Humboldt	Quinn River Crossing	0.89	2.45
Lander	Central Nevada Field Lab	1.43	2.03

Table K-19. Average Number of Days per Year with Extreme Snowfall for Sites in each County			
County	**Site**	**15th percentile = extreme snowfall in inches/day**	**Average number of days per year over 15th percentile**
Lander	Battle Mountain	1.43	1.94
Lander	Antelope Valley	1.43	3.13
Lander	Austin	1.43	2.00
Lincoln	Pioche	0.49	2.40
Lincoln	Caliente	0.49	2.65
Lincoln	Elgin	0.49	0.23
Lincoln	Pahranagat	0.49	0.73
Lyon	Wellington	0.57	3.26
Lyon	Yerington	0.57	2.35
Lyon	Smith	0.57	2.20
Lyon	Fernley	0.57	2.49
Mineral	Mina	0.34	2.41
Mineral	Thorne	0.34	2.29
Nye	Tonopah	0.37	2.31
Nye	Pahrump	0.37	0.42
Nye	Sarcobatus	0.37	1.72
Nye	Smoky Valley	0.37	2.09
Nye	Duckwater	0.37	2.80
Pershing	Rye Patch Dam	0.54	2.71
Pershing	Buffalo Ranch	0.54	2.96
Pershing	Lovelock Derby Field	0.54	3.12
Storey	Virginia City	2.09	2.81
Washoe	Reno Airport	1.98	2.82
Washoe	Stead	1.98	2.85
Washoe	Gerlach	1.98	2.37
Washoe	Marlette Lake	1.98	2.35
Washoe	Empire	1.98	4.34
White Pine	Ruth	1.58	2.38
White Pine	Shoshone	1.58	3.01
White Pine	McGill	1.58	2.36
White Pine	Lund	1.58	2.56
White Pine	Great Basin NP	1.58	2.45
White Pine	Ely Yelland Field	1.58	2.13

K.2.5 Thunderstorm Events (Hourly Observations) by County

Carson City:

No stations in Carson City County reported thunderstorm activity. It should be noted that while no formal reporting of thunderstorms occurred in Carson City, all surrounding counties did

record such hazard activity. It can be surmised from those records that thunderstorms have occurred but were not recorded in Carson City County.

Churchill County:
Within Churchill County there are two weather stations available that reported thunderstorm events during the time frame of 1945 - 2006. The reporting stations were Fallon NAS and Hawthorne; with Fallon NAS being the only one to have a complete record for the entire time span. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the four stations events by type break down as follows:

- Dry Thunderstorms - 599
- Thunderstorms - 9
- Thunderstorms w/o Hail - 566
- Heavy Thunderstorms w/o Hail - 1
- Total Hourly recordings – 1175

The majority of these observations were made at the Fallon NAS station. These numbers equate to over **19 thunderstorms per year**, with roughly **51% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Clark County:
Within Clark County there are three weather stations available that reported thunderstorm events during the time frame of 1942 - 2006. The reporting stations were Indian Springs, Las Vegas, and Nellis. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the three stations events by type break down as follows:

- Dry Thunderstorms - 1377
- Thunderstorms w/o Hail - 310
- Heavy Thunderstorms w/o Hail - 3
- Total Hourly recordings – 1690

The majority of these observations were made at the Las Vegas station. These numbers equate to over **26 thunderstorms per year**, with **81% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Douglas County:
None of the stations in Douglas County reported thunderstorm events.

Elko County:
Within Elko County there are four weather stations available that reported thunderstorm events during the time frame of 1977 - 2006. The reporting stations were Elko AP, Wells, Wildhorse Reservoir, and Owyhee; with Elko AP being the only one to have a complete record for the entire time span. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the four stations events by type break down as follows:

- Dry Thunderstorms - 932
- Thunderstorms w/o Hail - 204
- Thunderstorms w/ Hail - 2
- Heavy Thunderstorms w/o Hail - 1

- Total Hourly recordings – 1139

The majority of these observations were made at the Elko AP station. These numbers equate to nearly **38 thunderstorms per year**, with roughly **82% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Esmeralda County:
Within Esmeralda County there were not any stations reporting thunderstorm activity.

Eureka County:
Within Eureka County there was one weather station available that reported thunderstorm events during the time frame of 1992 - 2005. The reporting station was at Eureka. No thunderstorms were reported at this station during this time span.

Humboldt County:
Within Humboldt County there is one weather station available that reported thunderstorm events during the time frame of 1959 - 1972. The reporting station was Winnemucca AP. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the station events by type break down as follows:

- Dry Thunderstorms – 0
- Thunderstorms w/o Hail – 161
- Thunderstorms w/ Hail – 0
- Heavy Thunderstorms w/o Hail – 0
- Total Hourly recordings - 161

These numbers equate to over **12 thunderstorms per year**, which are a great concern for fire ignition.

Lander County:
Within Lander County there are two weather stations available that reported thunderstorm events during the time frame of 1973 - 2006. The reporting stations were Austin and Battle Mountain. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the two stations events by type break down as follows:

- Dry Thunderstorms - 472
- Thunderstorms w/o Hail - 293
- Total Hourly recordings – 765

The majority of these observations were made at the Battle Mountain station. These numbers equate to over **23 thunderstorms per year**, with roughly **62% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Lincoln County:
Within Lincoln County there was one weather station available that reported thunderstorm events during the time frame of 1977 - 2002; Caliente. At the Caliente station there weren't any thunderstorms reported.

Lyon County:
Within Lyon County there were not any stations available that were reporting thunderstorm activity.

Mineral County:
Within Mineral County there were not any stations available that reported thunderstorm activity.

Nye County:
Within Nye County there are three weather stations available that reported thunderstorm events during the time frame of 1942 - 2006. The reporting stations are Yucca Flats, Tonopah and Mercury Desert Rock AP, with Tonopah spanning the entire time frame. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the two stations events by type break down as follows:

- Dry Thunderstorms - 1753
- Thunderstorms w/o Hail - 872
- Thunderstorms w/ Hail - 3
- Heavy Thunderstorms w/o Hail - 28
- Total Hourly recordings – 2656

The majority of these observations were made at the Elko AP station. These numbers equate to nearly **42 thunderstorms per year**, with roughly **66% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Pershing County:
Within Pershing County there is one weather station available that reports thunderstorm events during the time frame of 1948 - 2006. The reporting station is Lovelock Derby Field. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the four stations events by type break down as follows:

- Dry Thunderstorms - 334
- Thunderstorms w/o Hail - 261
- Thunderstorms w/ Hail - 1
- Heavy Thunderstorms w/o Hail - 2
- Total Hourly recordings - 598

These numbers equate to over **10 thunderstorms per year**, with roughly **56% being reported as dry thunderstorms**; which are a great concern for fire ignition.

Storey County:
Within Storey County there were not any stations reporting thunderstorm activity.

Washoe County:
Within Washoe County there are two weather stations available that reported thunderstorm events during the time frame of 1943 - 2006. The reporting stations were Reno AP and Stead AFB, with Reno being the only one to have a complete record for the entire time span. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the two stations events by type break down as follows:

- Dry Thunderstorms - 679

- Thunderstorms w/o Hail - 514
- Normal Thunderstorms - 27
- Heavy Thunderstorms w/o Hail - 3
- Total Hourly recordings - 1223

The majority of these observations were made at the Elko AP station. These numbers equate to nearly **20 thunderstorms per year**, with roughly **56% being reported as dry thunderstorms** which are a great concern for fire ignition.

White Pine County

Within White Pine County there is one weather station available that reported thunderstorm events during the time frame of 1953 - 2006; Ely Yelland Field. These events were recorded hourly, so some days could have several readings for thunderstorm activity. A summary of the four stations events by type break down as follows:

- Dry Thunderstorms - 2035
- Normal Thunderstorms - 98
- Thunderstorms w/o Hail - 885
- Thunderstorms w/ Hail - 2
- Heavy Thunderstorms w/o Hail - 5
- Heavy Thunderstorms w/ Hail - 1
- Total Hourly recordings - 3026

The majority of these observations were made at the Elko AP station. These numbers equate to a little over **57 thunderstorms per year**, with roughly **67% being reported as dry thunderstorms**; which is a great concern for fire ignition.

K.2.6 Severe Wind (events greater than 58 mph) by County

Wind event data for Storey and Lyon Counties was not found.

Table K-20. Severe Wind (events greater than 58 mph) by County

Location	Number of Events	Average per Year
Carson City	7	1.75
Churchill County		
Dead Camel Mountain	53	2.94
Hawthorne	0	0.00
Fallon NAS	11	0.37
Clark County		
Big Bend	18	2.00
Christmas Tree Pass	5	1.00
Desert NWR	60	15.0
Kyle Canyon	32	4.00
Mountain Springs	15	2.00
Red Rock	94	5.70
Las Vegas AP	2	0.07

Table K-20. Severe Wind (events greater than 58 mph) by County		
Location	**Number of Events**	**Average per Year**
Indian Springs	15	0.94
Nellis AFB	8	0.27
Douglas County		
Fish Springs	18	0.9474
Mt. Como	21	6.0000
Elko County		
Antelope Lake	18	1.24
Crane Springs	16	1.88
Independence Valley	1	0.33
Long Hollow	57	3.00
Lower Dixie	2	1.00
Red Point	47	4.70
Rock Spring Creek	26	1.68
Ruby Lake NWR	8	2.29
Ruby Valley	101	50.5
Spring Gulch	59	3.58
Spruce Mountain	33	1.65
Stag Mountain	9	1.00
Elko AP	11	0.37
Owyhee	2	0.14
Wells	3	0.60
Wildhorse Reservoir	5	0.27
Esmeralda County		
Oriental Wash	9	0.47
Royston Hills	28	2.80
Eureka County		
Bailey Ranch	80	7.27
Coils Creek	14	0.88
Combs Canyon	23	1.21
Emigrant Canyon	13	4.33
Flat Spring	141	23.5
Palisade	86	12.3
Eureka	9	0.33
Humboldt County		
Burma Spring	11	1.47
Dry Canyon	18	0.92
Morey Creek	259	25.9
Texas Spring	54	3.27
Winnemucca	2	0.07

Table K-20. Severe Wind (events greater than 58 mph) by County		
Location	**Number of Events**	**Average per Year**
Lander County		
Argenta	18	6.00
Austin	78	14.2
Beacon Light	12	0.75
Desatoya Mountain	40	2.11
Red Butte	14	0.88
Battle Mountain	9	0.56
Lincoln County		
Buckhorn Ranch	13	2.17
Caliente	13	2.60
Coyote Wash	23	1.21
Immigration Wash	13	0.81
Kane Springs	195	10.3
Toquop Wash	4	0.50
Mineral County		
Brawley Peaks	168	7.47
Nye County		
Currant Creek	44	2.67
Garden Valley	23	2.30
Pahrump	96	9.60
Pancake	48	4.80
San Juan	2	0.50
Pershing County		
Bluewing Mountain	21	1.08
Coyote Canyon	29	3.87
Siard	32	1.56
Lovelock	21	0.70
Washoe County		
Barrel Springs	18	1.29
Buffalo Creek	15	1.00
Catnip Mountain	53	2.47
Desert Springs	57	2.92
Fox Mountain	7	0.44
Juniper Springs	4	0.29
Little Valley	47	11.8
Reno AP	8	0.27
Stead	0	0.00

Table K-20. Severe Wind (events greater than 58 mph) by County

Location	Number of Events	Average per Year
White Pine County		
Alligator Ridge	110	6.67
Cedar Pass	14	0.85
Ely	10	1.67
Mather	305	17.4
McGill Junction	37	3.36
Paris	2	0.67

Estimated Losses from Earthquakes near Nevada Communities, 2014, by Irene M. Seelye, Gary L. Johnson, Craig M. dePolo, James E. Faulds, and Jonathan G. Price

Available online at the following link:

http://pubs.nbmg.unr.edu/Updated-estimated-losses-p/of2014-05.htm



University of Nevada, Reno



Nevada Bureau of Mines and Geology Open-File Report 14-5

Updated Estimated Losses from Earthquakes near Nevada Communities

Irene M. Seelye, Gary L. Johnson, Craig M. dePolo,
James E. Faulds, and Jonathan G. Price

Edited by Jack Hursh

2014

This report is available as an online document at www.nbmg.unr.edu.
Please use links on the tables to view summary reports for scenarios involving
earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0
for 38 communities in Nevada.

The Nevada Bureau of Mines and Geology (NBMG) is a research and public service unit of the University of Nevada, Reno and is the state geological survey. Established by the Nevada Legislature as a department within the public service division of the Nevada System of Higher Education, NBMG is part of the Mackay School of Earth Sciences and Engineering within the College of Science and one of the Statewide Programs at the University of Nevada, Reno. NBMG's mission, to provide the State's needs for geological and mineral-resource information and research, is defined in its enabling legislation. NBMG scientists conduct research and publish reports that focus on the economic development, public safety, and quality of life in urban and rural areas of Nevada.

Updated Estimated Losses from Earthquakes near Nevada Communities

This report estimates losses from earthquakes that could occur near 38 Nevada communities, including all county seats and major population centers (Figure 1). The report uses the loss-estimation computer model of the Federal Emergency Management Agency, HAZUS-MH, to estimate such potential consequences as total economic loss, numbers of buildings receiving extensive to complete damage, number of people needing public shelter and hospital care, and number of fatalities from earthquakes of magnitude 5.0, 5.5, 6.0, 6.5, and 7.0. The report also tabulates earthquake probabilities for these communities from the probabilistic seismic hazard analysis of the U.S. Geological Survey (Table 1). Due to the inherent variability between earthquakes and the incomplete and imperfect information about the surface geology of the Earth and human structures, the specific effects of any future earthquake cannot be predicted in detail. The general types and extent of potential effects can be projected, as represented by these loss estimation models. Some factors, such as geologic setting and high visitor volumes, are not modeled by HAZUS but can significantly increase losses and damage.

The primary audiences for this report are emergency managers, emergency responders, and the local and state government officials responsible for action after a natural disaster. HAZUS reports have been quite helpful in response and recovery planning and exercises, identifying opportunities for mitigation, and in the case of an actual earthquake, providing the Governor, through the Chief of the Nevada Division of Emergency Management, with an early estimate of the likely severity of the event. Such information can be critical to decisions regarding disaster declarations, a timely and appropriate emergency response, and securing resources that will be necessary during recovery. As this report covers many of the likely earthquakes that could affect Nevada communities, it also serves as an immediate reference in case of an actual earthquake event, including as a reference point for comparison of the HAZUS reports that the Nevada Bureau of Mines and Geology produces immediately after a significant earthquake event. Another important audience for this report is the general public, including homeowners, operators of businesses, and individuals responsible for the well-being of others.

Earthquakes are inevitable. The report demonstrates that the consequences of earthquakes can be huge in Nevada, particularly if individuals are not prepared. Recommendations on what to do before, during, and after an earthquake are provided by dePolo et al. (2000) and on various websites, including the Nevada Bureau of Mines and Geology (http://www.nbmg.unr.edu/Geohazards/Earthquakes/Earthquakes.html), Nevada Seismological Laboratory (http://www.seismo.unr.edu/), and U.S. Geological Survey (http://earthquake.usgs.gov/).

The version of HAZUS-MH 2.1 (Federal Emergency Management Agency, 2012) used for this report was documented by Johnson (2012). Given an earthquake location and magnitude, HAZUS estimates amounts of various types of economic and social loss. This new study uses the most recent version of HAZUS-MH based on ShakeMap inputs and an estimated unreinforced masonry building inventory for Nevada. This had led to an increase in the estimated number of extensively to completely damaged buildings in several communities. An important planning

aspect related to this is the number of building inspections that will need to be conducted on short order following a damaging earthquake. A total of 38 communities, which include all major population centers in each of the 17 counties in Nevada (Figure 1), were chosen for study. Some communities were not explicitly listed in the tabulations, because the effects of earthquakes near those cities and towns are included in the effects of nearby communities. For example, losses in North Las Vegas are included in the scenarios for Las Vegas, Henderson, and Boulder City. For earthquake scenarios for each community, the closest Quaternary fault on the map by dePolo (2008) were chosen. Quaternary is the name of a geological time period that covers the past 2.6 million years. Quaternary faults moved more recently than approximately 2.6 million years ago and are likely candidates for future earthquakes. The epicenters of the earthquakes were chosen at the fault position closest to the community. Magnitudes from 5.0 to 7.0 were used to illustrate the impact that increasing magnitude has on losses. Earthquakes larger than magnitude 7.0 have occurred in Nevada (dePolo and dePolo, 1999; dePolo and others, 2000) and will occur here in the future. Thus, damages could be greater than listed in this report.

Five magnitudes for each of 38 communities amount to 190 individual earthquake scenarios, from which separate HAZUS summary reports were produced. Because many of these earthquakes would affect multiple counties or multiple states, separate summary reports were also produced so that the user can view the estimated losses for the county in which the earthquake occurred for the entire state or for all counties in any state within a 100 km radius of the epicenter. For each community, there is a one page summary with tables, which include total economic loss, numbers of buildings receiving extensive to complete damage, number of people needing public shelter and hospital care, and number of fatalities for the five magnitudes. These data are arranged alphabetically by community name. The tables give a short synopsis of the events, but for exercises and planning, full 20-page summary reports are available online through the provided links.

Table 2 lists the maximum total economic losses estimated by HAZUS for magnitude 6.0 earthquakes near each of the 38 communities. This magnitude is significant, because that was the size of the 21 February 2008 earthquake near Wells, Nevada. When developing the HAZUS program, the Federal Emergency Management Agency calibrated it against known losses from earthquakes in California in the 1980s and early 1990s. When HAZUS has been run for significant earthquakes that have occurred in the United States since then, the scenario results have generally been within a factor of two or three of reality. On the basis of calculated sensitivity analyses, uncertainties in locating and measuring magnitudes of earthquakes, and variations in local soil and geological conditions, basin effects, direction of propagating seismic waves, how well buildings have been retrofitted to withstand earthquakes, and number of visitors in Nevada at the time of the earthquake, it was concluded that the numbers could vary by a factor of ten. The current best estimate of the actual total economic loss from the Wells Earthquake is slightly more than $10.5 million, about 60% of the value estimated by HAZUS.

Figure 1. Locations of the 38 communities in Nevada for which HAZUS earthquake scenarios have been developed

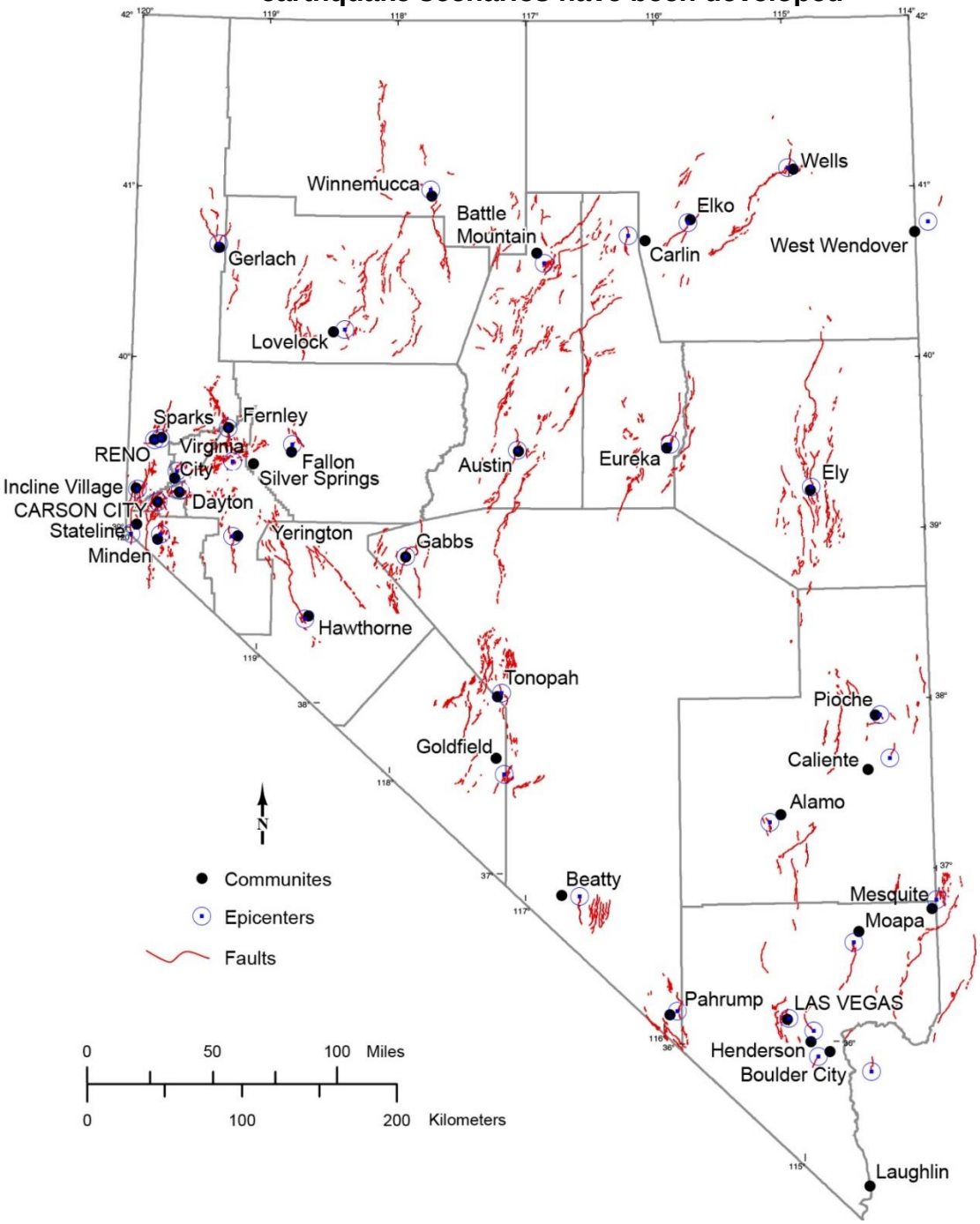


Figure 1. Location of the 38 communities in Nevada for which HAZUS earthquake scenarios have been developed. The faults chosen for the earthquake scenarios are also shown with red lines. The epicenters of the earthquakes shown with thin blue circles were chosen at the fault position that is closest to the community.

Table 1. Probabilities of earthquakes of various magnitudes occurring within 50 years within 50 kilometers (31 miles) of major communities in Nevada.

County	- County seat or other community	% Probability of magnitude greater than or equal to					Rank by Probability
		5.0	5.5	6.0	6.5	7.0	
Carson City	- Carson City	>90	~80	70	50–55	12–15	**2**
Churchill	- Fallon	80–90	~60	35	20–25	6–8	14
Clark	- Las Vegas	40–50	~30	12	4–5	<0.5	28
	Boulder City	50–60	~30	12	4–5	<0.5	23
	Henderson	50–60	~30	12	4–5	<0.5	23
	Laughlin	10–20	~5	2–3	0.5–1	<0.5	38
	Mesquite	20–30	~15	4–6	2	<0.5	35
	Moapa	40–50	~25	10	4–5	<0.5	30
Douglas	- Minden	>90	~80	67	50–60	10–12	**6**
	Stateline	>90	~80	60–70	40–50	10	**9**
Elko	- Elko	30–40	~25	10–15	6–8	0.5–1	31
	Carlin	40–50	~30	10–15	6–8	0.5–1	27
	Wells	30–40	~20	9	6	0.5–1	32
	West Wendover	20	~10	4	1–2	<0.5	37
Esmeralda	- Goldfield	80–90	~55	20–30	5–10	<1	15
Eureka	- Eureka	40–50	~30	10–15	4–6	<0.5	28
Humboldt	- Winnemucca	50–60	~35	15–20	5–10	1–1.5	22
Lander	- Battle Mountain	60–70	~40	18	10	1.5	20
	Austin	60–70	~40	20	10–15	2–3	19
Lincoln	- Pioche	30–40	~20	6–10	2–3	<0.5	33
	Alamo	70–80	~50	20–25	6–8	<0.5	17
	Caliente	50–60	~35	10–15	4	<0.5	23
Lyon	- Yerington	>90	~75	60	40–45	12	**8**
	Dayton	>90	~80	70–75	50–55	15–18	**1**
	Fernley	90	~70	48	35	8	12
	Silver Springs	>90	~70	50–60	30–40	10–12	11
Mineral	- Hawthorne	>90	~75	61	30–40	10–12	**10**
Nye	- Tonopah	70–80	~50	20–30	5–10	<1	17
	Beatty	70–80	~55	30–40	20–30	10–12	16
	Gabbs	90	~65	40–50	20–25	6–8	13
	Pahrump	30–40	~25	5–10	3	<1	33
Pershing	- Lovelock	50–60	~35	10–20	10	1–2	21
Storey	- Virginia City	>90	~80	70	50	12–15	**3**
Washoe	- Reno	>90	~80	67	50	12–15	**4**
	Gerlach	40	~25	10–15	6–10	2–3	26
	Incline Village	>90	~80	60–70	40–50	10–12	**7**
	Sparks	>90	~80	67	50	12–15	**4**
White Pine	- Ely	20–30	~15	4–6	1.5–2	<0.5	35

Data are taken from maps produced by the U.S. Geological Survey. Values for magnitude 5.5 are interpolated between values for magnitudes 5.0 and 6.0.

Links from Tables 1 and 2 take the user to the single pages with tables summarizing losses for each community, from which further links take the user to over 400 separate HAZUS summary reports. The individual HAZUS summary reports include the following sections and subsections:

- General Description of the Region
- Building and Lifeline Inventory
  - Building Inventory
  - Critical Facility Inventory
  - Transportation and Utility Lifeline Inventory
- Earthquake Scenario Parameters
  - Direct Earthquake Damage
  - Buildings Damage
  - Critical Facilities Damage
  - Transportation and Utility Lifeline Damage
- Induced Earthquake Damage
  - Fire Following Earthquake
  - Debris Generation
- Social Impact
  - Shelter Requirements
  - Casualties
- Economic Loss
  - Building Losses
  - Transportation and Utility Lifeline Losses
  - Long-term Indirect Economic Impacts
- Appendix listing population and building value data for counties included in the region

Tables 1 and 2 demonstrate that significant earthquake hazards exist throughout Nevada and that the potential losses from earthquakes are high for many communities. The magnitude 6.0 Wells Earthquake serves as a call for action. The probability that an earthquake of that magnitude or greater will occur in the Las Vegas area is 1.3 times higher than the probability for Wells, and the probability of such an earthquake in the Reno-Sparks-Carson City-Lake Tahoe-Minden area is approximately seven times higher than for Wells. The consequences for our major urban areas are enormous—from billions of dollars in Las Vegas to almost a billion in Reno. The largest projected loses are from the magnitude 7 events near Las Vegas ($21B) and Reno ($4.6B).

Although the risks are locally huge, actions can be taken to reduce those risks. Current building codes no longer allow construction of the types of unreinforced masonry buildings that collapsed in Wells. Over time, the remaining unreinforced masonry buildings in Nevada can be replaced, taken out of service for human occupation, or retrofitted. The HAZUS summary reports for individual earthquake scenarios indicate that much of the damage will be non-structural in nature – that is, not a collapsed building but damage from falling exterior facades, interior light fixtures, and bookshelves; broken china, glassware, pictures, and computers; and ruptured gas and water lines. With a little focused attention, these non-structural hazards can commonly be mitigated inexpensively.

References

dePolo, C.M., 2008, Quaternary faults in Nevada: Nevada Bureau of Mines and Geology Map 167, 1:1,000,000 scale.

dePolo, C.M., Jones, L.M., dePolo, D.M., and Tingley, S., 2000, Living with earthquakes in Nevada: Nevada Bureau of Mines and Geology Special Publication 27, 36 p.

dePolo, D.M., and dePolo, C.M., 1999, Earthquakes in Nevada: Nevada Bureau of Mines and Geology Map 112, 1:1,000,000 scale.

Federal Emergency Management Agency, 2003, *Multi-hazard loss estimation methodology, earthquake model, HAZUS-MH MR3 technical manual*, developed by the Department of Homeland Security, Emergency Preparedness and Response Directorate under a contract with the National Institute of Building Sciences, Washington, D.C., 16 chapters, and Multi-hazard loss estimation methodology, earthquake model, HAZUS®MH MR3 user manual, 11 chapters. Electronic document available at http://www.fema.gov/library/viewRecord.do?id=3503.

Federal Emergency Management Agency, 2004, *Using HAZUS-MH for risk assessment, how-to guide*, HAZUS®-MH Risk Assessment and User Group Series, FEMA 433, 5 chapters: Electronic document available at http://www.fema.gov/library/viewRecord.do?id=1985.

Ballard, C.M., Johnson, G., and Hastings, J.T., 2009, Nevada Statewide HAZUS Database Update: HAZUS-MH for Nevada: Nevada Bureau of Mines and Geology Open-File Report 09-7, 2 p.

Table 2. HAZUS estimates for maximum total economic loss from a magnitude 6.0 earthquake on a fault close to the communities and probabilities of earthquakes of this size or greater occurring within 50 years and within 50 kilometers (31 miles) of the communities.

County	- County seat or other community	Total economic loss	% Probability	Rank by Loss
Carson City	- Carson City	**$250,000,000**	70	**6**
Churchill	- Fallon	$53,000,000	35	14
Clark	- Las Vegas	**$3,100,000,000**	12	**1**
	Boulder City	**$590,000,000**	12	**5**
	Henderson	**$1,000,000,000**	12	**2**
	Laughlin	$44,000,000	2–3	16
	Mesquite	$62,000,000	4–6	13
	Moapa	$33,000,000	10	17
Douglas	- Minden	**$140,000,000**	67	**10**
	Stateline	**$160,000,000**	60–70	**7**
Elko	- Elko	$92,000,000	10–15	12
	Carlin	$7,500,000	10–15	31
	Wells	$17,000,000	9	22
	West Wendover	$6,000,000	4	34
Esmeralda	- Goldfield	$5,000,000	20–30	36
Eureka	- Eureka	$16,000,000	10–15	24
Humboldt	- Winnemucca	$18,000,000	15–20	20
Lander	- Battle Mountain	$8,600,000	18	30
	Austin	$15,000,000	20	25
Lincoln	- Pioche	$7,000,000	6–10	32
	Alamo	$5,100,000	20–25	35
	Caliente	$6,000,000	10–15	33
Lyon	- Yerington	$13,000,000	60	28
	Dayton	$110,000,000	70–75	11
	Fernley	$44,000,000	48	15
	Silver Springs	$29,000,000	50–60	19
Mineral	- Hawthorne	$14,000,000	61	26
Nye	- Tonopah	$9,000,000	20–30	29
	Beatty	$4,600,000	30–40	37
	Gabbs	$4,300,000	40–50	38
	Pahrump	$30,000,000	5–10	18
Pershing	- Lovelock	$13,000,000	10–20	27
Storey	- Virginia City	**$140,000,000**	70	**9**
Washoe	- Reno	**$970,000,000**	67	**3**
	Gerlach	$16,000,000	10–15	23
	Incline Village	**$140,000,000**	60–70	**8**
	Sparks	**$920,000,000**	67	**4**
White Pine	- Ely	$17,000,000	4–6	21

Disclaimer

The information in this report should be considered preliminary and approximate. It has not been thoroughly edited or peer reviewed. All numbers in this report are estimates derived from HAZUS, the loss-estimation model of the Federal Emergency Management Agency. Individual numbers may vary by a factor of 10, depending on location, depth, and magnitude of the earthquake and on other factors, including local soil and geological conditions, basin effects, direction in which the seismic waves travel, extent to which buildings have been retrofitted to withstand earthquakes, and number of visitors in Nevada at the time of the earthquake.

Note: To view the links in this report, a minimum of Adobe Reader 9.0 should be installed on your computer. Adobe Reader 9.0 can be downloaded for free from this site: http://get.adobe.com/reader/

Alamo, Nevada

Epicenter at 115.24°W longitude, 37.31°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.25	0.25	0.3	0.4	1.3

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.8	5.1	24	33

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.1	1.2	2.5	20	29

Austin, Nevada

Epicenter at 117.08°W longitude, 39.49°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lander County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	45	340	570
People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	1.1	11	36	71

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	45	340	570
People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	5.5	15	45	81

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	45	340	570
People needing public shelter	0	0	0	2	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.4	2.9	12	38	74

Battle Mountain, Nevada

Epicenter at 116.88°W longitude, 40.58°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lander County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	12	59
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.5	2.0	4.1	9.1	17

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	12	59
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	5.2	5.8	8.6	15	29

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	12	59
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.9	3.5	6.4	13	24

Beatty, Nevada

Epicenter at 116.62°W longitude, 36.89°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	82
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.52	0.6	1.3	5	11

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	82
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.9	4.6	12	34

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	5	81
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.50	1.6	2.3	10	32

Boulder City, Nevada

Epicenter at 114.92°W longitude, 35.95°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000
People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	3	75	590	2,100	5,000

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000
People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	6	79	590	2,100	5,000

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	130	1,600	6,000
People needing public shelter	0	0	13	300	1,800
People needing hospital care	0	0	4	50	250
Fatalities	0	0	0	5	41
Total economic loss ($ million)	5	78	590	2,100	5,000

Caliente, Nevada

Epicenter at 114.35°W longitude, 37.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	6	58
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.25	0.5	2	7	20

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	6	58
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	4.1	6	15	42

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	0	6	59
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.10	2.4	5	18	52

Carlin, Nevada

Epicenter at 116.23°W longitude, 40.73°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.60	0.9	3.8	14	35

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	4.3	7.5	24	49

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	2	31
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.80	2.2	6	17	40

Carson City, Nevada

Epicenter at 119.76°W longitude, 39.16°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Carson City County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,300
People needing public shelter	0	0	32	160	270
People needing hospital care	0	0	4	48	120
Fatalities	0	0	1	12	32
Total economic loss ($ million)	4	40	180	430	690

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,700
People needing public shelter	0	0	33	160	300
People needing hospital care	0	0	5	50	130
Fatalities	0	0	1	12	33
Total economic loss ($ million)	8	50	240	690	1,300

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	310	1,400	2,700
People needing public shelter	0	0	33	160	300
People needing hospital care	0	0	5	50	130
Fatalities	0	0	1	12	33
Total economic loss ($ million)	7	49	250	730	1,400

Dayton, Nevada

Epicenter at 119.60°W longitude, 39.23°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	31	250	470
People needing public shelter	0	0	0	7	14
People needing hospital care	0	0	1	5	12
Fatalities	0	0	0	1	2
Total economic loss ($ million)	1.1	7	30	74	120

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	38	440	1,400
People needing public shelter	0	0	1	20	98
People needing hospital care	0	0	1	8	29
Fatalities	0	0	0	1	5
Total economic loss ($ million)	5	18	110	390	890

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	38	430	1,400
People needing public shelter	0	0	1	20	98
People needing hospital care	0	0	1	8	29
Fatalities	0	0	0	1	5
Total economic loss ($ million)	4	18	110	410	950

Elko, Nevada

Epicenter at 115.77°W longitude, 40.81°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	180	770	1,200
People needing public shelter	0	0	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	1	13	32
Total economic loss ($ million)	3	15	88	280	480

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	180	770	1,200
People needing public shelter	0	1	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	0	13	32
Total economic loss ($ million)	6	18	92	290	500

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	1	180	770	1,200
People needing public shelter	0	0	25	110	170
People needing hospital care	0	0	3	48	120
Fatalities	0	0	0	13	32
Total economic loss ($ million)	3	15	89	280	480

Ely, Nevada

Epicenter at 114.88°W longitude, 39.26°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **White Pine County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.2	3	13	32	64

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	4.7	7	17	58	89

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	200
People needing public shelter	0	0	0	0	2
People needing hospital care	0	0	0	1	3
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3	5	15	35	67

Eureka, Nevada

Epicenter at 115.93°W longitude, 39.52°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Eureka County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	2	12	32	53

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	6	16	59	69

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	25	160	270
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	2	4	14	35	58

Fallon, Nevada

Epicenter at 118.77°W longitude, 39.51°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Churchill County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	610
People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	3	10	44	130	210

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	520
People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	7	14	53	150	280

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	41	300	520
People needing public shelter	0	0	4	35	61
People needing hospital care	0	0	1	13	29
Fatalities	0	0	0	3	8
Total economic loss ($ million)	5	12	51	150	270

Fernley, Nevada

Epicenter at 119.25°W longitude, 39.60°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	400
People needing public shelter	0	0	0	6	23
People needing hospital care	0	0	0	3	9
Fatalities	0	0	0	0	2
Total economic loss ($ million)	1.1	3	20	58	110

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	440
People needing public shelter	0	0	0	7	28
People needing hospital care	0	0	0	3	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	4.8	8	44	160	410

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	7	130	440
People needing public shelter	0	0	0	7	28
People needing hospital care	0	0	0	3	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	3	6	43	160	420

Gabbs, Nevada

Epicenter at 117.91°W longitude, 38.87°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.52	0.52	0.6	0.7	1.9

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.82	3.8	4.3	7.0	11

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	0
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1	1	2	2	6

Gerlach, Nevada

Epicenter at 119.36°W longitude, 40.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160
People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.3	2	12	39	81

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160
People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.8	5	16	46	88

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	81	160
People needing public shelter	0	0	0	1	4
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	1
Total economic loss ($ million)	2	3	14	43	87

Goldfield, Nevada

Epicenter at 117.17°W longitude, 37.61°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Esmeralda County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.1	0.2	2	6	15

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.0	5	12	22

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	28	140
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1	1	3	9	19

Hawthorne, Nevada

Epicenter at 118.65°W longitude, 38.50°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Mineral County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	240
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.2	2	10	27	43

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	140
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.9	6	14	34	54

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	16	140	240
People needing public shelter	0	0	0	2	4
People needing hospital care	0	0	0	2	6
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.7	4	12	32	55

Henderson, Nevada

Epicenter at 114.95°W longitude, 36.10°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000
People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	0	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	7	140	990	3,600	8,600

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000
People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	12	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	11	140	1,000	3,600	8,600

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	2	290	4,400	15,000
People needing public shelter	0	0	100	1,500	6,300
People needing hospital care	0	0	12	140	690
Fatalities	0	0	0	19	140
Total economic loss ($ million)	10	140	1,000	3,600	8,600

Incline Village, Nevada

Epicenter at 119.92°W longitude, 39.23°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	18	110	270
People needing public shelter	0	0	3	31	69
People needing hospital care	0	0	1	13	33
Fatalities	0	0	0	3	8
Total economic loss ($ million)	1	14	90	320	690

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	20	170	770
People needing public shelter	0	0	4	37	120
People needing hospital care	0	0	1	15	42
Fatalities	0	0	0	3	9
Total economic loss ($ million)	4	21	130	460	990

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	20	180	820
People needing public shelter	0	0	4	38	120
People needing hospital care	0	0	1	15	42
Fatalities	0	0	0	3	9
Total economic loss ($ million)	3	22	140	530	1,200

Las Vegas, Nevada

Epicenter at 115.12°W longitude, 36.17°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000
People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	100	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	21	470	3,100	11,000	20,000

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000
People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	110	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	24	470	3,100	11,000	21,000

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	15	2,600	18,000	35,000
People needing public shelter	0	16	1,600	10,000	20,000
People needing hospital care	0	3	100	1,400	4,400
Fatalities	0	0	9	320	1,200
Total economic loss ($ million)	23	470	3,100	11,000	21,000

Laughlin, Nevada

Epicenter at 114.54°W longitude, 35.85°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	75
People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	6
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.4	2	40	240	770

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	6	75
People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	6
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	5	44	240	770

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	7	93
People needing public shelter	0	0	0	3	42
People needing hospital care	0	0	0	1	7
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.2	3	43	250	790

Lovelock, Nevada

Epicenter at 118.39°W longitude, 40.18°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Pershing County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	6
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.9	2.6	9	21	36

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	9
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4.6	6.3	13	31	54

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	0	9
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	0
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.0	4	11	28	49

Mesquite, Nevada

Epicenter at 114.07°W longitude, 36.67°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	63	470	810
People needing public shelter	0	0	17	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	0.9	9	57	190	330

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	63	470	810
People needing public shelter	0	0	17	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	4.3	13	61	190	330

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	63	470	810
People needing public shelter	0	0	1	120	210
People needing hospital care	0	0	1	13	43
Fatalities	0	0	0	3	11
Total economic loss ($ million)	2.6	11	62	210	370

Minden, Nevada

Epicenter at 119.73°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Douglas County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	1	92	370	630
People needing public shelter	0	0	7	30	53
People needing hospital care	0	0	3	35	79
Fatalities	0	0	1	9	22
Total economic loss ($ million)	2	22	92	240	400

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	1	92	390	800
People needing public shelter	0	0	7	32	76
People needing hospital care	0	0	3	36	83
Fatalities	0	0	1	9	22
Total economic loss ($ million)	6	28	120	350	720

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	1	92	390	850
People needing public shelter	0	0	7	33	92
People needing hospital care	0	0	3	36	84
Fatalities	0	0	1	9	22
Total economic loss ($ million)	4	29	140	410	450

Moapa, Nevada

Epicenter at 114.65°W longitude, 36.61°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Clark County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270
People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.4	2	30	160	580

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270
People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	3.8	5	33	160	590

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	270
People needing public shelter	0	0	0	2	25
People needing hospital care	0	0	0	1	8
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1	2	31	160	590

Pahrump, Nevada

Epicenter at 115.92°W longitude, 36.22°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	710	2,000
People needing public shelter	0	0	0	7	23
People needing hospital care	0	0	0	3	14
Fatalities	0	0	0	0	3
Total economic loss ($ million)	0.6	3	12	76	160

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	720	2,000
People needing public shelter	0	0	0	8	37
People needing hospital care	0	0	0	3	18
Fatalities	0	0	0	0	3
Total economic loss ($ million)	3.9	7	30	220	720

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	4	720	2,000
People needing public shelter	0	0	0	8	37
People needing hospital care	0	0	0	3	18
Fatalities	0	0	0	0	3
Total economic loss ($ million)	2.7	6	29	220	720

Pioche, Nevada

Epicenter at 114.41°W longitude, 37.92°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lincoln County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	1	44	160
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.3	0.7	4	15	39

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	1	44	160
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.2	7	24	50

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	1	44	160
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.8	2.2	6	19	46

Reno, Nevada

Epicenter at 119.80°W longitude, 39.52°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100
People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	20	200	950	2,700	4,500

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100
People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	24	200	970	2,700	4,600

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	4	480	3,100	6,100
People needing public shelter	0	2	180	1,200	2,200
People needing hospital care	0	1	19	230	630
Fatalities	0	0	2	58	170
Total economic loss ($ million)	22	200	970	2,700	4,600

Silver Springs, Nevada

Epicenter at 119.21°W longitude, 39.41°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	510
People needing public shelter	0	0	0	0	4
People needing hospital care	0	0	0	0	2
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.4	3	12	37	84

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	560
People needing public shelter	0	0	0	1	7
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	0
Total economic loss ($ million)	5.1	8	29	130	350

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	120	560
People needing public shelter	0	0	0	1	7
People needing hospital care	0	0	0	1	4
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4	7	29	140	360

Sparks, Nevada

Epicenter at 119.76°W longitude, 39.53°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Washoe County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800
People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	21	180	910	2,600	4,400

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800
People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	25	190	920	2,700	4,500

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	3	460	3,000	5,800
People needing public shelter	0	1	150	1,100	2,000
People needing hospital care	0	1	19	240	590
Fatalities	0	0	2	61	160
Total economic loss ($ million)	23	180	920	2,700	4,500

Stateline, Nevada

Epicenter at 119.95°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Douglas County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	5	62	220
People needing public shelter	0	0	0	5	17
People needing hospital care	0	0	0	2	9
Fatalities	0	0	0	0	2
Total economic loss ($ million)	0	6	32	95	180

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	5	66	270
People needing public shelter	0	0	0	5	25
People needing hospital care	0	0	0	2	11
Fatalities	0	0	0	0	2
Total economic loss ($ million)	4	11	52	180	450

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	52	460	1,100
People needing public shelter	0	0	15	110	230
People needing hospital care	0	0	1	16	49
Fatalities	0	0	0	3	12
Total economic loss ($ million)	7	31	160	480	990

Tonopah, Nevada

Epicenter at 117.19°W longitude, 38.08°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Nye County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140
People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.0	2.0	6	19	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140
People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	4.3	5.3	9	23	40

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	2	49	140
People needing public shelter	0	0	0	2	8
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2	3	6	21	37

Virginia City, Nevada

Epicenter at 119.63°W longitude, 39.34°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Storey County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	3	55	120
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.9	4	13	29	43

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	170	980
People needing public shelter	0	0	0	16	130
People needing hospital care	0	0	1	5	23
Fatalities	0	0	0	0	2
Total economic loss ($ million)	6	19	140	510	1,200

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	6	170	980
People needing public shelter	0	0	0	16	130
People needing hospital care	0	0	1	5	22
Fatalities	0	0	0	0	3
Total economic loss ($ million)	5	18	130	520	1,200

Wells, Nevada

Epicenter at 115.00°W longitude, 41.12°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	29	140	200
People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	1.1	3	13	41	77

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	29	140	200
People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	4.4	7	17	59	94

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	29	140	200
People needing public shelter	0	0	0	5	10
People needing hospital care	0	0	0	5	10
Fatalities	0	0	0	1	3
Total economic loss ($ million)	2.1	4	15	43	80

West Wendover, Nevada

Epicenter at 113.94°W longitude, 40.78°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Elko County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120
People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.6	0.9	3	13	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120
People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	4.2	6	17	38

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	8	120
People needing public shelter	0	0	0	1	20
People needing hospital care	0	0	0	0	3
Fatalities	0	0	0	0	0
Total economic loss ($ million)	1.6	2.3	6	18	43

Winnemucca, Nevada

Epicenter at 117.74°W longitude, 41.00°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Humboldt County**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	16	220	490
People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	0.7	2	14	39	81

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	16	220	490
People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	4.2	6	18	44	87

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	**5.5**	**6.0**	**6.5**	**7.0**
Number of buildings with extensive to complete damage	0	0	16	220	490
People needing public shelter	0	0	0	1	5
People needing hospital care	0	0	0	1	5
Fatalities	0	0	0	0	1
Total economic loss ($ million)	1.8	3.3	15	41	84

Yerington, Nevada

Epicenter at 119.20°W longitude, 38.97°N latitude

Results of earthquake scenarios using HAZUS, the loss-estimation model from the Federal Emergency Management Agency. All numbers are estimates; individual numbers may vary by a factor of 10, depending on the location, depth, and magnitude of the earthquake.

Study Region: **Lyon County**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	66
People needing public shelter	0	0	0	0	0
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	0.1	1	3	12	34

Study Region: **All Nevada counties**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	73
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	3.8	5	13	43	160

Study Region: **All counties within 100km**	Earthquake Magnitude				
	5.0	5.5	6.0	6.5	7.0
Number of buildings with extensive to complete damage	0	0	0	4	73
People needing public shelter	0	0	0	0	1
People needing hospital care	0	0	0	0	1
Fatalities	0	0	0	0	0
Total economic loss ($ million)	2.4	3.2	12	49	180

Appendix A

The following tables report estimated losses from earthquakes that could occur near the 38 Nevada communities. These data represent damage from an earthquake for that location only within the specified county. Each table represents results from a specific magnitude that is noted above the table. For each community the table reflects the following data:

- Damage to Essential Facilities: these are separated into five separate building types: Hospitals, Schools, Emergency Operations Center (EOC), Police Stations, and Fire Stations. The number indicates how many facilities of each type will have at least moderate damage to at least 50% of the building. There were no facilities that are estimated to receive complete damage to more than 50% of the building.
- Residential: the estimated number of residential buildings that will be either extensively or completely damaged.
- Non-residential: the estimated number of non-residential buildings that will be either extensively or completely damaged.

MAGNITUDE 5.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	0	0
Churchill	- Fallon	0	0	0	0	0	0	0
Clark	- Las Vegas	0	0	0	0	0	0	0
	Boulder City	0	0	0	0	0	0	0
	Henderson	0	0	0	0	0	0	0
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	0	0
	Moapa	0	0	0	0	0	0	0
Douglas	- Minden	0	0	0	0	0	0	0
	Stateline	0	0	0	0	0	0	0
Elko	- Elko	0	0	0	0	0	0	0
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	0	0
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	0	0
Humboldt	- Winnemucca	0	0	0	0	0	0	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	0	0
Lincoln	- Pioche	0	0	0	0	0	0	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0
	Dayton	0	0	0	0	0	0	0
	Fernley	0	0	0	0	0	0	0
	Silver Springs	0	0	0	0	0	0	0
Mineral	- Hawthorne	0	0	0	0	0	0	0
Nye	- Tonopah	0	0	0	0	0	0	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	0	0
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	0	0
Washoe	- Reno	0	0	0	0	0	0	0
	Gerlach	0	0	0	0	0	0	0
	Incline Village	0	0	0	0	0	0	0
	Sparks	0	0	0	0	0	0	0
White Pine	- Ely	0	0	0	0	0	0	0

MAGNITUDE 5.5

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	2	0
Churchill	- Fallon	0	0	0	0	0	0	0
Clark	- Las Vegas	0	0	0	0	0	8	7
	Boulder City	0	0	0	0	0	1	0
	Henderson	0	0	0	0	0	1	1
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	0	0
	Moapa	0	0	0	0	0	0	0
Douglas	- Minden	0	0	0	0	0	1	0
	Stateline	0	0	0	0	0	0	0
Elko	- Elko	0	0	0	0	0	1	0
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	0	0
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	0	0
Humboldt	- Winnemucca	0	0	0	0	0	0	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	0	0
Lincoln	- Pioche	0	0	0	0	0	0	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0
	Dayton	0	0	0	0	0	0	0
	Fernley	0	0	0	0	0	0	0
	Silver Springs	0	0	0	0	0	0	0
Mineral	- Hawthorne	0	0	0	0	0	0	0
Nye	- Tonopah	0	0	0	0	0	0	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	0	0
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	0	0
Washoe	- Reno	0	0	0	0	0	2	2
	Gerlach	0	0	0	0	0	0	0
	Incline Village	0	0	0	0	0	0	0
	Sparks	0	0	0	0	0	1	2
White Pine	- Ely	0	0	0	0	0	0	0

MAGNITUDE 6.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	0	0	0	251	60
Churchill	- Fallon	0	0	0	0	0	28	13
Clark	- Las Vegas	0	0	0	0	0	1852	786
	Boulder City	0	0	0	0	0	103	31
	Henderson	0	0	0	0	0	222	72
	Laughlin	0	0	0	0	0	0	0
	Mesquite	0	0	0	0	0	41	22
	Moapa	0	0	0	0	0	2	1
Douglas	- Minden	0	0	0	0	0	58	34
	Stateline	0	0	0	0	0	4	1
Elko	- Elko	0	0	0	0	0	109	73
	Carlin	0	0	0	0	0	0	0
	Wells	0	0	0	0	0	26	3
	West Wendover	0	0	0	0	0	0	0
Esmeralda	- Goldfield	0	0	0	0	0	0	0
Eureka	- Eureka	0	0	0	0	0	22	3
Humboldt	- Winnemucca	0	0	0	0	0	16	0
Lander	- Battle Mountain	0	0	0	0	0	0	0
	Austin	0	0	0	0	0	45	0
Lincoln	- Pioche	0	0	0	0	0	1	0
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	0	0
Lyon	- Yerington	0	0	0	0	0	0	0
	Dayton	0	0	0	0	0	26	5
	Fernley	0	0	0	0	0	6	1
	Silver Springs	0	0	0	0	0	2	0
Mineral	- Hawthorne	0	0	0	0	0	15	1
Nye	- Tonopah	0	0	0	0	0	2	0
	Beatty	0	0	0	0	0	0	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	3	1
Pershing	- Lovelock	0	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	2	1
Washoe	- Reno	0	0	0	0	0	293	191
	Gerlach	0	0	0	0	0	4	2
	Incline Village	0	0	0	0	0	4	14
	Sparks	0	0	0	0	0	269	191
White Pine	- Ely	0	0	0	0	0	4	2

MAGNITUDE 6.5

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	1	0	0	0	1136	258
Churchill	- Fallon	0	0	1	0	0	223	73
Clark	- Las Vegas	11	16	1	0	7	12628	17859
	Boulder City	0	1	0	0	0	1153	408
	Henderson	0	0	0	0	0	3443	980
	Laughlin	0	0	0	0	0	4	2
	Mesquite	0	2	0	0	0	348	122
	Moapa	0	0	0	0	0	44	9
Douglas	- Minden	0	2	0	0	0	258	116
	Stateline	0	0	0	0	0	52	10
Elko	- Elko	1	0	0	0	0	455	314
	Carlin	0	0	0	0	0	1	1
	Wells	0	2	0	0	0	127	16
	West Wendover	0	0	0	0	0	7	1
Esmeralda	- Goldfield	0	0	0	0	0	28	0
Eureka	- Eureka	0	0	0	0	0	147	17
Humboldt	- Winnemucca	0	0	0	1	0	215	8
Lander	- Battle Mountain	0	3	0	0	0	9	3
	Austin	0	0	0	0	0	335	7
Lincoln	- Pioche	0	0	0	0	0	37	7
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	0	0	0	5	1
Lyon	- Yerington	0	0	0	0	0	3	1
	Dayton	0	0	0	0	1	217	29
	Fernley	0	0	0	0	0	118	13
	Silver Springs	0	1	0	0	0	110	6
Mineral	- Hawthorne	0	0	0	0	0	130	7
Nye	- Tonopah	1	0	0	0	0	46	3
	Beatty	0	0	0	0	0	5	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	0	0	0	0	684	32
Pershing	- Lovelock	1	0	0	0	0	0	0
Storey	- Virginia City	0	0	0	0	0	48	7
Washoe	- Reno	0	7	0	0	0	2190	951
	Gerlach	0	2	0	0	0	62	9
	Incline Village	0	0	0	0	0	40	70
	Sparks	0	7	0	0	0	2100	915
White Pine	- Ely	1	0	0	0	0	60	21

MAGNITUDE 7.0

County	- County seat or other community	Essential Facilities					Residential	Non-residential
		Hospital	Schools	EOC	Police	Fire		
Carson City	- Carson City	0	0	1	0	0	1868	457
Churchill	- Fallon	0	0	2	0	0	485	122
Clark	- Las Vegas	13	49	1	0	15	24031	10868
	Boulder City	2	4	1	0	0	3244	2794
	Henderson	3	13	1	0	0	11507	3924
	Laughlin	0	0	0	0	0	50	25
	Mesquite	0	2	0	0	0	609	201
	Moapa	0	0	0	0	0	224	45
Douglas	- Minden	0	2	0	0	0	421	208
	Stateline	0	0	0	0	0	161	54
Elko	- Elko	1	0	0	0	0	344	844
	Carlin	0	0	0	0	0	25	6
	Wells	0	2	0	0	0	178	22
	West Wendover	0	0	0	0	0	101	15
Esmeralda	- Goldfield	0	0	0	0	0	134	4
Eureka	- Eureka	0	0	0	0	0	239	32
Humboldt	- Winnemucca	0	0	0	1	0	464	22
Lander	- Battle Mountain	0	3	0	0	0	47	12
	Austin	0	0	0	0	0	558	11
Lincoln	- Pioche	0	0	0	0	0	130	27
	Alamo	0	0	0	0	0	0	0
	Caliente	0	0	1	0	0	49	9
Lyon	- Yerington	0	0	0	0	0	57	9
	Dayton	0	0	0	0	3	414	51
	Fernley	0	1	0	0	0	0	0
	Silver Springs	0	1	0	0	0	489	22
Mineral	- Hawthorne	0	0	0	0	0	229	13
Nye	- Tonopah	1	0	0	0	0	134	7
	Beatty	0	0	0	0	0	82	0
	Gabbs	0	0	0	0	0	0	0
	Pahrump	0	1	0	0	0	1881	84
Pershing	- Lovelock	1	0	0	0	0	5	1
Storey	- Virginia City	0	0	1	0	0	106	16
Washoe	- Reno	0	14	0	0	0	4372	1708
	Gerlach	0	2	0	0	0	124	35
	Incline Village	0	0	0	0	0	125	145
	Sparks	0	14	0	0	0	4138	1620
White Pine	- Ely	1	0	0	0	0	142	53

THREAT AND HAZARD IDENTIFICATION AND RISK ASSESSMENT

EXECUTIVE SUMMARY

2017 Report
Nevada

THIRA Executive Summary

THIRA Process

Every community should understand the risks it faces. By understanding its risks, a community can make smart decisions about how to manage risk, including developing needed capabilities. Risk is the potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences. By considering changes to these elements, a community can understand how to best manage and plan for its greatest risks across the full range of the threats and hazards it faces. The THIRA process helps communities identify capability targets and resource requirements necessary to address anticipated and unanticipated risks.

The THIRA follows a four-step process, as described in *Comprehensive Preparedness Guide (CPG) 201, Second Edition*:

1. **Identify the Threats and Hazards of Concern.** Based on a combination of experience, forecasting, subject matter expertise, and other available resources, identify a list of the threats and hazards of primary concern to the community.
2. **Give the Threats and Hazards Context.** Describe the threats and hazards of concern, showing how they may affect the community.
3. **Establish Capability Targets.** Assess each threat and hazard in context to develop a specific capability target for each core capability identified in the National Preparedness Goal. The capability target defines success for the capability. (Note that the Unified Reporting Tool (URT) breaks THIRA Step 3 into two sub-steps in which you develop impact and outcome statements in the first step and establish capability targets in the second step).
4. **Apply the Results.** For each core capability, estimate the resources required to achieve the capability targets through the use of community assets, while also considering preparedness activities.

Threats/Hazards in Context

Name	Context Description
Earthquake	1. A magnitude 6.9 earthquake along the Mount Rose Fault (April-September), resulting in significant damage/disruption to infrastructure and energy/fuel delivery systems, the moderate to severe damage of 1,200 residential structures, moderate to severe damages to 300 small to medium sized businesses, and other damage out to 40 miles from the epicenter. This event would displace +/- 5,000 persons, inflict moderate to severe injury to 3,000 persons, and cause 50 deaths. 2. A magnitude 6.0 earthquake along the Frenchman Mountain Fault occurs during the peak tourism months (April - September). This earthquake will result in widespread damage throughout the Las Vegas Urban Area, including aging unreinforced masonry buildings and high-rise resort hotels on the Las Vegas Strip. The economic loss as a result of the earthquake exceeds $7 billion. Over 15,000 buildings experience major damage. More than 3,600 people will require shelter, over 1,100 casualties are expected, and nearly 300 fatalities are likely. 3. A magnitude 7.8 Earthquake on the San Andreas Fault with epicenter near Salton Sea. This earthquake will result in damage out to 60 miles from the epicenter, impacting fuel, vehicular transportation, and power through Cajon Pass and the I-15 corridor to Las Vegas. While mass migration from impact areas within Southern California may occur with as many as 50,000 persons seeking temporary shelter, fuel disruption to the Las Vegas area and McCarran Airport is ongoing for 7-10 days.
Flood	A 100/500-year event results in catastrophic flash floods causing flooding to critical infrastructure including: 100 small/medium businesses with moderate to major damage, 15,000 residential homes with moderate to major damages. public roadways and highways damaged including the undercut of 30 miles of primary roadway, 300 culverts blocked or damaged. Discharge/Flow rates in excess of 23,500 cubic feet/second in strained public flood channels. Flooding impacts last for three months.
Wildfire	A lightning strike causes a 5,000-10,000 acre wildfire threatening 500 residential and small/medium commercial structures, as well as Critical Infrastructure/Key Resource (CIKR) sites in the urban interface in July. Because of this fire, 2,000 persons are displaced with 500 requiring shelter for a period of three days. Additionally, 100 (reduced from 200) persons have adverse respiratory/medical reactions due to smoke and fire activities requiring hospitalization for 24 hours. There is a displacement of animals and livestock requiring the establishment of sheltering/housing specific to this population, no more than 100, for seven days.

Name	Context Description
Pandemic – Human	An infectious disease outbreak is introduced to southern Nevada by way of direct air travel into Las Vegas and transmitted efficiently from person to person resulting in large numbers of people being infected. The pandemic wave will sweep across southern Nevada in 1-2 months (New timeframe), and observed after 1-2 months (new observation period) affecting multiple locations both in southern and northern (new location) Nevada, as well as simultaneously impacting other locations outside of state due to transient population movement (new wider population impact). 3.0 % of overall population have minor to moderate infections that impact their ability to work for one to three weeks.
Active Shooter	A coordinated active shooter incident (i.e., Mumbai/Paris-style attack) targeting multiple commercial soft targets along the Las Vegas Strip using small arms and improvised explosive devices (IEDs). 2-5 (new number) gunmen attack various locations, including three (3) luxury hotels/casinos, a hospital and nearby international airport. The attack stretches on for 6 hours. (shortened timeframe). There are 75 fatalities and 250 non-fatal (new human impacts) injuries as a result of the assault and or other actions or mechanisms of injury.
Cyber Attack	A cyber related incident resulting in the loss of system integrity to information technology systems that also severely compromises essential services. The event creates an inability for systems and their operators to understand, detect, and isolate the event, and destabilizes critical technology systems. One of the consequences is the inability to conduct financial transactions within the impacted systems.
Drought	8 years of persistent extreme to exceptional drought that results in: 20% of the county's private wells running dry; municipal water reserves are at emergency levels; and the effect of the drought results in a 20% economic downturn for the county.
Hazmat Release – Chemical	Non-terrorism transportation system release involving rail/freight line derailment near or on major highway corridor causing a chemical or hazardous material (i.e., chlorine) spill and potential plume over a major population area. This results in the displacement of 25,000 persons from 3,000 residential and 750 commercial buildings within the impacted area. Additionally, the release causes injury to 150 persons and death to 50 persons.

THIRA Capability Targets

Core Capability	Capability Target
Planning	Protection/Response/Recovery: Insure that 100% of Nevada's jurisdictions have developed and maintained all-risk/all-hazard plans, Continuity of Operations (COOP), Emergency Operations Plan's (EOP)'s, and Recovery Plans. Mitigation: Update the State of Nevada Hazardous Mitigation Plan every 5 years, to ensure it meets the Emergency Management Accreditation Program (EMAP) requirements for approval and certification during the specified time frames, and addresses all relevant threats/hazards identified in Nevada's THIRA and other appropriate risk assessments for the state.
Public Information and Warning	Within 30 minutes and using a variety of delivery systems, provide warnings to 100% of the people of an imminent event, including information on how to take appropriate actions, and provide the affected population with information on how to obtain essential services and access resources following the event.
Operational Coordination	Establish and maintain a unified command/control ICS structure with all intrastate and interstate stakeholders to identify and coordinate incident management activities within 30 minutes of awareness of the threat/hazard across the impacted area. Within 1 hour, mobilize critical resources and establish command, control, and coordination structures through the SEOC and 16 Emergency Support Functions in the state, as well as all appropriate local EOC's in the impacted area/community, and maintain, as needed, throughout the duration of an incident.
Forensics and Attribution	Prioritize, collect, and examine 100% of evidence associated with an act of terrorism or an imminent terrorist attack across 17 counties and all critical infrastructure sectors. Identify 100% of the terrorist actors, co-conspirators, and their sponsors by fusing all science-based forensic results and all source intelligence information and products across 17 counties and all critical infrastructure sectors.
Intelligence and Information Sharing	Ensure that 100% of applicable intelligence will be shared with stakeholders within 2 hours. Within 1 hour of receiving intelligence from the fusion center, disseminate actionable intelligence and information to key stakeholders from all agencies/organizations. Within 2 hours, develop information and intelligence gathering priorities in response to a dynamic threat scenario with a potential for follow-on attacks and ensure identification and tasking of all available intelligence assets to support these priorities.
Interdiction and Disruption	Deploy 20 specialized tactical alert teams, bomb squads, or EOD units within 1 hour to prevent initial or follow-on terrorist attacks. Conduct simultaneous tactical counter-terrorism operations in up to 5 separate locations on 3 consecutive days. Identify response capabilities and establish strategic plan for cyber-attack response.
Screening, Search, and Detection	Ensure 100% of Nevada's hospitals and local public health agencies have the ability to coordinate syndromic surveillance. Employ wide-area search and detection assets in 100% of the targeted areas in concert with local, state, tribal, private sector, or other federal agencies based on known or suspected threat information.

Core Capability	Capability Target
Access Control and Identity Verification	Ensure identities of 100% of personnel who are authorized to access systems and facilities for CIKR sites. Grant or deny physical access of an estimated 500 people to specific locations, information, and networks.
Cybersecurity	Within 2 years, using a phased approach, implement risk-informed guidelines, regulations, and standards to ensure the security, reliability, integrity, and availability of critical information, records, and communications systems and services to state networks, critical infrastructure and key resources, through collaborative cybersecurity initiatives and efforts.
Physical Protective Measures	Implement and maintain risk-informed physical protections, countermeasures, and policies, protecting all public sector critical infrastructure and key resources facilities, 17 jurisdictions, and tribal partners, operated internet systems, and those materials, products, and systems associated with critical infrastructure sectors and other key operational activities. Encourage all private sector critical infrastructure and key resources owners and operators to do likewise.
Risk Management for Protection Programs and Activities	Complete and maintain updated risk assessments for 100% of the CIKR sites within the State of Nevada.
Supply Chain Integrity and Security	Secure and make resilient all major interstate highways, nodes, methods of transportation between nodes, and materials in transit across all sectors and 17 counties within Nevada.
Community Resilience	Ensure 100% of the individuals in the affected area are educated regarding measures to be taken to safeguard their homes and businesses. Build human resource capacity by 30% through citizen engagement via citizen core groups such as community emergency response teams (CERT) or voluntary organizations active in disaster (VOAD).
Long-term Vulnerability Reduction	Develop a strategy to reduce or eliminate 50% of risks from natural, technological, and human caused hazards for people and property in 3 years.
Risk and Disaster Resilience Assessment	Support, assist, and motivate 17 counties in prioritizing their risks, needs, and resources using the most current knowledge of existing critical assets, key resource lifelines, systems, and networks and their performance post-quake. Conduct a statewide risk assessment every year that includes information about localized vulnerabilities.
Threats and Hazards Identification	Identify 5 of the worst-case, plausible threats and hazards to the region and provide timely and accurate data on these threats and hazards through a continual process of data collection and analysis. Encourage 17 jurisdictions to identify threats and hazards on an annual basis. Identify and provide context for 5 threats and hazards in collaboration with whole community partners and incorporate this into the analysis and planning process.

Core Capability	Capability Target
Critical Transportation	Within the first 24 hours after an incident, inspect, re-establish, and maintain 3 land and air routes to move all first responders and other resources to safely sustain 100% of the affected persons in the vicinity of the incident. Within the first 48 hours of an incident, establish physical access to deliver required resources to save lives and meet the needs of 100% of the people in the affected area.
Environmental Response/Health and Safety	During the first 12 hours of an incident, conduct health and safety hazard assessments and disseminate guidance and resources, including the deployment of hazardous materials teams, to support environmental health and safety actions for 100% of response personnel and 100% of the population within the affected area.
Fatality Management Services	Within 12 hours of an incident, conduct operations to recover all fatalities. Within 24 hours of a request to support a mass fatality incident, establish initial morgue operations, prepare for the arrival of Disaster Mortuary Operational Response Teams (DMORT) support, and obtain refrigeration units and other resources to recover or collect up to 200 fatalities and provide counseling services to 100% of the bereaved.
Fire Management and Suppression	Within +2 hours of wildfire ignition, initiate the wildfire response plan for the Ajency Having Jurisdiction (AHJ). Within this same time-frame, provide an accurate assessment of wildfire behavior and projected growth sufficient to provide accurate public information and warning to the affected community. Maintain or have available 15 Strike Teams of Type I engines, and 10 Strike Teams of Type II engines for deployment within +2 hours from ignition and/or notification. Upon containment of the wildfire impact area, and within a three day period after such containment, initiate damage assessment and establish short and long-term housing for the affected population up to the limits indicated by the threat context for wildfire. Maintain within the State of Nevada sufficient overhead personnel sufficient to manage two wildfires simultaneously at the size and complexity as identified in the Wildfire context within this document.
Infrastructure Systems	Within 72 hours of an event, restore 50% of peak household power outages of the total 200,000 customers without power, and 50% of critical facility outages. Within five days, restore 75% of peak household power outages and 75% of critical facility outages. Within 72 hours restore water and sewer services to 50% of the effected community, and within 5 days restore 75% of water and sewer services to the affected community. Within 96 hours, restore natural gas services to 50% of the affected community.
Logistics and Supply Chain Management	During the first 72 hours of an incident, mobilize and deliver essential public and private services and resources needed to save lives and meet the needs of all people in the impacted area.
Mass Care Services	Within 24 hours of an incident, mobilize resources and capabilities to provide life-sustaining services to the affected population, including animals, consisting of shelter for an estimated 100,000 people in need of potable water, sanitation disposal, security, mental health treatment, functional needs assistance, and veterinary services, and provide support for reunifying families.

Core Capability	Capability Target
Mass Search and Rescue Operations	Within the first 4 hours of the incident, identify and deploy 20 Type I and 20 Type III Wilderness Search and Rescue (SAR) Teams to the affected area. Within 12 hours of an incident, conduct search and rescue operations to search 75% of damaged structures to locate and rescue persons in distress. Within 24 hours of the incident, identify and deploy three Type I Urban Search and Rescue (USAR) Task Forces to the affected area and evaluate 75% of collapsed structures, locate and rescue 20% of the affected population in confined space. During the response phase of the incident, maintain a functional and qualified Incident Management Team (IMT) for SAR operations to insure continual operational continuity and safety.
On-scene Security, Protection, and Law Enforcement	Within 12 hours, establish and maintain on-scene security and protection needs for the incident area in order to mitigate the risk of further damage to persons, property, and the environment.
Operational Communications	Within 12 hours of an incident, ensure interoperable communication networks for emergency services are functional statewide through the repair or transition to backup systems. Restore traditional analog and digital communications systems within 24 hours. Ensure the ability to share data, including photographs and live video, among 3 command posts in the region, the state fusion center, and the state operations center. Provided for remote delivery of radio and communications systems to rural incidents.
Public Health, Healthcare, and Emergency Medical Services	Within 48 hours of the receipt of medical countermeasures from the Federal Government, distribute and dispense medications to 100% of the exposed population. Provide a mass immunization capacity of 460 people per hour (1 POD lane w/ 8 vaccinators = 460 PPH) for each POD opened (i.e. 5 one lane POD's = 2300 PPH) in the affected community for 2 days. Provide medical treatment to 100% of the incident casualties within 24 hours.
Situational Assessment	Within 12 hours of an incident, gather and compile situation reports from all affected jurisdictions (cities, counties, and state agencies) to develop and maintain a common operating picture. Deliver critical information updates every 4 hours (or sooner). Deliver critical information updates every 4 hours (or sooner, depending on the incident) throughout the operational period to inform decision makers regarding lifesaving and life-sustaining activities.
Economic Recovery	Within 14 days of an incident, develop a Recovery Support Strategy (RSS) in concert with whole community partners and a specific timeline to restore community infrastructure sites.
Health and Social Services	Within 7 to 10 days, engage in the following recovery functions: case management intake, direct physical labor, volunteer management, and leadership and capacity building for government, nonprofit, and faith-based organizations. Within 1 month of the opening of the Joint Field Office (JFO), restore basic health and social services functions. Identify critical areas of need for health and social services, as well as key partners and at-risk individuals (such as children, those with disabilities and others with access and functional needs, and populations with limited English proficiency).
Housing	Within 2 weeks of the opening of the JFO, assess preliminary housing impacts and needs, identify currently available options for temporary housing, and initiate a plan for permanent housing. Within 48 hours, assess preliminary housing impacts and needs across the entire jurisdiction; identify currently available options for temporary housing for 100% of the affected population, including individuals with access and functional needs.
Natural and Cultural Resources	Within 2 months of the opening of the JFO, complete an assessment of all affected natural and cultural resources and develop a timeline for addressing these impacts.

The Western States Seismic Policy Council (WSSPC) is a regional earthquake consortium in the western states organized as a 501(c)(3) non-profit organization and funded by the Department of Homeland Security's Federal Emergency Management Agency. Members are the State Geological Survey and Emergency Management Directors of 13 western states, 3 U.S. territories, one Canadian territory, one Canadian province, and liaisons to 7 western state seismic safety councils and commissions. Its mission is to develop seismic policies and share information to promote programs intended to reduce earthquake-related losses.

The Nevada Earthquake Safety Council (NESC) is Nevada's liaison with the Western States Seismic Policy Council. Members of NESC work to implement the Nevada Educational Seismic Network and work on mitigation of fault-related hazards.

Nevada Earthquake Safety Council members chaired and participated on the Western States Seismic Policy Counsel's Engineering, Construction, and Building Codes Committee. A representative was also on the 10-member National Earthquake Hazard Reduction Program (NEHRP) advisory committee. The group provides guidance to USGS, FEMA, NSF and NIST through the Department of Commerce on all issues relating to seismic activity and sustainability of structures.

Several scientists and NESC members participated in the 2015 WSSPC Basin and Range Province Seismic Hazard Summit III in Salt Lake City, Utah. Members shared information and helped develop geoscience-based policies. Sessions included recent fault investigations from Nevada and lessons learned from the 2008 Wells, Earthquake.

In 2016, WSSPC produced a manual for handling earthquake response. This was requested by an incident commander following the 2008 Wells, Nevada Earthquake. The manual titled, "*Earthquake Emergency Handbook for First Responders and Incident Commanders*", was developed by a multi-state group including Nevadans Craig dePolo and Richard Koehler of the Nevada Bureau of Mines and Geology, Ron Lynn, Chairman of the Nevada Earthquake Safety Council, and Janell Woodward of the Nevada Division of Emergency Management.

NESC has adopted several policies since the 2013. These policies include:

- Policy Recommendation 16-3 Post-Earthquake Technical Clearinghouses
- Policy Recommendation 16-12 Earthquake Actuated Automatic Gas Shutoff Devices
- Policy Recommendation 15-4 Identification and Mitigation of Non-Ductile Concrete Buildings
- Policy Recommendation 17-4 Identification and Mitigation of Unreinforced Masonry Structures
- Policy Recommendation 16-4 Seismic Provisions in the 2015 International Building Codes
- Policy Recommendation 15-1 Earthquake and Tsunami Planning Scenarios
- Policy Recommendation 15-3 Definitions of Recency of Surface Faulting for the Basin and Range Province

The most up-to-date version of WSSPC policies is available at the link listed below.
http://www.wsspc.org/public-policy/adopted-recommendations/

Mitigation is effective when action is taken now rather than later. Disasters can strike at any time, so it is important to be prepared to reduce loss of life and property. In order for mitigation to be effective, everyone must understand risks, address hard choices, and invest in community well-being. The state of Nevada has completed numerous mitigation activities, from multiple agencies.

Please note that it is difficult to capture all of the mitigation activities occurring in Nevada – organizations mentioned in this appendix might be doing more mitigation activities than captured. Likewise, some organizations may have been missed that have participated in mitigation activities.

O.1 SUMMARY OF MITIGATION ACTIVITIES

This appendix contains completed mitigation activities throughout the State of Nevada. Examples of agencies and organizations that have completed mitigation activities include: Nevada Bureau of Mines and Geology, Nevada Division of Emergency Management, Clark County's Regional Flood Control District, Nevada Division of Forestry, Southern Nevada Water Authority, The Nature Conservancy, Sierra Avalanche Center, Nevada Department of Transportation, Truckee River Flood Management Authority, Carson Water Sub Conservancy District, and more. Hazard mitigation outreach and public awareness activities are located in Appendix P. Table O-1 includes mitigation trainings throughout Nevada.

Table O-1. Mitigation Training in Nevada, 2014-2017

Training Code	Title of Training	Dates	Location
FEMA L-253	Introduction to Environmental and Historic Preservation Compliance	8/26/14-8/28/14	Carson City, NV
FEMA P50 and P 50-1	Simplified Seismic Assessment and Retrofit Guidelines for Detached, Single Family, Wood-Frame Dwellings	3/24/2015	Reno, NV
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	2/3/2015	Reno, NV
ATC 20	Postearthquake Safety Evaluation of Buildings (Post-Disaster)	2/3/2015	Reno, NV
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	2/4/2015	Las Vegas, NV
ATC 20	Postearthquake Safety Evaluation of Buildings (Post-Disaster)	2/4/2015	Las Vegas, NV
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	2/5/2015	Las Vegas, NV
ATC 20	Postearthquake Safety Evaluation of Buildings (Post-Disaster)	2/5/2015	Las Vegas, NV
FEMA 154	Rapid Visual Screening of Buildings for Potential Seismic Hazards (Pre-Disaster)	4/22/2015	Elko, NV
ATC 20	Postearthquake Safety Evaluation of Buildings (Post-Disaster)	4/22/2015	Elko, NV

Table O-1. Mitigation Training in Nevada, 2014-2017			
Training Code	**Title of Training**	**Dates**	**Location**
FEMA E-74	Reducing the Risks of Nonstructural Earthquake Damage	5/12/15	Reno, NV
FEMA P-909	Home and Business Earthquake Safety and Mitigation	5/12/15	Reno, NV
FEMA E-74	Reducing the Risks of Nonstructural Earthquake Damage	5/13/15	Las Vegas, NV
FEMA P-909	Home and Business Earthquake Safety and Mitigation	5/13/15	Las Vegas, NV
FEMA	Climate Resilient Mitigation Activities Webinar	2/19/16; 3/24/16	Online
FEMA 154 & ATC-20	Pre and Post Earthquake Inspection	3/7/16	Reno, NV
FEMA P-767	Earthquake Mitigation for Hospitals	3/8/16	Reno, NV
FEMA P-767	Earthquake Mitigation for Hospitals	3/10/16	Las Vegas, NV
FEMA 154 & ATC-20	Pre and Post Earthquake Inspections	3/11/16	Las Vegas, NV
FEMA 395	Earthquake Safety and Mitigation for Schools	12/8/2016	Reno, NV
FEMA 154 & ATC-20	Pre and Post Earthquake Inspection	06/28/2017	Reno, NV

O.2 EARTHQUAKE MITIGATION ACTIVITIES

As discussed in Section 3.3.3, Nevada is earthquake country, with over 250,000 earthquakes recorded within or adjacent to the state since 1857. Earthquake faults occur throughout Nevada, and potential losses from earthquakes are high for many communities. Therefore, it is crucial to be prepared to respond and mitigate structural and content risks.

O.2.1 Clark County Mitigation Activities

The following activities have been completed, or are currently in the process of being completed in Clark County:

1. Seismic Data Solutions conducted a project, for the Nevada System of Higher Education in 2010. The project is called the Clark County Microzonation project, and involved earthquake parcel classification mapping for increasing public safety within Clark County. The report is available at: http://crack.seismo.unr.edu/ftp/pub/louie/parcel/Clark_report_final.pdf

2. According to the 2014 Nevada State Report, obtained online from Western States Seismic Policy Council, Clark County School District submitted a PDM grant application, which was awarded to install automatic gas shut-off valves in their schools and facilities.

3. Noted in Nevada DEM's 2015-2016 Annual Report, Clark County collaborated with the Earthquake Engineering Research Institute on a ground-truthing project. The project verifies URM buildings throughout the county against a list of URM buildings. In September 2016, an app "URM Survey Tool- Clark County, NV", released. The app allows the county to inventory the URM structures into a central database. To download the free app go to: https://itunes.apple.com/us/app/urm-survey-tool-clark-county-nv/id1139114920?mt=8

O.2.2 Nevada Division of Emergency Management

Multihazard project completion reports, newsletters, and press releases: http://dps.nv.gov/media/

O.2.3 Nevada Department of Transportation

NDOT has conducted studies on earthquake mitigation. The studies include:

1. *The Analytical Investigation into Bridge Column Innovations for Mitigating Earthquake Damage* study focused on how to reduce post-earthquake damage to bridge columns. Not only is the damage expensive, it may lead to long-term closure of highways (available here: https://www.nevadadot.com/home/showdocument?id=9139).

2. Another study conducted by NDOT, *Development of Earthquake-Resistant Precast Pier Systems for Accelerated Bridge Construction in Nevada*, addressed the need to expand its accelerated bridge program, using earthquake-resistant elements and connections for bridges with two or more spans (available here: https://www.nevadadot.com/home/showdocument?id=9167).

3. *The Post-Earthquake Assessment of Nevada Bridges Using ShakeMap/ShakeCast* study involved an examination of post-earthquake capacity of Nevada highway bridges. The study used scenario earthquake evaluation (ShakeMap, ShakeCast, and 2014 USGS National Seismic Hazard Map) and engineering study to assess the capacity of bridges. Researchers provided NDOT with a list of potentially vulnerable bridges for use in seismic retrofit planning (available here: https://www.nevadadot.com/home/showdocument?id=9111).

Other earthquake mitigation activities include:

1. In 2018, NDOT will start a seismic retrofit project on I-515 at the Las Vegas Downtown Viaduct.

2. In 2016, NDOT maintained 82 bridges needing renovation by seismic deficiency.

O.2.4 The Great Nevada ShakeOut

The Great Nevada ShakeOut (the ShakeOut) is the largest earthquake drill in Nevada. It occurs annually on the third Thursday of October. The main goal of the ShakeOut is to prepare Nevadans for major earthquakes, before, during, and after. Participants are urged to visit http://www.earthquakecountry.info/roots/seven_steps.html and http://shakeout.org/nevada/ for tips on how to prepare, protect, and recover from a damaging earthquake.

O.2.5 Nevada Earthquake Safety Council

NESC participates in various workshops. For example, NESC and the California Seismic Safety Commission held a joint workshop in 2014. A presentation on the history of earthquakes, and a discussion about collaborating on future projects occurred during the workshop. However, due to the 2017 disasters in Northwest Nevada, participation has been limited.

The NESC URM Committee was created by NESC to address URM buildings throughout the state, and to identify solutions to improve the safety of these buildings. The committee met for the first time on October 4, 2016, and again on May 2, 2017. The meetings focused on setting goals and creating a work plan to accomplish goals.

O.2.6 Nevada Bureau of Mines and Geology

NBMG continues efforts to get Nevadans ready for earthquakes through talks and the ShakeOut event. The following are examples of NBMG resources are available online:

1. The Earthquake Resources webpage. Access the webpage to view maps, publications, presentations, and additional links & resources regarding earthquakes in Nevada: http://www.nbmg.unr.edu/Geohazards/Earthquakes/EarthquakeResources.html

2. NBMG's Find Your Home or Business on an Earthquake Fault Map webpage. Can be accessed at: http://www.nbmg.unr.edu/geohazards/earthquakes/Home_EQfaultfinder.html

3. Earthquake mitigation saves lives (video linked on NBMG's site) https://www.fema.gov/media-library/assets/videos/76530

4. NESC earthquake presentations are available at: http://www.nbmg.unr.edu/nesc/Presentations/index.html

5. Preliminary Assessment of Potentially Unreinforced Masonry Buildings in Nevada, 2012, by Jonathan G. Price, Gary Johnson, Craig M. dePolo, Wayne Carlson, NBMG Report 54.

   This report is a preliminary assessment of potentially unreinforced masonry buildings (URMs) in Nevada. These are the buildings that are highly susceptible to collapse or partial collapse during earthquakes and are therefore of concern for life safety and economic recovery. Data are compiled from information provided by county assessors' offices and the Public Works Division of the State of Nevada with assumptions that potential URMs

are those brick, stone, or cement-block masonry buildings that were constructed before 1974. There are tens of thousands of potential URMs in Nevada. They are located in every county and nearly every community. Many URMs are historically significant, and many are concentrated in downtown business districts and along thoroughfares. It is important to note that not all Nevada URMs have been identified in this study, and some structures identified as potential URMs may not be. Risks from URMs can be reduced by removing the buildings, seismic rehabilitating them, and minimizing human occupancy.

The report is available as an online document free on the web at the following online link: https://pubs.nbmg.unr.edu/Unreinforced-masonry-buildings-p/r054.htm

O.2.7 The Nevada Seismological Laboratory

The Seismo Lab has completed mitigation activities, including:

1. As of 2014, an upgrade of communication links and seismometers continues in the Tahoe-Reno region.
2. The USGS awarded $3.7 million to six universities in the fall of 2016, including UNR, to transition their ShakeAlert earthquake early warning system into a production system. This system gives communities time to take action before shaking waves arrive.

   The early warning system will be integrated into the Seismo Lab's seismic network. The focus will start in the California portion near Lake Tahoe, and will then expand into Nevada, near Las Vegas.

3. The Seismo Lab has supported multi-hazard sensors on their network. These sensors can be used for fire, earthquake, flood, and avalanche detection.

The Seismo Lab has numerous resources online to aid the public in their own mitigation efforts, a few examples include:

1. Preparedness tips and how to reduce home hazards, go to: http://www.seismo.unr.edu/Preparedness
2. To view an earthquake activity map, go to: http://www.seismo.unr.edu/Earthquake
3. Living with Earthquakes in Nevada: http://crack.seismo.unr.edu/ep/nvguide/nvguide.pdf
4. Earthquakes in Nevada and How to Survive Them (2010): http://crack.seismo.unr.edu/ep/nvsurvival/e16.pdf

O.3 FLOOD MITIGATION ACTIVITIES

As noted in Section 3.3.7.3.3, the state is working with a variety of stakeholders to reduce the number of properties considered to be at-risk from flooding and to prevent unwise development of properties in high-risk areas due to flooding. These stakeholders include Carson Water Subconservancy District, Clark County Regional Flood Control District, Truckee River Flood Management Authority and the "Living River Plan", and the Silver Jackets Program.

O.3.1 Clark County Regional Flood Control District

The Clark County RFCD has completed numerous mitigation activities, and has several projects planned in the near future. To view completed, and scheduled projects, see Tables O-2, O-3, and O-4.

Summary of accomplishments as of June 2017, listed in Clark County RFCD's 2016-2017 Annual Report:

1. Twelve projects completed in 2015-2016
2. Eight projects completed in 2016-2017
3. Fourteen projects are under construction or about to start construction
4. 82 open design and construction contracts are underway
5. 54 square miles removed from FEMA flood zones
6. 91 detention basins
7. 612 miles of channels and storm drains
8. $1.8 billion funded to date on capital improvement projects
9. Social media outreach and creation of the FloodSpot app
10. Proclamations with safety messages
11. Presentations to more than 100,000 students
12. Paid advertising campaigns
13. 34 detention basins and 205 miles of conveyance remaining to be constructed
14. Received the 2016 Flash Flood Safety Press Conference and Crisis Communications for the June 30th Flash Flood Response Pinnacle Awards
15. Received the Distinguished Budget Presentation Award for the District's Fiscal Year 2016-2017 budget and Financial Plan

Table O-2. Completed RFCD Projects, 2013-2017

Project	Completion Date	Location
North Railroad Conveyance	July 2013	Boulder City
Carey Avenue Storm Drain, Local Drainage Project	July 2013	Clark County
Freeway Channel- Owens Ave to Miller Ave, Phase II	August 2013	City of North Las Vegas
Las Vegas Wash Main Branch, Lake Mead Blvd to Las Vegas Blvd	September 2013	City of North Las Vegas

Table O-2. Completed RFCD Projects, 2013-2017		
Project	**Completion Date**	**Location**
Pittman Wash, UPRR to Santiago, Phase I	April 2014	City of Henderson
Grand Teton- Hualapai to Tee Pee	July 2014	City of Las Vegas
Angel Park Detention Basin Expansion	September 2014	City of Las Vegas
Bootleg Canyon Detention Basin, Phase II	October 2014	Boulder City
Tropicana Wash at Swenson St.	October 2014	Clark County
Ann Road Channel West- Rainbow Blvd.	October 2014	City of Las Vegas
North & South Environmental Enhancement Areas- Floyd Lamb Park	October 2014	City of Las Vegas
Vegas Drive Storm Drain- Rancho to Shadow Mountain	October 2014	City of Las Vegas
Equestrian Tributary, Phase II	January 2015	City of Henderson
Equestrian Detention Basin Expansion	March 2015	City of Henderson
Buchanan Blvd., Phase III Improvements	May 2015	Boulder City
Orchard Detention Basin	June 2015	Clark County
Outlying Areas- Muddy River Cooper Street Bridge	June 2015	Clark County
Pittman Wash, UPRR to Santiago, Phase II	June 2015	City of Henderson
Las Vegas Wash- Grand Teton, Mountain Spa to Durango Dr.	June 2015	City of Las Vegas
Rancho Road System Beltway to Elkhorn Rd	August 2015	City of Las Vegas
Duck Creek Sunset to Sandhill	September 2015	City of Henderson
Centennial Collector	November 2015	City of North Las Vegas
Colton Channel Flood Control Improvements	January 2016	City of North Las Vegas
Rancho Road System Elkhorn, Fort Apache to Grand Canyon	February 2016	City of Las Vegas
Simmons St. Drainage Improvements, Alexander Road to Gowan Outfall Channel	March 2016	City of North Las Vegas

Table O-2. Completed RFCD Projects, 2013-2017		
Project	**Completion Date**	**Location**
Pittman Wash Duck Creek I-515	May 2016	City of Henderson
Oakey Meadows Storm Drain, Phase III	May 2016	City of Las Vegas
Brooks Channel	May 2016	City of North Las Vegas
Lexington Street Storm Drain Improvements, Local Drainage Project	November 2016	City of Las Vegas
Racetrack Channel Drake to Burkholder	December 2016	City of Henderson
Centennial Parkway Channel West CC 215, Pioneer Way to US 95	December 2016	City of Las Vegas
Ann Road Channel East ULVW to Fifth St	January 2017	City of North Las Vegas
Pittman North Detention Basin and Outfall Phase I	January 2017	City of Henderson
Flamingo Diversion Rainbow Branch	May 2017	Clark County
Las Vegas Wash N Channel, Cheyenne to Gowan Rd	May 2017	City of North Las Vegas
Pittman, West Horizon Palm Hills	June 2017	City of Henderson

Data obtained from Clark County RFCD's 2016-2017 Annual Report.
Annual reports are available at http://www.ccrfcd.org/pi_annualreports.htm

Table O-3. RFCD Projects Under Construction or Planned (as of June 30, 2017)		
Project	**Est. Completion Date**	**Location**
Muddy River Logandale Levee	August 2017	Clark County
Las Vegas Wash- Sloan Channel to Stewart Ave and Flamingo Wash below Nellis Blvd	August 2017	Clark County
Pittman North Detention Basin and Outfall, Phase II- Starr Ave	September 2017	City of Henderson
Duck Creek Las Vegas Blvd	March 2018	Clark County
Las Vegas Wash- Water Reclamation Channel	April 2018	Clark County
Central Freeway Channel at Cheyenne	April 2018	City of North Las Vegas

Table O-3. RFCD Projects Under Construction or Planned (as of June 30, 2017)		
Project	**Est. Completion Date**	**Location**
Brent Drainage System- Floyd Lamb Park to Durango Drive	June 2018	City of Las Vegas
Hemingway System, Phase IIA Improvements, Constitution	June 2018	City of Boulder City
Center Street Storm Drain	July 2018	City of Henderson
Appaloosa Storm Drain Project Local Drainage Project	July 2018	City of Henderson
Freeway Channel- Washington, MLK to Rancho Drive	July 2018	City of Las Vegas
Duck Creek to Dean Martin	October 2018	Clark County
Centennial Parkway Channel West- US 95, CC 215 to Grand Teton and US 95 Crossing at Kyle Canyon Road	December 2018	City of Las Vegas
Gowan North- Buffalo Branch, Lone Mountain to Washburn Road	December 2018	City of Las Vegas

Data obtained from Clark County RFCD's 2016-2017 Annual Report.

Table O-4. RFCD Projects Scheduled for FY 2017-2018	
Location	**Number of projects**
City of Boulder City	4
Clark County	24
City of Henderson	5
City of Las Vegas	23
City of Mesquite	4
City of North Las Vegas	22

Data obtained from Clark County RFCD's 2016-2017 Annual Report.

For more information, see Clark County RFCD's website: http://www.ccrfcd.org/

O.3.2 Truckee River Flood Management Authority

TRFMA has a Financial Assistance Program for Home Elevation (the Home Elevation Program), which started in 2010. This program allows Washoe County and TRFMA to award grants to homeowners in an approved area (Hidden Valley, Rosewood Lakes, and Eastside Subdivision neighborhoods). Elevating homes in this flood-prone area is cost-effective, and makes the properties more resistant to flood damage. For more information regarding the Home Elevation Program, see: http://trfma.org/resources/home-elevation-program/

TRFMA has completed several flood mitigation projects. Table O-5 lists completed flood risk management projects. Project plans aim to reduce flood damages and casualties from a 100-year flood event. TRFMA has a Project Plan Mapbook available online at: http://trfma.org/wp-content/uploads/2017/03/Mapbook-6-01_14_2015_compressed.pdf

Table O-5. TRFMA Completed Flood Risk Management Projects (as of 2017)

Project	Description	Status
Virginia St. Bridge Replacement	Existing bridge was removed and replaced with a new, hydraulically efficient bridge. The new bridge is capable of passing the 100-year flood flow	Complete- 2016
Reno-Sparks Indian Colony Levee and Floodwall Construction	Constructed a levee and floodwall system (~2,300 ft.). The project also included the construction of a multiuse recreational pathway	Complete- 2009, received two awards
North Truckee Drain Relocation	The existing North Truckee Drain was relocated to move its confluence with the Truckee River to a location downstream of the Steamboat Creek confluence. Project will reduce flooding in the Sparks industrial area.	Complete- Phase I & II

Data obtained from http://trfma.org/the-project/construction/

Table O-6. TRFMA's Flood Project Plan (Local Rate Plan) Elements*

Element	Element Description
	Downtown Reno Reach (DR)
DR-1	Jones Street to Arlington Avenue Floodwall Construction
DR-2	Jones Street to Arlington Avenue Floodwall Drainage
DR-3	Jones Street and Keystone Avenue Intersection Improvements
DR-4	Booth Street Bridge Removal
DR-5	Pumping Station
DR-6	Pedestrian Safety Closure Structures
DR-7	Pedestrian Bridge Improvement (Arlington Avenue)
DR-8	Floodproofing (existing downtown Reno buildings)
DR-9	Arlington Avenue Bridge Protection
DR-10	Arlington Avenue to Lake Street Floodwall Replacement

DR-11	Sierra Street Bridge Replacement
DR-12	Virginia Street Bridge Replacement
DR-13	Center Street Bridge Replacement
DR-14	Lake Street Bridge Replacement
DR-15	Wells Avenue Pedestrian Bridge Improvements
DR-16	Wells Avenue Bank Stabilization and Bridge Protection
	Truckee Meadows Reach (TM)
TM-1	Reno-Sparks Indian Colony Levee and Floodwall Construction
TM-2	Grand Sierra Resort Floodwall Construction
TM-3	Glendale Avenue
TM-4	Greg Street to Rock Boulevard Levee Construction
TM-5	Greg Street to Rock Boulevard Terracing
TM-6	Rock Boulevard Bridge Protection
TM-7	Rock Boulevard to McCarran Boulevard Levee Construction (South Bank)
TM-8	Rock Boulevard to McCarran Boulevard Terracing
TM-9	Rock Boulevard to McCarran Boulevard Levee and Floodwall Construction (North Bank)
TM-10	Pumping Station
TM-11	East McCarran Bridge Protection
TM-12	UNR Main Station Farm Facilities Protection
TM-13	McCarran Boulevard to Vista Boulevard Levee and Floodwall Construction
TM-14	Steamboat Creek Terracing
TM-15	North Truckee Drain Relocation (project phase I and II complete)
TM-16	Vista Narrows Terracing
TM-17	Hidden Valley Voluntary Home Elevation Program (program initiated)
TM-18	Eastside Subdivision and Rosewood Lakes Voluntary Home Elevation (program initiated)
TM-19	Mandatory Home Elevation Program (only if necessary; requires additional analysis)
	Lower Truckee River Reach (LT)
LT-1	Lockwood Ecosystem Restoration and Recreational Trailhead (project complete)
LT-2	Rainbow Bend Mitigation
LT-3	Lower Mustang Ranch (project complete)
LT-4	Tracy Power Plant Ecosystem Restoration (project complete)
LT-5	102 Ranch Ecosystem Restoration
LT-6	Wadsworth Mitigation (additional analysis required)

*As of January 2017. For detailed descriptions for each project element listed in Table O-6, see: http://trfma.org/wp-content/uploads/2017/03/Flood-Project-Elements_010517_DMH.pdf

O.3.3 Carson Water Subconservancy District

The following list is an overview of work conducted by CWSD, as of September 2017, from the CRS Annual Report. Other CWSD projects are listed in Table O-7.

1. Weed management and streambank stabilization projects have continued throughout the Dayton Valley reach of the Carson River. Planning continues for additional projects located on private and public property near Dayton and Ft. Churchill State Park. Weed management and streambank stabilization projects help protect floodplains' natural functions.

2. CWSD helps fund the Alpine Watershed Group (AWG) to continue their work in the Upper Carson River Watershed. AWG is the first line of defense for flood hazard mitigation in the Watershed. AWG's work rehabilitates and restores river function in Alpine County, thus, benefiting the entire watershed.

    - In 2016, AWG partnered with American Rivers to complete Phase II of the Hope Valley Meadow/Floodplain and West Fork restoration project.
    - Restoration sites with AWG and USFS partners were pursued after American Rivers conducted a meadow assessment in Hope, Charity, and Faith Valley's upper reaches.
    - Alpine County finalized the purchase of the Markleeville Creek Floodplain Restoration in late 2013. The completed project will help reduce water velocity and erosion through the restoration of the natural stream channel and floodplain. Furthermore, the threat of water quality degradation will be reduced, as the restoration plan includes relocating and replacing old sewer infrastructure. To view a project overview flyer, see: http://docs.wixstatic.com/ugd/9cdc4e_f2d8edad6fad4ad59fafd180dc0f5a64.pdf
    - AWG, in partnership with Humboldt-Toiyabe National Forest (USFS), BLM, Friends of Hope Valley and Alpine County, was awarded a restoration grant from California State Parks' Off Highway Motor Vehicle Recreation program. The project aims to restore riparian habitat, which has been impacted by off road vehicles, and stabilize stream banks.

3. CWSD is working with floodplain managers and County planners to update local flood regulations.

4. Mapping Activity Statement 4 completed the final phase of the Carson River Physical Map revision, which supports FEMA's map modernization program. The maps are anticipated to be effective at the end of 2018.

5. CWSD is working with the USACE to map alluvial fans in the Carson River Watershed. The maps will be implemented in the Regional Plan.

6. CWSD continues to fund Carson Valley Conservation District (CVCD); Dayton Valley Conservation District (DVCD); and Lahontan and Stillwater Conservation Districts. The funding supports monitoring of known hazard and channel migration areas, and river channel change updates.

7. CWSD funded DVCD and CVCD to complete a winter flood damage inventory in federally declared disaster areas and met with FEMA officials in the spring of 2017.

8. CWSD assisted in funding CVCD bioengineering techniques used by CVCD and TNC at River Fork Ranch along Brockliss Slough and the East Fork, to promote use of nonstructural and bioengineering for river restoration and rehabilitation projects.

Table O-7. CWSD Completed River Rehabilitation Projects, since 2007			
Project Title	**County**	**Project Type**	**Project Lead**
Grover Hot Spring State Park	Alpine	Meadow rehabilitation/ Water Quality Enhancement	California State Parks, Alpine Watershed Group
Hope Valley Meadow Restoration	Alpine	Meadow and river restoration/ Floodplain and habitat enhancement	Alpine Watershed Group, American Rivers
Markleeville Creek Floodplain Restoration Project	Alpine	Floodplain restoration/river rehabilitation	Alpine County, Alpine Watershed Group
The Lahontan Conservation District's Carson River Restoration Project	Churchill	Bank stabilization/ habitat enhancement	Lahontan Conservation District, Churchill County

For more information, see the CWSD's webpages: http://www.cwsd.org/ and http://www.cwsd.org/river-projects/

O.3.4 Nevada Division of Forestry and the City of Reno

NDF and the City of Reno-Public Works department conducted flood mitigation efforts across the North Valleys of Reno in the spring of 2017. The goal was to keep water inside the channel and off of roads. This was done by clearing storm drains and placing sandbags on the banks of a canal. To view the article and video, posted on KLTVN News, see: http://www.ktvn.com/story/35091584/reno-public-works-conducting-flood-mitigation-efforts.

Additionally, the City of Reno completed a bank stabilization project at Oxbow Nature Study Area. The project involved the restoration of the eroded north bank of the Truckee River within the park's boundary. The erosion was due to flooding events in 1997 and 2005. The project involved reestablishing riparian habitat, and allowed for the control of erosion and sediment loading on the Truckee River.

O.3.5 Douglas, Lyon, and Storey Counties

The counties have been working with the USGS to fly LiDAR for future FEMA mapping efforts. This will provide more-detailed data.

O.3.6 The Nature Conservancy

The following are flood-related mitigation projects completed by TNC and partners:

1. **The Lower Truckee River Project:** The goal of the project is to give a natural shape to the Truckee River and reconnect the river to its floodplain. TNC has restored about 10 miles of the Truckee River and its floodplain over the past 14 years. The Lower Truckee River Project has implemented many strategies to restore the Truckee River, including:

reshaping the river, reconnecting the river to its floodplain, creating in-stream riffles to provide habitat for native fish, excavating banks to provide habitat, and invasive species management. This project lessens flood hazards by reconnecting the river and floodplain, floodwaters are able to spread out into floodplain without doing damage elsewhere. The project has proven to be successful during the flooding emergency of 2017 in Reno-Sparks, as water slowed down and thinly flowed as the floodwaters met the floodplain, protecting life and property.
To learn more about the Lower Truckee River Project, see:
https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/truckee-river-project.xml

2. **The Carson River project:**
The Carson River project focuses on land protection, restoration, public access, and collaboration. TNC is preserving land through conservation easements and working with landowners. Furthermore, TNC has been improving habitat along the Carson River and its floodplain, as well as enhancing wetlands. TNC has removed dredge spoils and berms in order to reconnect the river to its floodplain, which helps to protect life and property during a flood. TNC has collaborated with numerous stakeholders, from the Carson River Coalition to Floodplains by Design, to enhance flood protection, protect wildlife habitat, improve water quality, and recharge aquifers.
For more information on the project, see:
   - https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/carson-river-project.xml
   - https://www.nature.org/ourinitiatives/urgentissues/water/protecting-rivers/floodplains-by-design.xml

3. **Lockwood Property**
The Lockwood property, owned by Washoe County, was restored following flooding issues in 1997. Structures on the property were demolished, and the area is now a park. TNC, TRFMA, and other partners completed the project. The restoration included one new river meander, 8 riffles, 2 wetlands, and 28 acres of revegetation. Approximately 0.6 miles of river channel was restored, creating approximately 37 acres of native habitat. This restoration rehabilitates the land and reduces flooding risks. TRFMA and TNC are continually trying to acquire critical areas along the Truckee River before it is developed and becomes at risk for future flooding.

   For more information on the Lockwood property and partners, see:
   https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/nevada/placesweprotect/102-ranch.xml

O.3.7 Spring Thaw of 2017 Emergency Protective Measures

In 2017, record-setting snow accumulations from storms in early February, in addition to flooding in January, meant that there was a risk for flooding as the snow melted. NNG conducted a study identifying areas of major concern and the impacts of potential flooding. FEMA, NNG, Nevada DEM, and counties developed a Spring Flood Plan in order to create courses of action to respond to the potential flooding

risk. The county and tribe efforts in response to the flood risk are listed below. Nevada DEM worked to coordinate state support of the efforts.

- Churchill County:
  - Worked with Truckee Carson Irrigation District to install a weir to divert water from Lahontan spillway, allowing larger releases.
  - Worked with NDOT to install three major culverts under US-95 to allow the water to flow into the Carson Lake area without having to close the highway.
  - Developed unprecedented cooperation with local farmers, water districts, state agencies and county entities to protect homes and construct mitigation measures to protect the community.
  - Big Dig – almost 17 miles of drainage ditch constructed to drain the Carson Lake into the Stillwater area before it starting flooding the community.
  - Although the Lahontan Reservoir is an irrigation structure and not designed for flood control, The TCID has carefully controlled the releases from the reservoir to mitigate flooding.
  - Due to all the above measures, major flooding was completely avoided in Churchill County despite record snow runoff.

- Lyon County:
  - Worked with Walker River Irrigation District to clean drainage and irrigation ditches to handle floodwaters.
  - Provided equipment to constantly keep bridges clear of debris so water could flow without backing up.
  - Built many berms to control the high flows in the Walker River, especially where there is a history of flooding.
  - Did an outstanding job of keeping their residents informed and aware.
  - Used some of the Nevada DEM Hesco baskets to protect an area with a history of flooding during high river flows

- Yerington Paiute Tribe of the Yerington Colony & Campbell Ranch:
  - Opted in to the NRS-414A State Mutual Aid. This is only the second tribe to opt in.
  - Was very proactive working with the Walker River Irrigation District and Lyon County to clean irrigation ditches to handle high water flows.
  - Volunteered their resources to help with flood fighting if necessary, especially the use of their facilities as a staging area and did a great job of informing their tribal members of the issues.

- State of Nevada:
  - NDOT did millions of dollars in mitigation work to protect roads and access to communities.
  - State Health worked with the local jurisdictions to ensure planning was done, and to stage resources such as the Eureka County Casualty Bus for the transportation of patients.
  - Nevada DEM maintained weekly coordination calls to keep everyone informed and

coordinated.

- NNG provided an extraordinary amount of support for planning, and staged High Clearance Vehicles several times when it appeared there would be imminent flooding.

O.3.8 The "Big Dig"

The "Big Dig" project was the culmination of a series projects providing local flood mitigation measures on the Carson River near Fallon. The projects were the result of forecasts predicting runoff from the Sierra into the Carson River that would exceed the capacity of Lahontan Reservoir. To mitigate potential flooding from snowpack runoff, a series of projects were completed with coordination between local, state and federal partners. A weir was installed to divert flows below Lahontan Reservoir out into the desert and into Carson Lake. The completed "Big Dig" project is a 60-foot wide 17-mile long channel that diverts excess water from Carson Lake to the Stillwater Point Reservoir. It is anticipated that these flood mitigation measures will mitigate flooding in the area for many decades. The "Big Dig" project was completed in May 2017.

O.3.9 Walker River Clean-up Project

The Walker River Clean-up project was the result of the City of Yerington and Lyon County filing a joint resolution proclaiming the existence of an emergency and/or disaster within their respective jurisdictions with respect to the immediate necessity to clean the Walker River and remove debris and sediment that had built up since the 1997 flood. The Mason Valley Conservation District was the lead for the project with assistance from the Walker River Irrigation District, Federal Water master, City of Yerington, and Lyon County. Approximately 300,000 cubic yards of sediment and debris were removed from the Walker River main channel, including all three primary bridge crossings, increasing channel capacity by nearly twice what it was before the project was completed. The Walker River Clean-up project was completed in December 2015.

O.4 WILDFIRE MITIGATION ACTIVITIES

As noted in Section 3.3.19.3 the entire State of Nevada is at risk to wildfires due to fuel loading, ignition risk, weather, and topography. Furthermore, based on reported locations, wildfires are clustered largely near human population centers, though that is where the best detection methods and suppression resources are located. As population continues to grow in Nevada, so will the number of fires in these and other areas. Fire service agencies, cooperators, and the public take many actions to mitigate risks associated with wildfires, and seek to achieve a decrease in the amount of damage caused by wildfires. Mitigation actions cannot change the natural conditions that make wildfires possible in Nevada.

O.4.1 Nevada Seismological Laboratory

As noted in section O.2.7, the Seismo Lab has started supporting multi-hazard sensors on their network, including HD fire cameras. AlertTahoe, a joint project between the Seismo Lab and the Forest Guard team (and numerous partners), had early successes in the region in 2014, by helping fire personnel fight smaller fires before they become bigger ones. The expansion phase started in 2014-2015. The cameras are located in key areas, such as mountaintops. The cameras stream real-time images to firefighters and other emergency personnel. AlertTahoe provides many benefits,

including early detection, cost, and time-effectiveness. Eventually, the cameras will be equipped with auto-detect software, that way the system does not have to be monitored by firefighting agencies.

As of February 2018, a network, called AlertWildfire, has grown from the AlertTahoe system and has four networks with over 55 cameras. As noted in a *Nevada Today* article, AlertWildfire covers areas of Nevada and California, with the potential for areas of Oregon and Idaho to come online soon. In 2017, the AlertTahoe/AlertWildfire system was involved in 207 fires in northern Nevada and eastern California (Sierra Nevada). A single camera of the AlertTahoe network, in Santa Barbara, played a critical role in the devastating Southern California fires, Whittier Fire and Thomas Fire.

To view the images and videos, visit: http://www.alertwildfire.org/tahoe/ https://www.youtube.com/user/nvseismolab/videos.

For more information on AlertWildfire, see: https://www.unr.edu/nevada-today/news/2018/alertwildfire?utm_source=newsletter030118&utm_medium=email&utm_content=alertfire&utm_campaign=NevadaWeekly

O.4.2 Nevada Division of Forestry

NDF has completed numerous wildfire mitigation activities, including:

1. Prepared and compiled a report to Nevada State Legislature-AB75: Fire-Fuels-Forest Restoration Activities and Accomplishment at Lake Tahoe, Nevada. Some of the highlights from the report include:
    a. 2,507 acres of fuel reduction (prescribed fires, hand thinning) in 2016
    b. 985 acres of fuel reduction in 2015
    c. 1,367 acres of fuel reduction in 2014
    d. Fire prevention education
    e. Public education and communication

2. Highlighted projects:
    a. Horse Creek Fuels Reduction
        i. ~140 acres
        ii. 1,000+ residents
        iii. 200 + structures
        iv. Project will improve forest and riparian health
        v. Will create enhanced conditions to protect life and property from wildfires.
    b. West Washoe Valley Mistletoe Reduction
        i. 4 acres
        ii. Franktown community (6 residents, 4 structures)
        iii. Project will improve forest health by removing dwarf mistletoe infected trees and thin other trees to promote healthy tree growth
        iv. Brush will be removed

v. Project will enhance protection of life and property from wildfires.

c. Camp Stimson Forest Health Improvement
   i. 7 acres
   ii. Lee Canyon
   iii. 100 residents
   iv. 5 permanent structures
   v. 25 camp outbuildings
   vi. Project will improve forest health by thinning and removing trees and dying trees in overstocked aspen stands.
   vii. Project will help protect life and property from wildfires.
   viii. Help maintain hazard free tree resources to protect camp users.
d. Mormon Mesa Riparian Restoration Pilot Project
   i. 20 acres
   ii. Virgin River Watershed
   iii. Southwest Willow Flycatcher & Western Yellow-billed Cuckoo habitat restoration
   iv. Project will control and eliminate non-native salt cedar
   v. Project will restore native vegetation crucial for wildlife habitat
   vi. Project will protect life and property from wildfires.
e. Washoe County Regional Archery Facility
   i. 85 acres
   ii. Lemmon Valley subdivision
   iii. 500 residents
   iv. 300 structures
   v. Project will improve forest health
   vi. Project will additionally protect life and property from wildfires.
f. Cottonwood Ranch Conservation Credit System Project
   i. 1,009 acres
   ii. O'Neil Basin and Wells, Nevada
   iii. Project will improve and protect habitat for greater sage-grouse for at least a five-year period.
   iv. Project will improve protection from wildfires, invasive species, and sustainable water supplies.
g. Arrow Creek Hazardous Fuels Reduction
   i. 178 acres
   ii. ~5,000 residents
   iii. 1,653 structures
   iv. City of Reno and Arrow Creek Subdivision and others.
   v. Project will improve fire safety
h. Mount Wilson Guest Ranch
   i. 7.18 acres
   ii. 100 residents
   iii. 75 structures
   iv. Mount Wilson Subdivision
   v. Project will maintain habitat for wildlife use.

vi. Project will improve forest health and create a shaded fuel break to protect life and property from wildfires.

i. City of Sparks – Truckee River Corridor Restoration
   i. 7 acres
   ii. 100,000 residents
   iii. Sparks, Nevada
   iv. Project will improve forest health and enhance urban forest conditions to protect life and property.

j. John's Ranch Conservation Credit System Project
   i. 1,075 acres of greater sage-grouse habitat for at least an initial five year period
   ii. Clover Valley and Wells, Nevada
   iii. Upon sale of Nevada Conservation Credit System credits to a mitigation buyer, the project proponent will commit to preserving habitat for at least 30-year term.
   iv. This project will protect greater sage-grouse habitat and improve protection from wildfires.

k. South Fork State Recreation Area: Stabilization and Meadow Restoration
   i. 600 acres
   ii. 3.5 miles of riparian
   iii. Lucky Nugget Subdivisions 1 & 2
   iv. 409 developed and undeveloped lots
   v. Project will improve rangeland health and water quality.

l. Lamoille Hazardous Fuels Reduction Project
   i. 219 acres
   ii. 132 residents (in 2016)
   iii. 80 homes
   iv. Town of Lamoille
   v. Project will improve riparian gallery woodland health.
   vi. Project will protect life and property from wildfires, and maintain sustainable water flows.

m. Virgin River- Mesquite/Bunkerville Area
   i. Fuels reduction treatment
   ii. Overgrowth of tamarisk crowded out native vegetation and created several public safety hazards.
   iii. Project protects life and property from wildfires.

n. Wiley Ranch-Southern Lyon County
   i. Fuels reduction and forest health project
   ii. Project protects life and property from wildfires

To view project fact sheets online, see: http://forestry.nv.gov/highlighted-projects/

To see more information on activities and accomplishments, see http://forestry.nv.gov/wp-content/uploads/2017/02/AB75-FINAL-REPORT-2016.pdf

O.4.3 Living With Fire

Living With Fire has completed the following mitigation activities:

1. Community Wildfire Protection Plans
   CWPPs prepare communities for wildfires. The online resource has information on how to complete a CWPP, and has a one-hour webinar available online.
   http://www.livingwithfire.info/cwpp

2. Received the National Wildfire Mitigation Award in 2015 for its leadership role in promoting fire-adapted communities. The article is available online at:
   https://www.unr.edu/nevada-today/news/2015/wildfire-mitigation-award .

3. Living With Fire's annual reports contain numerous mitigation and outreach activities. A summary of Living With Fire's outreach efforts are tracked in Appendix P.
   http://www.livingwithfire.info/wp-content/uploads/2017/03/2016-Living-With-Fire-Program-Activity-Report.pdf

O.4.4 Tahoe Fire & Fuels Team

Tahoe Fire and Fuels Team (TFFT) focuses on protecting lives, property, and the environment of the Lake Tahoe Basin. It was formed in 2008, and has many partners and sponsors. Prescribed fire operations have included (performed by multiple agencies):

1. Upper Jennifer/Tyner Urban Fuels Reduction (17 acres)
2. West 1st Creek (25 acres)
3. Copeland (3 acres)
4. USFS Urban Lots (6 acres)
5. Diamond Peak Ski Resort Area (25 acres)
6. Champagne Road (9 acres)
7. Slaughter House Creek (4 acres)
8. Kingsbury/Edgewood Creek (60 acres)
9. Spooner (Logan Shoals to Spooner Summit) – (15 acres)
10. Brockway, Kings Beach (70 acres)
11. General Creek – West of Tahoma (8 acres)
12. Panther- Fallen Leaf Lake (100 acres)

TFFT has an interactive prescribed fire operations map, available online, at:
http://tahoe.livingwithfire.info/tahoe-fire-fuels-team/

O.4.5 Southern Nevada Public Land Management Act Projects

As stated by the Bureau of Land Management, "Southern Nevada Public Land Management Act (SNPLMA) allows the BLM to sell public land within a specific boundary around Las Vegas. The revenue derived from land sales is split between the State of Nevada General Education fund (5%), the

Southern Nevada Water Authority (10%), and a special account available to the Secretary of the Interior for various projects, including: conservation initiatives, Lake Tahoe restoration projects, hazardous fuels reduction and wildfire prevention, environmentally sensitive land acquisitions." For more information, see: https://www.blm.gov/SNPLMA

O.4.5.1 Lake Tahoe Environmental Improvement Program Projects

The Lake Tahoe Environmental Improvement Program (EIP) Project Tracker was launched in 1997, and is a partnership of federal, state, and local agencies, private interests, and the Washoe Tribe (Nevada and California). Hundreds of projects are completed each year. One area EIP projects focus on is forest management. SNPLMA and EIP projects are listed in Table O-8 below. Data was obtained online from the Lake Tahoe EIP Project Tracker, https://eip.laketahoeinfo.org/

Table O-8. SNPLMA and EIP Projects

Project	Implementers	Duration	Expenditures	Details
Sugar Pine Recruitment: Memorial Point-Slaughterhouse Phase I	NDF, Nevada Tahoe Resource Team (NTRT)	2007-2015	Tahoe Bonds Act (NDSL): $20,618	42 acres of forest fuels reduction treatment, and 49 acres of habitat restore/enhanced.
Forest Restoration III-Nevada	NDF, NTRT	2008-2015	Tahoe Bonds Act: $1,561,758 SNPLMA (BLM): $864,388	Forest restoration and fuels reduction in Slaughterhouse Canyon, Tunnel Creek SNPLMA Round 9, 8, 10, and 11. 2,508 acres of forest fuels reduction treatment.
Spooner Hazardous Fuel Reduction & Healthy Forest Restoration	USFS- LTBMU	2010-2018	As of 11/2017: SNPLMA (USFS): $3,971,443	Project will continue to implement treatments on approximately 3,300 acres of the east shore of Lake Tahoe. The project focuses on the WUI.
Incline Hazardous Fuels Reduction & Healthy Forest Restoration/Implementation	USFS-Lake Tahoe Basin Management Unit	2011-2024	As of 11/2017: $1,589,697 SNPLMA	1,008 acres. Project covers North Lake Tahoe and Incline Village- will reduce fuel ladders, standing and down fuel accumulations and canopy densities by modifying vegetation structure and fuel loads.
Rosewood Creek Restoration- Middle Reach (Area A)	Nevada Tahoe Conservation District	2012-2016	U.S. Bureau of Reclamation	5.25 acres of forest fuels treated, project also included habitat

Table O-8. SNPLMA and EIP Projects				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
			(BOR): $2,030,000 Tahoe Bonds Act: $672,402 SEZ Mitigation Funds (TRPA): $48,268	restoration and stream restoration.
Upper Haines Canyon-Kingsbury 1000	Tahoe Douglas Fire Protection District (TDFPD)	2015-2018	None provided	The project encompasses 40 acres of forest thinning. The project will protect the Tahoe Basin from a wildland fire that could originate outside of the Basin and run into the Basin.
Tahoe Village Fuels Reduction Project	TDFPD	2016-2018	None provided	A 57 acres forest thinning and fuels reduction project. The project is located on undeveloped land west of Tahoe Village HOA community. The project was originally funded by FEMA, and then the funding source was switched to USFS so that pile burning can be utilized to dispose of slash.
Lakeview Lookout CWPP Implementation Project	North Lake Tahoe Fire Protection District (NLTFPD)	2016-2019	None provided	Project is on four privately owned lots, at the edge of a neighborhood in the WUI Defense Zone. Overcrowded and/or diseased tree will be thinned & will be piled & burned in fall/winter
Diamond Peak Lodge Fuels Reduction Project	NLTFPD	2016-2020	Incline Village General Improvement District: $13,163 USFS- Lake Tahoe Basin Management	Project will reduce hazardous wildland fuels on 63 acres in the WUI of Incline Village to mitigate wildfire risk to the community and improve forest health.

Table O-8. SNPLMA and EIP Projects				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
			Unit (LTBMU): $32,325	
Glenbrook Fuels Reduction Project	Tahoe Douglas Fire Protection District (TDFPD)	2016-2020	None provided	Project will create a shaded fuel break on 161-200 acres of overstocked forest within the defense zone of the WUI in the region.
Highway 50 Fuels Reduction Project	TDFPD	2016-2020	USFS- LTBMU: $46,604	Project will reduce the risk of catastrophic fire and resulting damage to communities. The project will reduce wildland fuels in the WUI. The project is composed of 138 acres over six units.
Upper Diamond Peak Fuels Reduction Project	NLTFPD	2016-2021	As of 11/2017: $25,658 Incline Village General Improvement District (IVGID)	The project is within the Defense and Threat Zones of the WUI of Incline Village. A fire could restrict evacuation routes for 500 residential units. This project will provide a safer working environment for firefighters, and protect public evacuation routes.
SNPLMA Round 16 Sub Grant- NV Regional Fuels Reduction Project	NLTFPD	2017-2021	None provided	286 acres will be treated using hand thinning. 150 acres will be treated with prescribed fire.

O.4.6 Desert Research Institute

DRI's Wildland Fire Science Center (WFSC) has many capabilities and areas of expertise in wildland fire. For example, WFSC is using UASs (unmanned aircraft system) as a tool to mitigate and predict wildland fires. WFSC's applications of UASs include real time data analytics in support of fire management, situation awareness and safety, integrating UAS observations into fire operations, and fire remote sensing. Moreover, WFSC has hourly and daily forecasts, and assesses fuels, topography, and weather to predict fire spread.

To see more mitigation efforts, please see:
https://www.dri.edu/images/stories/centers/wsfc/WFSCFactSheet2_16_6.pdf

O.4.7 The Nature Conservancy

TNC and partners are working to preserve habitat, reduce risk of invasive species introduction, and decrease the risk of wildfire by implementing forest management strategies at Independence Lake. Another wildfire mitigation project, at Clear Creek, focuses on forest restoration. The project was designed to reduce the risk of catastrophic fires, help protect water supplies, and enhance wildlife habitat.

O.5 INFESTATION MITIGATION ACTIVITIES

As noted in Section 3.3.12, infestations can negatively affect Nevada's economy through the destruction of crops and natural resources. Additionally, some of the plant infestations are highly flammable and assist in the spread of wildfires. Although infestation is considered a low risk in Nevada, it is still important to be proactive and continue mitigation activities.

O.5.1 Lake Tahoe EIP Projects

As previously noted, the Lake Tahoe EIP partners focus on projects that will protect and improve natural resources of the Lake Tahoe Basin, such as forest management, water quality, air quality, transportation, and more. Table O-9 below lists Lake Tahoe EIP infestation mitigation projects.

Table O-9. Lake Tahoe EIP Infestation Mitigation Projects				
Project	**Implementers**	**Duration**	**Expenditures**	**Details**
Crystal Shores Aquatic Invasive Species Plant Control and Monitoring	Tahoe Resource Conservation District	2014-2019	As of 11/2017: Lake Tahoe License Plate Program (NDSL): $28,200	Aquatic plant removal and other invasive species including invertebrates and warm water fish. Project is being implemented at Crystal Shores West and East, and Crystal Shores Villas.
Sand Harbor Asian Clam Control Project	Tahoe Regional Planning Agency	2016-2017	None provided.	Asian clams (1.5-acre population size) will be treated with gas impermeable bottom barriers.
Elks Point Marina Aquatic Invasive Species Plant Control	Tahoe Regional Planning Agency	2017-2020	As of 11/2017: Nevada Division of Environmental Protection- $10,000	Project includes removal of aquatic invasive plant populations inside Elks Point Marina

Data obtained from the Lake Tahoe EIP Project Tracker, https://eip.laketahoeinfo.org/

O.5.2 Carson Water Subconservancy District

The following infestation mitigation activities have been completed by CWSD:

1. Carson River Watershed Invasive Species Awareness month- June

2. Has materials on the Play.Clean.Go campaign, about how to stop invasive species in your tracks
3. The Nevada State Parks Recreational Motorized Trails' invasive species sign project (2015), to reduce the spread of weeds on motorized trails. CWSD also wants to put up signage throughout the watershed on USFS and BLM trailheads.

4. CWSD met with BLM and USFS staff to build partnerships, and enhance and maximize funding.

5. CWSD has four Coordinated Weed Management Areas in the Carson River Watershed, including:
    a. Alpine/Upper Carson Weed Management Area
    b. Carson City Weed Coalition
    c. West Central Lyon County Weed Management Area
    d. Churchill County Weed Management Area

6. Works with Nevada State Parks and NDOW to strategize solutions to aquatic invasive species.

For more information on CWSD's infestation mitigation efforts, see: http://www.cwsd.org/invasive-species/

O.5.3 Nevada State Parks and Nevada Department of Wildlife

In 2014, Nevada State Parks and NDOW opened four northern Nevada aquatic invasive species watercraft inspection/decontamination stations. Funding was provided by USFWS grants and Nevada's AIS watercraft decal. The stations are free to the public, and are important in order to prevent the spread and introduction of invasive species. To view more details on the stations, and the hours of operation, see: http://www.ndow.org/Boat-Inspection-Stations-Open-Combat-Aquatic-Invasive-Species/

O.5.4 Truckee River Fund

The Truckee River Fund was established in 2004 by TMWA. The Truckee River Fund, known as "The Fund", is a non-profit organization, and is used for projects that protect and enhance water quality and/or water resources. Table O-10 lists completed projects under The Fund, while Table O-11 lists approved projects.

Table O-10. Completed Projects under the Truckee River Fund

Project Name	Description	Sponsor
2017 Spring Invasive Weed Pull & Fall Truckee River Cleanup	Volunteers removed invasive weeds at hot spots along the Truckee River.	Keep Truckee Meadows Beautiful
Mount Rose Noxious Weed Monitoring and Treatment #4	Staff and volunteers removed noxious weeds and scouted/monitored new sites.	Friends of Nevada Wilderness
Trout Creek Pocket Park & Restoration Initiative	The project included the removal of noxious weeds along the creek bank, and re-vegetation of native plants.	Mountain Area Preservation Foundation
Rosewood and Third Creeks Invasive Weed Removal	The project focused on the management and control of spotted knapweed, bull thistle, and common teasel. Invasive weed training	Nevada Tahoe Conservation District

Table O-10. Completed Projects under the Truckee River Fund		
Project Name	**Description**	**Sponsor**
	was provided, as was educational material.	
Truckee River Cleanup/Invasive Weeds 2016	Project partners and staff identified areas for volunteers to weed pull, tree wrap, remove trash, and spread mulch.	Keep Truckee Meadows Beautiful
Truckee River Cleanup/Invasive Weeds 2015	Project partners and staff identified areas for volunteers to weed pull, tree wrap, remove trash, and spread mulch.	Keep Truckee Meadows Beautiful
Mount Rose Noxious Weed Monitoring and Treatment #3	Invasive and noxious weeds were removed from 50 acres of the Hunter Creek watershed (near Verdi, NV).	Friends of Nevada Wilderness

Table O-11. Approved Projects under the Truckee River Fund		
Project Name	**Description**	**Sponsor**
2018 Spring Invasive Weed Pull & Fall Truckee River Cleanup	The cleanup targets invasive weeds and trash along the Truckee River corridor	Keep Truckee Meadows Beautiful
Truckee River Native and Non-Native Aquatic Plant and Trash Survey	Preparation for a map, delineating aquatic invasive species and trash. The map covers: Tahoe City to Pyramid Lake, Donner Lake, Prosser Reservoir, and Boca Reservoir tributaries.	Tahoe Resource Conservation District
Mount Rose Noxious Weed Monitoring and Treatment #5	Treatment of 75 acres of noxious weeds on Humboldt-Toiyabe National Forest lands.	Friends of Nevada Wilderness
Eyes of the Lake/Truckee River Watershed Volunteer Invasive Species Monitoring	Aquatic species removal (Eurasian milfoil and others)	League to Save Lake Tahoe

Data for Tables O-10 and O-11obtained from http://truckeeriverfund.org/ projects page.

O.5.5 Alpine Watershed Group

AWG is looking to build a Grover Weed Team in 2018. The purpose of the weed team is to prevent the invasive species from spreading into a meadow while California State Parks completes a trail maintenance project. AWG is sponsoring the 19th Annual Markleeville Creek Day in September of 2018. Volunteers will work on watershed restoration, which includes the removal of invasive weeds. A flyer from the 2016 Markleeville Creek Day is in Appendix P.

O.6 DROUGHT MITIGATION ACTIVITIES

As discussed in Section 3.3.2, droughts are a medium/significant risk to the state of Nevada. Not only can droughts cause economic loss and environmental damage, they can cause insect infestations, dust storms, and WUI fires.

O.6.1 Southern Nevada Water Authority

SNWA is a non-profit water utility formed to address Southern Nevada's water needs on a regional basis. Drought mitigation activities completed by SNWA include:

1. During FY 2015-2016, 15 projects conserved 65,000 acre-feet annually in the Colorado River as part of the System Conservation Pilot Program.
2. Voluntary summer watering restrictions saved an additional 900 million gallons per year
3. Southern Nevada replaced 179 million square feet of turf, which saved more than 98 billion gallons of water since 1999.
4. 99% of all indoor water in Southern Nevada is recycled for non-potable use or is treated and returned to Lake Mead for credit.
5. Water Smart Landscapes rebate program- SNWA pays residents $2.00 for each square foot of grass that is replaced with water-efficient desert landscaping. This program has saved Southern Nevada billions of gallons of water, and has replaced over 183 million square feet of lawn to water-efficient landscaping.

For more information on SNWA and the Water Smart Landscapes rebate program, see:

- https://www.snwa.com/
- https://www.snwa.com/rebates/wsl/index.html

O.6.2 Las Vegas Water District

The Las Vegas Water District (LVWD) is a member agency of SNWA. LVWD adopted mandatory conservation measures in order to combat droughts.

1. Between 2002 and 2016, the community in Southern Nevada reduced its Colorado River consumption by 30 billion gallons.
2. Conservation measures that have been used to combat drought include outdoor watering restrictions, landscape watering assignments, turf limitation codes for Clark County and the City of Las Vegas, increases in water rates and water waste fees.

For more information, see: https://www.lvvwd.com/

O.6.3 Truckee Meadows Water Authority

TMWA created a drought plan that was adopted in 2009, called the Water Resource Plan. The current version is for 2016-2035. Some of the actions listed in the drought plan includes:

1. "The Negotiated Settlement", an agreement that allows up to 14,000 acre-feet of storage in federally operated reservoirs for use during extended droughts.
2. Water treatment plants use as much Truckee River water as possible.
3. Encourage customers to use water efficiently and reduce water use during droughts by converting all water customers to meters.
4. Delay the use of surface water held in upstream reservoirs by maximizing well use during the months of June through October.

5. One billion gallons of water are pumped during the winter months into the aquifer for drought storage.

Drought mitigation projects completed by TMWA include:

1. Arrowcreek Drought Response Phase I Project
   - Pumping supplemental water supply to the upper reaches of the Mt. Rose alluvial fan area in order to reduce the amount of groundwater pumping from wells.

2. North Valleys Integration Project, was completed in June 2016 and cost $17.8 million:
   - Construction of ~29,000 feet of water main in the Lemmon Valley area.
   - Fish Springs groundwater supply to provide up to 8,000 acre-feet per year for use within the North Valleys area.
   - Project will help TMWA conserve additional upstream drought reserves

For more information on TMWA's projects, see: https://tmwa.com/projects/

O.6.4 Desert Research Institute

DRI is conducting drought prevention and mitigation research using UASs. Current UAS research at DRI includes iodine-induced applications for weather modification, digital mapping, visual monitoring, soil stability and thermal stress modeling. These applications focus on drought prediction and prevention.

To see more research being conducted by DRI, see: http://www.dri.edu/uas-research/our-research

O.6.5 Nevada Drought Forum

The drought forum was created in 2015 by Governor Sandoval to bring together experts from various areas to prepare and plan for how the state can deal with droughts.

For more information, see: http://drought.nv.gov/

O.7 SEVERE STORMS MITIGATION ACTIVITIES

As discussed in Section 3.3.15, severe storms are considered to be "Medium/Significant Risk" hazards. They occur frequently and can cause significant damage to structures that have not been built to meet current building codes. Because the transportation infrastructure within the state is rather robust, weather-related events do not generally have much long-lasting effect on the transportation network. Severe winter weather events may cause temporary closures, but generally do not cause damage.

O.7.1 Nevada Department of Transportation

A snow fence was constructed in Washoe Valley along U.S. Highway 395, in 2013 by NDOT in order to increase road safety and make snow removal easier. The wooden fence prevents snow from drifting onto the roadway. The fence is 1,400 feet long, and cost $70,000 to construct. Eventually, the fence might extend along the entire Washoe Valley Corridor.

O.8 AVALANCHE MITIGATION ACTIVITIES

As discussed in Section 3.3.1, avalanches are considered to be low risk in Nevada. Avalanche possibilities exist in Douglas, Elko, Clark, and Washoe Counties. Mitigation are relegated to the local jurisdictions where the hazards exist. The State will support local jurisdiction activities in lessening this hazard where it occurs.

O.8.1 Nevada Department of Transportation

NDOT performs avalanche control on Mt. Rose Highway. The portions of the highway are temporarily closed while NDOT triggers man-made avalanches, reducing the hazard and making the highway safer for travelers.

O.8.2 Nevada Ski Resorts

Ski resorts in Nevada, primarily located in the Lake Tahoe region, perform avalanche mitigation activities regularly.

For example, Mt. Rose Ski Resort performs avalanche control in the Chutes and avalanche-prone areas on Mt. Rose Hwy, and has an agreement with NDOT. Diamond Peak Ski Area, of the Lake Tahoe region, has hosted avalanche awareness courses led by the Sierra Avalanche Center. Heavenly Mountain Resort, of the Lake Tahoe region, has an avalanche dog and avalanche closure boundaries.

In Southern Nevada, Lee Canyon Ski Area and USFS conduct avalanche mitigation by triggering avalanches in areas particularly at risk. Mt. Charleston Ski Area, near Las Vegas, also takes preventative measures, and triggers man-made avalanches, while also checking conditions twice per day.

Avalanche control is conducted by triggering man-made avalanches using explosives. Small slides are forced to lessen the risk of snow buildup, as snow buildup can cause large, hazardous slides. Most ski resorts have ski patrols every morning to look for risks associated with avalanches, including heavy snow formations on ridges, and conditions that make snow unstable (high wind, rising temperatures).

O.8.3 Sierra Avalanche Center

SAC provides backcountry avalanche, snow, and weather information for the greater Lake Tahoe area. Forecasters post daily avalanche advisories and weekly reviews online. SAC also provides information on how to read avalanche advisories, and avalanche education information. Members of the public can

submit observations and incidents on SAC's website. Appendix P has examples of avalanche awareness classes led by SAC.

Sierra Avalanche Center's website: https://www.sierraavalanchecenter.org/

Interactive weather station map: https://www.sierraavalanchecenter.org/weather-station-map

O.9 HAZARDOUS MATERIALS MITIGATION ACTIVITIES

As noted in Section 3.3.11, hazardous materials are substances that pose a significant risk to life or to the environment. Environment includes surface water, groundwater, drinking water supply, land surface, subsurface strata, ambient air, dry gullies and storm sewers that discharge to surface waters.

O.9.1 City of North Las Vegas Office of Emergency Management

The City of North Las Vegas Office of Emergency Management (NLVOEM) and the Office of Economic Development hosted a Hazmat and Transportation Incident Summit, a two-day event, in 2015. The summit is described in Figure O-1 below.



Figure O-1. A flyer for the 2015 Hazardous Materials & Transportation Summit, City of North Las Vegas.

O.9.2 Nevada Division of Environmental Protection

NDEP participates in Flood Awareness Week. Additionally, NDEP's BWQP 319(h) Nonpoint Source Protection Grant Program is funded through the Clean Water Act. The Grant Program provides funding to qualifying counties, conservation districts, higher education institutions, regional agencies, and nonprofit organizations to improve conditions of Nevada's watersheds and protect against nonpoint source water pollution. Mitigation is inherently a part of protecting the quality of Nevada's surface waters.

NDEP's BWQP Source Water Protection Program focuses on identifying potential threats (human activities and land uses) which may affect or contaminate a public drinking water well if a failure were to occur (i.e., mechanical failure, accident, spill, etc.) and to manage/mitigate these potential threats through source restrictions and land use practices.

NDEP's BSDW Closure of Orphaned/Abandoned Wells Project is funded through the Safe Drinking Water Act. Closure of abandoned wells mitigates drinking water pollution.

Source Water Protection and Watershed Management in Washoe County Team Projects, ostensibly lead by NDEP BWQP, NDEP BSDW and Resource Concepts, Inc. The team mission is to create a plan that can be used as a tool for communities in Washoe County to help protect drinking water sources and manage the Truckee River watershed to maintain and/or improve water quality. Specific mitigation projects will be conducted under this plan.

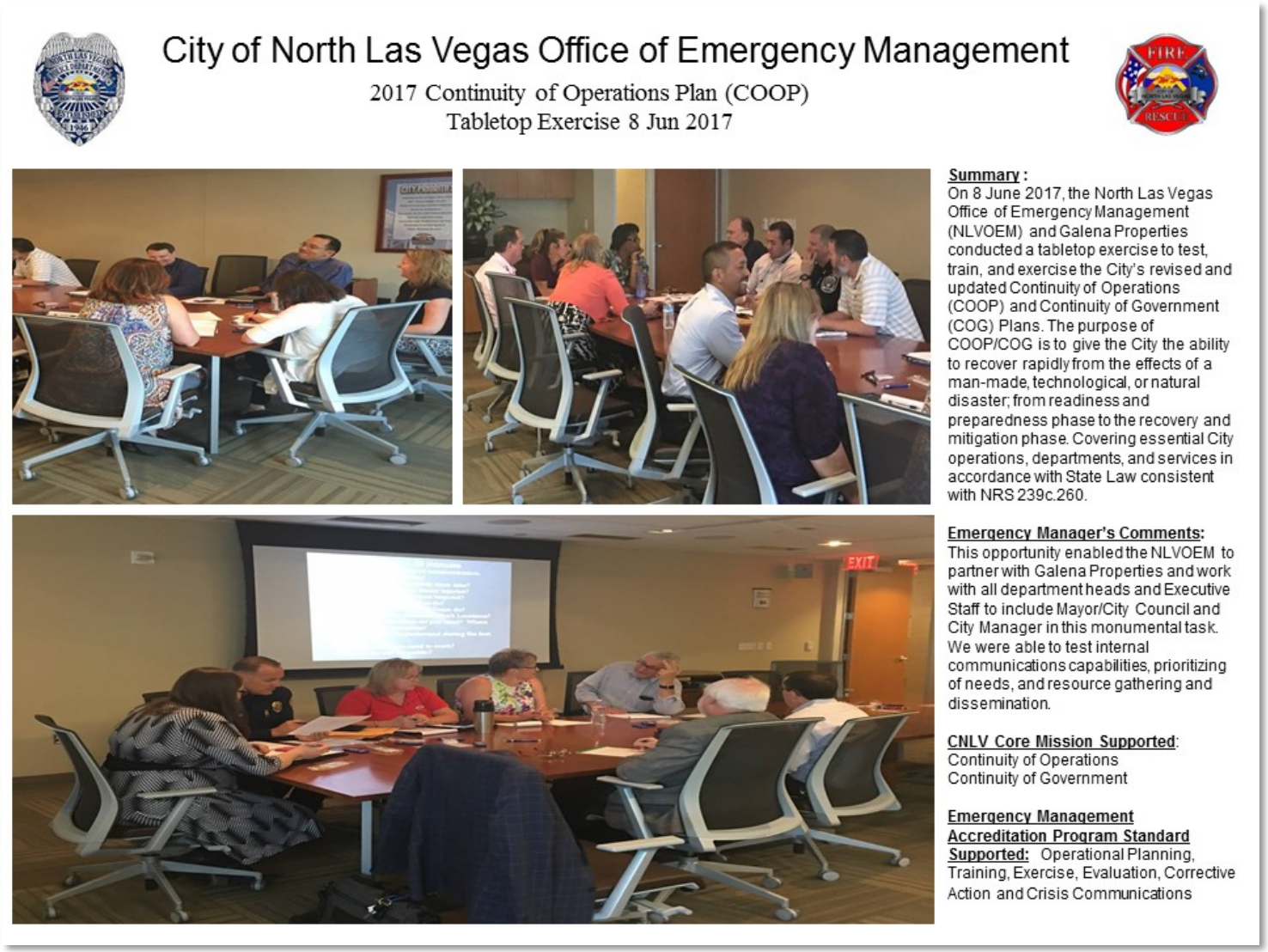
O.10 MISCELLANEOUS MITIGATION ACTIVITIES

This section lists miscellaneous mitigation activities throughout Nevada.

O.10.1 City of North Las Vegas Office of Emergency Management

NLVOEM and Galena Properties conducted a tabletop exercise to test, train, and exercise the City's revised and updated Continuity of Operations and Continuity of Government Plans in June 2017. Figure O-2 describes the tabletop exercise.

In February 2018, NLVOEM held a CERT Program training class for Spanish-speaking CERT members to become CERT Certified. Figure O-3 describes the training class, and includes comments from NLVOEM's Emergency Manager.



City of North Las Vegas Office of Emergency Management

2017 Continuity of Operations Plan (COOP)
Tabletop Exercise 8 Jun 2017

Summary:
On 8 June 2017, the North Las Vegas Office of Emergency Management (NLVOEM) and Galena Properties conducted a tabletop exercise to test, train, and exercise the City's revised and updated Continuity of Operations (COOP) and Continuity of Government (COG) Plans. The purpose of COOP/COG is to give the City the ability to recover rapidly from the effects of a man-made, technological, or natural disaster; from readiness and preparedness phase to the recovery and mitigation phase. Covering essential City operations, departments, and services in accordance with State Law consistent with NRS 239c.260.

Emergency Manager's Comments:
This opportunity enabled the NLVOEM to partner with Galena Properties and work with all department heads and Executive Staff to include Mayor/City Council and City Manager in this monumental task. We were able to test internal communications capabilities, prioritizing of needs, and resource gathering and dissemination.

CNLV Core Mission Supported:
Continuity of Operations
Continuity of Government

Emergency Management Accreditation Program Standard Supported: Operational Planning, Training, Exercise, Evaluation, Corrective Action and Crisis Communications

Figure O-2. A flyer describing the City of North Las Vegas's 2017 Tabletop Exercise.

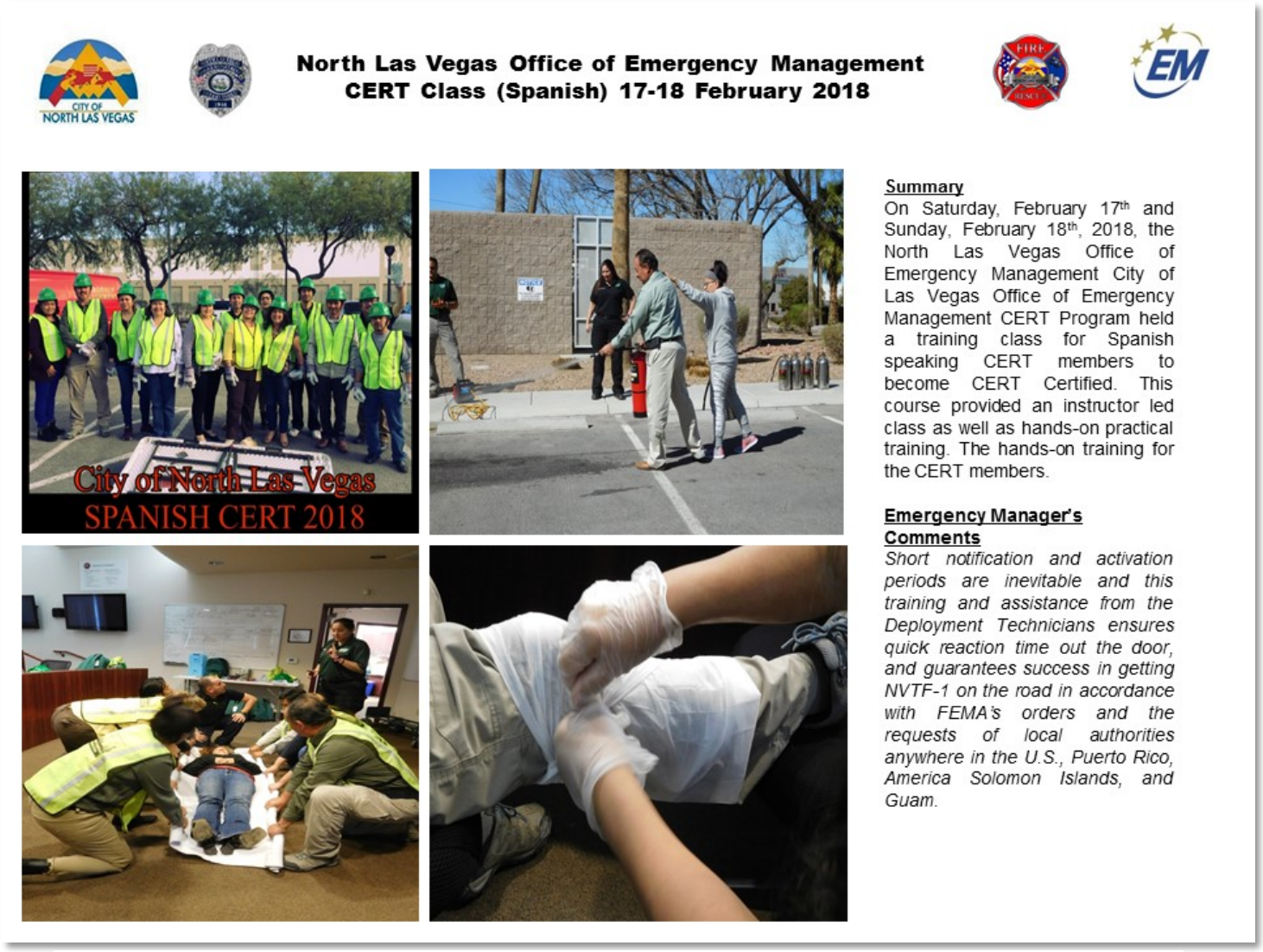


Figure O-3. A flyer describing the City of North Las Vegas's 2018 CERT class.

Public outreach is an essential part of hazard mitigation planning. By engaging and educating the public about hazards and mitigation strategies, individuals are motivated to take action and get involved. Outreach efforts aid planners in recognizing public concerns and priorities, making for a more thorough hazard mitigation plan. The NHM Planning Committee and Subcommittee members provide information on mitigation activities at meetings with members, staff, the public and other organizations, etc. speaking about the planning process and offering information about how to provide input.

Please note that it is difficult to capture all of the outreach efforts occurring in Nevada – organizations mentioned in this appendix might be doing more outreach than captured. Likewise, some organizations may have been missed that have participated in outreach efforts.

P.1 OUTREACH METHODS

Local, state, and federal agencies participated in outreach efforts, in addition to non-profit and private sectors. In order to reach a large audience, a wide variety of outreach methods was used. The following resources were used for public outreach and awareness efforts:

- Social media: Facebook, Twitter, YouTube, and Instagram.
- Online resources: web GIS applications and websites.
- Public Meetings and Presentations
- Flyers: distributed online and in person.
- Media Coverage: Press releases and radio announcements.

P.1.1 Social Media

Numerous agencies utilize social media sites to educate the public of hazards and mitigation. The following organizations are active on social media sites and provide helpful information to the public:

- Nevada Division of Emergency Management
  https://www.facebook.com/NVEmergencyMgmt/
  https://twitter.com/nvemergencymgmt?lang=en

- Nevada Bureau of Mines and Geology
  https://www.facebook.com/NevadaGeology/
  https://www.instagram.com/nevadageology/

- Nevada Division of Forestry
  https://www.facebook.com/NevadaDivisionSouth/
  https://www.facebook.com/NevadaForestry/
  https://www.facebook.com/pg/NevadaDivisionNorth/photos/?ref=page_internal

- Nevada Department of Public Safety
  https://www.facebook.com/NevadaDPS/
  https://twitter.com/nevadadps?lang=en

- Nevada Division of Insurance
  https://www.facebook.com/NevadaDivisionOfInsurance/

- Nevada Seismological Laboratory
  https://www.facebook.com/NevadaSeismo/
  https://twitter.com/NVSeismoLab?lang=en

- Truckee River Flood Management Advisory
  https://www.facebook.com/trfma/
  https://twitter.com/TruckeeRiverFMA?lang=en

- Nevada Floods
  https://www.facebook.com/NevadaFloods/?hc_location=ufi

- Weather Ready Nation Ambassadors
  https://twitter.com/WRNAmbassadors?lang=en

- Federal Emergency Management Agency
  https://www.facebook.com/FEMA/

- Clark County's Regional Flood Control District
  https://www.facebook.com/RegionalFloodControlDistrict
  https://twitter.com/RegionalFlood
  https://www.youtube.com/user/CCRFCD
  https://www.instagram.com/regionalflood/

- The Great Nevada Shakeout
  https://www.instagram.com/greatshakeout/
  https://www.shakeout.org/nevada/index.html
  https://www.facebook.com/GreatShakeOut/
  https://twitter.com/nvearthquakes
  https://www.youtube.com/user/greatshakeout

- Southern Nevada Water Authority
  https://www.facebook.com/thesnwa/
  https://es-la.facebook.com/snwaenespanol/
  https://twitter.com/SNWA_H2O
  https://www.youtube.com/user/snwavideo

- Nevada Department of Transportation
  https://www.facebook.com/NevadaDOT/
  https://twitter.com/nevadadot?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

- Living With Fire
  https://www.facebook.com/LivingWithFire/
  https://www.youtube.com/playlist?list=PLE2F3834692634B77

- North Lake Tahoe Fire Protection District
  https://www.facebook.com/NorthLakeTahoeFire/?hc_ref=ARRHycNmwcemaNfXqTjYIGEZjx4D-SU0U55MdJmZzAYM0N20xxKo-XOQsVaEXc4RE7w&fref=nf
  https://twitter.com/ntfpd_?lang=en

- Desert Research Institute
  https://www.facebook.com/driscience/
  https://twitter.com/DRIScience?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor
  https://www.instagram.com/driscience/

- The Nature Conservancy in Nevada
  https://www.facebook.com/NatureNevada/
  https://twitter.com/nature_nevada?lang=en

- Alpine Watershed Group
  https://www.facebook.com/AlpineWatershedGroup/
  https://twitter.com/alpinewatershed

- Truckee Meadows Water Authority
  https://www.facebook.com/truckeemeadowswaterauthority/
  https://twitter.com/tmwa?lang=en

- Sierra Avalanche Center
  https://www.facebook.com/sacnonprofit/
  https://www.instagram.com/savycenter/?hl=en
  https://twitter.com/sierraavalanche?lang=en

P.1.2 Online Resources

P.1.2.1 Nevada Bureau of Mines and Geology

NBMG has many online resources available to the public, http://www.nbmg.unr.edu/.

- MyHAZARDS is created and maintained by NBMG, and is updated monthly. This user-friendly web application allows citizens to identify flood, fire, earthquake, and radon hazards in Nevada. https://gisweb.unr.edu/MyHAZARDS/

- The NHMPC page has meeting minutes, approved local and tribal HMPs, committee schedule, presentations, and preparedness links. http://www.nbmg.unr.edu/nhmpc/

P.1.2.2 Nevada Division of Emergency Management

Nevada DEM has a lot of information available online, including NHMPC meeting minutes, agendas, notifications, and disaster preparedness tips, among other information. See: http://dem.nv.gov/ and http://dem.nv.gov/boards/nhmpc/.

P.1.2.3 Nevada Division of Forestry

NDF has the Nevada Natural Resources and Fire Information Portal available online. Use the GIS application to see wildfire threats, fire intensity, precautions, and preparedness measures. See: http://forestry.nv.gov/ and https://nevadaresourcesandwildfireinfo.com/Map/Public.

P.1.2.4 Carson Water Subconservancy District

CWSD has an online Outreach and Education webpage, which is available for viewing at: http://www.cwsd.org/outreach-and-education/.

P.1.2.5 State of Nevada Division of Water Resources

NDWR information available online, including news, programs, mapping and data, hearings, calendar, and helpful links. Please see: http://water.nv.gov/index.aspx.

P.1.3 Flyers, Media Coverage, and Presentations

Flyers are typically posted and shared on social media sites, as well as websites. Flyers, in addition to banners, are also posted throughout communities. Examples of outreach flyers are in section P.2.

Media releases and radio announcements have been used to announce hazard mitigation-related events, such as Nevada's Flood Awareness Week.

Presentations on hazards in Nevada and NHMPC are posted on various websites, including NBMG's.

P.2 PUBLIC OUTREACH AND AWARENESS EXAMPLES

Hazard and mitigation presentations, talks, and events are tracked in the Table P-1. Outreach data was provided by NHM Planning Subcommittee members. Tables P-2 and P-3 lists Living With Fire 2016 summary and presentations. Table P-4 summarizes Nevada Wildfire Awareness Month activities from 2014-2017. Following the tables, there are examples of outreach efforts (flyers, brochures, social media posts) throughout the state of Nevada.

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Nevada Department of Transportation Emergency Response Exercise	talk: A Multiple Earthquake Scenario for Las Vegas	Nevada Bureau of Mines and Geology	February 1, 2013	Reno, Nevada
2013 Nevada Health and Safety Conference	talk: Preparing for Major Earthquakes in Nevada	Nevada Bureau of Mines and Geology	May 22, 2013	Reno, Nevada
Washoe County of Emergency Preparedness Council meeting	talk: Earthquake Hazards of Washoe County	Nevada Bureau of Mines and Geology	September 26, 2013	Reno, Nevada
Nevada Wildfire Awareness Month			May 2014	Statewide
2014 Nevada Emergency Manager's Meeting	talk: Historical Earthquakes in Nevada	Nevada Bureau of Mines and Geology	October 15, 2014	Reno, Nevada
2014 Nevada Bureau of Mines and Geology Open House	talk: Earthquake Faults, Historical Earthquakes, and Earthquake Preparedness	Nevada Bureau of Mines and Geology	October 16, 2014	Reno, Nevada
Nevada Flood Awareness Week	-	-	November 10-14, 2014	Northern Nevada
City of Las Vegas Emergency Management and Building Departments	talk and field trip: Tour of Las Vegas Valley faults	Nevada Bureau of Mines and Geology	April 1, 2015	Las Vegas, Nevada
NDEM Disaster Recovery Project - Task force meeting	Guided by the principles outlined in the National Disaster Recovery Framework and the Nevada State Comprehensive Emergency Management Plan, this project is intended to engage Nevada and providing tools to support developing their own plans.in better understanding the principles of disaster recovery Disaster Recovery Plan that supports local and tribal partners communities in the development of a State	Nevada Department of Emergency Management	April 14, 2015	Las Vegas, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Earthquake Economic Resiliency Forum - SSA	Precedes the annual Seismological Society of America meeting being held in Reno, Nevada April 20-22 at the Peppermill Resort Hotel. The seismological annual meeting has attracted 800 seismologists from around the country and around the world. Inquires can be directed to Graham Kent at gkent@unr.edu. ; http://www.unr.edu/nevada-today/news/2016/earthquake-economic-resiliency-forum	University of Nevada, Reno & Seismological Society of America	April 19, 2015	Reno, Nevada
Earthquake billboard	-	-	April 27- May 26, 2015	Reno, Nevada
Nevada Wildfire Awareness Month	-	-	May 2015	Northern Nevada
Invasive Species Awareness Day	Information on invasive species affecting the Carson River Watershed and what is being done to stop their spread.	Carson Water Subconservancy District & Alpine Watershed Group	June 30, 2015	Markleeville, California
Carson City Hazard Mitigation Public Meeting	talk: Earthquake Hazards and Consequences in Carson City	Nevada Bureau of Mines and Geology	October 1, 2015	Carson City, Nevada
Nevada Bureau of Mines and Geology Public Field Trip and Lecture	talk: The 1915 Pleasant Valley Earthquake - 100 Years Ago; Guidebook 1915 Pleasant Valley Earthquake Centennial Guidebook	Nevada Bureau of Mines and Geology	October 3, 2015	
Southern Nevada Section of the Association of Engineering Geologists	talk: Earthquake Hazards in Las Vegas	Nevada Bureau of Mines and Geology	October 13, 2015	Las Vegas, Nevada
2015 Nevada Bureau of Mines and Geology Open House	talk: The 1915 Pleasant Valley Earthquake - 100 Years Ago	Nevada Bureau of Mines and Geology	October 27, 2015	Reno, Nevada
2015 Nevada Bureau of Mines and Geology Open House	talk: The Capital of Earthquake Country: Earthquake Hazards in Carson City	Nevada Bureau of Mines and Geology	October 27, 2015	Reno, Nevada
Nevada Flood Awareness Week	-	-	November 1-7, 2015	Northern Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
BLM Station- fire prevention Media Day	25 persons educated	NDF- Southern Region	2016	Las Vegas, Nevada
Kyle Canyon – Participated with MCFPD with Pine needle clean up Lee Canyon	25 persons educated	NDF- Southern Region & Mt. Charleston Fire Dept.	2016	Lee Canyon, Nevada
Smokey bear @ Creative Kids	50 persons educated	NDF- Southern Region	2016	Las Vegas, Nevada
Laughlin fire prevention	50 persons educated	NDF- Southern Region	2016	Laughlin, Nevada
We Got Your Back-Backpack Challenge (NLVFD)	50 persons educated	NDF- Southern Region & North Las Vegas Fire Dept.	2016	North Las Vegas, Nevada
Clifford J. Lawrence Middle School Prevention	100 persons educated	NDF- Southern Region	2016	Las Vegas, Nevada
Career day at Monaco Middle School	100 persons educated	NDF- Southern Region	2016	Las Vegas, Nevada
Mountain Springs – waterslide, fire prevention	200 persons educated	NDF- Southern Region	2016	Mountain Springs, Nevada
Spring Mountain Ranch Metro Search and Rescue Emergency Vehicle Rally	250 persons educated	NDF- Southern Region	2016	Spring Mountain, Nevada
Clark County Fair- fire prevention	300 persons educated	NDF- Southern Region	2016	Clark County, Nevada
Imlay school prevention education	17 persons educated	NDF- Northern Region	2016, 1st qtr	Imlay, Nevada
Kings River School prevention education	20 persons educated	NDF- Northern Region	2016, 1st qtr	Kings River, Nevada
Orovada school prevention education	26 persons educated	NDF- Northern Region	2016, 1st qtr	Orovada, Nevada
Pershing County Fuel Pile Burning	30 persons educated	NDF- Northern Region	2016, 1st qtr	Pershing County, Nevada
Paradise Valley school prevention education	60 persons educated	NDF- Northern Region	2016, 1st qtr	Paradise Valley, Nevada
VC Children's Prevention Minors Park	75 persons educated	NDF- Western Region	2016, 1st qtr	Virginia City, Nevada
Grammar school prevention education	400 persons educated	NDF- Northern Region	2016, 1st qtr	Winnemucca, Nevada
Sonoma School prevention education	400 persons educated	NDF- Northern Region	2016, 1st qtr	Sonoma, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Grass Valley school prevention education	400 persons educated	NDF- Northern Region	2016, 1st qtr	Grass Valley, Nevada
Basin and Range Section of the Association of Engineering Geologists Meeting	talk: The Capital of Earthquake Country: Earthquake Hazards in Carson City	Nevada Bureau of Mines and Geology	January 21, 2016	Reno, Nevada
Nevada Westerners Corral	talk: Nevada's Big One: 1915 Pleasant Valley Earthquake	Nevada Bureau of Mines and Geology	February 18, 2016	Reno, Nevada
Earthquake Mitigation Hospital Class	-	-	March 8, 2016	Reno, Nevada
Earthquake Mitigation Hospital Class	-	-	March 10, 2016	Las Vegas, Nevada
NDEM Disaster Recovery Project - Task force meeting	Guided by the principles outlined in the National Disaster Recovery Framework and the Nevada State Comprehensive Emergency Management Plan, this project is intended to engage Nevada and providing tools to support developing their own plans.in better understanding the principles of disaster recovery Disaster Recovery Plan that supports local and tribal partners communities in the development of a State	Nevada Department of Emergency Management	March 15, 2016	Reno, Nevada
Nevada Wildfire Awareness Month	Events and activities statewide, some examples include: posters and banner displayed in various locations, wildfire awareness presentations, distribution of flyers, Smokey Bear events, and Touch-A-Truck event.	-	May 1, 2016	Statewide
NDEM Disaster Recovery Project - Regional Training	-	Nevada Department of Emergency Management	May 11, 2016	Henderson, Nevada
NDEM Disaster Recovery Project - Regional Training	-	Nevada Department of Emergency Management	June 22, 2016	Elko, Nevada
Celebrate Washoe Prevention	50 persons educated	NDF- Western Region	2016, 2nd qtr	Washoe Valley, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Washoe Valley Veterinary Prevention	50 persons educated	NDF- Western Region	2016, 2nd qtr	Washoe Valley, Nevada
Junk the Junipers	80 persons educated	NDF- Western Region	2016, 2nd qtr	Washoe Valley, Nevada
Rancho San Rafael Regional Park Wildfire Awareness 5k Run	200 persons educated	NDF- Western Region	2016, 2nd qtr	Reno, Nevada
Lemmon Valley Elementary Preventions	300 persons educated	NDF- Western Region	2016, 2nd qtr	Lemmon Valley, Nevada
Spring Forward for Autism Prevention	500 persons educated	NDF- Western Region	2016, 2nd qtr	Reno, Nevada
National Night Out	500 persons educated	NDF- Western Region	2016, 2nd qtr	Carson City, Nevada
Living With Fire Prevention Education NWAM	8,655 persons educated	NDF- Western Region	2016, 2nd qtr	Statewide
NDEM Disaster Recovery Project - Regional Training	-	Nevada Department of Emergency Management	July 13, 2016	Reno, Nevada
Fallon Paiute Shoshone Tribe Emergency Preparedness Committee	talk: Earthquake Hazards and Consequences in Churchill County	Nevada Bureau of Mines and Geology	July 27, 2016	Fallon, Nevada
Nevada Earthquake Safety Council Meeting	talk: The 1954 Churchill County Earthquakes	Nevada Bureau of Mines and Geology	August 2, 2016	Reno, Nevada
Churchill County Mitigation Plan Project	map: Earthquakes, Quaternary Faults, and Quaternary Volcanoes in Churchill County, 1:250,000 scale	Nevada Bureau of Mines and Geology	September 1,2016	Churchill County, Nevada
Sage Elementary School: Smokey Bear	80 persons educated	NDF- Northern Region	September 14, 2016	Spring Creek, Nevada
Sage Elementary School: Smokey Bear	65 persons educated	NDF- Northern Region	September 15, 2016	Spring Creek, Nevada
NDEM Disaster Recovery Project - Task force meeting	-	Nevada Department of Emergency Management	September 21, 2016	Reno, Nevada
Elko Outdoor Expo	2,500 persons educated	NDF- Northern Region	September 24, 2016	Elko, Nevada
National Night Out: Fire/EMS Awareness	1,500 persons educated	NDF- Northern Region	October 1, 2016	Elko, Nevada
Spring Creek Elementary: Smokey Bear	75 persons educated	NDF- Northern Region	October 6, 2016	Spring Creek, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Spring Creek Elementary: Smokey Bear	85 persons educated	NDF- Northern Region	October 7, 2017	Spring Creek, Nevada
Rye patch Cutting and Chipping Oct 10 - Cont.	2 persons educated	NDF- Northern Region	October 10, 2016	Rye Patch, Nevada
Mtn. View Elementary: Smokey Bear	155 persons educated	NDF- Northern Region	October 11-12, 2016	Elko, Nevada
NDEM Disaster Recovery Project - Task force meeting	-	Nevada Department of Emergency Management	October 12, 2016	Las Vegas, Nevada
Carlin Combined Schools	70 persons educated	NDF- Northern Region	Oct 27 & Nov 8, 2016	Carlin, Nevada
Unionville fuels reduction: Oct - Cont.	4 persons educated	NDF- Northern Region	October 2016	Unionville, Nevada
Tuscarora Road Re-seed	145 persons educated, 6 HF Grant acres	NDF- Northern Region	November 1-3, 2016	Tuscarora, Nevada
Petan Ranch Re-seed	100 persons educated, 17.5 HF Grant acres	NDF- Northern Region	November 7-8, 2016	Independence Valley, Nevada
Southfork tree planting	200 persons educated, 33 HF Grant acres	NDF- Northern Region	November 10,16, & 21-30, 2016	Spring Creek, Nevada
Maggie Fire Re-Seed	500 persons educated, 45 HF Grant acres	NDF- Northern Region	November 14-16, 2016	Carlin, Nevada
Nevada Department of Transportation Emergency Response Exercise	talk: NDOT Earthquake Disaster Exercise and Earthquake Impacts to Roadways	Nevada Bureau of Mines and Geology	Nov 15, 2016	Reno, Nevada
University of Nevada Osher Lifelong Learning Institute extended studies program	talk: Earthquakes in Nevada and How to Prepare for Them	Nevada Bureau of Mines and Geology	Nov 17, 2016	Reno, Nevada
Walley Fire Re-Seed	50 persons educated, 22 HF Grant acres	NDF- Northern Region	November 17-18,2016	Wells, Nevada
Tree Removal and Chipping	15 persons educated	NDF- Northern Region	December 5-8 & 12-15, 2016	Elko, Nevada
NDEM Disaster Recovery Project- Statewide Training Conference	-	Nevada Department of Emergency Management	December 6, 2016	Reno, Nevada
Southfork Weed spray and Re-Seed	100 persons educated	NDF- Northern Region	December 8-12, 2016	Spring Creek, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Learn About Nevada Lecture Series	talk: Earthquakes in Nevada and How to Prepare for Them	Nevada Bureau of Mines and Geology	Dec 20, 2016	Reno, Nevada
We Got Your Back-Backpack Challenge (NLVFD)	10 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Lowes Event	40 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Creative kids	50 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Meadows school event	50 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Dean Allen Elementary School Event	100 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Laughlin E-manning	150 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Spring Mountain Ranch Waterslide	200 persons educated	NDF- Southern Region	2016, 4th qtr	Red Rock, Nevada
Fire Safety Event @ Home Depot	200 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Preventions-Holiday with a hero Carson City Wal-Mart	200 persons educated	NDF- Western Region	2016, 4th qtr	Carson City, Nevada
Pigs For The Kids	500 persons educated	NDF- Southern Region	2016, 4th qtr	Las Vegas, Nevada
Laughlin River Regatta	31,000	NDF- Southern Region	2016, 4th qtr	Laughlin, Nevada
Bishop Manogue High School Geology Class	talk: Earthquakes in Nevada (three talks)	Nevada Bureau of Mines and Geology	Feb 17-18, 2017	Reno, Nevada
Johnson Lane Neighborhood Preparedness Meeting	talk: Earthquakes in Carson Valley	Nevada Bureau of Mines and Geology	Feb 22, 2017	Carson Valley, Nevada
Eagle Valley Middle School (EVMS) STEM night. Partnered with Reno Public Works.	Eagle Valley Middle School (EVMS) STEM night. Partnered with Reno Public Works (~50 students)	Nevada Division of Water Resources & Reno Public Works	March 3, 2017	Reno, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Lemmon Valley Community Assistance Meeting - NFIP outreach.	Assist Lemmon Valley residents with needs due to the recent and ongoing flooding in their area, and provide information and resources to affected homeowners. (~40 adults)	Nevada Division of Water Resources	March 6, 2017	Lemmon Valley, Nevada
Lemmon Valley Community Assistance Meeting - NFIP outreach.	Assist Lemmon Valley residents with needs due to the recent and ongoing flooding in their area, and provide information and resources to affected homeowners. (~40 adults)	Nevada Division of Water Resources & NFIP	March 9, 2017	Lemmon Valley, Nevada
River Wranglers "Trout in the Classroom" release days.	Flood safety and education through flood model demonstrations. (~180 students)	Nevada Division of Water Resources	March 10 & 17, 2017	Carson City, Nevada
Lemmon Valley Community Assistance Meeting - NFIP outreach.	Assist Lemmon Valley residents with needs due to the recent and ongoing flooding in their area, and provide information and resources to affected homeowners. (~40 adults)	Nevada Division of Water Resources & NFIP	March 15, 2017	Carson City, Nevada
Flagview Intermediate School Flood Safety	Flood safety and education through flood model demonstrations (~360 students)	Nevada Division of Water Resources	March 20 & 21, 2107	Elko, Nevada
EIAA Charter School Flood Safety	Flood safety and education through flood model demonstrations (~160 students)	Nevada Division of Water Resources	March 22, 2017	Elko, Nevada
Lemmon Valley Community Assistance Meeting - NFIP outreach.	Assist Lemmon Valley residents with needs due to the recent and ongoing flooding in their area, and provide information and resources to affected homeowners. (~40 adults)	Nevada Division of Water Resources & NFIP	March 29, 2017	Lemmon Valley, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada

Event	Description	Presenting Agency	Dates	Location
2017 Nevada Spring Flood planning process & event- Protect existing assets from the effects of flooding	The Nevada Healthcare Preparedness Partners developed the South Lyon Medical Center Incident Action Plan. This plan covered specific mitigation, response and recovery tasks and plans designed to reduce the loss of life and protect the provision of hospital care to the South Lyon communities.	Nevada Hospital Association	April-July, 2017	South Lyon County, Nevada
Fish Springs Flat Neighborhood Preparedness Meeting	talk: Earthquakes in Carson Valley	Nevada Bureau of Mines and Geology	April 5, 2017	Carson Valley, Nevada
Nevada Mining Association: Southern Nevada Earth Science Teacher Workshop	Inform teachers from Southern Nevada about the State Hazard Mitigation Plan.	Nevada Bureau of Mines and Geology	April 11-12, 2017	Las Vegas, Nevada
University of Las Vegas Geoscience Symposium Keynote Talk	talk: Earthquakes in Nevada	Nevada Bureau of Mines and Geology	April 17, 2017	Las Vegas, Nevada
Western Nevada and Eastern California Economic Resiliency Forum, Reno, Nevada	talk: Unreinforced Masonry Building Inventory of Reno-Sparks-Carson City Urban Corridor	Nevada Bureau of Mines and Geology	April 19, 2017	Reno, Nevada
Fallon Paiute Shoshone Tribe Public Emergency Preparedness Meeting	talk: Earthquake Hazards in Churchill County	Nevada Bureau of Mines and Geology	April 20, 2017	Fallon, Nevada
Fallon Shoshone-Piute Tribe Earth Day Event	Flood safety and education through flood model demonstrations (~30 people)	Nevada Division of Water Resources	April 22, 2017	Fallon, Nevada
Reno Earth Day Event	Flood safety and education. Partnered with NDEP on water quality / pollution (~50 people)	Nevada Division of Water Resources & Nevada Division of Environmental Protection	April 23, 2017	Reno, Nevada
Washoe Valley Wildfire and Home Insurance Presentation	Raising awareness of home insurance and how to prepare to ensure that the residents have adequate and correct coverage	Nevada Division of Insurance	May 1, 2017	Washoe Valley, NV

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Nevada Mining Association: Northern Nevada Earth Science Teacher Workshop	Discuss the State Hazard Mitigation Plan with teachers from Northern Nevada and members of the education committee with the Nevada Mining Association.	Nevada Bureau of Mines and Geology	July 11-12, 2017	Winnemucca, Nevada
Carson City's National Night Out	Flood safety and education through flood model demonstrations. Partnered with CWSD & NWS (~75 people)	Nevada Division of Water Resources, National Weather Service, & Carson Water Subconservancy District	August 1, 2017	Carson City, Nevada
Aviation Roundup	~200 people	Nevada Division of Water Resources	October 7 & 8, 2017	Minden, Nevada
Great Shake Out- promotion and earthquake drills throughout the state	The Nevada Healthcare Preparedness Partners developed and administered a full-scale, statewide healthcare community exercise in coordination with the Great Nevada ShakeOut. The healthcare exercise. "Shake, Rattle and Roll" was conducted on Oct. 19 and involved a swarm of background earthquakes that affected all hospitals within NV. The exercise had participants from hospitals, coalitions, health departments, LEPCs, State agencies, fire and law enforcement. In all, more than 42 agencies within NV participated. NHA plans to make this an annual exercise.	Nevada Hospital Association	October 19, 2017	Statewide
Flood Awareness Week	Kickoff event at Meadowood Mall, ~50 people	Nevada Division of Water Resources, Nevada Division of Environmental Protection, City of Reno Public Works, National Weather Service, US Army Corps of Engineers, Truckee	November 12, 2017	Reno, Nevada

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
		River Flood Management Authority		
Flood Awareness Week	River Wranglers Carson City Work Day event. Flood education through flood model demonstration. ~150 high school and elementary students	Nevada Division of Water Resources	November 13, 2017	Carson City, Nevada
Flood Awareness Week	Douglas County event, ~80 people	Nevada Division of Water Resources	November 14, 2017	Minden, Nevada
Flood Awareness Week	Event outside of Scolaris grocery store, ~65 people	Nevada Division of Water Resources	November 15, 2017	Yerington, Nevada
Flood Awareness Week	Event outside of Walmart, ~50 people	Nevada Division of Water Resources	November 17, 2017	Elko, Nevada
Southern Nevada Earth Science Teacher Workshop	Disaster response and planning was discussed with several teachers attending the workshop. Teachers were given information regarding the HMP and made aware of the benefits the HMP has for the state of Nevada. A session on natural hazards in Nevada was also presented. ~130 teachers attended the workshop.	Nevada Bureau of Mines and Geology, Nevada Mining Association (sponsor), and Nevada Division of Minerals (sponsor)	March 27-28, 2018	Las Vegas, Nevada
Environmental literacy, adaptation, and using real science in education	DRI and GreenPower to do education and outreach related to climate change, persistent drought, and other weather-related hazards.	Desert Research Institute & National Oceanic and Atmospheric Administration	January 1, 2016-present (ongoing)	Statewide

Table P-1. Public Awareness and Outreach Events in Nevada				
Event	**Description**	**Presenting Agency**	**Dates**	**Location**
Reno National Weather Service - Weather Ready Nation Ambassadors	Call to agencies, groups, and companies in both the public and private sector to be ambassadors to part of a growing effort to prepare Americans for natural hazards. http://www.nws.noaa.gov/com/weatherreadynation/ambassadors.html	Reno National Weather Service	Ongoing	Statewide
Provides publications and workshops to promote the exchange of information related to earthquakes among professionals and managers	The Nevada Hospital Association, through two of their committees (Nevada Healthcare Preparedness Partners and the Rural Healthcare Preparedness Partners) provides discussion, materials and direction to healthcare providers and hospitals regarding how to mitigate the effects of an earthquake.	Nevada Hospital Association	Ongoing	Rural Nevada
Earthquake Planning Scenarios	Nevada Healthcare Preparedness Partners, a standing sub-committee of the NHA, has created earthquake-planning scenarios and conducted multiple planning sessions that have involved hospitals, LEPCs and mine safety personnel in the rural parts of our state.	Nevada Hospital Association	Multiple Dates	Rural Nevada

Table P-2. Living With Fire 2016 Presentations *In addition to those given at NWAM and workshops*				
Event/Audience	**Description**	**Presenter**	**Number of Participants**	**Location**
IAFC WUI Conference	A presentation as part of a panel on non-traditional partnerships in Fire Adapted Communities.	Smith	200	Reno, Nevada
Truckee Meadows Fire Protection District- Board of Directors	Wildfire hazard mapping for Washoe County	Smith	30	Washoe County, Nevada
Oregon State University's Starker Lecture Series	Background and operation of the LWF program	Smith & Miller	50	Oregon
Oregon State University's Starker Lecture Series	Ember awareness and why people do not take pre-fire actions	Smith & Miller	20	Oregon
Local media in Washoe County	Available educational materials and resources from LWF Program	Smith	40	Washoe County, Nevada
Great Basin Mitigation, Education and Prevention Conference	Collaborators of the LWF Program	Smith, Miller, Sistare	75	Idaho
HOA Council members	Presentation on the LWF and The Network	Smith	32	Not Available

Table P-2. Living With Fire 2016 Presentations *In addition to those given at NWAM and workshops*				
Event/Audience	**Description**	**Presenter**	**Number of Participants**	**Location**
Lake Tahoe Garden Club	Good plant choices	Smith	20	Douglas County, Nevada
Lakeridge Springs HOA	A presentation to the residents	Smith	7	Washoe County, Nevada
Town Hall Meeting presentations to Somerset residents (2)	Not Available	Smith	69	Reno, Nevada
Sommerset HOA	Presentation to the communications committee on the Fire Adapted Community concept	Smith	10	Reno, Nevada
Fire Adapted Community Learning Network National Workshop	The success of Nevada's statewide conferences for WUI communities and fire services	Miller	82	Not Available
Board of Supervisors- UNCE hosted luncheon	LWP Program's efforts	Sistare	4	Carson City, Nevada
Total number of participants:			**639**	

Data provided by Living With Fire

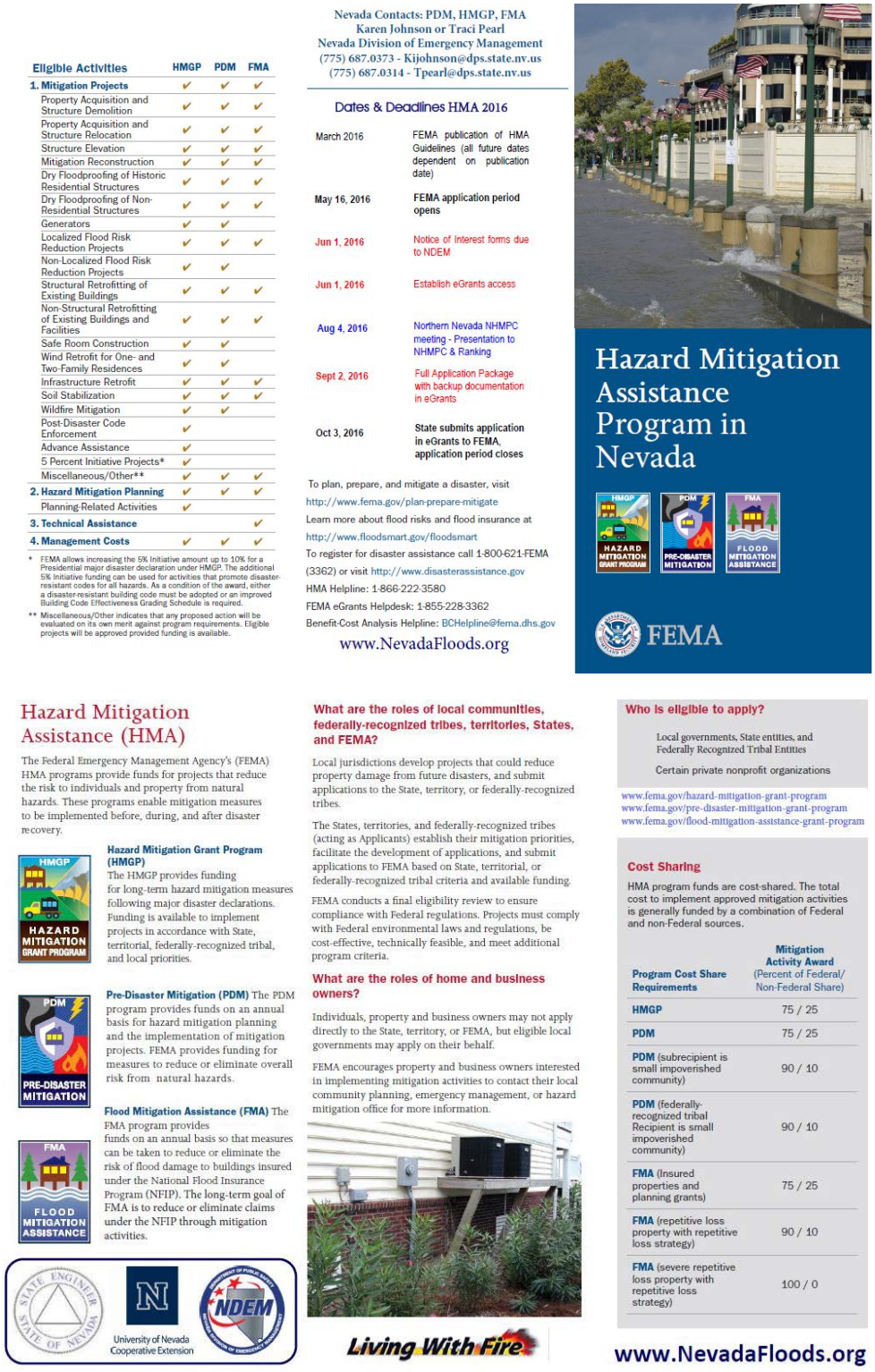
Table P-3. Nevada Wildfire Awareness Month 2014-2017 Summary							
Year	**County Participation**	**Events/Activities**	**Proclamations/Resolutions**	**Indirect Contacts**	**Participants**	**Planning Committee**	**Partners**
2014	17	165	19	3,046	4,424	22 entities	153
2015	17	190	18	7,939	8,945	27 entities	156
2016	17	185	11	1,290,862	8,655	24 entities	148
2017	17	189	23	866,120	9,974	21 entities	179

Data obtained from NWAM Summary Reports

Table P-4. Living With Fire 2016 Summary				
Quarter	**Indirect Contacts**	**Direct Contacts**	**Publications/Swag Distributed**	**Be Ember Aware! Sales**
1st	622	802	1,388	800
2nd	2,588	2,650	16,372	1,400
3rd	12,413	1,369	3,437	2,100
4th	401	537	672	0
2016 Grand Total	***16,024***	***5,358***	***21,869***	***4,300***

Data provided by Living With Fire

Pages P-20 to P-88 lists examples of outreach efforts throughout Nevada. Examples were submitted by NHM Planning Subcommittee and Committee members, and were found on social media sites, (Twitter, Instagram, Facebook, and YouTube). All examples are referenced in Section 7.



Eligible Activities	HMGP	PDM	FMA
1. Mitigation Projects	✔	✔	✔
Property Acquisition and Structure Demolition	✔	✔	✔
Property Acquisition and Structure Relocation	✔	✔	✔
Structure Elevation	✔	✔	✔
Mitigation Reconstruction	✔	✔	✔
Dry Floodproofing of Historic Residential Structures	✔	✔	✔
Dry Floodproofing of Non-Residential Structures	✔	✔	✔
Generators	✔	✔	
Localized Flood Risk Reduction Projects	✔	✔	✔
Non-Localized Flood Risk Reduction Projects	✔	✔	
Structural Retrofitting of Existing Buildings	✔	✔	✔
Non-Structural Retrofitting of Existing Buildings and Facilities	✔	✔	✔
Safe Room Construction	✔	✔	
Wind Retrofit for One- and Two-Family Residences	✔	✔	
Infrastructure Retrofit	✔	✔	✔
Soil Stabilization	✔	✔	✔
Wildfire Mitigation	✔	✔	
Post-Disaster Code Enforcement	✔		
Advance Assistance	✔		
5 Percent Initiative Projects*	✔		
Miscellaneous/Other**	✔	✔	✔
2. Hazard Mitigation Planning	✔	✔	✔
Planning-Related Activities	✔		
3. Technical Assistance			✔
4. Management Costs	✔	✔	✔

* FEMA allows increasing the 5% Initiative amount up to 10% for a Presidential major disaster declaration under HMGP. The additional 5% Initiative funding can be used for activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Nevada Contacts: PDM, HMGP, FMA
Karen Johnson or Traci Pearl
Nevada Division of Emergency Management
(775) 687.0373 - Kijohnson@dps.state.nv.us
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Dates & Deadlines HMA 2016

March 2016	FEMA publication of HMA Guidelines (all future dates dependent on publication date)
May 16, 2016	FEMA application period opens
Jun 1, 2016	Notice of Interest forms due to NDEM
Jun 1, 2016	Establish eGrants access
Aug 4, 2016	Northern Nevada NHMPC meeting - Presentation to NHMPC & Ranking
Sept 2, 2016	Full Application Package with backup documentation in eGrants
Oct 3, 2016	State submits application in eGrants to FEMA, application period closes

To plan, prepare, and mitigate a disaster, visit
http://www.fema.gov/plan-prepare-mitigate
Learn more about flood risks and flood insurance at
http://www.floodsmart.gov/floodsmart
To register for disaster assistance call 1-800-621-FEMA (3362) or visit http://www.disasterassistance.gov
HMA Helpline: 1-866-222-3580
FEMA eGrants Helpdesk: 1-855-228-3362
Benefit-Cost Analysis Helpline: BCHelpline@fema.dhs.gov

www.NevadaFloods.org

Hazard Mitigation Assistance Program in Nevada

HMGP HAZARD MITIGATION GRANT PROGRAM
PDM PRE-DISASTER MITIGATION
FMA FLOOD MITIGATION ASSISTANCE

FEMA

Hazard Mitigation Assistance (HMA)

The Federal Emergency Management Agency's (FEMA) HMA programs provide funds for projects that reduce the risk to individuals and property from natural hazards. These programs enable mitigation measures to be implemented before, during, and after disaster recovery.

Hazard Mitigation Grant Program (HMGP)
The HMGP provides funding for long-term hazard mitigation measures following major disaster declarations. Funding is available to implement projects in accordance with State, territorial, federally-recognized tribal, and local priorities.

Pre-Disaster Mitigation (PDM) The PDM program provides funds on an annual basis for hazard mitigation planning and the implementation of mitigation projects. FEMA provides funding for measures to reduce or eliminate overall risk from natural hazards.

Flood Mitigation Assistance (FMA) The FMA program provides funds on an annual basis so that measures can be taken to reduce or eliminate the risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP). The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities.

What are the roles of local communities, federally-recognized tribes, territories, States, and FEMA?

Local jurisdictions develop projects that could reduce property damage from future disasters, and submit applications to the State, territory, or federally-recognized tribes.

The States, territories, and federally-recognized tribes (acting as Applicants) establish their mitigation priorities, facilitate the development of applications, and submit applications to FEMA based on State, territorial, or federally-recognized tribal criteria and available funding.

FEMA conducts a final eligibility review to ensure compliance with Federal regulations. Projects must comply with Federal environmental laws and regulations, be cost-effective, technically feasible, and meet additional program criteria.

What are the roles of home and business owners?

Individuals, property and business owners may not apply directly to the State, territory, or FEMA, but eligible local governments may apply on their behalf.

FEMA encourages property and business owners interested in implementing mitigation activities to contact their local community planning, emergency management, or hazard mitigation office for more information.

Who is eligible to apply?

Local governments, State entities, and Federally Recognized Tribal Entities

Certain private nonprofit organizations

www.fema.gov/hazard-mitigation-grant-program
www.fema.gov/pre-disaster-mitigation-grant-program
www.fema.gov/flood-mitigation-assistance-grant-program

Cost Sharing

HMA program funds are cost-shared. The total cost to implement approved mitigation activities is generally funded by a combination of Federal and non-Federal sources.

Program Cost Share Requirements	Mitigation Activity Award (Percent of Federal/ Non-Federal Share)
HMGP	75 / 25
PDM	75 / 25
PDM (subrecipient is small impoverished community)	90 / 10
PDM (federally-recognized tribal Recipient is small impoverished community)	90 / 10
FMA (Insured properties and planning grants)	75 / 25
FMA (repetitive loss property with repetitive loss strategy)	90 / 10
FMA (severe repetitive loss property with repetitive loss strategy)	100 / 0

STATE ENGINEER STATE OF NEVADA
University of Nevada Cooperative Extension
NDEM

Living With Fire

www.NevadaFloods.org

Figure P-1. Flyer describing the Hazard Mitigation Assistance Program in Nevada



Figure P-2. Flyer describing the Silver Jackets program, which aims to establish solutions to flood hazard issues. For more information, visit: https://silverjackets.nfrmp.us/State-Teams/Nevada.

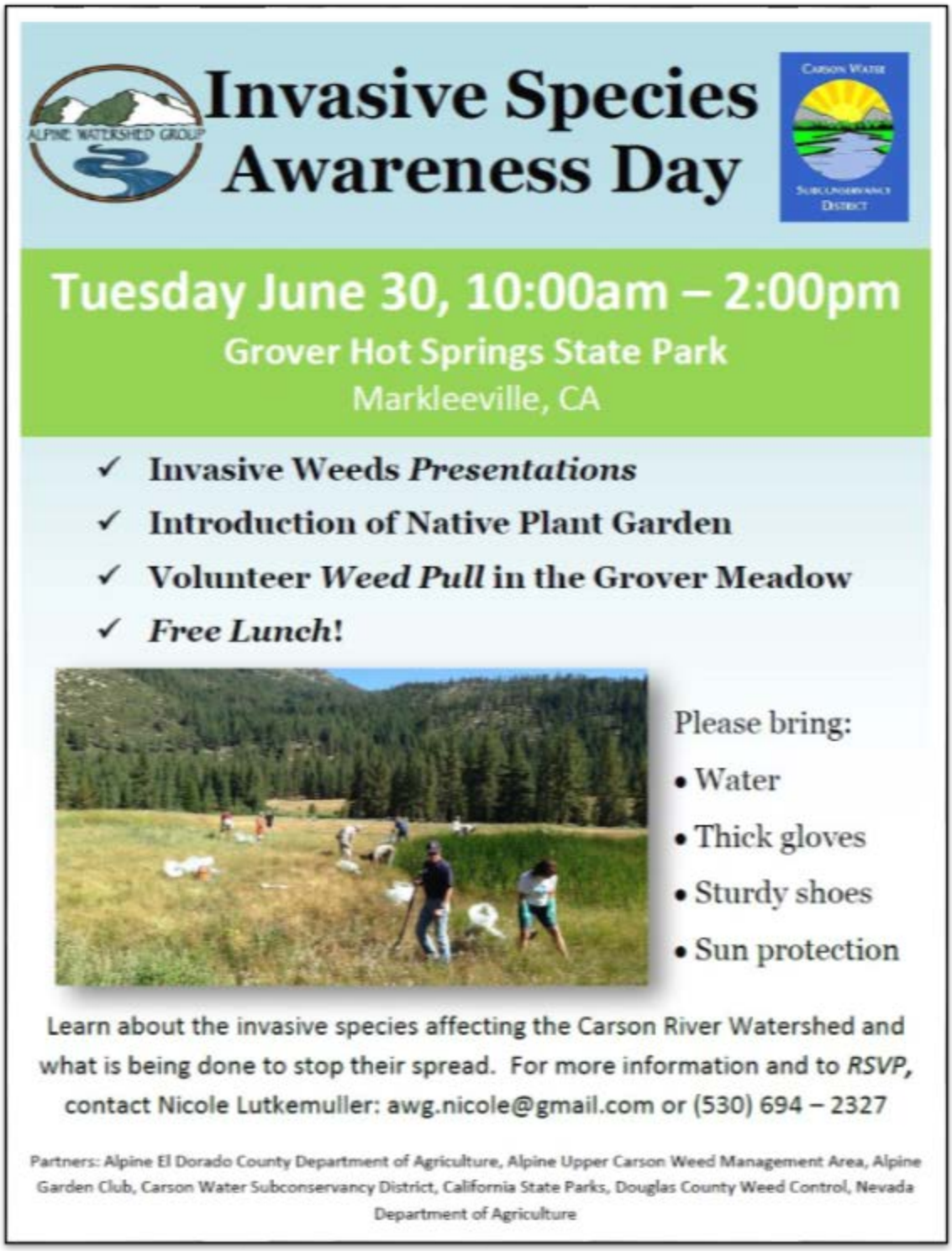


Figure P-3. Flyer for an Invasive Species Awareness Day, for similar events, see: http://www.cwsd.org/calendar/ and http://www.alpinewatershedgroup.org/get_involved



RADIO COPY: SECONDS
STATION:
CLIENT:
SFX NOTES:

1 THE NEVADA DEPARTMENT OF PUBLIC SAFETY AND THE DIVISION OF EMERGENCY
2 MANAGEMENT URGES NEVADANS TO PREPARE FOR ALL DISASTERS. OCTOBER
3 HIGHLIGHTS THE GREAT NEVADA SHAKE OUT AND CYBER SECURITY MONTH. STATE
4 OFFICES WILL PRACTICE AN EARTHQUAKE DRILL ON HOW TO DROP, COVER AND HOLD
5 ON OCTOBER 15 AT 10:15. REGISTER AT SHAKEOUT.ORG THROUGHOUT OCTOBER
6 SEVERAL STATE AND FEDERAL AGENCIES ARE PARTICIPATING IN CYBER SECURITY
7 AWARENESS MONTH TO EDUCATE AND PROMOTE ONLINE SAFETY. REMEMBER
8 WHETHER NATURAL OR HUMAN CAUSED WE ALL PLAY A ROLE KEEPING NEVADA
9 SAFE. IF YOU SEE SOMETHING, SAY SOMETHING, REPORT SUSPICIOUS ACTIVITY TO
10 LOCAL LAW ENFORCEMENT. FOR MORE INFO ON HOW TO PREPARE CONTACT YOUR
11 LOCAL EMERGENCY MANAGER'S OFFICE OR GO TO DPS DOT NV DOT GOV AND CLICK
12 ON PLAN AHEAD NEVADA.THIS AD IS SPONSORED BY THE FEDERAL DEPARTMENT OF
13 HOMELAND SECURITY, NEVADA DEPARTMENT OF PUBLIC SAFETY, DIVISION OF
14 EMERGENCY MANAGEMENT, YOUR LOCAL EMERGENCY MANAGER'S OFFICE AND
15 AIRED IN COOPERATION WITH THE NEVADA BROADCASTERS ASSOCIATION AND THIS STATION.

:10 = 3 LINES IN ENGLISH
: 30 = 8 LINES IN ENGLISH
:60 = 15 LINES IN ENGLISH
TEXT IN FONT SIZE 12 AND ALL CAPITAL LETTERS.

Figure P-4. A disaster awareness radio announcement, broadcasted in October 2015.

BRIAN SANDOVAL
Governor

LEO M. DROZDOFF, P.E.
Director

KAY SCHERER
Deputy Director

State of Nevada
Department of Conservation and Natural Resources
Office of the Director
Richard H. Bryan Building
901 S. Stewart Street, Suite 1003
Carson City, Nevada 89701-5244
Telephone (775) 684-2700
Facsimile (775) 684-2715
www.dcnr.nv.gov

Division of Environmental Protection
Division of Forestry
Division of State Lands
Division of State Parks
Division of Water Resources
Conservation Districts Program
Natural Heritage Program
State Historic Preservation Office

STATE OF NEVADA
Department of Conservation and Natural Resources

FOR IMMEDIATE RELEASE
CONTACT: JoAnn Kittrell, *jkittrell@dcnr.nv.gov,* 775-684-2712

Nevada Flood Awareness Week
November 1 -7

CARSON CITY, NV — Governor Brian Sandoval has declared this November 1 – 7, Nevada Flood Awareness Week. Members of the Nevada Flood Awareness Committee, working with local communities, have scheduled series of events, activities and exhibits to raise awareness among northern and rural Nevadan's that serious flooding occurs regularly and that there are steps individuals can take to mitigate the risk.

"Our goal is to create flood resilient communities in Nevada that encourage protection of life, property, water quality, environmental values and the preservation of natural floodplain functions. Nevada" Nevada Flood Awareness Outreach Planning Team

"In Northern Nevada, our biggest floods occur during the winter. Historically, Nevada's northern Rivers flood about every 10 to 15 years. Recently, we have been reminded that flash flooding can occur at any time. Knowing what to do before, during and after a flood can save lives, protect pets and help minimize property damage," says Rob Palmer, Nevada's Floodplain Manager.

Events include:

November 1: Carson City - North Carson Walmart, 3200 Market Street – 1:00 p.m. – 3 p.m.

November 2: Battle Mountain Civic Center, 625 S. Broad Street – 5:30 p.m. – 7 p.m.

November 4: Yerington/Lyon County, Fire Station118 S. Main Street – 10: a.m. – 3: p.m.

November 5: Gardnerville, Douglas County Community & Senior Center, North Room 1329 Waterloo Lane – 11:00 a.m. – 6:00 p.m.

November 7&8: Reno Sparks Convention Center (in the Reno Fall Home & Lifestyle Show) 11:00 a.m. – 7:00 p.m. on Saturday, 11:00 a.m. – 5:00 p.m. on Sunday.

More information on what Nevadan's need to know to protect themselves, loved ones and property – before, during and after a flood, can be found at nevadafloods.org.

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Figure P-5. A press release for the 2015 Nevada Flood Awareness Week. For more information, please see: http://www.nevadafloods.org/



Figure P-6. A flyer outlining and describing 2015 FAW events

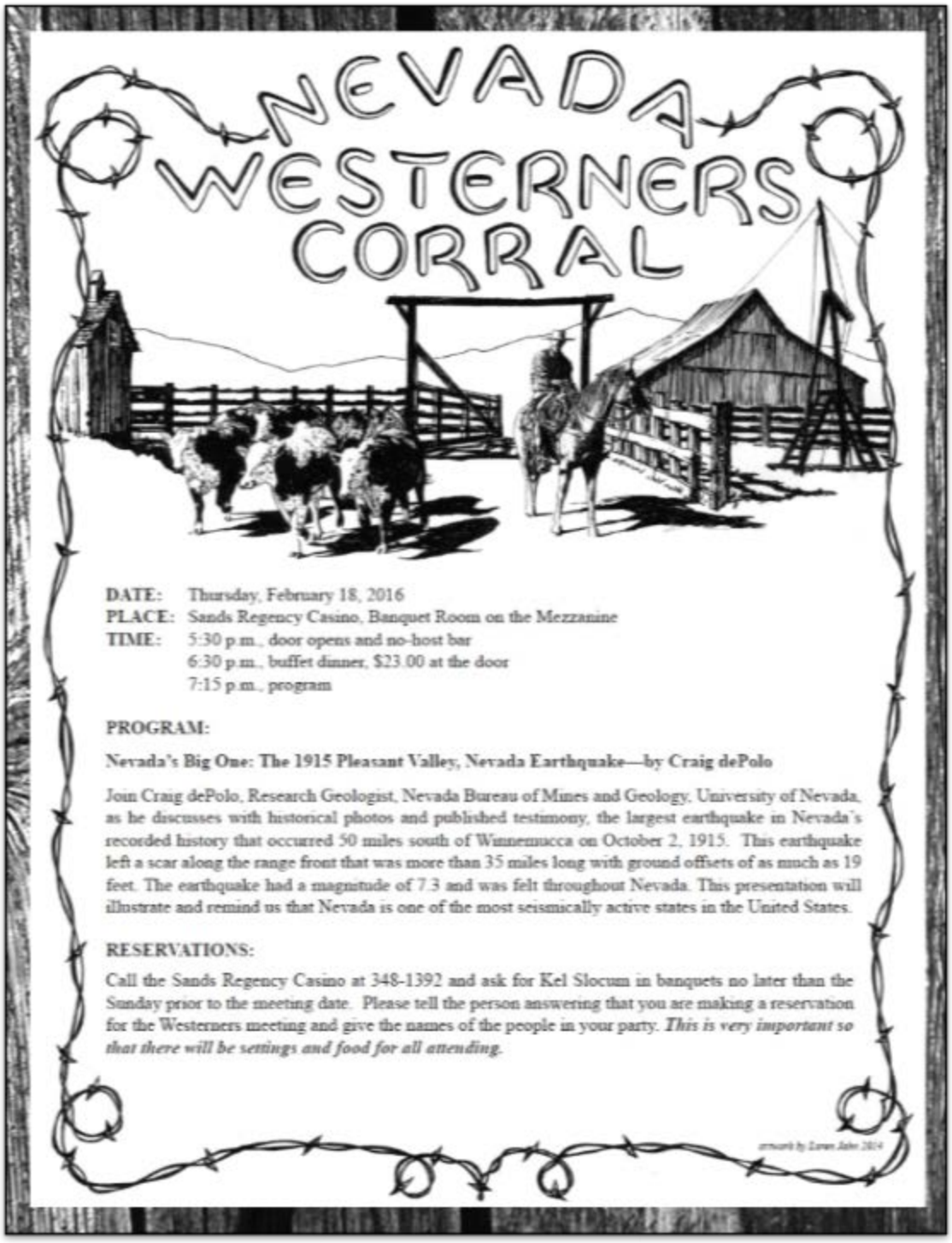


Figure P-7. Flyer for a presentation on earthquake hazards. Estimated 80-120 attendees.

PROJECT ANNOUNCEMENT

Join us for the Project Meetings and Trainings in Your Region!

NEVADA EM Disaster Recovery Project

Stabilizing, Rebuilding, Revitalizing, Recovering Nevada
Communities to Build Back Stronger After a Disaster

Making the Leap from Response to Recovery

Many communities have invested significant time and resources in planning for disaster response, but often what follows in the days, months, and even years after a disaster is a planning gap. This project is designed to help! Disaster recovery in Nevada includes a wide range of activities including:

- **Short-Term Recovery activities** that focus on ***stabilizing*** communities including care and shelter, debris removal, and damage assessment.
- **Intermediate-Recovery activities** that focus on ***rebuilding*** including repair of critical infrastructure and delivery of public and individual disaster assistance.
- **Long-Term Recovery activities** that focus on ***revitalizing*** the community including enhancement of systems and long-term strategies for resiliency.

Guided by the principles outlined in the National Disaster Recovery Framework and the Nevada State Comprehensive Emergency Management Plan, this project is intended to engage Nevada communities in the development of a State Disaster Recovery Plan that supports local and tribal partners in better understanding the principles of disaster recovery and providing tools to support developing their own plans.



Register to Attend

To find out more about this project and register to attend the upcoming task force meetings please visit our website at www.nvrecovery.org

Who Should Attend

- Emergency Managers
- Public Safety Officials
- Local and Tribal Elected Officials
- Private-Sector Partners
- Community-Based Organizations
- Planners responsible for any of the following:
  - Community Planning and Capacity Building
  - Economic Recovery
  - Disaster Housing
  - Health and Social Services
  - Infrastructure Systems
  - Natural and Cultural Resources

2016 Meeting Schedule

Date	Event	City	Time	Location
3/15/16	Task Force Meeting	Reno	10:00 am to 1:00 pm	Regional Emergency Operations Center
4/14/16	Task Force Meeting	Las Vegas	10:00 am to 1:00 pm	City of Las Vegas EOC
5/11/16	Regional Training	Henderson	9:00 am to 5:00 pm	Sunset Station Hotel
6/22/16	Regional Training	Elko	9:00 am to 5:00 pm	Great Basin College
7/13/16	Regional Training	Reno	9:00 am to 5:00 pm	Regional Emergency Operations Center
9/21/16	Task Force Meeting	Reno	10:00 am to 1:00 pm	Regional Emergency Operations Center
10/12/16	Task Force Meeting	Las Vegas	10:00 am to 1:00 pm	City of Las Vegas EOC
12/6/16	Statewide Training Conference	Reno	9:00 am to 4:00 pm	To Be Announced

Travel reimbursement is not available for Task Force Meetings or Training Sessions. The meetings and trainings are open to Nevada participants and there is no cost to attend. *This project is a Homeland Security Initiative and funded by the State of Nevada.*

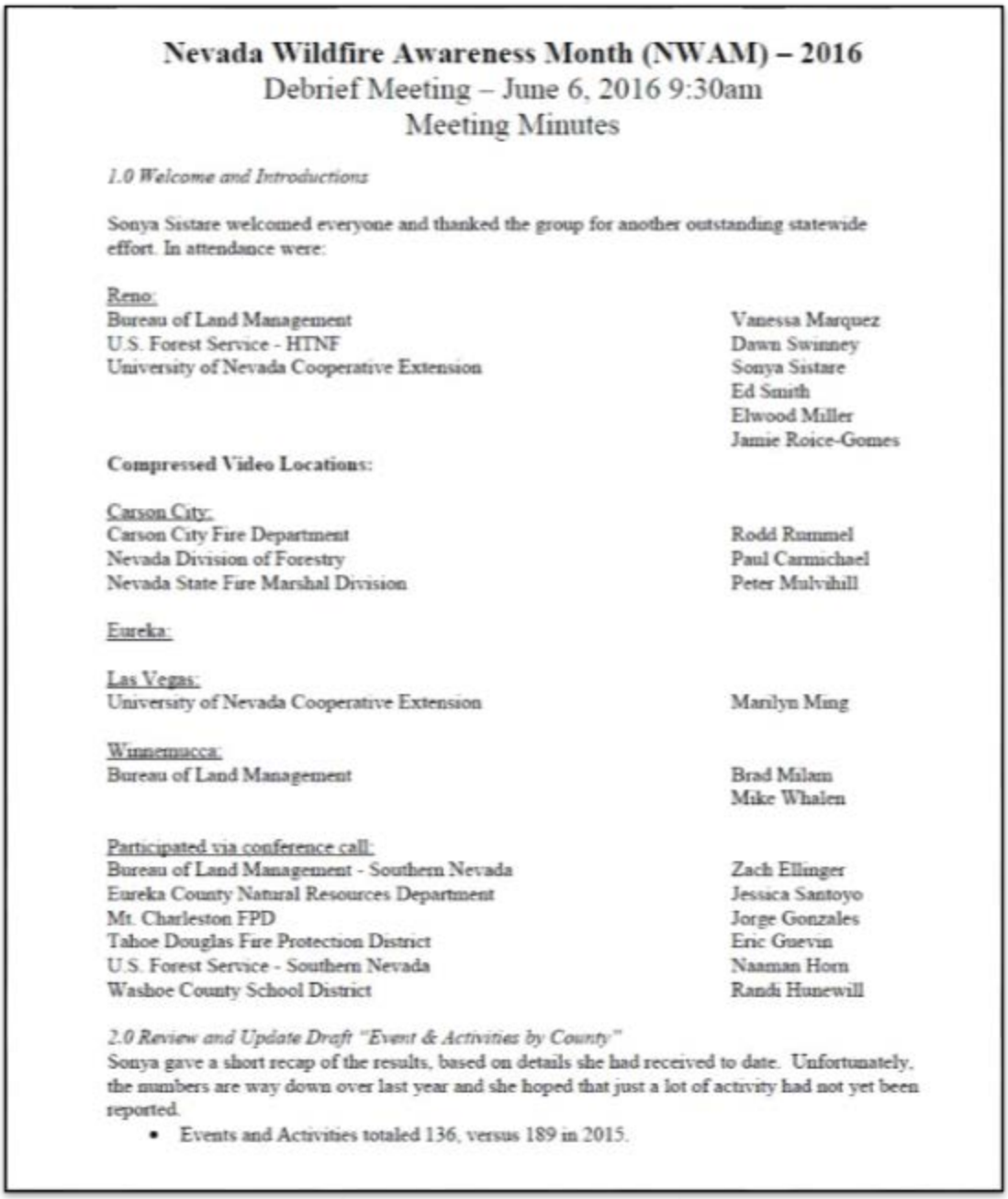
For More Information

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Figure P-8. An announcement for NV Emergency Manager's Disaster Recovery Project, including a 2016 meeting schedule.



Nevada Wildfire Awareness Month (NWAM) – 2016
Debrief Meeting – June 6, 2016 9:30am
Meeting Minutes

1.0 Welcome and Introductions

Sonya Sistare welcomed everyone and thanked the group for another outstanding statewide effort. In attendance were:

Reno:	
Bureau of Land Management	Vanessa Marquez
U.S. Forest Service - HTNF	Dawn Swinney
University of Nevada Cooperative Extension	Sonya Sistare
	Ed Smith
	Elwood Miller
	Jamie Roice-Gomes
Compressed Video Locations:	
Carson City:	
Carson City Fire Department	Rodd Rummel
Nevada Division of Forestry	Paul Carmichael
Nevada State Fire Marshal Division	Peter Mulvihill
Eureka:	
Las Vegas:	
University of Nevada Cooperative Extension	Marilyn Ming
Winnemucca:	
Bureau of Land Management	Brad Milam
	Mike Whalen
Participated via conference call:	
Bureau of Land Management - Southern Nevada	Zach Ellinger
Eureka County Natural Resources Department	Jessica Santoyo
Mt. Charleston FPD	Jorge Gonzales
Tahoe Douglas Fire Protection District	Eric Guevin
U.S. Forest Service - Southern Nevada	Naaman Horn
Washoe County School District	Randi Hunewill

2.0 Review and Update Draft "Event & Activities by County"

Sonya gave a short recap of the results, based on details she had received to date. Unfortunately, the numbers are way down over last year and she hoped that just a lot of activity had not yet been reported.

- Events and Activities totaled 136, versus 189 in 2015.

Figure P-9. Debrief meeting minutes from the 2016 Nevada Wildfire Awareness Month (NWAM). For more information about NWAM see http://www.livingwithfire.info/

- Number of participants at the events totaled 4,711, versus 8,940 in 2015.

We reviewed the spreadsheet of reported events and activities by county, and many details were added. The spreadsheet will be updated with this new information plus any additional that is provided in the next few days. The updated list will be sent out with these meeting minutes by the end of the week.

3.0 Discuss Key Events and Promotional Efforts:

Carson City:

- The community clean up event in Lakeview was very successful, and the picnic afterwards was equally great as a community-building effort. Sonya thanked Rodd Rummel for all of his and Carson City Fire Department's efforts for this community, especially because she lives here! Everyone appreciated having the one-on-one conversation with Rodd during the picnic. Promotional efforts included digital messages at Bodine's Casino, the Community Center, Casino Fandango, a billboard on Highway 50 heading up to Tahoe and at the fire station.
- The BIA held an open house event, which had participation by BLM, NDF and UNCE. Jamie Roice-Gomes reported that about 60 people participated.

Clark County:

- Vanessa Marquez reported that the race at Mt. Charleston had about 120 participants, which was less than half of last year's at Red Rock. There were difficulties with the location, and very little if any media attention. We'll need to revisit this idea soon to either find a more cooperative location or combine the two races into one. It was very expensive to hold with poor turnout. Sonya added that Desert Sky Adventures reports that $4,550 was raised for the Wildland Firefighter Foundation (WFF) from this race.
- Zach Ellinger provided details on additional events that occurred in Clark County, and offered to look into alternate locations for consideration. He especially liked the Spring Mountain Ranch State Park location as they had a good trail system. Another option would be the Clark County Wetlands area.
- Sonya also added that the Clark County Proclamation was a great example of collaboration, with representatives from BLM, Clark County Fire, Mt. Charleston FPD and USFS all accepting the proclamation together.

Churchill County:

- Sonya did not have any activity beside posters being displayed. Vanessa will check with Dennis Terry to see if he was aware of anything else to add.

Douglas County:

- The Cowboy Festival in Genoa was not such a great venue this year. The weather was cold, windy and rainy and we collectively reached only 52 people. We'll have to think about this before committing again next year. Sonya thanked all the partners who participated that day.
- Sonya added that there is a static billboard is posted Highway 395 south of Pinenut Road.

Elko County:

- Ed Smith reported on the extremely successful Community Wildfire Preparedness Day event at Home Depot. They had once again received one of the State Farm $500.00 awards to help fund the event. They estimate close to 500 participants…it was packed! He also gave an interview during the event, which aired on KENV later that day.

Figure P-9. Debrief meeting minutes, continued.

Eureka County:

- Jessica Santoyo shared information about her Firewise events, and thanked Ed for coming to help with the Ember House. They had good attendance, and also conducted the 3-d defensible space model contest. They are phasing it out in the next 2 years so they don't burn out the kids. Ed commented about how great the models turn out each year.

Humboldt County:

- Mike Whalen just sent Sonya details on activity here, and provided additional information, such as who was all involved at each event and dates. Sonya asked for photos to include in the summary report.

Lander County:

- Brad Milam added the Mill Creek Environment Day.

Lincoln County:

- Sonya had heard from Rick Stever, Lincoln County Fire Protection District, who was trying to coordinate a community BBQ, but she had not yet received details. She also shared information about Tye Mizer winning one of the State Farm Awards for an event in Caliente, but is also waiting for details.

Lyon County:

- Although Randi Hunewill is no longer with the fire department, she was able to provide some details. The replacement for her position should be on board soon. The open house event was once again successful, and also served as a training day for the firefighters, as they were able to use funds from a Safer Grant to bring in the burn trailer. It was a good opportunity for residents to see them in action. Dennis reported via his report that BLM reached 200 people at that event, and Randi was not sure if that reflected the total or not.
- Sonya also provided information about the Smith Valley Fire's open house, which continues to decline in participation. She hoped we could find a way to help make it grow instead. There was also supposed to be a small BBQ in Mound House, but still waiting on details.

Mineral County:

- Adam Greenfield, the new fire chief for the Walker Lake VFD, formerly with Kingston VFD, was planning a big pancake breakfast at the station. No details on the outcome yet. Sonya added that this is the first NWAM event she is aware of in Mineral County.

Nye County:

- Dawn Swinney added details about the Jim Butler Day event, and Mike said that the Round Mountain event had been delayed until June.

Pershing County:

- Mike added details about banners and poster placement in McDermitt, Winnemucca and Lovelock. They also issued a proclamation.

Storey County:

- Patty Blakely was unable to attend, but Sonya and Jamie talked about the school event at Hillside Elementary. Everyone was so thankful and appreciative, and the kids really enjoyed learning about embers and playing the Ember House game.

Washoe County:

- Jamie talked about the Palomino Valley event, which had a very good turnout with 64 participants. Residents could order reflective house address numbers, and some were given as prizes.

Figure P-9. Debrief meeting minutes, continued.

- Ed reported on the West Washoe Valley Wildfire Preparedness Group event, held at Thunder Canyon. Their participation nearly doubled, and everyone was really engaged…especially when he showed video footage of the Ft. McMurray fire and junipers igniting and then carrying the fire to the home within 30-seconds. Very powerful images! Ed thanked Paul Carmichael for participating and TMFPD as well.
- Elwood added details about the Washoe County Community meeting held there at the Cooperative Extension. It provided an open forum to exchange information about their community efforts, and sparks good communication with the BLM, NDF and USFS representatives who participated. Ed added that there was interest in holding this type of meeting on a regular basis, perhaps quarterly.
- Sonya wrapped things up with details about the final trail run event at Rancho San Rafael Park on May 29th. Participation increased over last year with 171 paid versus 120 last year. Results showed that 154 runners participated and finished the race, and a total of $5,504 will be donated from this event to the WFF from this race, or a total of $10,054 from both events combined. Vanessa added that it is much more cost effective and easy to work with the Regional Park personnel and she hopes to use the same location next year and make it even bigger. She added that there will be a debrief meeting in July if anyone wants to participate, and we can begin planning for 2017. Pete Mulvihill added that there was good media coverage as well, with Chief Moore and he featured during the evening news, and a BLM rep featured on another network.

White Pine County:

- Sonya was happy to report that Chief Waters of the Ely Fire Department were able to secure a proclamation for the County.

Other promotional activity:

- Sonya showed the Multistate Proclamation, with 8 participating states this year. It's a very impressive document, and would certainly stand out to the Governor as he signs 24 copies. Elwood thought it would be good to expand to all 17 Western States…something to work towards.

4.0 Planning Ahead for 2017

- *New ideas, locations, partners to pull into efforts:* Ed would like to target the Nevada Landscape Association, and will talk to their current president, Heidi Kratsch who is also with UNCE.
- *Events to start planning for now:* The trail runs!
- *Theme ideas:* No one had any ideas to share, but Sonya asked that we all keep it on the back burner and to email her with any ideas that may come up.

5.0 Final Thoughts

- Ed added that he thought this year's theme and graphics were unique and really got your attention. Good job everyone!
- Sonya thanked everyone again and will be working to complete the report by early July. Remember to send her any details on anyone she should send a thank-you note to on behalf of the planning committee…it really helps to get continued cooperation!

Figure P-9. Debrief meeting minutes, continued

Table P-5. Summary of NWAM 2016 Events and Activities

Nevada Wildfire Awareness Month 2016 Events and Activities - DRAFT 6.9.16						
	Date(s)	Event or Activity	Partner(s)	Direct	# Participants	
				Mail/Dist	Direct	Indirect
Carson City						
1	April - May	Posters displayed various locations	BLM - Carson City District, CCFD, Lakeview, NDEM, NDF, NSFM, USFS, UNCE			
2	April - May	Banners displayed in communities	BLM - Carson City District, CCFD			
3	May 4 & 5	Articles promoting Wildfire Awareness Month events featured on CarsonNow.org	CarsonNow.org			
4	April 23	Door-to-door distribution of community event flyer to Lakeview Community	CCFD, Lakeview Firesafe Committee, UNCE	230		
5	May	Message on Casino Fandango marquee	Casino Fandango, Ann Grant, UNCE			
6	May	Message on Carson Community Center marquee	Carson City Community Center, CCFD, UNCE			
7	May	Message on Carson City Fire Department's digital sign	CCFD, UNCE			
8	May 1 - 31	Message on NDOT's DMS	NDOT-District II, UNCE			
9	May 1 - 31	Message on Bodine's Casino marquee	Bodine's Casino, UNCE			
10	May 2 - 8	Main Street Banner	BLM, Carson City Fire, UNCE			
11	May 2 - June 26	Wildfire Awareness Outdoor Digital Ad US Hwy 50 west of Hwy 395	BLM-Nevada State Office, UNCE			
12	May 5	County proclamation issued	Carson City BOS, CCFD, UNCE		25	
13	May 7	Lakeview Community Cleanup and Picnic	Carson City Fire Dept., Lakeview Firesafe Committee, UNCE		48	
14	May 8	Lakeview event article featured in Nevada Appeal	CCFD, Nevada Appeal			14,000
15	May 2	Wildfire awareness messages shared during Casino Fandango VIP event	Casino Fandango, Ann Grant		100	
16	May 23	Wildfire awareness presentation at the Governor's 2016 Fire Season Briefing	NDF, UNCE		40	
17	May 26	BIA Western Area Agency Open House	BLM, Bureau of Indian Affairs, NDF, UNCE		61	
Churchill						
18	April-May	Posters displayed	UNCE			
Clark						
19	April - May	Posters displayed various locations	BLM - Southern NV District, Clark County FD, Mt. Charleston FPD, NDF, UNCE, USFS			
20	April 14 - 30	Facebook Ad promoting Trail Run event	BLM - Nevada State Office, UNCE			1,760
21	May 1	Wildfire Awareness Half Marathon and 5K Trail Run and Event - Mt. Charleston	BLM - Southern NV District, Clark County FD, Desert Sky Adventures, NDF, USFS, UNCE, USFS		150	
22	May 6	Tabletop Event at Red Rock	BLM - Southern District		50	

Table P-5. Continued

23	May 10	LV Metro Search & Rescue Event at Spring Mountain Ranch Park	BLM - Southern District, USFS		200	
24	May 14	Touch-A-Truck Event	Clark County Fire Dept., Las Vegas Metro Police Dept., NDF, USFS		250	
25	May 14	Wildfire Awareness Float/Display at Heldorado Parade	Multiple agencies			15,000
26	May 16	Bozarth Elementary School Program	USFS		130	
27	May 17	County proclamation issued	BLM - Southern NV District, Clark County, Clark County FD, Mt. Charleston FPD, USFS, UNCE		40	
28	May 20	Hinman Elementary School Program	USFS		250	
29	May 25	Reedom Elementary School Program	USFS		450	
Douglas						
30	April - May	Posters displayed various locations	BLM - Carson City District, UNCE			
31	May 1 - 31	Message on NDOT's DMS	NDOT-District II, UNCE			
32	May 1 - 31	Message on Carson Valley Inn marquee	Carson Valley Inn, UNCE			
33	April 30 - May 1	Wildfire Awareness Booth at Cowboy Festival	BLM - Carson City District, Mormon Station State Historic Park, Nevada Air National Guard, NDF, Town of Genoa, USFS, UNCE		52	
34	May 2 - June 26	Wildfire Awareness Outdoor Digital Ad US Hwy 395 south of Pinenut Road	BLM-Nevada State Office, UNCE			
35	May 14	Skyland Community Neighbor-To-Neighbor Clean-up Project	Ann Grant, Skyland Fire Adapted Community		8	
36	May 18	Zephyr Cove Elementary School Fire Safety Day	Ann Grant, Cal Star, Douglas County CERT, TDFPD		125	
Elko						
37	April - May	Posters displayed various locations	BLM-Elko District, Elko County FPD, Elko FD, NDF, NNFPG, USFS, UNCE			
38	April - May	Banners displayed in various locations	BLM-Elko District, Elko County FPD, Elko FD, NDF, NNFPG, USFS			
39	April 20	County proclamation issued	Elko County, Elko County FPD		40	
40	April 29	Ag in the Classroom, K - 5	BLM - Elko District		220	
41	May 1 - 31	Awareness message on the Red Lion Hotel & Casino marquee	Red Lion Hotel & Casino, UNCE			
41	May 4	Article in the Elko Daily Free Press	Elko Fire Department, Elko Daily Free Press			6,305
42	May 6	Interview on Five Steps to Creating Defensible Space aired on KELK radio	BLM - Elko District, KELK			
43	May 7 & 8	Wildfire Awareness Display at Elko Home Exposition	BLM - Elko District		500	
44	May 8	Bring your Kids To Work Day	BLM - Elko District, Elko Charter School		140	
45	May 14	Touch-A-Truck Event	USFS		507	

Table P-5. Continued

46	May 7	Community Wildfire Preparedness Day	American Red Cross, BLM-Elko District, Elko County CERT, Elko County FPD, Elko County Sherriff, Elko Fire Department, Fire Prevention Association of Nevada, Green Day Landscaping, Home Depot, Liberty Mutual Insurance, NNFPG, Southwest Gas, State Farm Insurance, USFS, UNCE		500	
47	May 7	Interview on the community event aired on KENV - News 10 Elko	Elko Fire Department, KENV, NNFPG, UNCE			
48	May 16 - 31	Wildfire Awareness Outdoor Digital Ads, rotating at Idaho Street and 12st Street	BLM-Elko District			
49	May 23 - 28	Lamoille Canyon Environmental Education Days	BLM - Elko District		520	
Esmeralda						
50	April - May	Posters displayed various locations	BLM, UNCE			
Eureka						
51	March 16 & 17	Eureka Elementary School Firewise Presentation & distribution of materials (FAC, Mulch, event flyer)	BLM-Battle Mountain, Eureka County DNR, Eureka County Firewise Communities, Eureka County School District, Firewise Communities USA, UNCE		80	
52	March 21 & 22	Eureka Elementary School 3-D Defensible Space Model Contest Presentation & distribution of materials (FAC, Mulch, Ember Aware)	BLM-Battle Mountain, Eureka County DNR, Eureka County Firewise Communities, Eureka County School District, Firewise Communities USA, UNCE		50	
53	April	Direct mailing of Plain Talk Newsletter and event flyer to residents promoting Firewise events	Eureka County DNR, Eureka County Firewise Communities, Eureka County Public Works Dept., Firewise Communities USA	1009		
54	April - May	Posters displayed various locations	Eureka County DNR, Firewise Communities USA, UNCE			
55	April - May	Banners displayed in Crescent Valley and Eureka	Eureka County DNR, UNCE			
56	April - May	Message on County Fairgrounds Marquee	CV Fairgrounds, Eureka County DNR, Eureka County Public Works Dept.			
57	April 4	Crescent Valley School Firewise Presentation & distribution of materials (FAC, Mulch, event flyer)	Eureka County DNR, Eureka County Firewise Communities, Firewise Communities USA, UNCE		60	
58	April 20	County proclamation Issued	Eureka County, Eureka County DNR, Eureka Firewise Communities		1	

Table P-5. Continued

59	April 29	Direct mailing of postcards to Eureka residents promoting Firewise events	Eureka County DNR, Eureka County Firewise Communities, Firewise Communities USA	629		
60	May 6	Eureka/Diamond Valley Firewise Day	BLM-Battle Mountain, Diamond Mountain FFA, Diamond Valley VFD, Eureka/Diamond Valley Firewise Community, Eureka County Emergency Medical Services, Eureka Co. Lions Club, Eureka Co. Dept. of Natural Resources, Eureka Co. Public Works Dept., Eureka County VFD, Eureka Co. 4-H, Firewise Communities USA, General Moly/Eureka Moly, Raine's Market, UNCE, USFS-Austin Ranger District		180	
61	May 6	Eureka/Diamond Valley Clean-up Project	Diamond Valley FFA, Eureka/Diamond Valley Firewise Communities, Eureka County Department of Natural Resources		10	
62	May 16	Direct mailing of postcards to Crescent Valley residents promoting Firewise events	Eureka County DNR, Eureka County Firewise Communities, Firewise Communities USA	380		
63	May 17	Direct mailing to Eureka residents: Defensible space contest, FAC, Mulch, and Ember Aware publications	Eureka County DNR, Eureka County Firewise Communities, Firewise Communities USA	600		
64	May 21	Crescent Valley/Beowawe Firewise Day	Barrick-Cortez Mine, BLM-Battle Mountain, Crescent Valley/Beowawe Firewise Community, Crescent Valley VFD, Diamond Mountain FFA, Eureka Co. Emergency Medical Services, Eureka Co. Dept. of Natural Resources, Eureka Co. Sherriff's Office, Eureka Co. Public Works Dept., Firewise Communities USA, Golden Oldies, UNCE		104	
Humboldt						
65		County proclamation issued	BLM, Humboldt County		5	
66	May 21	Wildfire Awareness Both at Newmont Family Day	BLM - Winnemucca District		410	
67	May 21	Wildfire Awareness Booth at Lowry High School Health Fair	BLM - Winnemucca District, Nevada Outdoor School, Newmont Gold		150	
68	May 23 & 24	Wildfire Awareness Booth at Winnemucca Ecology Fair	BLM - Winnemucca District		165	

Table P-5. Continued

69	May	Banners displayed in various locations	BLM - Winnemucca District, NDF, Winnemucca City Fire			
70	May	Posters displayed in various locations	BLM, NDF, USFS, UNCE			
71	May - June	Billboard posted	BLM - Winnemucca District			
Lander						
72	TBD	County proclamation issued	BLM - Battle Mountain District, Lander County		5	
73	May 23	K - 12 Austin School Program	USFS		20	
74	April - May	Posters displayed various locations	BLM, USFS, UNCE			
75	April - May	Banners displayed in various locations	BLM, USFS, UNCE			
76	May 31	Mill Creek Environmental Day	BLM - Battle Mountain District		60	
Lincoln						
77	April 1	Article in the Lincoln County Record	Lincoln County FPD			1,800
78	April 4	County proclamation issued	Lincoln County, Lincoln County Department of Emergency Management, Lincoln County FPD		10	
79	April - May	Posters displayed in various locations	Lincoln County FPD, UNCE			
80	May	Banners displayed in various locations	BLM, Lincoln County FPD, NDF			
81	May - June	Billboard posted	BLM - Winnemucca District			
82	May 1 - 7	Curbside chipping - Caliente	City of Caliente, Caliente Volunteer Fire Department, State Farm Insurance		10	
83	May 7	Community Wildfire Preparedness Day Event	BLM, City of Caliente, Caliente Volunteer Fire Department, State Farm Insurance		20	
84	May 7	City of Caliente Proclamation	City of Caliente, Caliente Volunteer Fire Department, State Farm Insurance		5	
85	May 13	Article in the Lincoln County Record	Lincoln County Record, Caliente VFD			*
86	May 21	Fire Awareness Luncheon - Mt. Wilson	BLM - Central District, Lincoln County FPD, NDF, Pioche Fire Department		30	
Lyon						
87	April - May	Posters displayed	BLM - Carson City District, North Lyon FPD, UNCE			
88	April - May	Banners displayed various locations	Mound House FAC, North Lyon FPD, Smith Valley FPD,			
89	May 1 - 31	Message on Pioneer Crossing-Dayton marquee	Pioneer Crossing, UNCE			
90	May 1 - 31	Message on Pioneer Crossing-Fernley marquee	Pioneer Crossing, UNCE			
91	May 1 - 31	Message on Pioneer Crossing-Yerington	Pioneer Crossing, UNCE			
92	May 7	Smith Valley Fire Station Open House	BLM-Carson City District, Smith Valley Conservation District, Smith Valley FPD, USFS		10	
93	May 9 - 26	Wildfire awareness display in Smith Library	Smith Valley Conservation Districts, Smith Library			1,500

Table P-5. Continued

94	May 21	Fire Station Open House: Wildland Fire Education and Prevention, and Burn Trailer Firefighter Training Exhibition	BLM-Carson City District, Lowes, Lyon County Sheriff, North Lyon FPD, UNCE		200	
Mineral						
95	April - May	Posters displayed	Walker Lake VFD,UNCE			
96	May	Banners displayed in Walker Lake	Walker Lake VFD			
97	May 14	Walker Lake VFD Breakfast	Walker Lake VFD			
Nye						
98	April - May	Posters displayed various locations	UNCE			
99	May 12 & 19	Elementary School Programs	USFS		190	
100	May 28	Jim Butler Day Event	USFS		200	
Pershing						
101	May 4	County proclamation issued	BLM - Battle Mountain District, Pershing County		10	
102	April - May	Posters displayed various locations	BLM - Battle Mountain District, UNCE			
103	April - May	Banner displayed in Lovelock	BLM - Battle Mountain District, UNCE			
104	May - June	Billboard posted	BLM - Battle Mountain District			
Storey						
105	April - May	Posters displayed various locations	Storey County FD, UNCE			
106	May	Banners displayed various locations	Storey County FD, UNCE			
107	May 3	County proclamation issued	Storey County FD		15	
108	May 12	Hillside Elementary School Presentations & Ember House Activity	Hillside Elementary School, Storey County FD, UNCE		45	
109	May 19	Virginia City Highlands Fire Safe Council Meeting	Storey County FD		25	
Washoe						
110	April - May	Posters displayed various locations	BLM, City of Reno Fire Dept., Nevada Air National Guard, NDF, NV Energy, TMFPD, UNCE, USFS			
111	April - May	Banners displayed various locations	City of Reno Fire Dept., Nevada Air National Guard, NV Energy, NDF, TMFPD, USFS, UNCE			
112	April 18	Wildfire Awareness Presentation at Media Training Day	NLTFPD, Sierra Front Wildfire Coop., UNCE		40	
113	April 19	County proclamation issued	Truckee Meadows FPD, Washoe County		50	
114	April 27	City of Reno proclamation issued	Reno FD, UNCE		45	
115	May 1 - 31	Message on the Bonanza Casino Marquee	Bonanza Casino, UNCE			
116	May 15 - 31	Message on the UNR - Lawlor Sign	UNR, UNCE			
117	May 1 - 31	Message on NDOT's DMS	NDOT-District II, UNCE			
118	May 2	Smokey Bear Event at Bailey Charter Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		55	
119	May 2	Smokey Bear Event at Bernice Matthews Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		127	

Table P-5. Continued

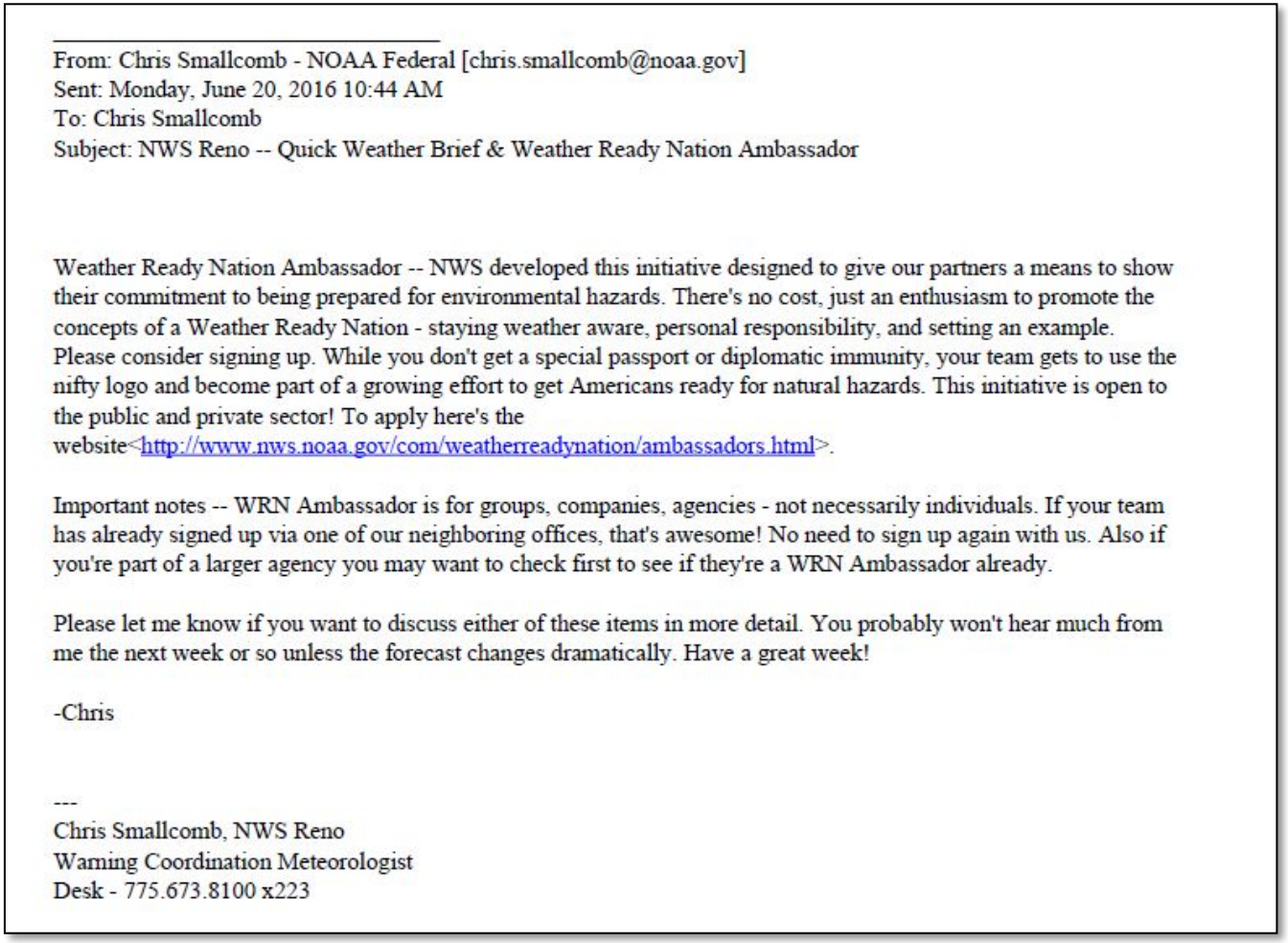
120	May 6	Smokey Bear Event at Lois Allen Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		100	
121	May 7	Palomino Valley Community Fire Safety Fair	Palomino Valley VFD, State Farm Insurance, TMFPD, UNCE		64	
122	May 7	Interview during Palomino Valley event	Sparks Tribune			
123	May 9	Article promoting Junk the Junipers events featured on ThisIsReno.com	ThisIsReno.com			
124	May 9	Smokey Bear Event at Alice Maxwell Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		87	
125	May 11	West Washoe Wildfire Preparedness Community Meeting	NDF, TMFPD, UNCE, WWWPG		58	
126	May 12	Smokey Bear Event at Anderson Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		88	
127	May 13	Smokey Bear Event at Mariposa STEM Academy - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		27	
128	May 2 - June 26	Wildfire Awareness Outdoor Ad US 395 south of Stead Blvd.	BLM-Nevada State Office, UNCE			
129	May 5	Article in RGJ on Defensible Space	RGJ, UNCE			66,507
130	May 14	Celebrate Washoe Valley - Info booth and Juniper Toss Game	BLM-Carson City District, NDF, UNCE, Washoe Valley Alliance		200	
131	May 17	Smokey Bear Event at Rita Cannan Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		92	
132	May 18	Smokey Bear Event at Glenn Duncan Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		70	
133	May 18	Washoe County Community Event	BLM- Carson City District, NDF, USFS, UNCE		12	
134	May 19	Wildfire Awareness Presentation to Washoe County CERT - Maverick Team	Washoe County Sherriff's Office CERT, UNCE		15	
135	May 20	Smokey Bear Event at Lemmon Valley Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		103	
136	May 21	Junk the Junipers - Silver Lake	BLM, Moana Nursery, Silver Lake VFD, TMFPD, UNCE		37	
137	May 21	Junk the Junipers - Washoe Valley	NDF, Moana Nursery, Washoe Valley Alliance, UNCE		72	
138	May 23	Smokey Bear Event at Stead Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		115	
139	May 24	Wildfire Awareness Presentation at Esther Bennett Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		71	
140	May 26	Smokey Bear Event at Roger Corbett Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		79	

Table P-5. Continued

141	May 29	Wildland Fire Awareness Half-Marathon and 5K Trail Run and Event at Rancho San Rafael Regional Park	BLM - Carson City District and Nevada State Office, City of Reno Fire Department, Desert Sky Adventures, Nevada Division of Forestry, Truckee Meadows Fire Protection District, US Forest Service, University of Nevada Cooperative Extension, Washoe County Regional Parks, Washoe County Sherriff's Office CERT Volunteers		200	
142	May 31	Smokey Bear Event at Florence Drake Elementary - Reno Rodeo Reading Roundup	BLM-Carson City District, Washoe County School District		45	
White Pine						
143	April - May	Posters displayed various locations	BLM, NDF, USFS, UNCE, White Pine County Fire			
144	May 11	County proclamation Issued	White Pine County, White Pine County Fire		20	
145	May 12	McGill Elementary School Program	White Pine County School District, USFS		60	
146	May 18	Little People Head start Program	USFS		20	
147	May 19	Learning Bridge School Program	White Pine County School District, USFS		80	
148		Baker School Program	White Pine County School District, USFS		15	
149		Garrison School Program	White Pine County School District, USFS		10	
150		David E. Norman School Program	White Pine County School District, USFS		200	
Regional or Statewide						
151	May	Sage Signals 1/2-page ad and NWAM article	NV Cattlemen's Association, UNCE			600
152	May 1	Interview on NWAM aired on KOLO	KOLO, UNCE			
153	May - August	Northern Nevada radio PSA campaign	BLM,Nevada Broadcasters Association, NDF, USFS, UNCE			
154	May/June	Progressive Rancher ad	Northeastern Nevada Fire Prevention Group, Progressive Rancher			6,000
155	May/June	Nevada Magazine 1/2-page ad	Nevada Magazine, UNCE			20,000
156	May/June	Nevada Events & Shows 1/2-page ad	Nevada Magazine, UNCE			20,000
157	May/June	Community Living Magazine ad and article	Community Living Magazine			
158	May - August	Northern Nevada television PSA campaign	BLM,Nevada Broadcasters Association, NDF, USFS, UNCE			
159	May 3	Junk the Junipers article on website	UNR's Nevada Today			
160	May 3	Nevada League of Cities and Municipalities Resolution	Nevada League of Cities and Municipalities			
161	May 4	Wildfire awareness article on website	Nevada Insurance Council			
162	May 6	Interview on wildfire awareness aired on KKOH radio	KKOH, UNCE			

Table P-5. Continued

163	May 11	Interview on wildfire awareness aired on KRNV	KRNV, UNCE			
164	May 13	NWAM promotional messages aired on KKOH radio	KKOH			
165	May 13 - 27	Facebook Ad promoting Trail Run event	BLM- Nevada State Office, UNCE			4,408
166	May 14	Interview on dangers of junipers aired on KOLO - News 8	KOLO, UNCE, Washoe Valley Alliance			
167	May 20	Interview on wildfire danger aired on KRNV	KRNV			
168	May 21	Interview during Junk the Junipers event at Silver Lake aired on KTVN	KTVN			
169	May 21	Interview during Junk the Junipers event at Silver Lake aired on KRNV	KRNV			
170	May 21	Interview during Junk the Junipers event at NDF aired on KOLO	KOLO			
171	May 29	Interview during Race event aired on KTVN	KTVN, BLM			
172	May 29	Interview during Race event aired on KOLO	KOLO, NSFM, TMFPD			
Good Neighbor or National						
173	April-May	A collaborative, multi-state proclamation between California, Idaho, Montana, Nevada, Oregon, South Dakota, Utah and Washington	Governors of CA, ID, MT, NV, OR, SD, UT, WA, Keep Oregon Green, NDF, Idaho Firewise, UNCE, Washington Department of Natural Resources, Urban & Community Forestry Wildfire Division			
	Date(s)	Event or Activity	Partner(s)	Direct	# Participants	
				Mail/Dist.	Direct	Indirect
			TOTAL	**2,848**	**8,733**	**157,880**
		Key:				
		Color block indicates a public event				
		* indicates indirect participants already counted				



From: Chris Smallcomb - NOAA Federal [chris.smallcomb@noaa.gov]
Sent: Monday, June 20, 2016 10:44 AM
To: Chris Smallcomb
Subject: NWS Reno -- Quick Weather Brief & Weather Ready Nation Ambassador

Weather Ready Nation Ambassador -- NWS developed this initiative designed to give our partners a means to show their commitment to being prepared for environmental hazards. There's no cost, just an enthusiasm to promote the concepts of a Weather Ready Nation - staying weather aware, personal responsibility, and setting an example. Please consider signing up. While you don't get a special passport or diplomatic immunity, your team gets to use the nifty logo and become part of a growing effort to get Americans ready for natural hazards. This initiative is open to the public and private sector! To apply here's the website<http://www.nws.noaa.gov/com/weatherreadynation/ambassadors.html>.

Important notes -- WRN Ambassador is for groups, companies, agencies - not necessarily individuals. If your team has already signed up via one of our neighboring offices, that's awesome! No need to sign up again with us. Also if you're part of a larger agency you may want to check first to see if they're a WRN Ambassador already.

Please let me know if you want to discuss either of these items in more detail. You probably won't hear much from me the next week or so unless the forecast changes dramatically. Have a great week!

-Chris

Chris Smallcomb, NWS Reno
Warning Coordination Meteorologist
Desk - 775.673.8100 x223

Figure P-10. An email regarding the National Weather Service's Weather Ready Nation Ambassador program. For more information, please see: https://www.weather.gov/wrn/ambassadors



Figure P-11. NWS-Reno's Facebook post about an outreach activity at Aviation Roundup, which draws thousands of people.



Figure P-12. A flyer posted on NWS-Reno's Facebook page about a presentation on the spring flood and summer wildfire season,

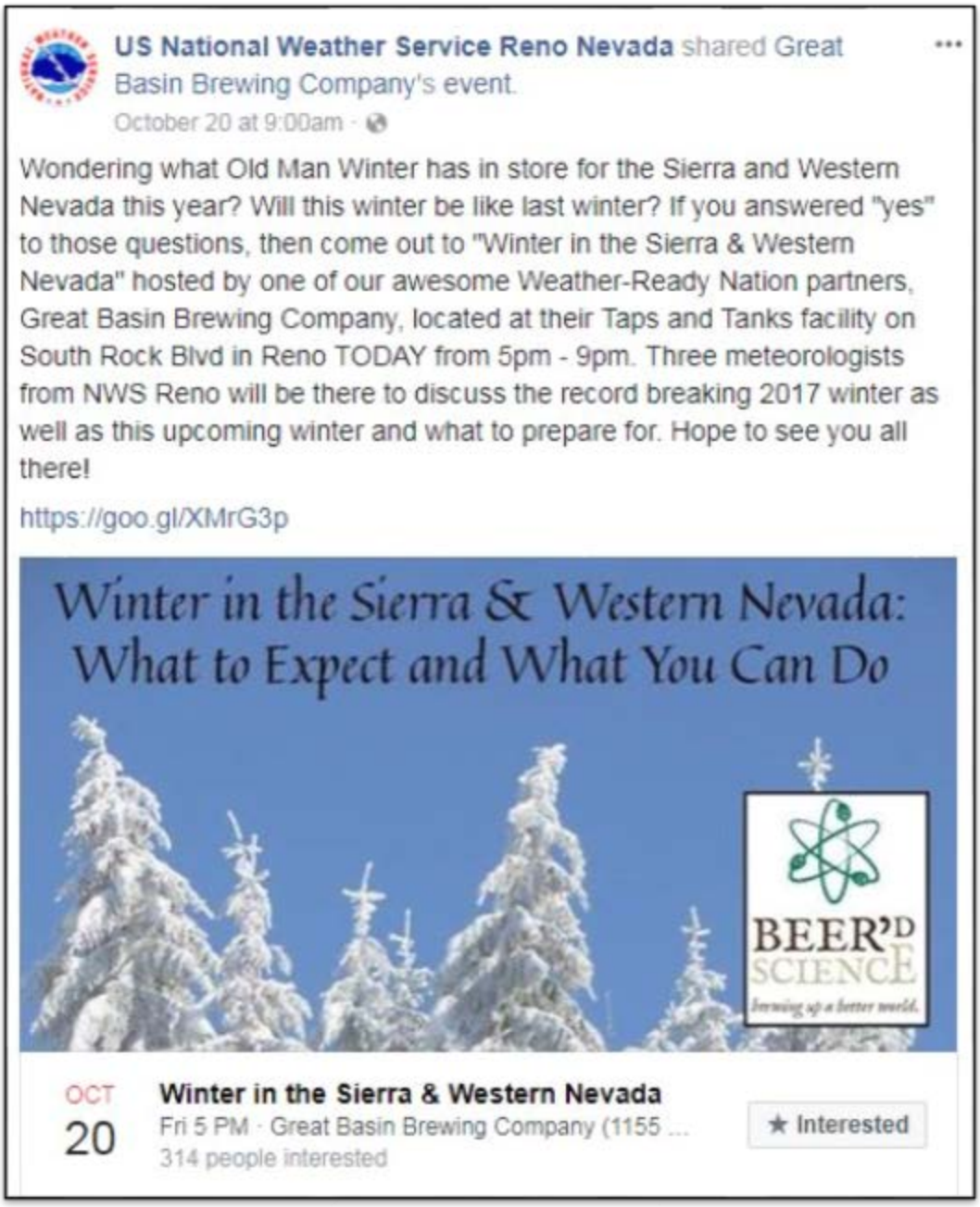


Figure P-13. A flyer posted on NWS-Reno's Facebook page about a presentation on winter weather in the Sierra & Western Nevada.



Figure P-14. Flyer posted on NWS-Reno's Facebook page, about Wildfire Awareness Week, including topics for each day of the awareness week.



Figure P-15. A flyer posted on NWS-Reno's Facebook page, about the 2017 Disaster Preparedness Fair.



Figure P-16. A flyer posted on Nevada DEM's Facebook page, about wildland fire safety. For more information, see: https://www.nfpa.org/education



Figure P-17. A flyer posted on NDF's Facebook page, about the Wildfire Awareness Half Marathon and 5K Run in 2016.

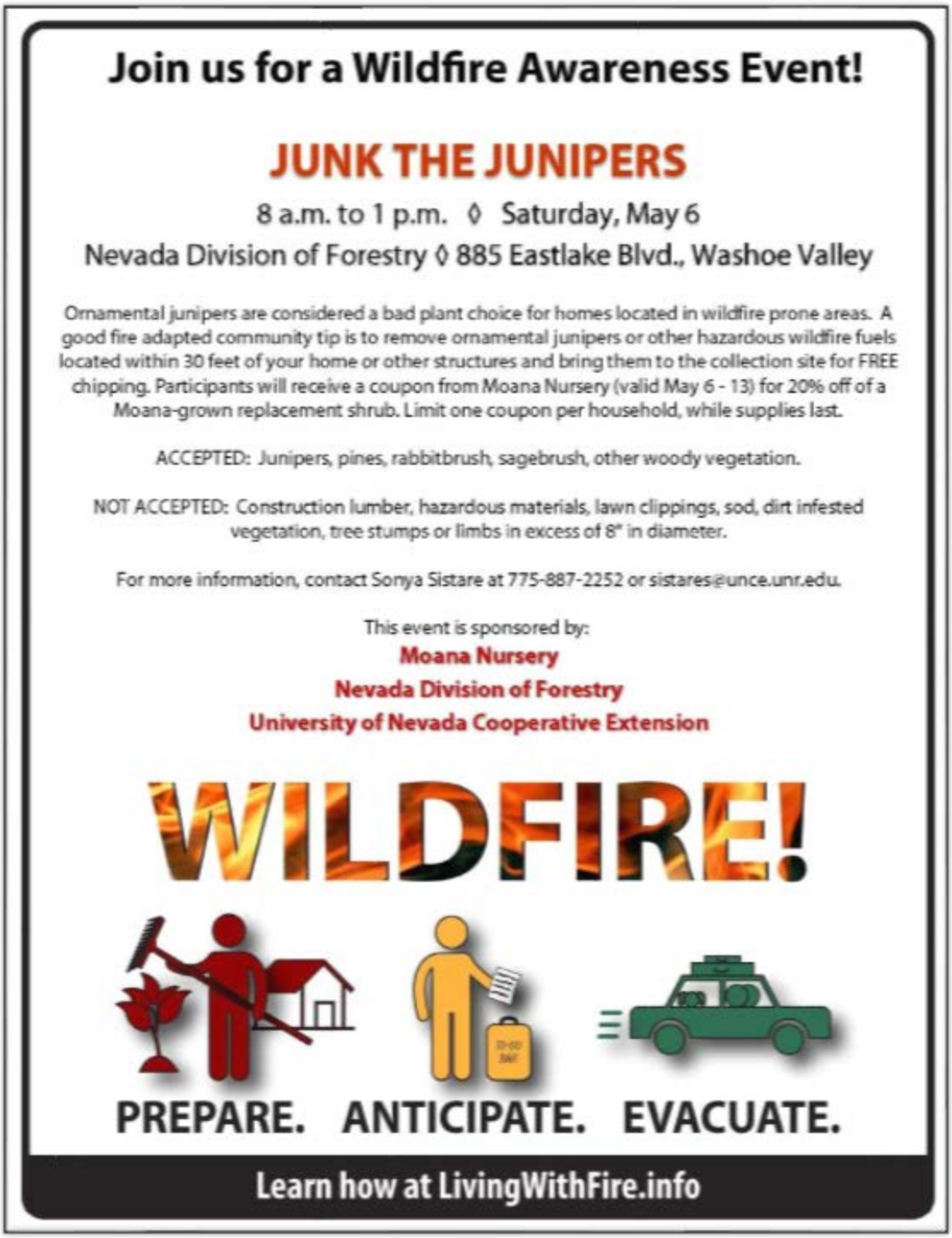
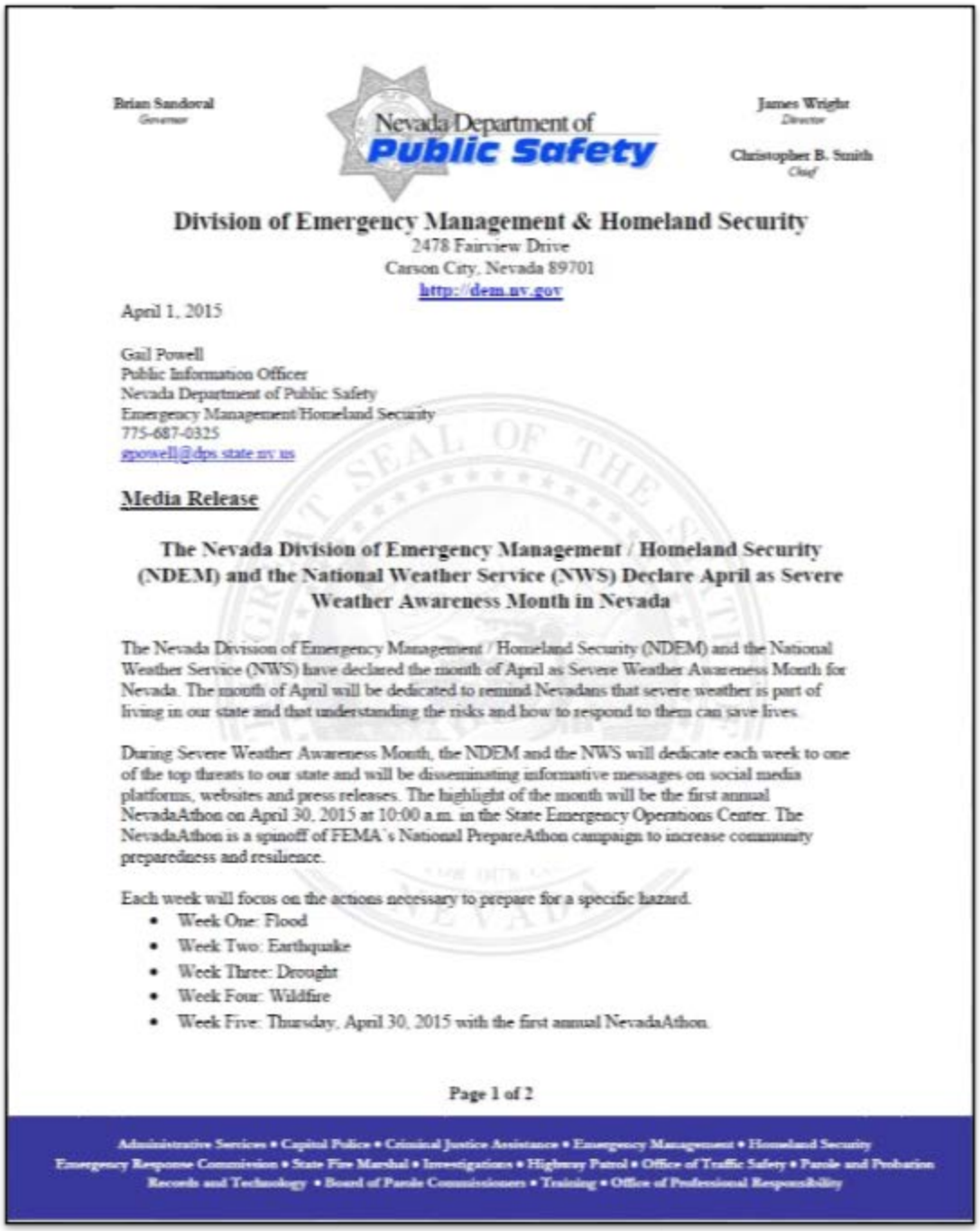


Figure P-18. A flyer for a Wildfire Awareness Event, Junk the Junipers, posted on NDF's Facebook page.



Brian Sandoval
Governor

Nevada Department of Public Safety

James Wright
Director

Christopher B. Smith
Chief

Division of Emergency Management & Homeland Security
2478 Fairview Drive
Carson City, Nevada 89701
http://dem.nv.gov

April 1, 2015

Gail Powell
Public Information Officer
Nevada Department of Public Safety
Emergency Management/Homeland Security
775-687-0325
gpowell@dps.state.nv.us

Media Release

The Nevada Division of Emergency Management / Homeland Security (NDEM) and the National Weather Service (NWS) Declare April as Severe Weather Awareness Month in Nevada

The Nevada Division of Emergency Management / Homeland Security (NDEM) and the National Weather Service (NWS) have declared the month of April as Severe Weather Awareness Month for Nevada. The month of April will be dedicated to remind Nevadans that severe weather is part of living in our state and that understanding the risks and how to respond to them can save lives.

During Severe Weather Awareness Month, the NDEM and the NWS will dedicate each week to one of the top threats to our state and will be disseminating informative messages on social media platforms, websites and press releases. The highlight of the month will be the first annual NevadaAthon on April 30, 2015 at 10:00 a.m. in the State Emergency Operations Center. The NevadaAthon is a spinoff of FEMA's National PrepareAthon campaign to increase community preparedness and resilience.

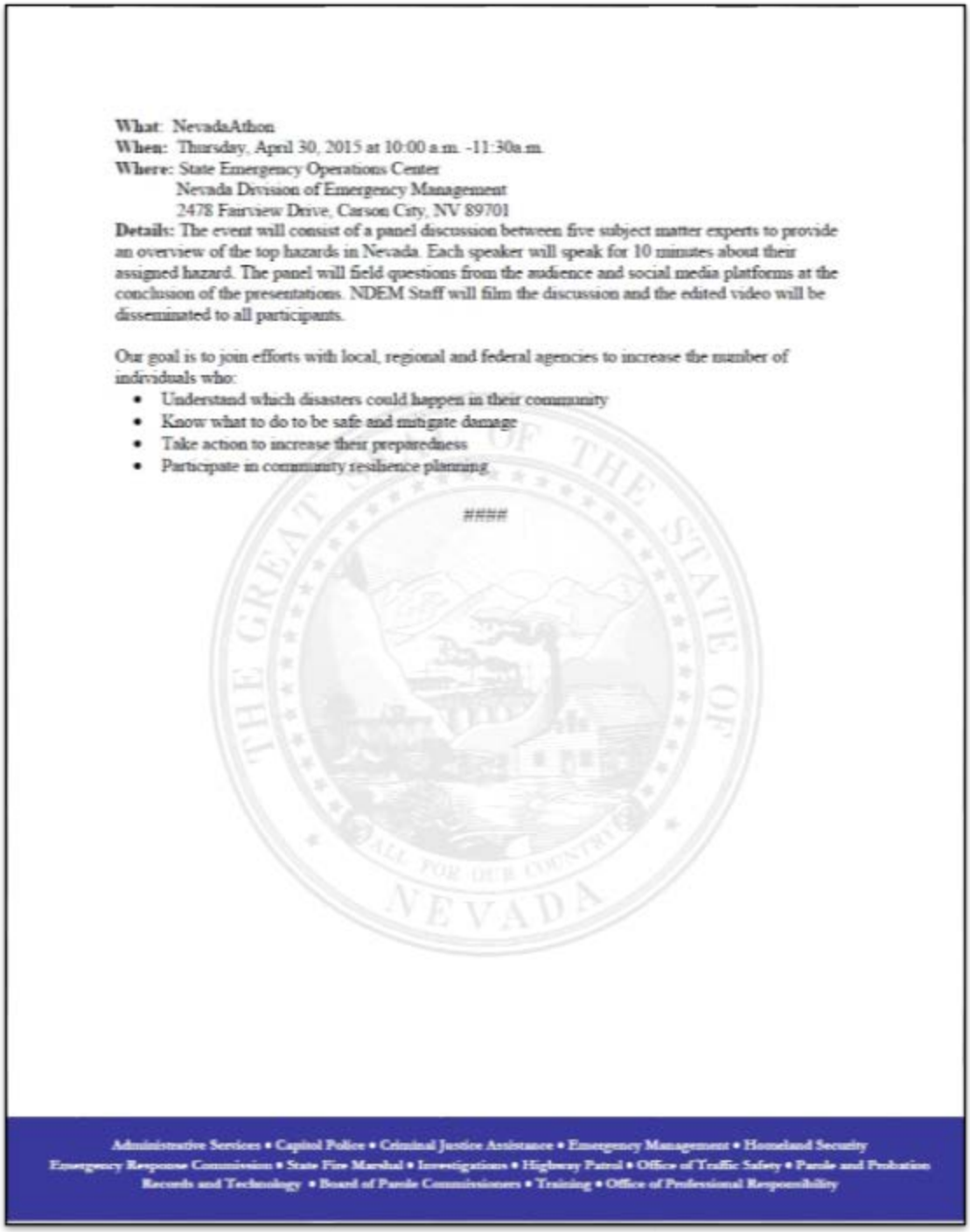
Each week will focus on the actions necessary to prepare for a specific hazard.

- Week One: Flood
- Week Two: Earthquake
- Week Three: Drought
- Week Four: Wildfire
- Week Five: Thursday, April 30, 2015 with the first annual NevadaAthon.

Page 1 of 2

Administrative Services • Capitol Police • Criminal Justice Assistance • Emergency Management • Homeland Security
Emergency Response Commission • State Fire Marshal • Investigations • Highway Patrol • Office of Traffic Safety • Parole and Probation
Records and Technology • Board of Parole Commissioners • Training • Office of Professional Responsibility

Figure P-19. A media release from 2015, declaring April as Severe Weather Awareness Month in Nevada.



What: NevadaAthon
When: Thursday, April 30, 2015 at 10:00 a.m. -11:30a.m.
Where: State Emergency Operations Center
Nevada Division of Emergency Management
2478 Fairview Drive, Carson City, NV 89701
Details: The event will consist of a panel discussion between five subject matter experts to provide an overview of the top hazards in Nevada. Each speaker will speak for 10 minutes about their assigned hazard. The panel will field questions from the audience and social media platforms at the conclusion of the presentations. NDEM Staff will film the discussion and the edited video will be disseminated to all participants.

Our goal is to join efforts with local, regional and federal agencies to increase the number of individuals who:

- Understand which disasters could happen in their community
- Know what to do to be safe and mitigate damage
- Take action to increase their preparedness
- Participate in community resilience planning

####

Administrative Services • Capitol Police • Criminal Justice Assistance • Emergency Management • Homeland Security
Emergency Response Commission • State Fire Marshal • Investigations • Highway Patrol • Office of Traffic Safety • Parole and Probation
Records and Technology • Board of Parole Commissioners • Training • Office of Professional Responsibility

Figure P-19. Continued

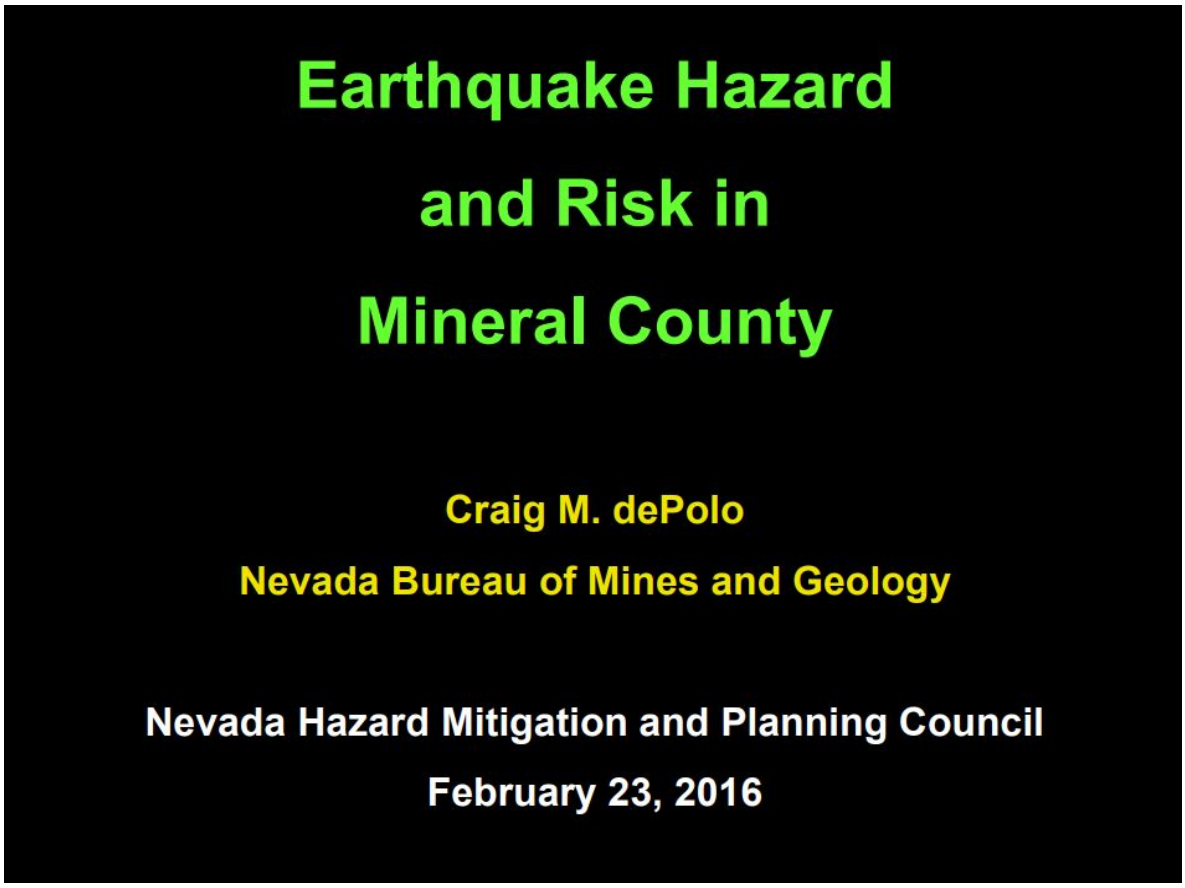


Figure P-20. An earthquake hazard presentation, presented by a NHM Planning Subcommittee member. For more presentations on earthquake hazards, please see: http://www.nbmg.unr.edu/nhmpc/Presentations/index.html

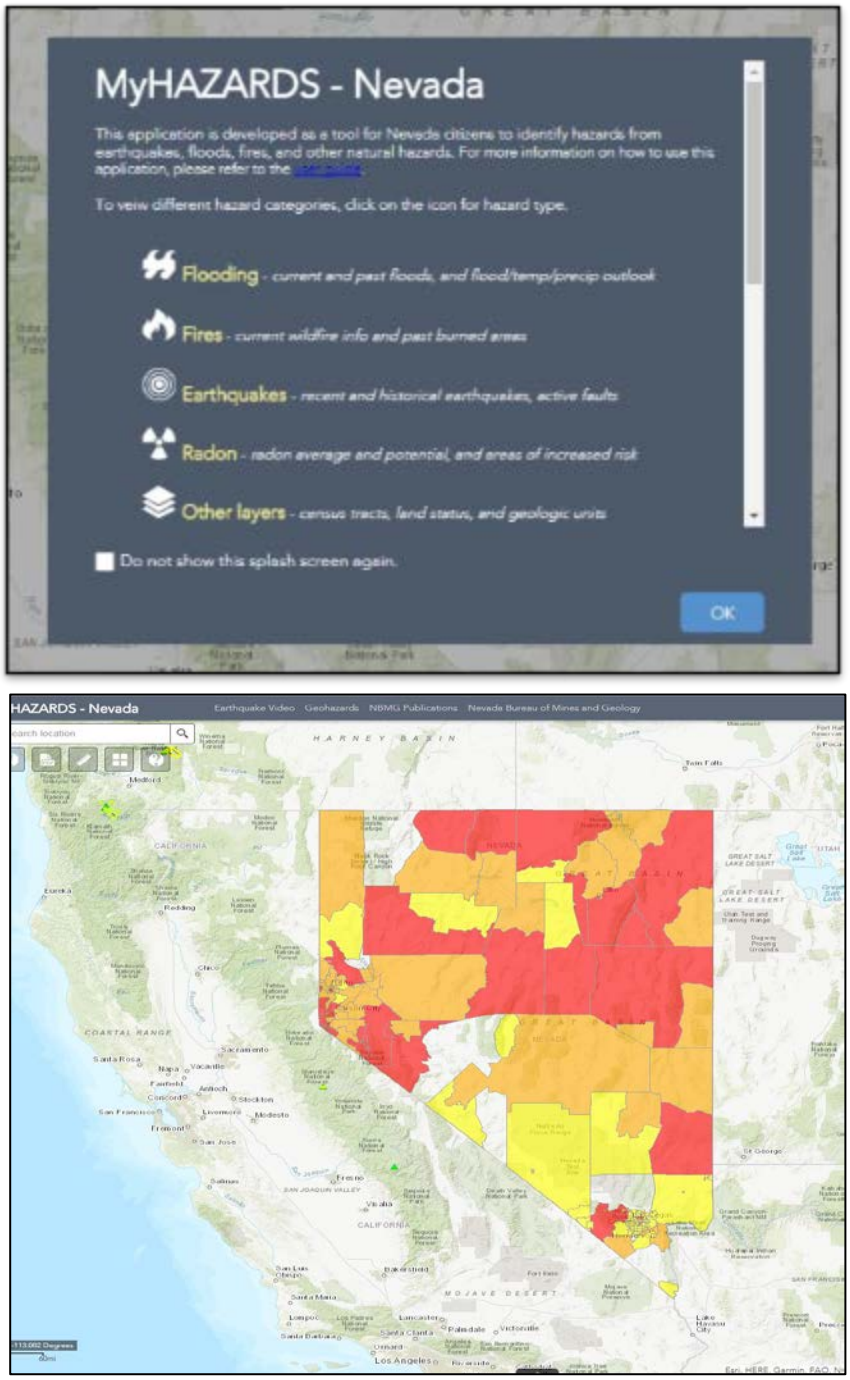


Figure P-21. Screenshots of MyHAZARDS, an online mapping service created and published by NBMG. To access, please see: https://gisweb.unr.edu/MyHAZARDS/

Earthquake Economic Resiliency Forum for the greater Reno/Sparks, Carson, Tahoe and Truckee region

Eldorado Resort Casino, April 19th, 2016, 8:45 AM to 2:30 PM

The annual Seismological Society of America meeting is being held in Reno, Nevada this spring (April 20th-22nd) at the Peppermill Resort Hotel and presents a unique opportunity to hold a first-of-a-kind Earthquake Economic Resiliency Forum for the California-Nevada border region. The goal of this Forum is to explore the common earthquake hazards within this bi-state region, but more importantly, how to begin to plan for greater economic resilience in the face a catastrophic ground motion event. Contrary to the general public perception, the CA-NV border region is at risk for large, M7+ earthquakes striking the greater Reno-Tahoe region. One source of this cultural misperception is likely the region's earthquake 'drought'. There have been no M6.5 or larger earthquakes in Nevada for 61 years. Seven M6.5 earthquakes from 1915 to 1954 preceded this hiatus in large events! Considering the unpredictability of large events anywhere in the western US, the local earthquake risk and issues of economic fragility are as important here as in California, the Pacific Northwest and Utah. In these states, resiliency programs are evolving to address not only public safety (e.g., earthquake early warning), but also effective economic recovery. Managed properly, this approach can minimize the economic impact in the weeks, months and years following a large event and may be the most important aspect to a community's long-term health. The latter task is no small feat given the current roadblocks that the region faces and an economy that is in an era of unprecedented growth—we must collectively plan today! Resilience can be defined as "the ability of a system to absorb shock and maintain its structure and functions with a minimum loss and resume pre-event functionality in a relatively short period of time". The first step toward economic resiliency to natural hazards is to understand all of the interrelated and potentially cascading dependencies that may occur shortly after an earthquake or major disaster. Guest speakers will introduce an up-to-date view of earthquake hazards within our region, followed by 'real world experience' when it comes to building an earthquake resilient community. The aim of the meeting is to address specific solutions tailored to our communities and how we might implement them. This Forum is for those who hold critical positions within the local, state and federal government, small business owners, large business owners, utilities, real estate agents, news organizations, insurance agents, hospital administration, interested citizens—anyone who will be impacted by a large earthquake event. The Forum is free—but requires preregistration. Let's band together, plan together, and be prepared when the next large earthquake hits our community. Remember, on average, Nevada and the California border region experiences one M6 earthquake each decade, and one M7 every 30 years. Let's take advantage of this extraordinary quiescent period in our earthquake history.

Please register by emailing Erik Williams at: eswilliams@unr.edu; inquires can be directed to Graham Kent: gkent@unr.edu, or 1 (775) 527-1574

Figure P- 22. Summary and agenda of the Earthquake Economic Resiliency Forum 2016. For more information: https://www.unr.edu/nevada-today/news/2016/earthquake-economic-

Earthquake Economic Resiliency Forum *Agenda*

Eldorado Resort Casino, Reno, Nevada: April 19th, 2016, 8:45 AM–2:30 PM

Complimentary Lunch with Free Registration

8:45 Introductory Remarks – Graham Kent (Nevada Seismological Laboratory)

The Problem (geologic background for the Reno-Carson City–Tahoe-Truckee Corridor)

9:00-9:15 New LiDAR Mapping of Faults in the NV-CA border region, Steve Wesnousky (Nevada Seismological Laboratory)

9:20-9:35 Historical Earthquakes in the NV-CA border region, Rich Koehler (Nevada Bureau of Mines and Geology)

9:40-9:55 Seismic Network, Seismicity and EEW design of the NV-CA border region, Ken Smith (Nevada Seismological Laboratory)

10:00-10:15 Unreinforced Masonry Inventory of the Reno-Sparks-Carson City Corridor, Craig dePolo (Nevada Bureau of Mines and Geology)

Break 10:15-10:30

Aftermath and Recovery (real world experiences from the Christchurch, NZ and Napa, CA earthquakes)

10:30-10:55 Lessons Learned from the Canterbury Earthquake Sequence, Christchurch, NZ, Mark Stirling (Chair of Earth Science, University of Otago, NZ)

11:00-11:25 Back to Normal: Earthquake Recovery Modeling Project, Napa, CA, Christopher Burton (Global Earthquake Model (GEM), Pavia, Italy)

Economic Resilience (what we can do as a region to recover more quickly)

Lunch 11:45-12:30 Keynote, AlertTahoe–multihazard, early warning monitoring (earthquakes, fire and extreme weather), Graham Kent (Nevada Seismological Laboratory)

12:35-12:50 '100 Resilient Cities' – Lessons from Western US Cities, Annie Kell (Nevada Seismological Laboratory)

12:55-1:25 "Fix the Bricks" Program, Salt Lake City, Cory Lyman (Salt Lake City EMP Director)

Break 1:30-1:45

Next Steps, Panel Discussion 1:45-2:30 Moderators: Dick McCarthy (Executive Director, California Seismic Safety Commission), Kyle West (City of Reno, Safety & Training Manager) & Cory Lyman (Salt Lake City EMP Director)

Figure P-22. Continued

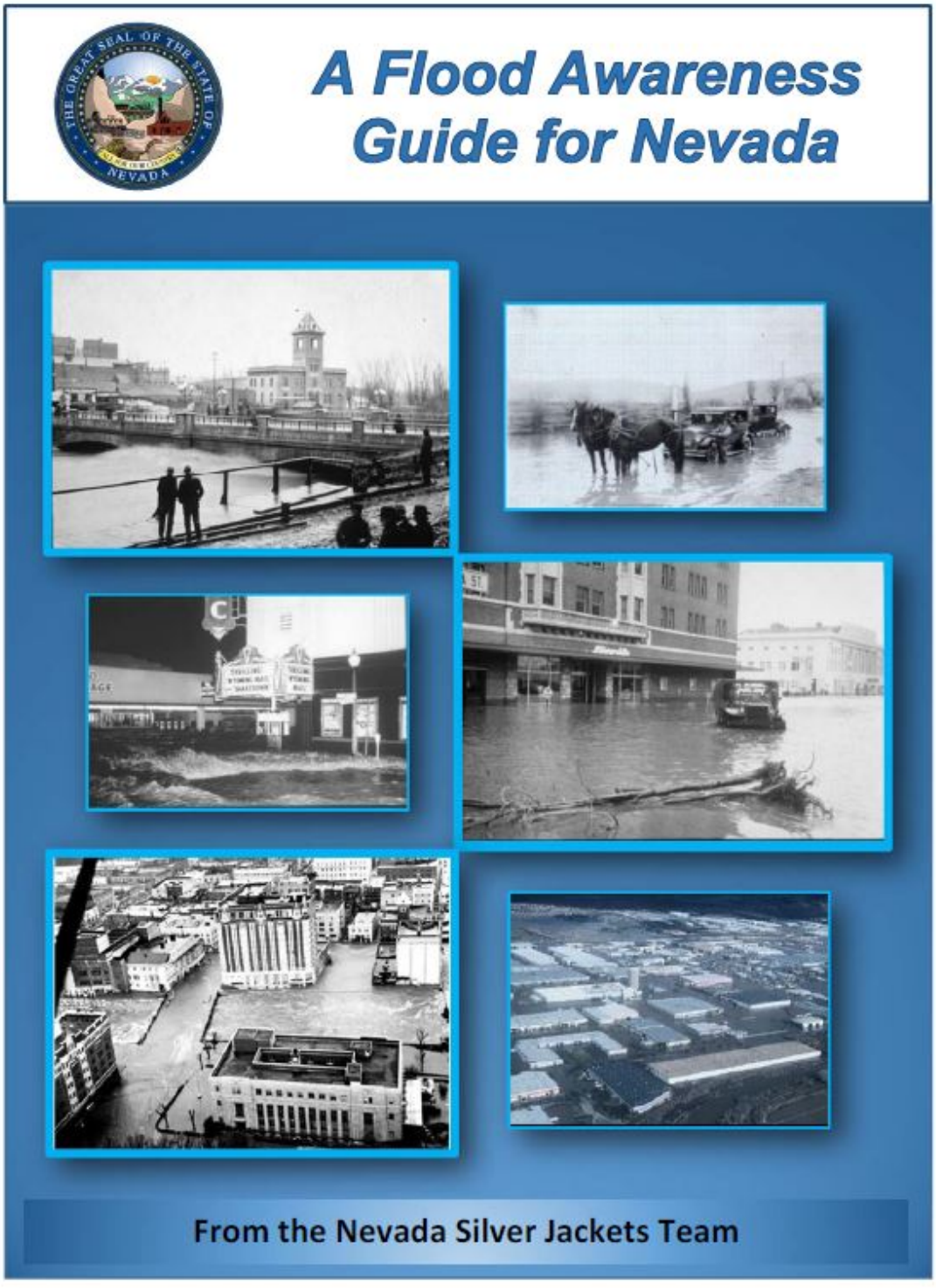
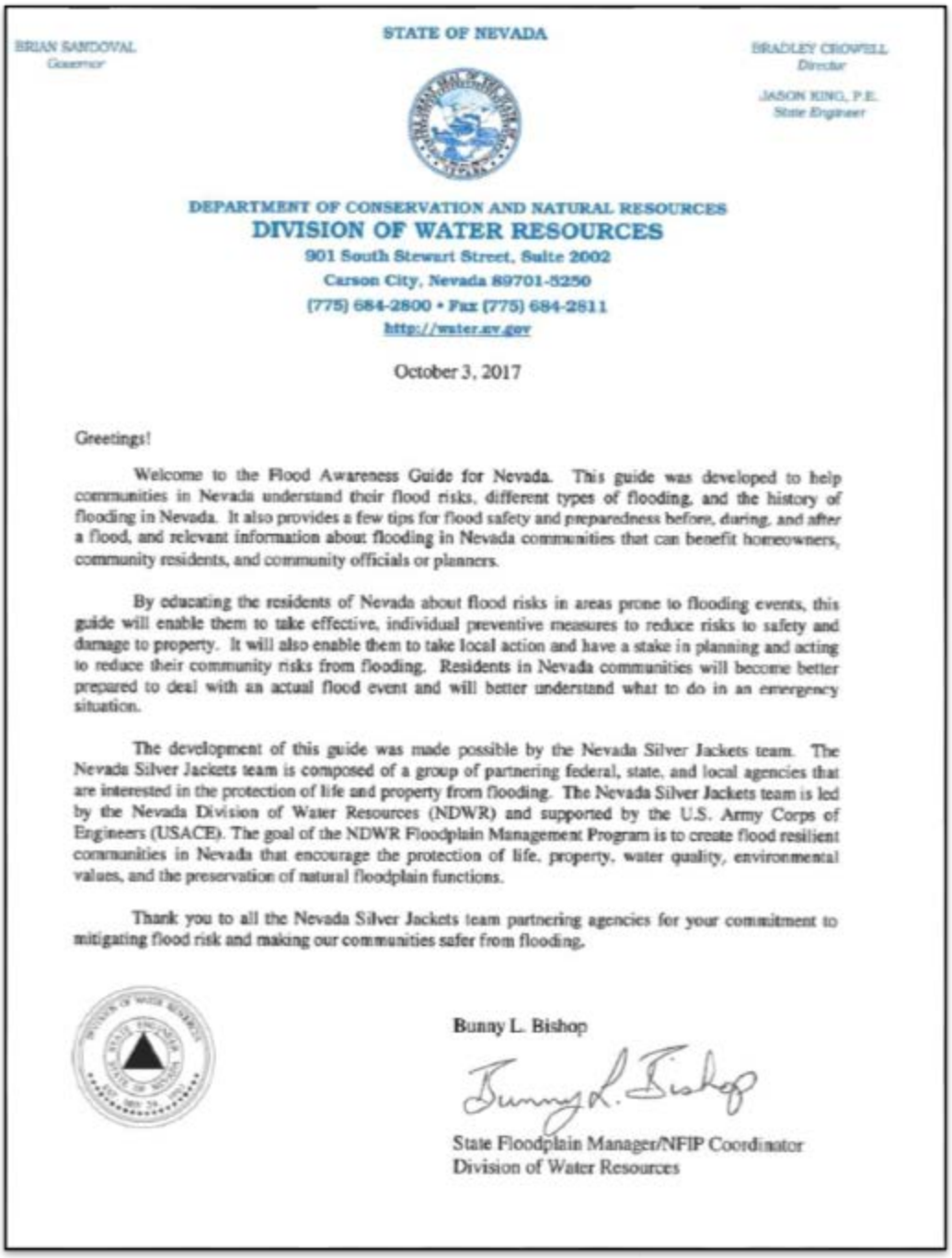


Figure P-23. The Nevada Flooding Booklet, published by the Nevada Silver Jackets team



STATE OF NEVADA

BRIAN SANDOVAL
Governor

BRADLEY CROWELL
Director

JASON KING, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WATER RESOURCES
901 South Stewart Street, Suite 2002
Carson City, Nevada 89701-5250
(775) 684-2800 • Fax (775) 684-2811
http://water.nv.gov

October 3, 2017

Greetings!

Welcome to the Flood Awareness Guide for Nevada. This guide was developed to help communities in Nevada understand their flood risks, different types of flooding, and the history of flooding in Nevada. It also provides a few tips for flood safety and preparedness before, during, and after a flood, and relevant information about flooding in Nevada communities that can benefit homeowners, community residents, and community officials or planners.

By educating the residents of Nevada about flood risks in areas prone to flooding events, this guide will enable them to take effective, individual preventive measures to reduce risks to safety and damage to property. It will also enable them to take local action and have a stake in planning and acting to reduce their community risks from flooding. Residents in Nevada communities will become better prepared to deal with an actual flood event and will better understand what to do in an emergency situation.

The development of this guide was made possible by the Nevada Silver Jackets team. The Nevada Silver Jackets team is composed of a group of partnering federal, state, and local agencies that are interested in the protection of life and property from flooding. The Nevada Silver Jackets team is led by the Nevada Division of Water Resources (NDWR) and supported by the U.S. Army Corps of Engineers (USACE). The goal of the NDWR Floodplain Management Program is to create flood resilient communities in Nevada that encourage the protection of life, property, water quality, environmental values, and the preservation of natural floodplain functions.

Thank you to all the Nevada Silver Jackets team partnering agencies for your commitment to mitigating flood risk and making our communities safer from flooding.

Bunny L. Bishop

State Floodplain Manager/NFIP Coordinator
Division of Water Resources

Figure P-23. Continued.

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Flooding in Nevada – Why Should I Care? 1
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Flood Myths 4
Types of Flooding in Nevada 6
Nevada Flood Chronology 13
What are the Risks of Living in a Floodplain? 17
Local Government Flood Planning Efforts 20
Key Flood Terms 25
Flood Safety and Preparedness 28
Who Can I Contact for Emergency Help Immediately Following a Flood? 33
Where Can I Get Additional Flood Recovery Assistance? 36
Acknowledgements 44



Figure P-23. Continued.

From: Meghan Collins [Meghan.Collins@dri.edu]
Sent: Tuesday, January 05, 2016 4:33 PM
To: Karen I. Johnson
Subject: Hazard Mitigation and Education

Hi Karen,

I am the Environmental Education Lead at the Desert Research Institute, and I am currently working on a NOAA grant on environmental literacy, adaptation, and using real DRI science in educational exercises. If funded, the grant will allow DRI and GreenPower to do education and outreach related to climate change, persistent drought, and other weather-related hazards. We are proposing several Green Boxes (travelling science kits), service learning projects, and a massive open online course. I have been looking at the Nevada Hazard Mitigation Plan, and I have been aligning some portions of our proposed programs to the recommendations therein.

I'm writing to see if DEM has any educational materials or tools that we could help to disseminate through this grant. Our projects would be a very strong platform to help educate the public about emergency management, and your tools and materials would be a good complement to the outreach that we are planning. I am happy to explain more about the project.

I am in the office until the 7th, after which I am on annual leave for about two weeks. It would be great to speak with you before then about this if you are interested.

Best,
Meghan Collins

Figure P-24. An email from the Desert Research Institute about aligning outreach programs to recommendations in the State Enhanced HMP.



Figure P-25. Flyers posted on Clark County Regional Flood Control District's Instagram page, highlighting a free app called "Flood Spot". The purpose of the app is to educate users about flood safety.



2016 Living With Fire (LWF) Program Activity Report

Program Materials Distributed

Publications – Out of print and only available online

LWF in the Big Sagebrush/Bitterbrush Environment (Publication #CM-02-05)
Online visits 383
DVD version (Publication #AV-04-01)
Online visits 267
Spanish version pub (Publication #CM-05-10)
Online visits 29
Spanish version DVD (Publication #AV-05-06)
Online visits 61

LWF in the Pinyon-Juniper Woodland (Publication #CM-03-01)
Online visits 329
DVD version (Publication #AV-04-09)
Online visits to DVD 263
Spanish version pub (Publication #CM-05-08)
Online visits 42
Spanish version DVD (Publication #AV-05-02)
Online visits 53

LWF in the Big Sagebrush/Grass Environment (Publication #CM-03-11)
Online visits 234
DVD version (Publication #AV-04-03)
Online visits 258
Spanish version pub (Publication #CM-05-09)
Online visits 21
Spanish version DVD (Publication #AV-05-04)
Online visits 67

LWF in the Mt. Charleston Area (Publication #CM-03-13)
Online visits 271
DVD version (Publication #AV-04-07)
Online visits 256
Spanish version pub (Publication #CM-05-12)
Online visits 22
Spanish version DVD (Publication #AV-05-10)
Online visits 66

Eastern Sierra Front Guide for the Homeowner (Publication #SP-05-07)
Online visits 385

Lake Tahoe Basin Guide for the Homeowner (Publication #SP-06-11)
Online visits 995

Great Basin Guide for the Homeowner (Publication #SP-06-12)
Online visits 396

Figure P-26. A page from Living With Fire's 2016 Activity Report, highlighting the number of program materials distributed.

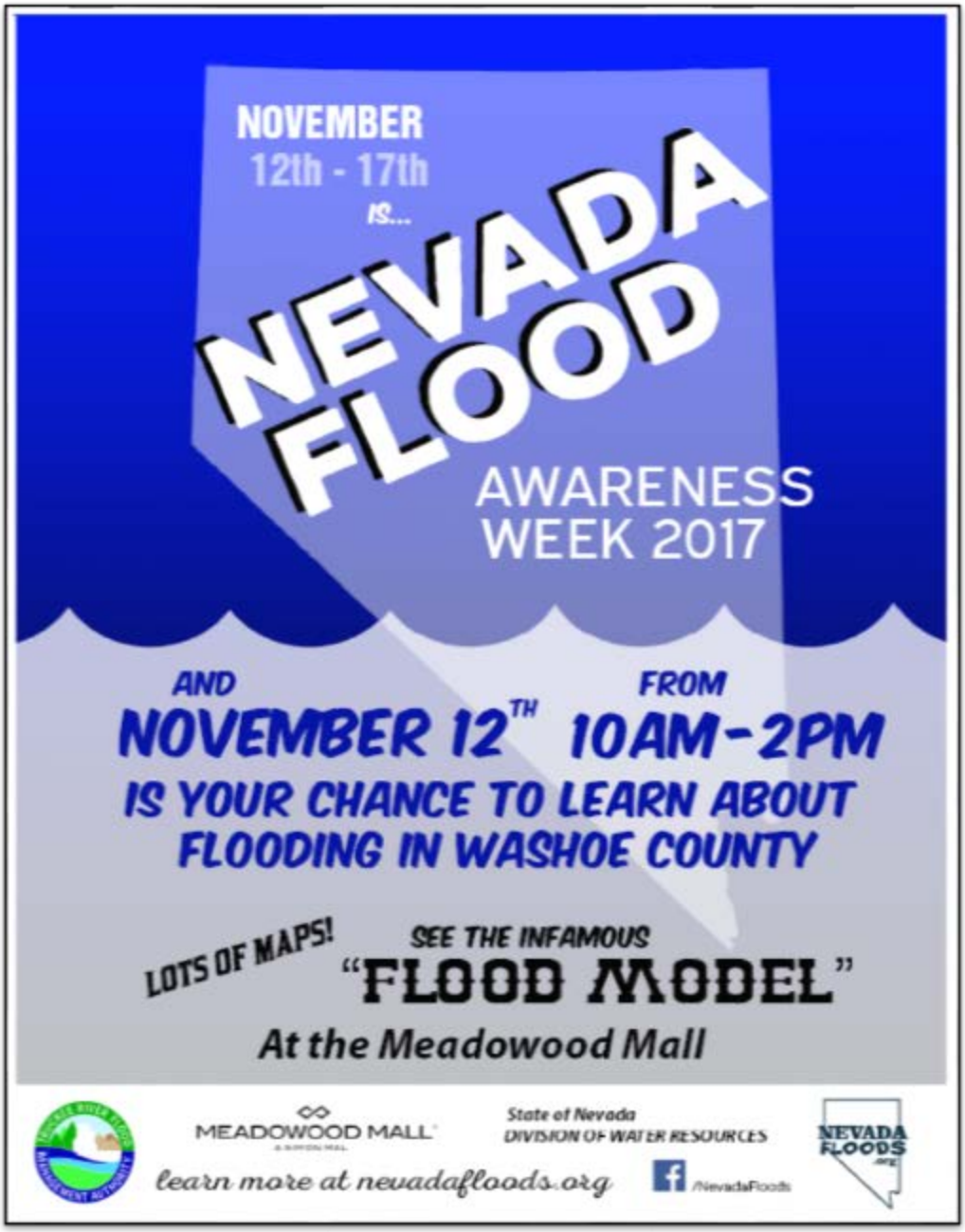


Figure P-27. A flyer posted on TRFMA's Facebook page, about a FAW event at Meadowood Mall in Reno.



Using Floods To Prevent Flood Damage In Nevada

By NOAH GLICK • APR 4, 2017

Tweet
Share
Google+
Email

A photo taken from a drone shows River Fork Ranch in Genoa, Nevada during February's flooding. The plains were designed to hold water rather than sending it downstream to Fallon.

JOHN HUMPHREY

Figure P-28. A screenshot of a story from an interview between Reno Public Radio and TRFMA, about ecosystem restoration and flood mitigation efforts along the Truckee River. To read or listen to the story, please see: http://trfma.org/2017/04/using-floods-to-prevent-flood-damage-in-nevada/

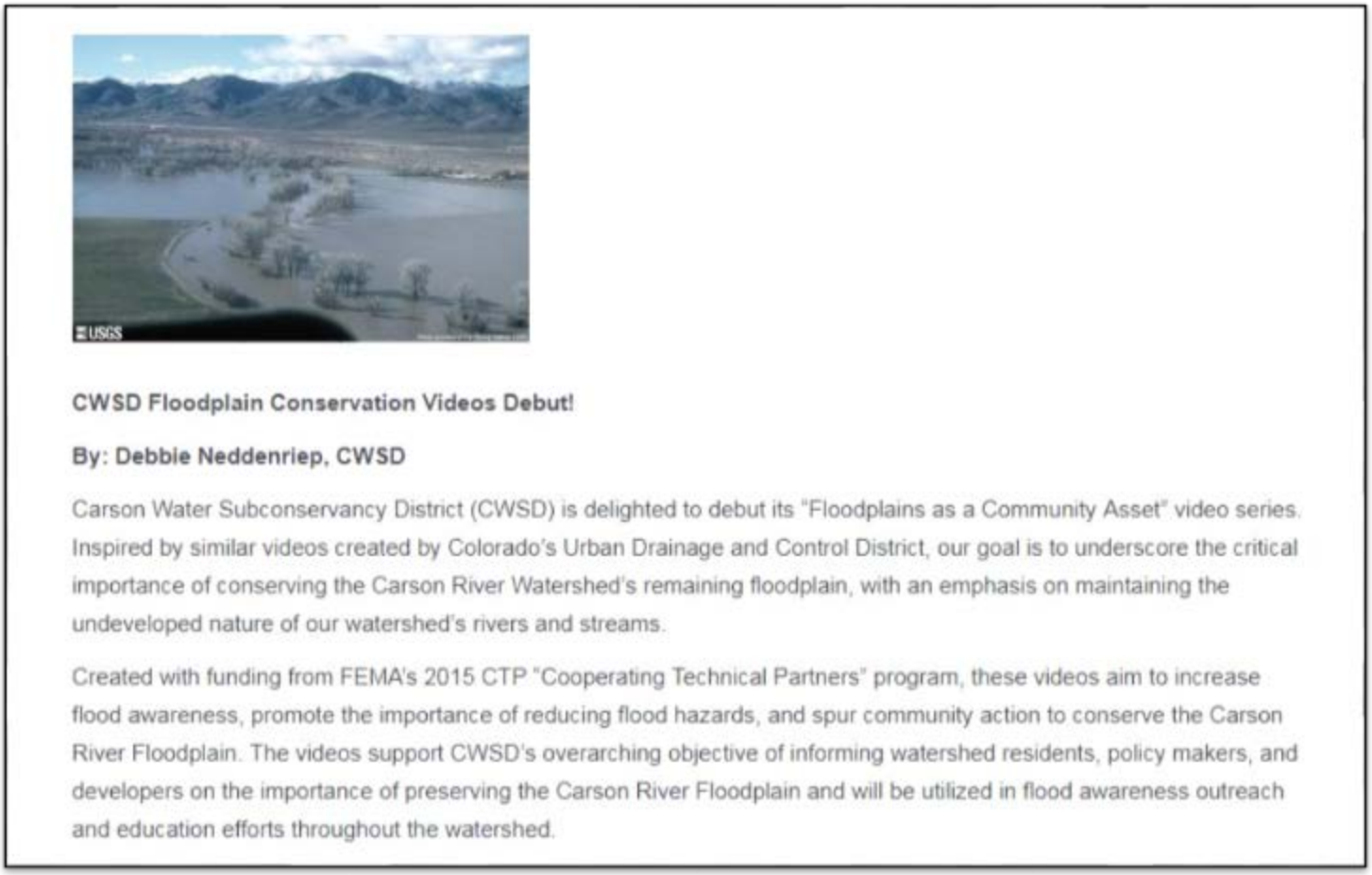
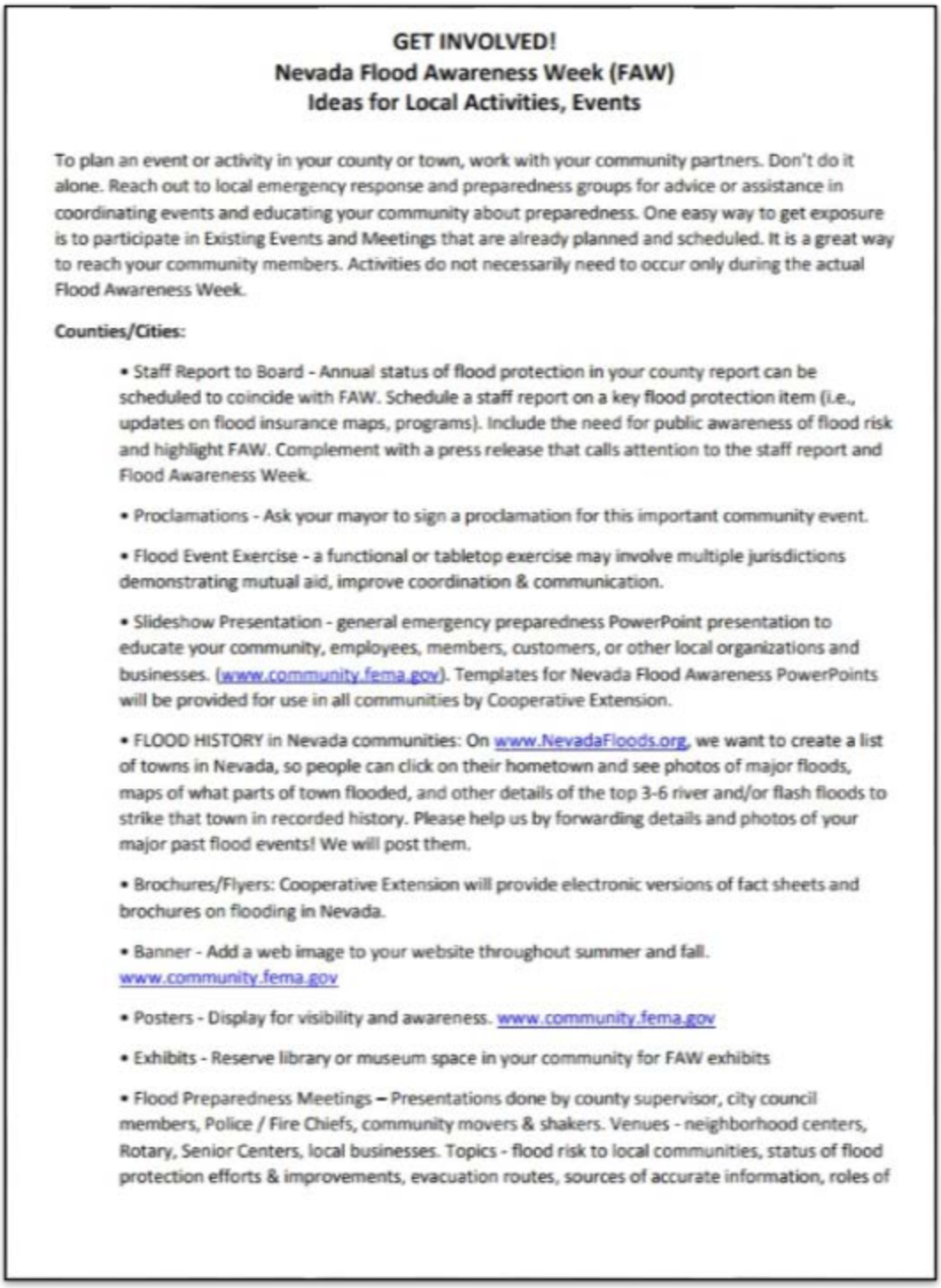


Figure P-29. A screenshot of an article about the debut of CWSD's floodplain conservation videos. In addition to discussing conservation, flood hazards and flood awareness is discussed. To view the videos, please see: https://www.youtube.com/channel/UC7gdKmh76lPiV_sgf1G-0nQ



GET INVOLVED!
Nevada Flood Awareness Week (FAW)
Ideas for Local Activities, Events

To plan an event or activity in your county or town, work with your community partners. Don't do it alone. Reach out to local emergency response and preparedness groups for advice or assistance in coordinating events and educating your community about preparedness. One easy way to get exposure is to participate in Existing Events and Meetings that are already planned and scheduled. It is a great way to reach your community members. Activities do not necessarily need to occur only during the actual Flood Awareness Week.

Counties/Cities:

- Staff Report to Board - Annual status of flood protection in your county report can be scheduled to coincide with FAW. Schedule a staff report on a key flood protection item (i.e., updates on flood insurance maps, programs). Include the need for public awareness of flood risk and highlight FAW. Complement with a press release that calls attention to the staff report and Flood Awareness Week.
- Proclamations - Ask your mayor to sign a proclamation for this important community event.
- Flood Event Exercise - a functional or tabletop exercise may involve multiple jurisdictions demonstrating mutual aid, improve coordination & communication.
- Slideshow Presentation - general emergency preparedness PowerPoint presentation to educate your community, employees, members, customers, or other local organizations and businesses. (www.community.fema.gov). Templates for Nevada Flood Awareness PowerPoints will be provided for use in all communities by Cooperative Extension.
- FLOOD HISTORY in Nevada communities: On www.NevadaFloods.org, we want to create a list of towns in Nevada, so people can click on their hometown and see photos of major floods, maps of what parts of town flooded, and other details of the top 3-6 river and/or flash floods to strike that town in recorded history. Please help us by forwarding details and photos of your major past flood events! We will post them.
- Brochures/Flyers: Cooperative Extension will provide electronic versions of fact sheets and brochures on flooding in Nevada.
- Banner - Add a web image to your website throughout summer and fall. www.community.fema.gov
- Posters - Display for visibility and awareness. www.community.fema.gov
- Exhibits - Reserve library or museum space in your community for FAW exhibits
- Flood Preparedness Meetings – Presentations done by county supervisor, city council members, Police / Fire Chiefs, community movers & shakers. Venues - neighborhood centers, Rotary, Senior Centers, local businesses. Topics - flood risk to local communities, status of flood protection efforts & improvements, evacuation routes, sources of accurate information, roles of

Figure P-30. An idea list for Nevada Flood Awareness Week, posted on Nevada Flood's website. To view the list online, please see: http://www.nevadafloods.org/docs/get_involved.pdf



Figure P-31. Events presented by the Sierra Avalanche Center, posted on their Facebook page



Figure P-32. An Avalanche Safety Presentation by the Sierra Avalanche Center, posted on their Facebook page

Education Provider	Classes offered	Locations
Know Before You Go	Avalanche Awareness	Donner Summit - Truckee - North Lake Tahoe | Mt. Rose Area | South Lake Tahoe - Kirkwood - Gardnerville | Bear Valley Area | Bay Area | Reno
Avalanche.org	Avalanche Awareness |	Online |
Mountain Adventure Seminars	Avalanche Awareness | Refresher | Level 1 | Level 2 |	Bear Valley Area | Bay Area |
REI	Avalanche Awareness	
NASTC - North American Ski Training Center	Level 1 | Level 2 | Level 3 |	Donner Summit - Truckee - North Lake Tahoe |
Alpenglow Expeditions	Avalanche Awareness | Refresher | Level 1	Donner Summit - Truckee - North Lake Tahoe
Free Avalanche Transclever Workshops	Avalanche Awareness	Donner Summit - Truckee - North Lake Tahoe
National Avalanche Center	Avalanche Awareness |	Online |
Tahoe Mountain School	Avalanche Awareness | Refresher | Level 1 | Level 2	Donner Summit - Truckee - North Lake Tahoe
Donner Summit Avalanche Seminars	Avalanche Awareness | Refresher | Level 1 | Level 2 |	Donner Summit - Truckee - North Lake Tahoe | Mt. Rose Area |
Backcountry Babes	Level 1 | Level 2	Donner Summit - Truckee - North Lake Tahoe
Expedition Kirkwood	Avalanche Awareness | Level 1 | Level 2 |	South Lake Tahoe - Kirkwood - Gardnerville |
SAFE-AS	Avalanche Awareness	Donner Summit - Truckee - North Lake Tahoe
Eldorado Nordic Ski Patrol	Avalanche Awareness	
Squaw Valley Avalanche Offerings	Avalanche Awareness | Level 1	Donner Summit - Truckee - North Lake Tahoe
Alpine Skills International	Avalanche Awareness | Refresher | Level 1 | Level 2 | Level 3	Donner Summit - Truckee - North Lake Tahoe
Outdoor Adventure Club	Refresher | Level 1 | Level 2	
Lake Tahoe Community College	Avalanche Awareness | Level 1 | Level 2 |	South Lake Tahoe - Kirkwood - Gardnerville |
Sierra Mountain Guides	Refresher | Level 1 | Level 2	

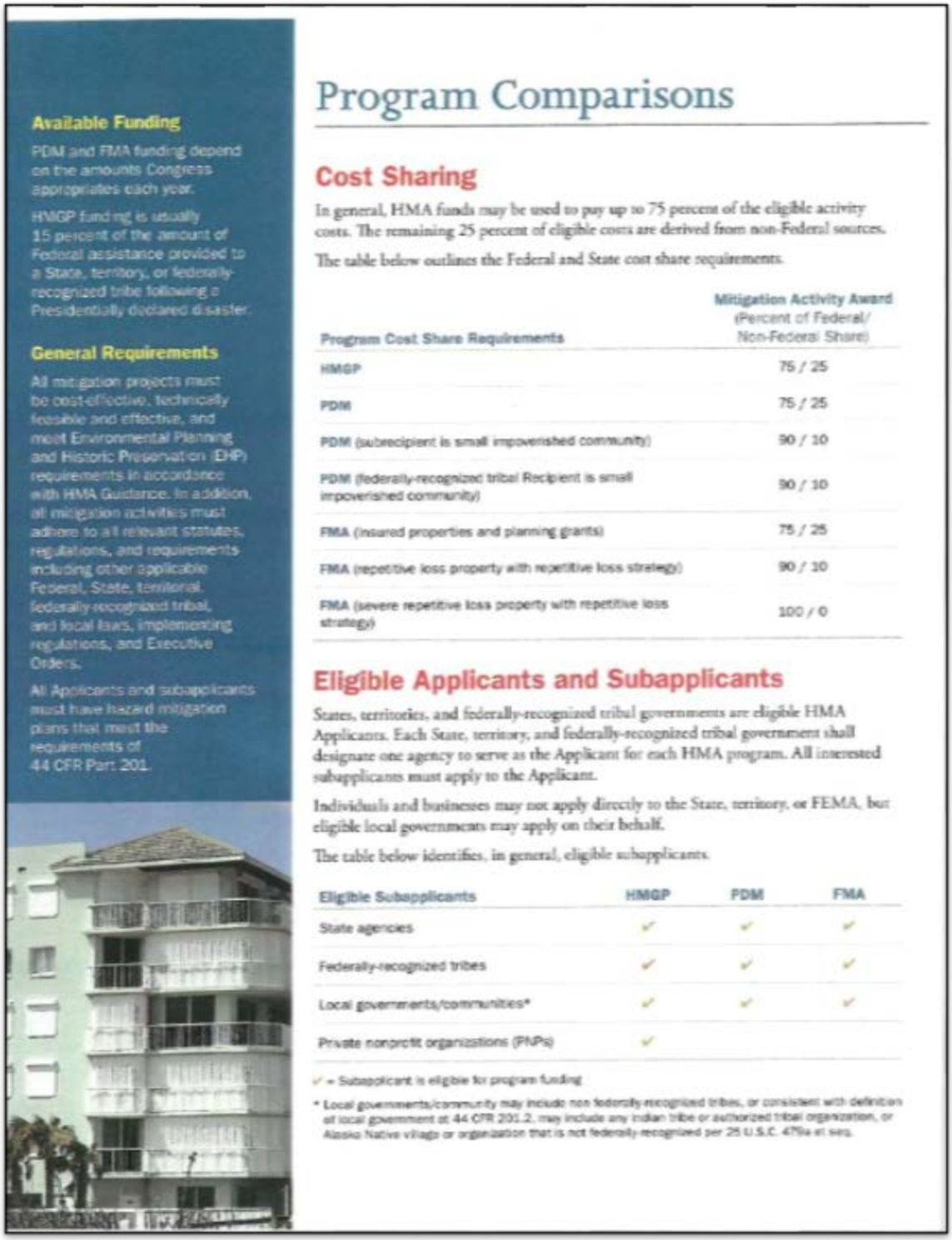
Figure P-33. A table posted on Sierra Avalanche Center's website, listing avalanche awareness courses. https://www.sierraavalanchecenter.org/education



Figure P-34. A flyer posted on NDOT's Facebook page, notifying the public of the Great Nevada Shakeout



Figure P-35. A flyer describing FEMA's HM Assistance Grant Programs



Available Funding

PDM and FMA funding depend on the amounts Congress appropriates each year.

HMGP funding is usually 15 percent of the amount of Federal assistance provided to a State, territory, or federally-recognized tribe following a Presidentially declared disaster.

General Requirements

All mitigation projects must be cost-effective, technically feasible and effective, and meet Environmental Planning and Historic Preservation (EHP) requirements in accordance with HMA Guidance. In addition, all mitigation activities must adhere to all relevant statutes, regulations, and requirements including other applicable Federal, State, territorial, federally-recognized tribal, and local laws, implementing regulations, and Executive Orders.

All Applicants and subapplicants must have hazard mitigation plans that meet the requirements of 44 CFR Part 201.

Program Comparisons

Cost Sharing

In general, HMA funds may be used to pay up to 75 percent of the eligible activity costs. The remaining 25 percent of eligible costs are derived from non-Federal sources.

The table below outlines the Federal and State cost share requirements.

Program Cost Share Requirements	Mitigation Activity Award (Percent of Federal/ Non-Federal Share)
HMGP	75 / 25
PDM	75 / 25
PDM (subrecipient is small impoverished community)	90 / 10
PDM (federally-recognized tribal Recipient is small impoverished community)	90 / 10
FMA (insured properties and planning grants)	75 / 25
FMA (repetitive loss property with repetitive loss strategy)	90 / 10
FMA (severe repetitive loss property with repetitive loss strategy)	100 / 0

Eligible Applicants and Subapplicants

States, territories, and federally-recognized tribal governments are eligible HMA Applicants. Each State, territory, and federally-recognized tribal government shall designate one agency to serve as the Applicant for each HMA program. All interested subapplicants must apply to the Applicant.

Individuals and businesses may not apply directly to the State, territory, or FEMA, but eligible local governments may apply on their behalf.

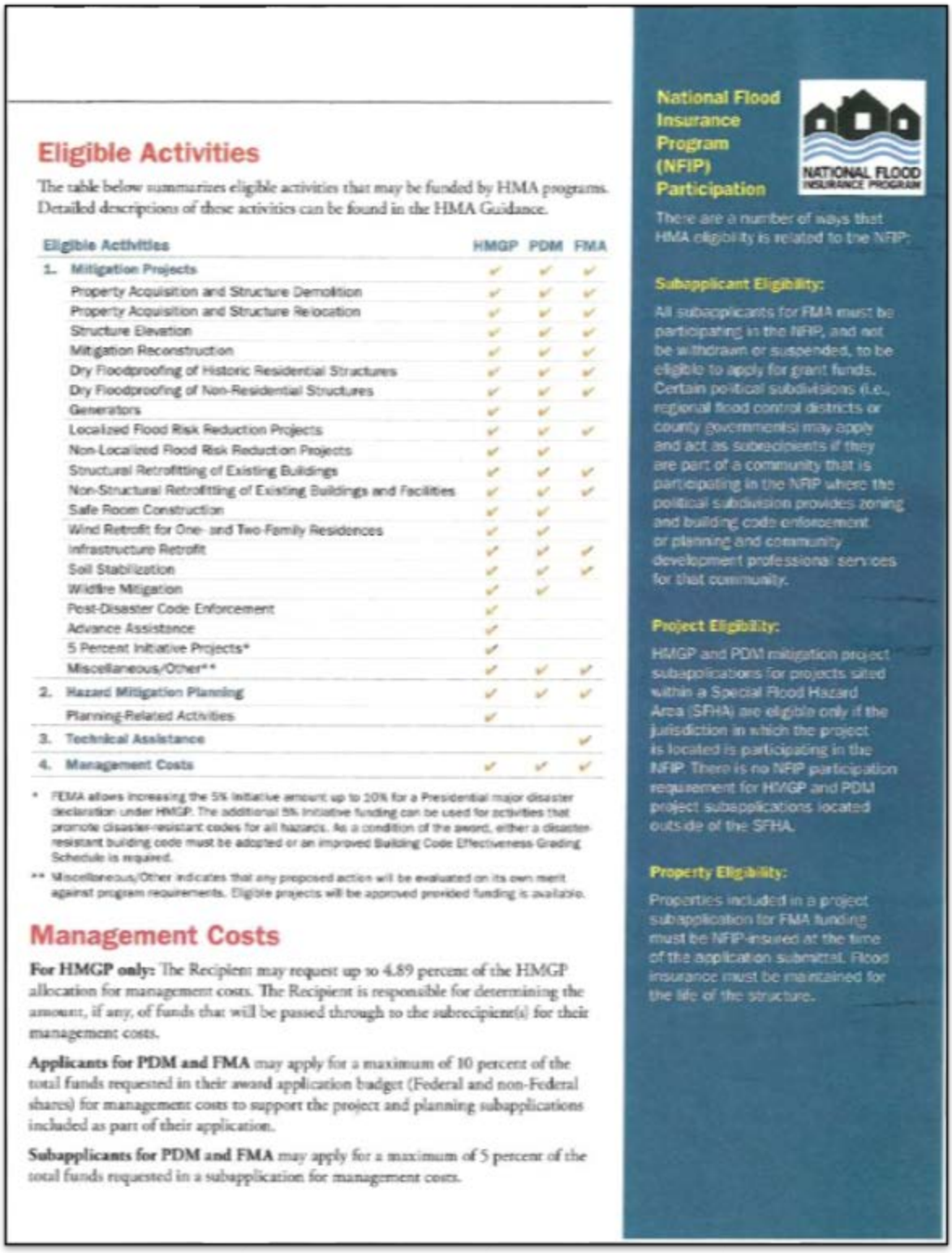
The table below identifies, in general, eligible subapplicants.

Eligible Subapplicants	HMGP	PDM	FMA
State agencies	✓	✓	✓
Federally-recognized tribes	✓	✓	✓
Local governments/communities*	✓	✓	✓
Private nonprofit organizations (PNPs)	✓		

✓ = Subapplicant is eligible for program funding

* Local governments/community may include non federally-recognized tribes, or consistent with definition of local government at 44 CFR 201.2, may include any Indian tribe or authorized tribal organization, or Alaska Native village or organization that is not federally-recognized per 25 U.S.C. 479a et seq.

Figure P-35. Continued



Eligible Activities

The table below summarizes eligible activities that may be funded by HMA programs. Detailed descriptions of these activities can be found in the HMA Guidance.

Eligible Activities	HMGP	PDM	FMA
1. Mitigation Projects	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓
Generators	✓	✓	
Localized Flood Risk Reduction Projects	✓	✓	✓
Non-Localized Flood Risk Reduction Projects	✓	✓	
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-Structural Retrofitting of Existing Buildings and Facilities	✓	✓	✓
Safe Room Construction	✓	✓	
Wind Retrofit for One- and Two-Family Residences	✓	✓	
Infrastructure Retrofit	✓	✓	✓
Soil Stabilization	✓	✓	✓
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
Advance Assistance	✓		
5 Percent Initiative Projects*	✓		
Miscellaneous/Other**	✓	✓	✓
2. Hazard Mitigation Planning	✓	✓	✓
Planning-Related Activities	✓		
3. Technical Assistance			✓
4. Management Costs	✓	✓	✓

* FEMA allows increasing the 5% initiative amount up to 10% for a Presidential major disaster declaration under HMGP. The additional 5% initiative funding can be used for activities that promote disaster-resistant codes for all hazards. As a condition of the award, either a disaster-resistant building code must be adopted or an improved Building Code Effectiveness Grading Schedule is required.

** Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects will be approved provided funding is available.

Management Costs

For HMGP only: The Recipient may request up to 4.89 percent of the HMGP allocation for management costs. The Recipient is responsible for determining the amount, if any, of funds that will be passed through to the subrecipient(s) for their management costs.

Applicants for PDM and FMA may apply for a maximum of 10 percent of the total funds requested in their award application budget (Federal and non-Federal shares) for management costs to support the project and planning subapplications included as part of their application.

Subapplicants for PDM and FMA may apply for a maximum of 5 percent of the total funds requested in a subapplication for management costs.

National Flood Insurance Program (NFIP) Participation

There are a number of ways that HMA eligibility is related to the NFIP:

Subapplicant Eligibility:

All subapplicants for FMA must be participating in the NFIP, and not be withdrawn or suspended, to be eligible to apply for grant funds. Certain political subdivisions (i.e., regional flood control districts or county governments) may apply and act as subrecipients if they are part of a community that is participating in the NFIP where the political subdivision provides zoning and building code enforcement or planning and community development professional services for that community.

Project Eligibility:

HMGP and PDM mitigation project subapplications for projects sited within a Special Flood Hazard Area (SFHA) are eligible only if the jurisdiction in which the project is located is participating in the NFIP. There is no NFIP participation requirement for HMGP and PDM project subapplications located outside of the SFHA.

Property Eligibility:

Properties included in a project subapplication for FMA funding must be NFIP-insured at the time of the application submittal. Flood insurance must be maintained for the life of the structure.

Figure P-35. continued



Figure P-36. A flyer posted on NWS-Reno's Facebook page for Nevada Flood Awareness Week.



Figure P-37. A flyer posted on Nevada Inter-Tribal Emergency Response Commission's Facebook page, about the Nevada Network of Fire Adapted Communities' 2015 second annual conference.

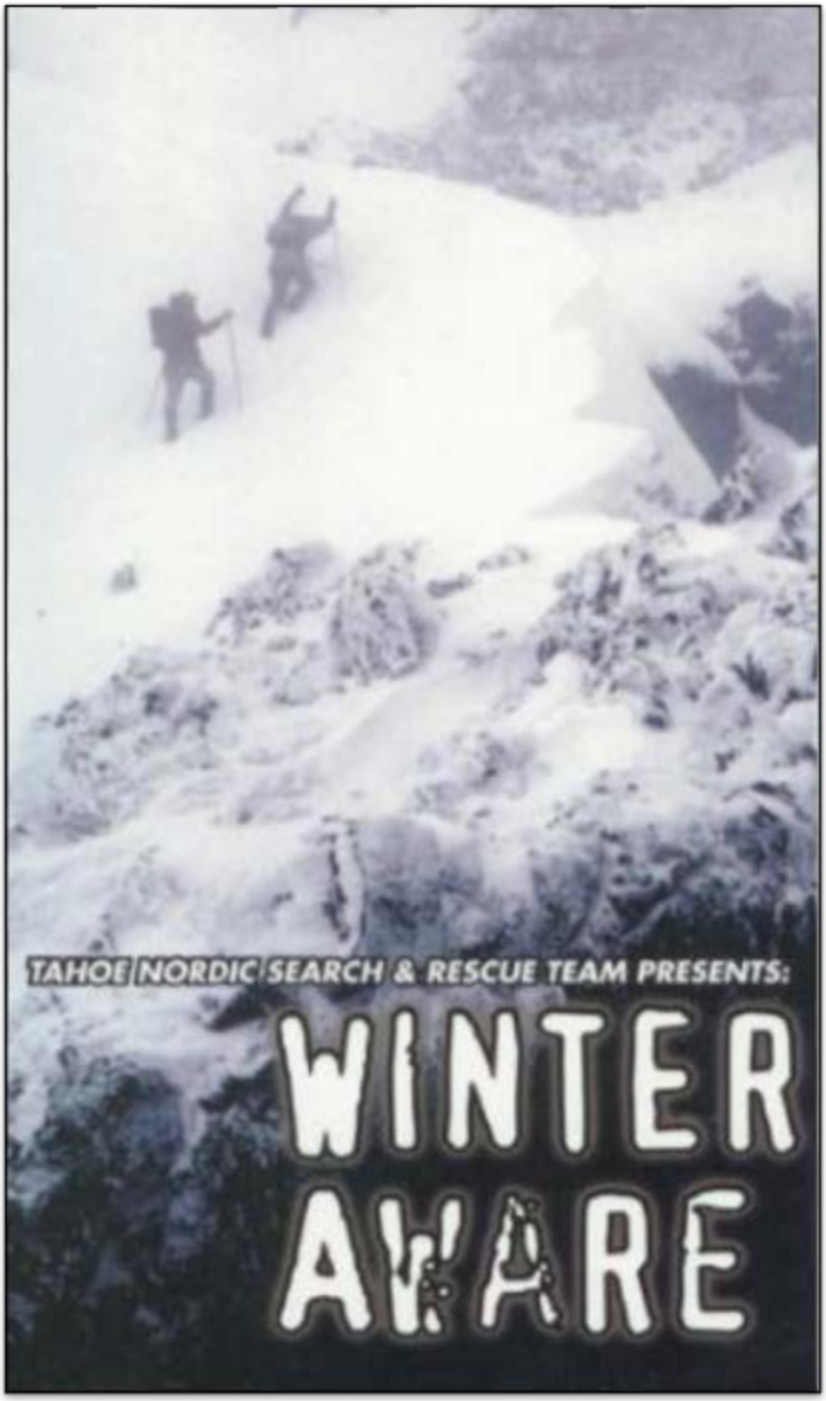


Figure P-38. Winter Aware, a video presented by the Tahoe Nordic Search and Rescue. To view more details on the video, and information on where to obtain a free copy, see: http://www.tahoenordicsar.com/Education/WinterAware.shtml

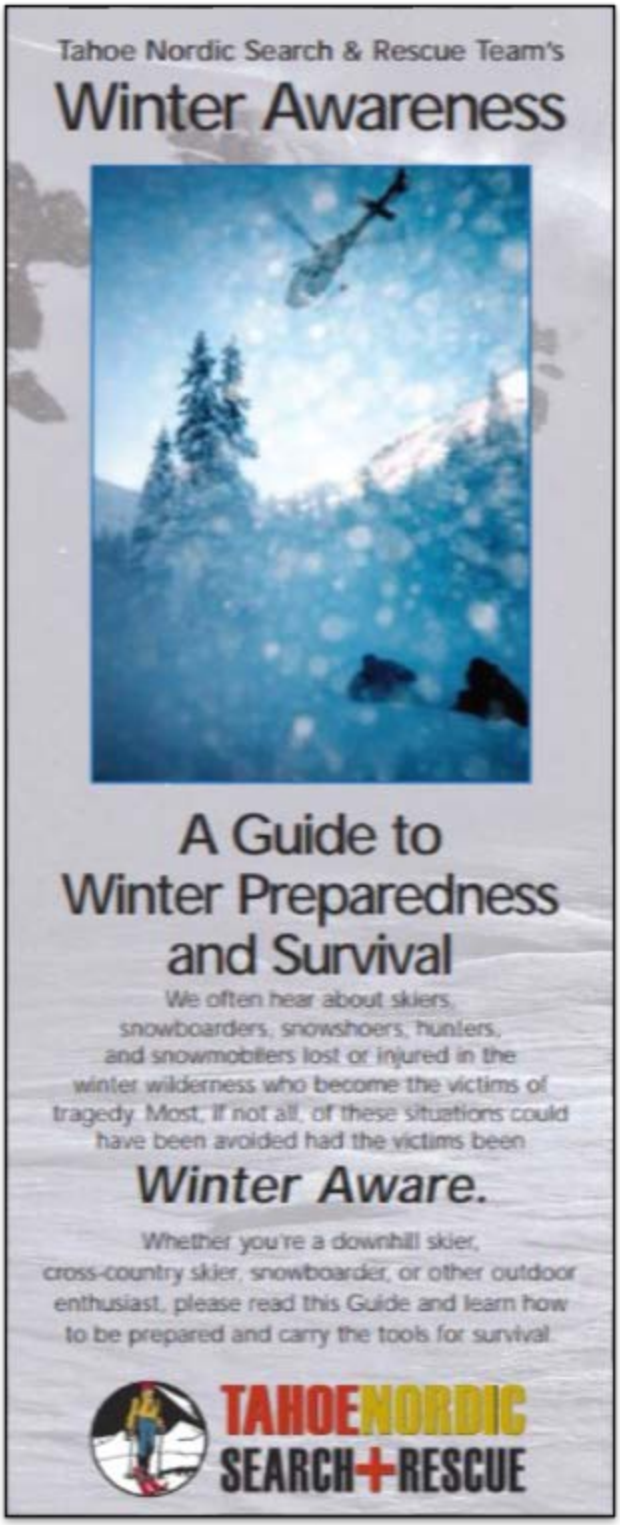


Figure P- 39. Tahoe Nordic SAR's Winter Awareness Guide. The guide is available online at http://www.tahoenordicsar.com/TSARsml.pdf



Figure P-40. A flyer for a snowmobile avalanche awareness clinic, posted on Sierra Avalanche Center's Facebook page.



Figure P-41. A flyer posted on Southern Nevada Water Authority's Facebook page, about their Water Smart Landscapes Program.

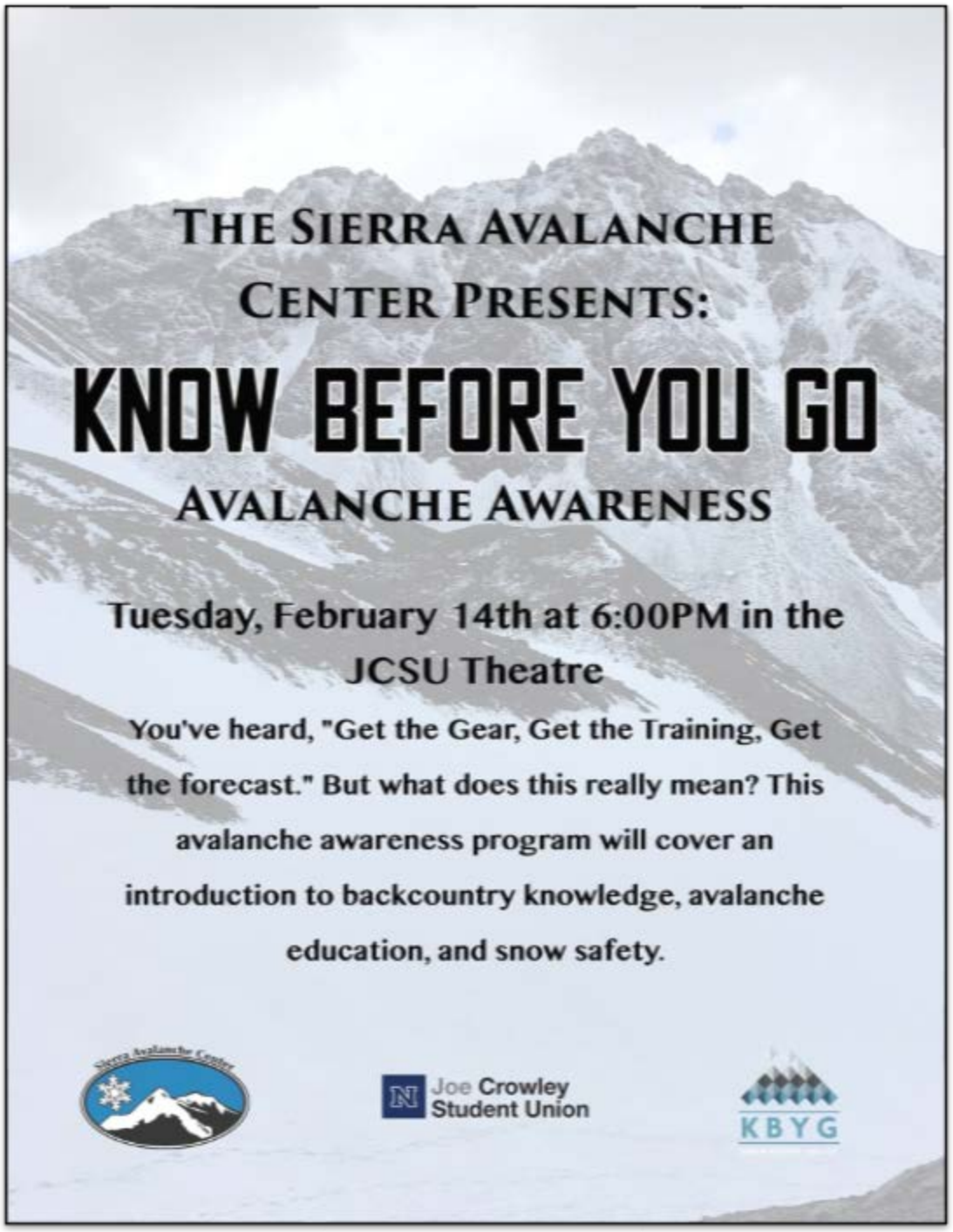


Figure P-42. A flyer for an avalanche awareness event, posted on Sierra Avalanche Center's Facebook page

BRIAN SANDOVAL
Governor

LEO M. DROZDOFF, P.E.
Director

KAY SCHERER
Deputy Director

State of Nevada
Department of Conservation and Natural Resources
Office of the Director
Richard H. Bryan Building
901 S. Stewart Street, Suite 1003
Carson City, Nevada 89701-5244
Telephone (775) 684-2700
Facsimile (775) 684-2715
www.dcnr.nv.gov

Division of Environmental Protection
Division of Forestry
Division of State Lands
Division of State Parks
Division of Water Resources
Conservation Districts Program
Natural Heritage Program
State Historic Preservation Office

STATE OF NEVADA
Department of Conservation and Natural Resources

FOR IMMEDIATE RELEASE
CONTACT: JoAnn Kittrell, *jkittrell@dcnr.nv.gov*, 775-684-2712

Governor to kick-off Flood Awareness Campaign on Friday, October 10

CARSON CITY, NV – A campaign to increase flood awareness and the need to be prepared will kick off at 10:00 a.m. Friday, October 10, at the West Street Plaza in Reno. The public is invited to attend the event that will, after an opening flag ceremony by the Nevada National Guard, include comments from Governor Brian Sandoval, Sparks Mayor Gino Martini, the National Weather Service's Chris Smallcomb, Kevin Dick from the Washoe County Health Department and Farley Howell from FEMA. In addition, the Nevada Community Emergency Response Team (NVCERT) will follow with a demonstration on how to fill and use sandbags.

"In Northern Nevada, our biggest floods occur during the winter. Historically, Nevada's northern Rivers flood about every 10 to 15 years. Recently, we have been reminded that flash flooding can occur at any time. Knowing what to do before, during and after a flood can save lives, protect pets and help minimize property damage," says Rob Palmer, Nevada's Floodplain Manager.

The awareness campaign will culminate with Northern Nevada's Flood Awareness Week, November 10-15. Agencies, organizations and residents are encouraged to participate in educational and outreach activities that are scheduled during the week. Information on how to become involved and other critical preparedness information can be found at *www.NevadaFloods.org*.

###

Figure P-43. A press release for a Flood Awareness Campaign.



State of Nevada

Executive Department

A Proclamation by the Governor

WHEREAS, flooding creates emergencies of great concern to the State of Nevada, with an imminent threat to life and property, as well as the potential for hundreds of millions of dollars in damage to homes, businesses and local government infrastructure; and

WHEREAS, since 1955 Nevada has received 15 presidential disaster declarations for flooding; and

WHEREAS, Nevadans are able to reduce their risk by taking actions to prepare for floods, and in turn help make our communities safer and more damage resistant; and

WHEREAS, Nevada communities are able to reduce flood damage through floodplain management; and

WHEREAS, the multi-entity Nevada Flood Awareness Committee was formed to raise awareness among Nevadans and provide information about floods, flood awareness, and flood insurance;

NOW, THEREFORE, I, BRIAN SANDOVAL, GOVERNOR OF THE STATE OF NEVADA, do hereby proclaim November 10-15, 2014, as

NEVADA FLOOD AWARENESS WEEK

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Nevada to be affixed at the State Capitol in Carson City, this 23rd day of September, 2014

By the Governor — Governor

Secretary of State

By _____ Deputy

Figure P-44. Nevada Flood Awareness Week proclamation.



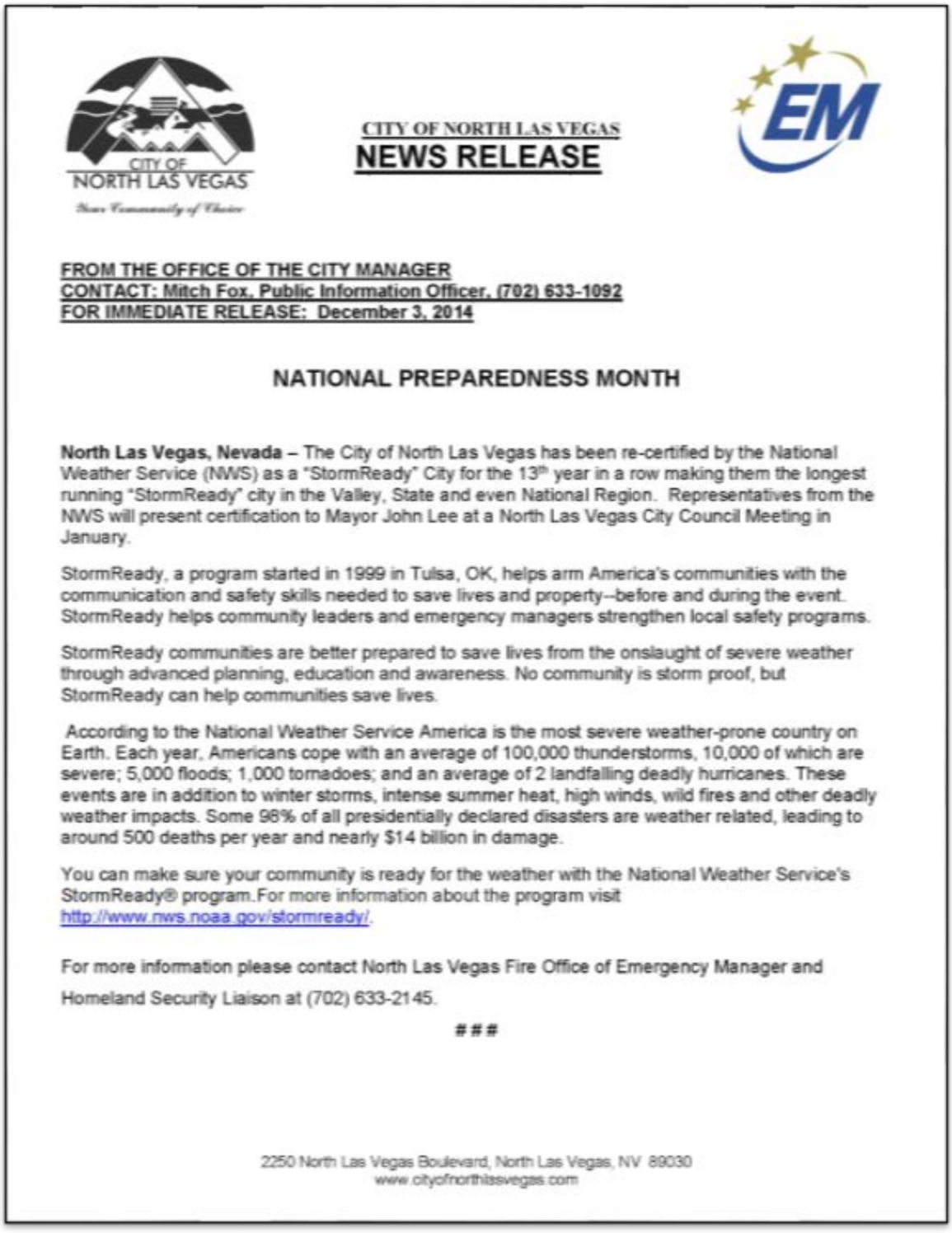
Figure P-45. A flyer describing the City of North Las Vegas's participation in National Preparedness Month 2014.



Figure P-46. A flyer describing the City of North Las Vegas's participation in National Preparedness Month 2015.



Figure P- 47. A flyer describing the City of North Las Vegas's participation in National Preparedness Month 2017.



CITY OF NORTH LAS VEGAS
NEWS RELEASE

FROM THE OFFICE OF THE CITY MANAGER
CONTACT: Mitch Fox, Public Information Officer, (702) 633-1092
FOR IMMEDIATE RELEASE: December 3, 2014

NATIONAL PREPAREDNESS MONTH

North Las Vegas, Nevada – The City of North Las Vegas has been re-certified by the National Weather Service (NWS) as a "StormReady" City for the 13th year in a row making them the longest running "StormReady" city in the Valley, State and even National Region. Representatives from the NWS will present certification to Mayor John Lee at a North Las Vegas City Council Meeting in January.

StormReady, a program started in 1999 in Tulsa, OK, helps arm America's communities with the communication and safety skills needed to save lives and property--before and during the event. StormReady helps community leaders and emergency managers strengthen local safety programs.

StormReady communities are better prepared to save lives from the onslaught of severe weather through advanced planning, education and awareness. No community is storm proof, but StormReady can help communities save lives.

According to the National Weather Service America is the most severe weather-prone country on Earth. Each year, Americans cope with an average of 100,000 thunderstorms, 10,000 of which are severe; 5,000 floods; 1,000 tornadoes; and an average of 2 landfalling deadly hurricanes. These events are in addition to winter storms, intense summer heat, high winds, wild fires and other deadly weather impacts. Some 98% of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage.

You can make sure your community is ready for the weather with the National Weather Service's StormReady® program.For more information about the program visit http://www.nws.noaa.gov/stormready/.

For more information please contact North Las Vegas Fire Office of Emergency Manager and Homeland Security Liaison at (702) 633-2145.

###

2250 North Las Vegas Boulevard, North Las Vegas, NV 89030
www.cityofnorthlasvegas.com

Figure P-48. A news release about National Preparedness Month.



Figure P-49. A flyer describing the City of North Las Vegas's participation in the Great Shakeout 2015.



Figure P-50. A flyer describing the City of North Las Vegas's participation in the Great Shakeout 2017.



Figure P-51. A certificate of recognition for the City of North Las Vegas regarding their participation in NOAA's Weather Ready Nation program.

Table Q-1. Nevada Ditches from:
http://nevada.hometownlocator.com/features/cultural,class,canal,startrow,1.cfm

Canal/Ditch Name	County	Topographic Quadrangle Name
	CARSON CITY	
Mexican Ditch	Carson City (city)	New Empire
	CHURCHILL	
A Line Canal	Churchill	Fallon
Baily Drain	Churchill	Stillwater
Branch 5 Drain	Churchill	Grimes Point
Branch One Drain	Churchill	Indian Lakes
Carson Lake 1 Drain	Churchill	South of Fallon
Carson Lake A1 Extension Drain	Churchill	South of Fallon
Carson Lake Drain	Churchill	Grimes Point
D 3 Canal	Churchill	Indian Lakes
D Canal	Churchill	Grimes Point
D Line Canal	Churchill	Indian Lakes
E Line Canal	Churchill	Fallon
East Canal	Churchill	Foxtail Lake
East Lee Drain	Churchill	Carson Lake
Erb Drain	Churchill	Soda Lake East
F 2 Drain	Churchill	Indian Lakes
G 3 Canal	Churchill	South of Fallon
G Line Canal	Churchill	South of Fallon
G Line Drain	Churchill	South of Fallon
G Line Extension Drain	Churchill	South of Fallon
Goose Lake Bypass	Churchill	Foxtail Lake
Grimes Slough	Churchill	Grimes Point
Grimes Slough Extension	Churchill	Grimes Point
Gummow Drain	Churchill	Fallon
Harmon Drain	Churchill	Grimes Point
Harmon Number One Drain	Churchill	Grimes Point
Hazen Drain	Churchill	Hazen
Hunter Drain	Churchill	Foxtail Lake
Kent Drain	Churchill	Stillwater
Kent Lake Drain	Churchill	Stillwater
KX Lateral Canal	Churchill	Hazen
L 12 Canal	Churchill	Grimes Point
L 3 Drain	Churchill	Grimes Point
L D Drain	Churchill	Fallon
L Drain	Churchill	Grimes Point
L Line Canal	Churchill	Fallon

Canal/Ditch Name	County	Topographic Quadrangle Name
L2 Drain	Churchill	Fallon
Lead Bypass Canal	Churchill	Stillwater
Lead Lake Canal	Churchill	Foxtail Lake
Lower Diagonal Drain	Churchill	Lahontan Mountains
Lower Diagonal Number 1 Drain	Churchill	Grimes Point
Lower Humboldt Drain	Churchill	Ocala
Lower Soda Lake Drain	Churchill	Soda Lake East
Mills Drain	Churchill	Fallon
Mussi Drain	Churchill	Indian Lakes
N Line Canal	Churchill	Sheckler Reservoir
New River Drain	Churchill	Grimes Point
New River Extension Branch Drain	Churchill	Fallon
Norton Drain	Churchill	Stillwater
O Line Canal	Churchill	Indian Lakes
Paiute Diversion Drain	Churchill	Stillwater
Paiute Drain	Churchill	Stillwater
Patrick Drain	Churchill	Stillwater
Pierson Slough	Churchill	Carson Lake
Ponte Drain	Churchill	Soda Lake East
R Drain	Churchill	Soda Lake East
R Line Canal	Churchill	Grimes Point
Rice Ditch	Churchill	Carson Lake
Rock Dam Ditch	Churchill	Lahontan Dam
Rock Dam Ditch Number 1	Churchill	Lahontan Dam
S 2 Canal	Churchill	Stillwater
S 5 A Drain	Churchill	Stillwater
S 5 Canal	Churchill	Indian Lakes
S 7 Canal	Churchill	Grimes Point
S Line Canal	Churchill	Grimes Point
Shaffner Branch	Churchill	Indian Lakes
Shaffner Drain	Churchill	Indian Lakes
Sheckler 1 Drain	Churchill	Fallon
Sheckler Drain	Churchill	Fallon
Sky Lateral	Churchill	Lahontan Dam
Soda Lake Drain	Churchill	Soda Lake East
S-One Canal	Churchill	Grimes Point
South Upper Soda Lake Drain	Churchill	Fallon
Stillwater Point Reservoir Diversion Canal	Churchill	Lahontan Mountains
Stillwater Slough Cutoff	Churchill	Stillwater
S-Two Canal	Churchill	Grimes Point

Canal/Ditch Name	County	Topographic Quadrangle Name
Swope Drain	Churchill	Stillwater
T Line Canal	Churchill	Soda Lake East
Thoma Drain	Churchill	Fallon
UID Drain	Churchill	Soda Lake East
Upper Paiute Drain	Churchill	Indian Lakes
Upper Paiute Number Two	Churchill	Stillwater
Upper Soda Lake 1 Drain	Churchill	Fallon
Upper Soda Lake Drain	Churchill	Fallon
Upper West Side Drain	Churchill	Sheckler Reservoir
V Line Canal	Churchill	Sheckler Reservoir
Vencill Drain	Churchill	Indian Lakes
Wade Drain	Churchill	Soda Lake East
West Canal	Churchill	Foxtail Lake
West Carson Lake Drain	Churchill	South of Fallon
West Lee Drain	Churchill	Carson Lake
Westside Drain	Churchill	Fallon
Winsett Drain	Churchill	Lahontan Mountains
	CLARK	
Boulder City Lateral	Clark	Boulder Beach
Bunkerville Ditch	Clark	Mesquite
Henderson Lateral	Clark	Henderson
Las Vegas Valley Lateral	Clark	Henderson
	DOUGLAS	
Allerman Canal	Douglas	Gardnerville
Big Ditch	Douglas	Minden
Edna Wilslef Ditch	Douglas	Gardnerville
Falke and Tillman Ditch	Douglas	Carters Station
Fredericksburg Ditch	Douglas	Woodfords
Heise Company Ditch	Douglas	Minden
Heyburn Ditch	Douglas	Genoa
Highline Ditch	Douglas	Risue Canyon
Lower Old Virginia Canal	Douglas	Gardnerville
Middle Ditch	Douglas	Minden
Middle River Ditch	Douglas	Minden
Old Virginia Canal	Douglas	Gardnerville
Park and Bull Slough	Douglas	Minden
Saint Louis Straight Ditch	Douglas	Minden
Topaz Canal	Douglas	Long Dry Canyon
Upper New Virginia Canal	Douglas	Gardnerville
	ELKO	
Agency Canal	Elko	Owyhee

Canal/Ditch Name	County	Topographic Quadrangle Name
Agency Canal	Elko	The Point
Duck Valley Canal	Elko	The Point
Hankins Bellinger Ditch	Elko	West of Lee
High Line Canal	Elko	Squaw Valley Ranch
Hilton Ditch	Elko	Te-Moak Well
Homer Ditch	Elko	Dry Creek Reservoir
Main Canal	Elko	Owyhee
Main Canal	Elko	Mountain View Lake
O'Connells Ditch	Elko	Green Mountain
Sheep Creek Ditch	Elko	The Point
Suttles Ditch	Elko	Green Mountain
Swamp Ditch	Elko	Noon Rock
Thacker Lateral	Elko	The Point
White Rock Lateral	Elko	The Point
White Rock Lateral	Elko	The Point
	EUREKA	
Anderson Canal	Eureka	Beowawe
Corbett Canal	Eureka	Beowawe
Highline Canal	Eureka	Beowawe
Merchant Canal	Eureka	Bobs Flat
Rose Canal	Eureka	Dunphy
Westside Ditch	Eureka	The Geysers
	HUMBOLDT	
Big Cedar Creek Ditch	Humboldt	Schoolhouse Butte
Bull Creek Ditch	Humboldt	Schoolhouse Butte
French Canal	Humboldt	Pole Creek
Hammond Ditch	Humboldt	Red House Flat East
Humboldt Canal	Humboldt	Golconda Butte
Knott Creek Channel	Humboldt	Knott Creek
Little Cedar Creek Ditch	Humboldt	Schoolhouse Butte
Lyng Ditch	Humboldt	Willow Point
	LANDER	
Blue House Ditch	Lander	Argenta
Fred Ahles Ditch	Lander	Dutch Flat
Gimble Four Ditch	Lander	Battle Mountain
Gimble One Ditch	Lander	Battle Mountain
Gimble Two Ditch	Lander	Battle Mountain
Lower Twenty-five Ditch	Lander	Battle Mountain
Rock Creek Ditch	Lander	Dunphy
T-S Ditch	Lander	Stony Point
Twenty Five Ditch	Lander	Battle Mountain

Canal/Ditch Name	County	Topographic Quadrangle Name
White House Ditch	Lander	Argenta
	LINCOLN	
Alamo Company Canal	Lincoln	Alamo
Alamo Company East Ditch	Lincoln	Alamo
Garden Springs Pipe Line	Lincoln	Blue Nose Peak
Mesquite Ditch	Lincoln	Mesquite
New East Ditch	Lincoln	Ash Springs
Number Four Ditch	Lincoln	Ash Springs
Number One Ditch	Lincoln	Ash Springs
Number Three Ditch	Lincoln	Ash Springs
	LYON	
A Drain	Lyon	Fernley East
Back Fox Ditch	Lyon	Yerington
Buckland Ditch	Lyon	Silver Springs South
Campbell Ditch	Lyon	Mason Butte
Colony Ditch	Lyon	Oreana Peak
D and GW Ditch	Lyon	Wilson Canyon
Dayton Town Ditch	Lyon	Dayton
East Campbell Ditch	Lyon	Mason Butte
Fernley Drain	Lyon	Fernley East
Fox Ditch	Lyon	Yerington
Gee Ditch	Lyon	Flowery Peak
Greenwood Ditch	Lyon	Yerington
Hall Ditch	Lyon	Yerington
High Ditch	Lyon	Yerington
Hillbun Ditch	Lyon	Wilson Canyon
Houghman and Howard Ditch	Lyon	Churchill Butte
Joggles Ditch	Lyon	Hinkson Slough
K2B Canal	Lyon	Fernley East
Kelly Alkali Ditch	Lyon	Wilson Canyon
Koch Ditch	Lyon	Misfits Flat
Lee Sanders Ditch	Lyon	Wilson Canyon
Lower Charlebois Ditch	Lyon	Yerington SE
Main Fox Ditch	Lyon	Yerington
McLeod Ditch	Lyon	Yerington
Merritt Ditch	Lyon	Hinkson Slough
Mickey Ditch	Lyon	Yerington
Nelson Ditch	Lyon	Yerington
Nichols-Merritt Ditch	Lyon	Mason Butte
Plymouth Canal	Lyon	Smith
Randall Ditch	Lyon	Dayton

Canal/Ditch Name	County	Topographic Quadrangle Name
Sand Ridge Ditch	Lyon	Mason Butte
Sanders Canal	Lyon	Wilson Canyon
Saroni Canal	Lyon	Desert Creek Ranch
Spragg-Alcorn-Bewley Ditch	Lyon	Mason Butte
Spragg-Woodcock Ditch	Lyon	Yerington
Streiff Drain	Lyon	Fernley East
Strosnider East Ditch	Lyon	Yerington SE
Strosnider West Ditch	Lyon	Yerington SE
Truckee Canal	Lyon	Fernley East
Tunnel Ditch	Lyon	Wilson Canyon
Upper Cardelli Ditch	Lyon	Flowery Peak
Upper Charlebois Ditch	Lyon	Yerington SE
Wabuska Drain	Lyon	Mason Butte
West Campbell Ditch	Lyon	Mason Butte
West Hyland Ditch	Lyon	Mason Butte
West Side Canal	Lyon	Wilson Canyon
Wiley Ditch	Lyon	Nye Canyon
Woods Ditch	Lyon	Yerington
	MINERAL	
Canal Number One	Mineral	Schurz
Canal Number Two	Mineral	Schurz
Drain Number One	Mineral	Schurz
Lateral One-A	Mineral	Schurz
Lateral Two-A	Mineral	Schurz
Lateral Two-B	Mineral	Schurz
Lateral Two-D	Mineral	Schurz
Lateral Two-E	Mineral	Schurz
	PERSHING	
American Canal	Pershing	Lovelock
Army Drain	Pershing	Granite Point
Big Five Canal	Pershing	Wildhorse Pass
Fairview Slough	Pershing	Lovelock
Graveyard Drain	Pershing	Lovelock
Irish-American Canal	Pershing	Lovelock
Johnson Drain	Pershing	Lovelock
Lakeshore Ditch	Pershing	Granite Point
Lovelock Drain	Pershing	Lovelock
Lower Taylor Ditch	Pershing	West of Lovelock
Old Channel Canal	Pershing	Lovelock
Pitt-Taylor Diversion Canal	Pershing	Imlay
Reed Ditch	Pershing	Lovelock

Canal/Ditch Name	County	Topographic Quadrangle Name
Rodgers Ditch	Pershing	Lovelock
Rudell Ditch	Pershing	Lovelock
Seven Ditch	Pershing	Wildhorse Pass
Seventeen Ditch	Pershing	Wildhorse Pass
Sommers Ditch	Pershing	Wildhorse Pass
Taylor Canal	Pershing	Lovelock
Toulon Drain	Pershing	Granite Point
Union Canal	Pershing	Lovelock
Union Canal	Pershing	Lovelock
Union Rodgers Canal	Pershing	Lovelock
Willow Slough	Pershing	West of Lovelock
Young Canal	Pershing	Lovelock
	STOREY	
McCarran Ditch	Storey	Patrick
	WASHOE	
Big Ditch	Washoe	Virginia City
Chandler Ditch	Washoe	Steamboat
Cochran Ditch	Washoe	Mount Rose NE
Coldron Ditch	Washoe	Verdi
Crane Ditch	Washoe	Steamboat
Highland Ditch	Washoe	Reno
Lake Ditch	Washoe	Reno
Last Chance Ditch	Washoe	Reno
North Truckee Drain	Washoe	Vista
North Truckee Irrigation Ditch	Washoe	Vista
Orr Ditch	Washoe	Vista
Pioneer Ditch	Washoe	Vista
Prosser Valley Ditch	Washoe	Reno
Pyramid Lake Fishway	Washoe	Pah Rah Mountain
Steamboat Ditch	Washoe	Verdi
	WHITE PINE	
Chin Creek Ditch	White Pine	Chin Creek Reservoir
Duck Creek Overflow Canal	White Pine	McGill
Dunham McGill Ditch	White Pine	McGill
Hamblin Valley Flood Water Wash Ditch	White Pine	Tweedy Wash
John Magnuson Ditch	White Pine	Mattier Creek

The following maps have been created and updated in order to highlight the widespread distribution of ditches and canals across the state and in select urban areas. On the Reno area map, spillways and additional stream data was removed in order to focus more on ditch locations.

Figure Q-1.

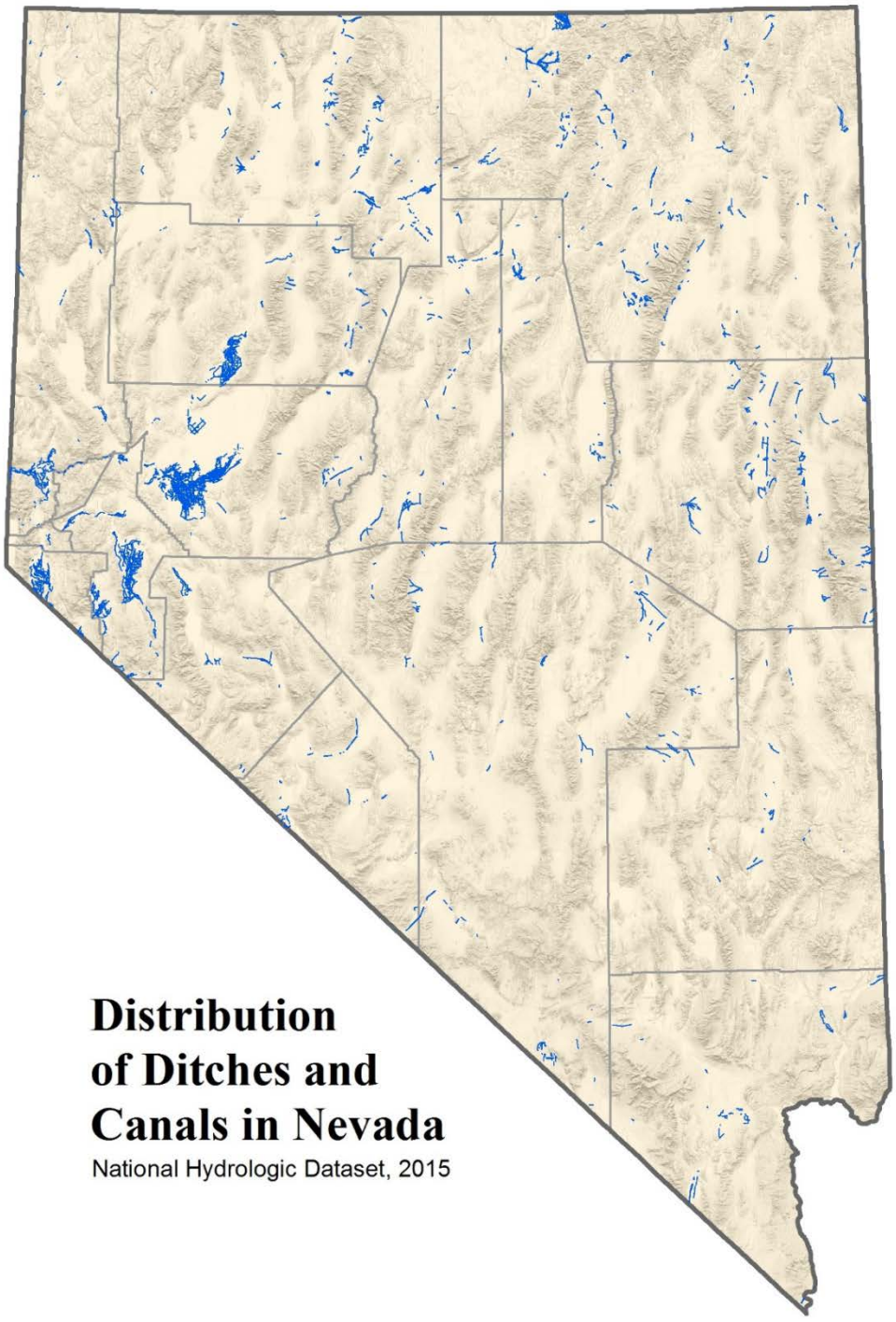


Figure Q-2. Ditches in the Reno area.

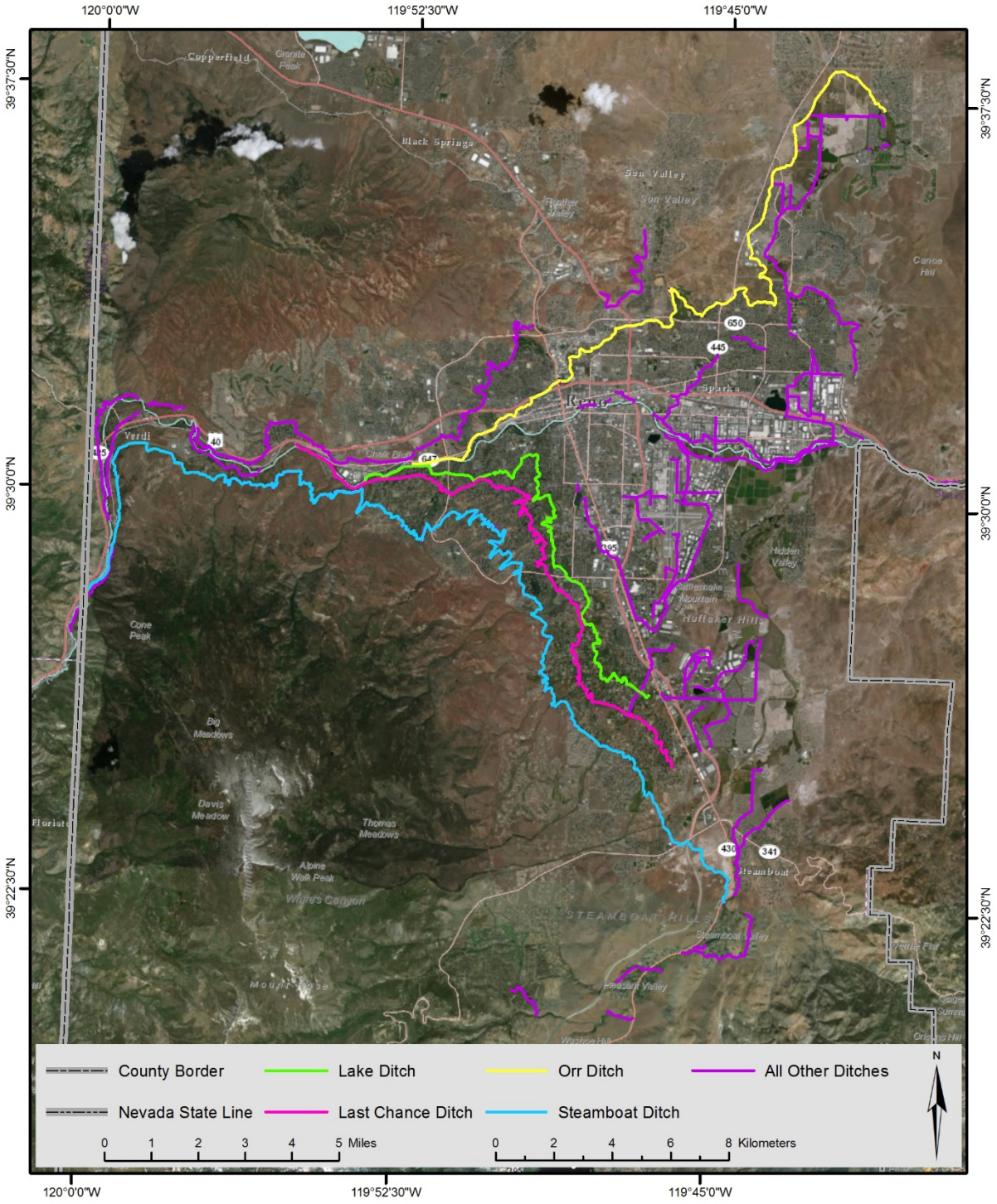
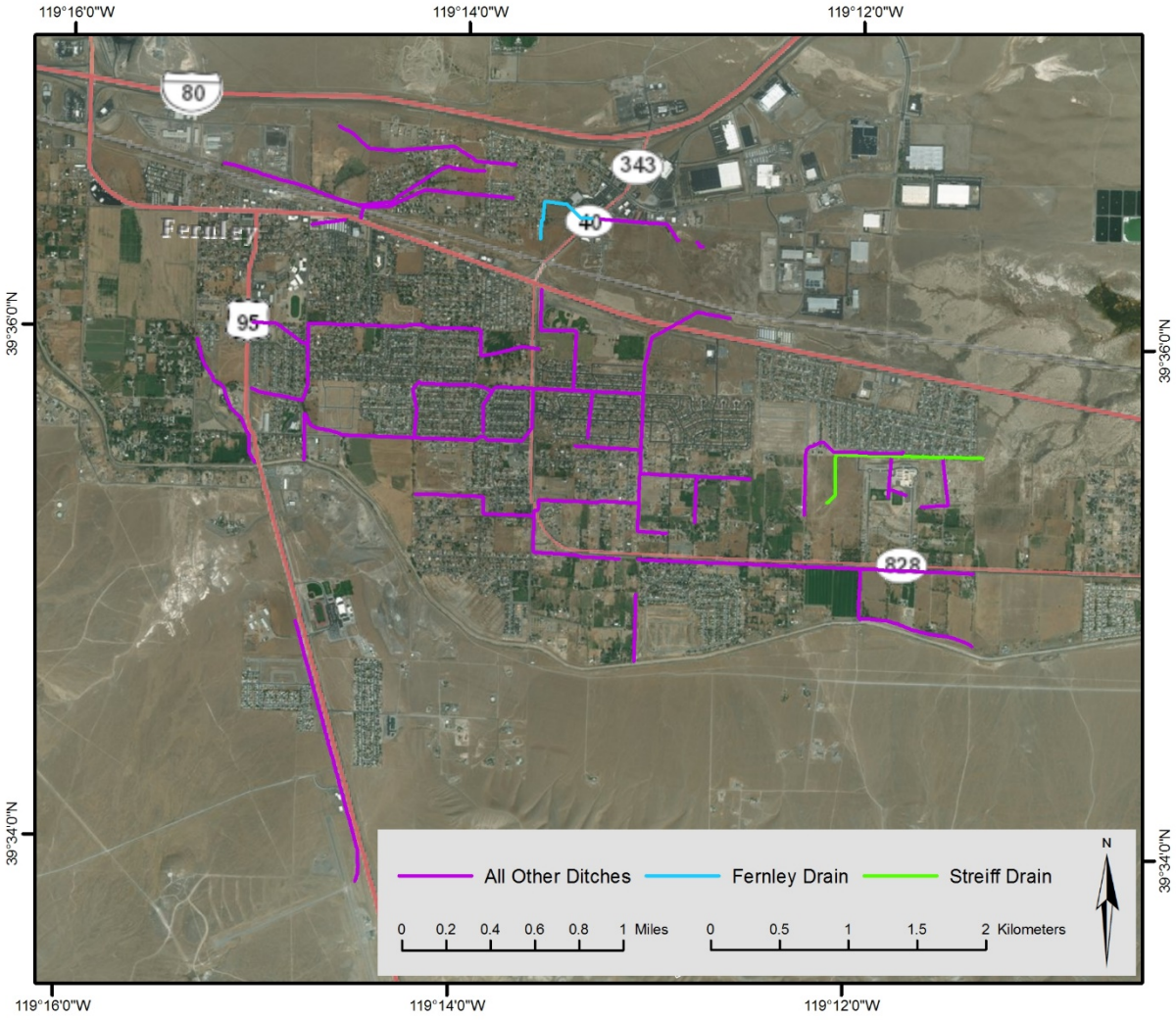


Figure Q-3. Ditches in the Fernley area.



REGION IX STATE HAZARD MITIGATION PLAN REVIEW TOOL

The *State Hazard Mitigation Plan Review Tool* demonstrates how the State Hazard Mitigation Plan meets the regulation in 44 CFR §201.4, for standard state plans, and 44 CFR §201.5, for enhanced state plans.

Standard State Hazard Mitigation Plan	Yes	No
Does the plan meet the standard state hazard mitigation plan requirements?		
Repetitive Loss Strategy	**Yes**	**No**
Does the plan include a Repetitive Loss Strategy? [S6/RL1; S8/RL2; S9/RL3; S10/RL4; S13/RL5; and S15/RL6]		
Enhanced State Hazard Mitigation Plan	**Yes**	**No**
Does the plan meet the enhanced state hazard mitigation plan requirements?		

State/Territory: Nevada	**Title of Plan:** The State of Nevada Enhanced Hazard Mitigation Plan	**Date of Plan:** June 2018
Point of Contact: Janell Woodward	**Address:** 2478 Fairview Drive Carson City, NV 89701	
Title: State Hazard Mitigation Officer		
Agency: Department of Public Safety, Division of Emergency Management		
Phone Number: 775-687-0314	**E-Mail:** jwoodward@dps.state.nv.us	

Date Received at FEMA:	**Date Results Sent from FEMA:**	
FEMA Reviewer Name:	**FEMA Reviewer Title:** (Planning)	**Date:**
FEMA Reviewer Name:	**FEMA Reviewer Title:** (Hazard Mitigation Assistance)	**Date:**
FEMA Reviewer Name:	**FEMA Reviewer Title:** (Floodplain Management)	**Date:**
FEMA Approver Name:	**FEMA Approver Title:** (Mitigation Division Director)	**Date:**

Standard State Hazard Mitigation Plan Checklist

Standard Plan Regulation Checklist		Location in Plan	Yes	No
Planning Process				
S1. Does the plan describe the planning process used to develop the plan? [44 CFR §§201.4(b) and (c)(1)]	a. Does the plan describe the current update process, including: how the plan was prepared, schedule or timeframe, specific milestones and activities, and agencies and stakeholders who were involved.	Section 2: 2.1.1 (p. 2-2), 2.1.2 (pp. 2-3 - 2-6), 2.1.3 (pp. 2-6 - 2-9), 2.1.4 (pp. 2-9 - 2-16), 2.2 (pp. 2-18 - 2-23), 2.2.1 (pp. 2-19 - 2-20), 2.2.2 (pp. 2-20 - 2-21)		
	b. Was the mitigation planning process integrated to the extent possible with other state planning efforts?	Section 2: 2.2.3 (pp. 2-21 - 2-22), 2.3 (pp. 2-24 - 2-31), 2.3.1 (pp. 2-24 - 2-28), 2.3.2 (pp. 2-28 - 2-31)		
S2. Does the plan describe how the state coordinated with other agencies and stakeholders? [44 CFR §§201.4(b) and (c)(1)]	a. Does the plan describe how other state and Federal agencies and other stakeholders were involved in the process?	Section 2: 2.2 (pp. 2-18 - 2-23)		
	b. Does the plan describe how the state coordinated with other agencies and stakeholders responsible for: - Emergency management - Economic development - Land use/development - Housing - Health/social services - Infrastructure - Natural/cultural resources	Section 2: 2.2.2 (pp. 2-20 - 2-21), 2.2.4 (p. 2-24), 2.2.5 (pp. 2-22 - 2-23)		
	a. Does the plan describe limitations in sectors where coordination with agencies and stakeholders is not practicable?	Section 2: 2.2.2 (pp. 2-20 - 2-21)		
Planning Process - Required Revisions:				

Hazard Identification and Risk Assessment				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S3. Does the risk assessment include an overview of the type and location of all natural hazards that can affect the state? [44 CFR §201.4(c)(2)(i)]	a. Does the plan include a current summary of the natural hazards that can affect the state, including information on: - Location - Extent - Previous occurrences	Section 3: 3.3 (pp. 3-9 - 3-196)		
	b. Does the plan provide an explanation for any commonly recognized natural hazards that were omitted?	Section 3: Table 3-1 (pp. 3-4 - 3-5)		
S4. Does the risk assessment provide an overview of the probabilities of future hazard events? [44 CFR §201.4(c)(2)(i)]	a. Does the risk assessment provide a summary of the probability of future hazard events, including projected changes in occurrences for each natural hazard in terms of: - Location - Extent - Intensity - Frequency and/or duration?	Section 3: 3.3 (pp. 3-9 - 3-196)		
	b. Do the probabilities include considerations of changing future conditions, including the effects of long-term changes in weather patterns and climate on the identified hazards?	Section 3: 3.3 (pp. 3-9 - 3-196)		
S5. Does the risk assessment address the vulnerability of state assets located in hazard areas and estimate the potential dollar losses to these assets? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	a. Does the risk assessment include an analysis of the potential impacts of hazard events to state assets and a summary of the assets most vulnerable to the identified hazards or probably future hazard events?	Section 3: 3.5 (pp. 3-200 - 3-206), 3.6 (pp. 3-207 - 3-214)		
	b. Does the risk assessment estimate potential dollar losses to state assets located in identified hazard areas?	Section 3: 3.5 (pp. 3-200 - 3-206), 3.6 (pp. 3-207 - 3-214)		

S6. Does the risk assessment include an overview and analysis of the vulnerability of jurisdictions to the identified hazards and the potential losses to vulnerable structures? [44 CFR §§201.4(c)(2)(ii) and 201.4(c)(2)(iii)]	a. Does the risk assessment provide a current summary of the most vulnerable jurisdictions based on the state, local, and tribal, as applicable, risk assessments in terms of: - Jurisdictions most threated by identified the hazards - Jurisdictions most susceptible to damage and loss from hazard events related to populations and assets	Section 3: 3.5 (pp. 3-200 - 3-206), 3.5.3 (pp. 3-203 - 3-204)		
	b. Does the risk assessment include a summary of potential losses to the identified vulnerable structures based on estimates in the local risk assessments, as well as the state risk assessment?	Section 3: 3.5 (pp. 3-200 - 3-206), 3.5.3 (pp. 3-203 - 3-204)		
	c. Does the risk assessment address repetitive loss (RL) and severe repetitive loss (SRL) properties (see Element RL1)?	Section 3: 3.3.7.3.2 (pp. 3-79 - 3-81) 3.3.7.3.3 (pp. 3-81 - 3-85)		
S7. Was the risk assessment revised to reflect changes in development? [44 CFR §201.4(d)]	a. Does the plan provide a summary of the changes in development that have occurred or are projected to occur in hazard prone areas based on the state, local, and tribal, as applicable, risk assessments? Including: - Changes to land use and the built environment - Changes in population demographics that may affect vulnerability to hazard events - Changes to the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities	Section 3: (pp. 3-1 - 3-227)		
Hazard Identification and Risk Assessment - Required Revisions:				

Mitigation Strategy and Priorities				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S8. Does the mitigation strategy include goals to reduce / avoid long-term vulnerabilities from the identified hazards? [44 CFR §201.4(c)(3)(i)]	a. Does the plan identify hazard mitigation goals representing what the state seeks to accomplish through mitigation plan implementation?	Section 4: 4.1 (pp. 4-2 - 4-15)		
	b. Are the goals consistent with the hazards and vulnerabilities identified in the risk assessment?	Section 4: 4.1 (pp. 4-2 - 4-15), Table 4-2 (pp. 4-5 - 4-16)		
	c. Do the goals address reducing the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities?	Section 4: 4.1 (pp. 4-2 - 4-15) Table 4-2 (pp. 4-5 - 4-16)		
	d. Does the plan include goals to address RL and SRL properties? (See Element RL2)	Section 4: 4.6 (pp. 4-83 - 4-85)		
S9. Does the plan prioritize mitigation actions to reduce vulnerabilities identified in the risk assessment? [44 CFR §§201.4(c)(3)(iii) and (iv)]	a. Does the plan identify actions based on the current risk assessment to reduce the vulnerability of jurisdictions within the state as well as the vulnerability of state-owned or operated buildings, infrastructure, and critical facilities?	Section 4: 4.4 (pp. 4-55 - 4-79)		
	b. Does the plan describe the process used by the state to evaluate and prioritize actions that are cost effective, environmentally sound, and technically sound?	Section 4: 4.4 (pp. 4-55 - 4-79)		
	c. Does the plan describe how each action contributes to the hazard mitigation goals?	Section 4: 4.4 (pp. 4-55 - 4-79)		
	d. Does the plan describe how the local and tribal, as applicable, mitigation strategies are linked within the state mitigation strategy?	Section 4: 4.4.3 (p.4-79)		
	e. Does the plan address RL and SRL properties in the risk assessment? (See Element RL 3)	Section 3 & 4: 3.3.7.3.2 (pp. 3-79 - 3-81), 3.3.7.3.3 (pp. 3-81 - 3-85), 4.6 (pp. 4-83 - 4-85)		

S10. Does the plan identify current and potential sources of funding to implement mitigation actions and activities? [44 CFR §201.4(c)(3)(iv)]	a. Does each mitigation action or project include the identification of current and/or potential sources of Federal, state, local, tribal, as applicable, or private funding for implementation?	Section 4: 4.5 (pp. 4-80 - 4-83), Table 4-11 (p. 4-81), Table 4-12 (pp. 4-82 - 4-83)		
	b. At a minimum, does the plan identify FEMA mitigation funding sources, including, if applicable, but not limited to HMGP, PDM, FMA and PA C-G?	Section 4: 4.5 (pp. 4-80 - 4-83), Table 4-11 (p. 4-81), Table 4-12 (pp. 4-82 - 4-83)		
	c. Does the plan identify current and potential sources of funding with respect to RL and SRL properties? (See Element RL4)	Section 4: 4.5.1 (pp. 4-80 - 4-81) 4.5.2 (pp. 4-82 - 4-83)		
S11. Was the plan updated to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities? [44 CFR §201.4(d)]	a. Does the plan describe the status of hazard mitigation actions in the previous plan by identifying those that have been completed or not completed? For actions not completed, does the plan must narrate the status?	Section 4: Table 4-12 (pp. 4-82 - 4-83)		
	b. Is the prioritization of mitigation actions and activities updated based on the updated analysis of risks, capabilities, and progress?	Section 4: Table 4-10 (pp. 4-58 - 4-77)		
Mitigation Strategy and Priorities - Required Revisions:				

State Mitigation Capabilities				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S12. Does the plan discuss the evaluation of the state's hazard management policies, programs, capabilities, and funding sources to mitigate the hazards identified in the risk assessment? [44 CFR §201.4(c)(3)(ii)]	a. Does the plan describe existing state pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the state?	Section 4: 4.2.1 (pp. 4-17 - 4-40), Table 4-3 (pp. 4-18 - 4-40)		
	b. Does the plan include an evaluation of state laws, regulations, policies, and programs related to hazard mitigation, as well as to development in hazard-prone areas, to include the state's administration of the NFIP and CRS; and Risk MAP program?	Section 4: 4.2.2 (p. 4-41)		
	c. Does the plan include a discussion of state funding capabilities for hazard mitigation projects, including a general description of the state's use of funds for hazard mitigation projects and a general discussion on the state's use of FEMA mitigation programs and funding sources, including but not limited to HMGP, PDM, and FMA; and PA C-G?	Section 4: 4.2.3 (p. 4-41), Figure 4-1 (p. 4-45), Figure 4-2 (p. 4-46), Figure 4-3 (p. 4-46)		
	d. Does the plan include a general summary of obstacles and challenges; and changes since the previous plan approval?	Section 4: 4.2.2 (p. 4-41), 4.2.4 (pp. 4-41 - 4-47), Table 4-8 (pp. 4-51 - 4-54)		
State Mitigation Capabilities - Required Revisions:				

Local Coordination and Mitigation Capabilities				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S13. Does the plan generally describe and analyze the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities? [44 CFR §201.4(c)(3)(ii)]	a. Does the plan provide a general summary of current local and tribal, as applicable, policies, programs, and capabilities of jurisdiction to accomplish hazard mitigation?	Section 5: 5.1 (pp. 5-1 - 5-14)		
	b. Does the plan describe the effectiveness of local and tribal, as applicable, mitigation policies, programs, and capabilities? Including, challenges and opportunities for implementing local and tribal mitigation policies, programs, and capabilities?	Section 4 & 5: Table 4-8 (pp. 4-51 - 4-54) 5.1 (pp. 5-1 - 5-14)		
	c. Does the plan include RL and SRL properties in the analysis of effectiveness? (See Element RL5)	Section 8: Figure 8-1 (pp. 8-6 - 8-7), 8.4 (pp. 8-17 - 8-18)		
S14. Does the plan describe the process to support the development of approvable local and tribal, as applicable, mitigation plans? [44 CFR §§201.3(c)(5) and 201.4(c)(4)(i)]	a. Does the plan describe how the state supports developing or updating FEMA-approvable local and tribal, as applicable, mitigation plans, including the process used to provide training; technical assistance; and funding?	Section 5: 5.1 (pp. 5-1 - 5-14)		
	b. Does the plan provide a summary of the FEMA-approved local and tribal, as applicable, mitigation plan coverage; barriers to developing or updating, adopting, and implementing FEMA-approved local and tribal, as applicable, mitigation plans; and an approach to remove barriers to advance mitigation planning?	Section 5: 5.1.1 (pp. 5-2 - 5-13)		

S15. Does the plan describe the criteria for prioritizing funding? [44 CFR §201.4(c)(4)(iii)]	a. Does the plan describe criteria for prioritizing jurisdictions to receive planning and project grants under available Federal and non-Federal programs?	Section 8: 8.2.3 (pp. 8-9 - 8-10) Figure 8-2 (p. 8-8)		
	b. Does the plan address RL and SRL properties when prioritizing funding? (See Element RL6)	Section 8: 8.4, Figure 8-2 (p. 8-8)		
S16. Does the plan describe the process and timeframe to review, coordinate, and link local and tribal, as applicable, mitigation plans with the state mitigation plan?	a. Does the plan describe the process and timeframe used by the state to review and submit approvable local and tribal, as applicable, mitigation plans to FEMA?	Section 5: 5.1 (pp. 5-1 - 5-14) Table 5-1 (pp. 5-5 - 5-6)		
	b. Does the plan describe the process and timeframe used by the state to coordinate and link risk assessments and mitigation strategy information from local and tribal, as applicable, mitigation plans into the state mitigation plan?	Section 5: 5.2.1 (p. 5-15)		
Local Coordination and Mitigation Capabilities - Required Revisions:				

Plan Review, Evaluation, and Implementation				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S17. Is there a description of the method and schedule for keeping the plan current? [44 CFR §§201.4(c)(5)(i) and 201.4(d)]	a. Does the plan describe the process to monitor, evaluate, and update the plan?	Section 6: 6.1 (pp. 6-1 - 6-4)		
	b. Does the plan specifically identify the agency/office responsible for monitoring, evaluating, and updating?	Section 2 & 6: 6.1 (pp. 6-1 - 6-4), Table 2-2 (pp. 2-7 - 2-9)		
	c. Does the plan specifically identify the schedule for monitoring, evaluating, and updating?	Section 6: 6.1 (pp. 6-1 - 6-4)		
S18. Does the plan describe the systems for monitoring implementation and reviewing progress? [44 CFR §§201.4(c)(5)(ii) and 201.4(c)(5)(iii)]	a. Does the plan describe the system for tracking the implementation of the mitigation activities and projects identified in the mitigation strategy? Including all mitigation strategies, not just those funded by FEMA.	Section 6: 6.2 (pp. 6-5 - 6-10)		
	b. Does the system include a schedule; agency/office responsible for coordination; and role of the agencies/offices identified in the mitigation strategy as responsible for implementation of actions?	Section 6: 6.2.1 (p. 6-5 - 6-6)		
	c. Does the plan describe a system for reviewing progress on achieving the goals of the mitigation strategy that includes the criteria and process for evaluating progress?	Section 6: 6.2.5 (p. 6-6)		
Plan Review, Evaluation, and Implementation - Required Revisions:				

Adoption and Assurances				
Standard Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
S19. Did the state provide documentation that the plan has been formally adopted? [44 CFR §201.4(c)(6)]		Appendix A		
S20. Did the state provide assurances? [44 CFR §201.4(c)(7)]	a. Does the plan include assurances that the state will manage and administer FEMA funding in accordance with applicable Federal statutes and regulations?	Appendix I		
	b. Does the plan include assurances that the state will amend its plan whenever necessary to reflect changes in state or Federal laws and statutes?	Appendix I		
Adoption and Assurances - Required Revisions:				

Repetitive Loss (RL) Strategy			
Standard Plan Regulation Checklist	**Location in Plan**	**Yes**	**No**
RL1. Did Element S6 (risk assessment) address RL and SRL properties? [44 CFR §§201.4(c)(2)(ii), 201.4(c)(2)(iii), and 201.4(c)(3)(v)]	Section 3: 3.3.7.3.2 (pp. 3-79 - 3-81), 3.3.7.3.3 (pp. 3-81 - 3-85)		
RL2. Did Element S8 (mitigation goals) address RL and SRL properties? [44 CFR §§201.4(c)(3)(i) and 201.4(c)(3)(v)]	Section 4: 4.6 (pp. 4-83 - 4-85), Table 4-2 (pp. 4-5 - 4-16)		
RL3. Did Element S9 (mitigation actions) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iii) and 201.4(c)(3)(v)]	Section 4: 4.6 (pp. 4-83 - 4-85), Table 4-10 (pp. 4-58 - 4-77)		
RL4. Did Element S10 (funding sources) address RL and SRL properties? [44 CFR §§201.4(c)(3)(iv) and 201.4(c)(3)(v)]	Section 4: 4.5.1 (pp. 4-80 - 4-81), 4.5.2 (pp. 4-82 - 4-83), 4.6 (pp. 4-83 - 4-85)		

RL5. Did Element S13 (local and tribal, as applicable, capabilities) address RL and SRL properties? [44 CFR §§201.4(c)(3)(ii) and 201.4(c)(3)(v)]	Section 4: 4.2.1 (pp. 4-17 - 4-40), 4.6 (pp. 4-83 - 4-85), Table 4-3 (pp. 4-18 - 4-40)		
RL6. Did Element S15 (prioritizing funding) address RL and SRL properties? [44 CFR §§201.4(c)(4)(iii) and 201.4(c)(3)(v)]	Section 4: 4.5.1 (pp. 4-80 - 4-81), 4.5.2 (pp. 4-82 - 4-83), 4.6 (pp. 4-83 - 4-85)		
Repetitive Loss Strategy - Required Revisions:			

Enhanced State Hazard Mitigation Plan Checklist

Enhanced Plan Regulation Checklist	Location in Plan	Yes	No
Meet Standard State Mitigation Plan Elements			
E1. Does the Enhanced plan include all elements of the standard state mitigation plan? [44 CFR §201.5(b)]	Entire Plan		
Required Revisions:			

Integrated Planning				
E2. Does the plan demonstrate integration to the extent practicable with other state and/or regional planning initiatives and FEMA mitigation programs and initiatives? [44 CFR §201.5(b)(1)]	a. Does the Enhanced plan demonstrate integration with other state and/or regional planning initiatives, including, at a minimum: - Emergency management - Economic development d use/development - Housing - Health/social services - Infrastructure - Natural/cultural resources	Section 8: 8.1 (pp. 8-1 - 8-3)		
	b. Does the Enhanced plan describe limitations where integration with other state and/or regional planning initiatives representing these sectors is not practicable?	Section 8: 8.1 (pp. 8-1 - 8-3)		
	c. Does the Enhanced plan demonstrate integration of FEMA mitigation programs and initiatives, including, if applicable: HMGP, PDM, FMA, NFIP, CRS, Risk MAP, and the National Dam Safety Program, as well as FEMA programs that advance mitigation?	Section 8: 8.1.2 (p. 8-3)		
	d. Does the Enhanced plan describe limitations where integration with FEMA mitigation programs and initiatives is not practicable?	Section 8: 8.1.2 (p. 8-3)		
Integrated Planning - Required Revisions:				

State Mitigation Capabilities				
Enhanced Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
E3. Does the state demonstrate commitment to a comprehensive mitigation program? [44 CFR §201.5(b)(4)]	a. Does the plan describe an existing comprehensive state mitigation program that might include, but is not limited to, examples listed in the mitigation planning regulation at 44 CFR §201.5(b)(4)	Section 8: 8.2 (pp. 8-4 - 8-10), 8.6 (pp. 8-29 - 8-40)		
E4. Does the enhanced plan document capability to implement mitigation actions? [44 CFR §§201.5(b)(2)(i), 201.5(b)(2)(ii), and 201.5(b)(2)(iv)]	a. Does the Enhanced plan describe the system to rank the mitigation measures according to established eligibility criteria?	Section 8: 8.2.3 (pp. 8-9 - 8-10)		
	b. Is there a process to prioritize between funding programs, jurisdictions, and proposals that address different or multiple hazards?	Section 8: 8.2.3 (pp. 8-9 - 8-10)		
	c. Does the Enhanced plan describe how the state will assess the effectiveness of mitigation actions, including the agencies that are involved as well as the timeline, and use the results to inform the mitigation strategy?	Section 8: 8.3 (pp. 8-11 - 8-17), 8.4.1 (pp. 8-17 - 8-18), 8.4.2 (pp. 8-18 - 8-21)		
E5. Is the state effectively using existing mitigation programs to achieve mitigation goals? [44 CFR §201.5(b)(3)]	a. Does the enhanced plan document how the state has fully made use of the funding available through the FEMA assistance programs?	Section 8: 8.5 (pp. 8-21 - 8-28), Table 8-3 (p 8-26)		
	b. If the state has not made full use of available funding, does the Enhanced plan document the reasons why funding was not used and does it explain the process to improve this capacity?	Section 8: 8.5 (pp. 8-21 - 8-28)		
	c. Does the Enhanced plan document how the state effectively uses existing state programs to achieve its mitigation goals?	Section 8: 8.5.2 (pp. 8-23 - 8-28)		

State Mitigation Capabilities - Required Revisions:

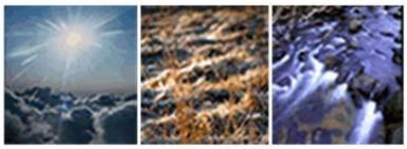
HMA Grants Management Performance				
Enhanced Plan Regulation Checklist		**Location in Plan**	**Yes**	**No**
E6. With regard to HMA, is the state maintaining the capability to meet application timeframes and submitting complete project applications? [44 CFR §201.5(b)(2)(iii)(A)]	a. Are all applicants and amendments submitted by the end of each program's respective application period?	Section 8: 8.3(pp. 8-11 - 8-17)		
	b. Are all applicants entered into FEMA's electronic data systems (such as, NEMIS and/or eGrants?	Section 8: 8.3 (pp. 8-11 - 8-17)		
	c. Is the eligibility and Completeness Checklist prepared for all applications?	Section 8: 8.3 (pp. 8-11 - 8-17)		
	d. Are all applications determined to be complete by FEMA within 90 days of submittal or selection for further review?	Section 8: 8.3 (pp. 8-11 - 8-17)		
E7. With regard to HMA, is the state maintaining the capability to prepare and submit accurate environmental reviews and benefit-cost analyses? [44 CFR §201.5(b)(2)(iii)(B)]	a. Are all applications and amendments determined to be complete by FEMA within 90 days of submittal or selection for further review, including all data requested by FEMA to support Cost Effectiveness determinations and environmental/ historic preservation compliance reviews?	Section 8: 8.3 (pp. 8-11 - 8-17)		

E8. With regard to HMA, is the state maintaining the capability to submit complete and accurate quarterly progress and financial reports on time? [44 CFR §201.5(b)(2)(iii)(C)]	a. Have all progress reports been completed and submitted on time? Does the information in the reports accurately describe grant activities, including data related to the completion of individual property acquisitions?	Section 8: 8.3.3 (pp. 8-15 - 8-16)		
	b. Have all Federal financial reports (FFR), Standard Form (SF) SF-425 been submitted on time? Does the information in the reports accurately describe grant activities, as described in the HMA Guidance?	Section 8: 8.3 (pp. 8-11 - 8-17)		
	c. Is there compliance with the Financial Management Standard requirements described in 2 CFR §§200.300 to 200.309?	Section 8: 8.3 (pp. 8-11 - 8-17)		
E9. With regard to HMA, is the state maintaining the capability to complete HMA projects within established performance periods, including financial reconciliation? [44 CFR §201.5(b)(2)(iii)(D)]	a. Has all work as part of HMA subawards been completed by the end of Period of Performance as described in the HMA Guidance?	Section 8: 8.3.4 (pp. 8-16 - 8-17)		
	b. Have there been no major findings on the last single audit obtained by the state related to HMA programs?	Section 8: 8.3 (pp. 8-11 - 8-17)		
	c. Have all grant close-out activities been completed within 90 days from the end of the performance period? Are all expenditures	Section 8: 8.3 (pp. 8-11 - 8-17)		
	d. Are all expenditures consistent with SF-424A or SF-424C?	Section 8: 8.2 (pp. 8-4 - 8-10)		

A Grants Management Performance - Required Revisions:

The information contained in this appendix does not reflect Nevada Hazard Mitigation Plan appendix letters or naming conventions, and has its original table of contents.

DRI Desert Research Institute



Science Environment Solutions

Assessment of Drought Resiliency in Rural Northern Nevada



Wells, NV

Investigators: Greg Pohll, Rina Schumer, Susie Rybarski, Jackson Crews, Chris Pearson
Presented to: Nevada Division of Emergency Management

Date: July 31, 2016

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Introduction

Unusually severe to exceptional multi-year droughts are not an uncommon occurrence in Nevada. Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length of the recent drought and the increase in population in recent decades have led to questions about the vulnerability of all of the state's municipal water systems. This includes those serving areas outside of urban centers. In 2013, the Nevada Drought Response Committee (DRC) held a strategic planning workshop during which the workgroup identified a goal of strengthening the resiliency of municipal water systems. The DRC recommended the development of public water supply vulnerability studies in the 2014 strategic plan.

The Nevada Division of Emergency Management (NDEM), in accordance with its mission of providing guidance to the state of Nevada and local jurisdictions on pre-disaster mitigation issues, desires to survey public water supply systems and domestic wells in rural northern Nevada to determine the vulnerability of those systems and sources to the effect of long-term drought. The NDEM also desires to develop guidelines to promote drought resiliency for municipal water systems and develop drought mitigation recommendations for rural water systems.

Most rural communities rely on groundwater to serve their customers. Generally, groundwater systems provide more resiliencies during drought periods because groundwater storage is typically much larger than surface water systems (e.g. reservoirs). Although the groundwater does allow small communities a certain amount of relief during short drought periods, groundwater levels can be depleted during long periods of drought. This study assesses the occurrence of drought and the potential effects on groundwater systems in northern rural Nevada.

This drought resiliency analysis focuses on small communities in northern Nevada. This includes communities north of highway 50 including Gerlach, Wadsworth, and Vya. This analysis also includes a general assessment of the potential impact drought may have on domestic wells. The domestic well analysis focuses on the expected shallow water table declines within each hydrographic basin in northern Nevada.

Objectives

This report presents the results a study designed to complete the following tasks:

1. Survey northern rural Nevada municipal/community water supply systems
2. Determine criteria for drought vulnerability of public water supply systems
3. Determine drought vulnerability for domestic wells
4. Develop municipal/community water system drought resiliency recommendations
5. Review and update the NV State Hazard Mitigation Plan's Drought Risk Assessment.

Background

Three or four major droughts occurred in the U.S. during the more than 100-year period for which records are available, not including the extreme and exceptional drought currently affecting Nevada and California. Two of the major droughts in that interval include the Dust Bowl of the 1930's and another drought during the 1950's. Both of those events persisted for a duration lasting between five and seven years, and both affected very large geographic areas (NOAA, 2008).

Medieval-era (1100-1300 CE) droughts were no more severe than modern droughts, but they persisted longer than any recent drought event, lasting 30-50 years (https://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically-increase-risk-of-us). The likelihood of such persistent mega-droughts in the second half of this century may be exacerbated in the Southwest and Central Plains (Cook et al., 2015).

In designing a drought scenario for this study, a 15-year period of 50 percent recharge was selected as it represents a more severe and more persistent drought than has been recorded for the region, but still represents a fairly realistic scenario. There are several means by which drought is identified and its severity quantified, including the Palmer Drought Severity Index (Palmer, 1965), which is a comparison of current soil moisture to average soil moisture. For the present study, annual precipitation totals from each basin (wrcc.dri.edu) were compared to the mean total. In general, annual totals on the order of 50 percent of normal precipitation constitute some of the driest years on record.

Methods

The study presented here was conducted primarily through numerical modeling. While a previous report (Pohll et al., 2016) focused on more populated areas, the NDEM requested that three additional towns be included in the study: Gerlach, Wadsworth, and Vya (Figure 1). Estimations of the perennial yields for these basins are shown in Table 1. However, it should be noted that although these basins were selected based on the state's estimation of perennial yield, these values were further researched and reevaluated, and generally served only as a starting point for calibration of mountain block recharge and interbasin flow.

Modeling Methods

MODFLOW-NWT (Niswonger et al., 2011) was used to simulate the groundwater system within the selected hydrographic areas. MODFLOW is considered the industry standard and has been extensively tested and verified by numerous hydrogeologists. The model was developed within the Groundwater Modeling System (GMS) environment (version 10.0). GMS acts as a database for all of the hydrogeologic information and provides an easy to use pre- and post-processor to MODFLOW.

Model domains were defined by a 1-layer mesh of 0.386 mi^2 (1 km^2) grid cells fit to the shape of the hydrographic basin. Surface elevations were defined by a DEM, and grid cell thicknesses were determined by the difference between the surface elevation and a uniform bottom elevation. All models use the convertible layer option in MODFLOW, which allows for a variable saturated thickness as defined by the simulated water table position.

While the design of the individual basin models will be discussed later in this document, in general, models were developed to include zones of mountain block groundwater recharge, evapotranspiration (ET) over phreatophyte zones, rivers and streams, and interbasin flow where applicable. Hydraulic conductivities were determined by physical properties of the formations, analysis of aquifer test results where available, and use of the parameter estimation (PEST) function in GMS. With the exception of the municipal wells in some basins, the functionality and pumping rates of wells in these basins were not available. Therefore, each well with existing water rights as stated by the NDWR was assumed to be active and pumping at the full water right issued to that well, including those wells with only supplementary water rights.

For all modeled hydrographic basins, three simulation periods were developed. First, a steady-state model was created to represent pre-development water levels. Steady state models were calibrated to observed water levels, such that the ratio of the mean absolute error to the total simulated head drop was less than 10%. These water levels were then used as the initial conditions for two sets of transient models – one set modeling normal mountain block recharge conditions, and one set modeling drought conditions, for which recharge was reduced by 50% from normal. Each transient simulation was run for 15 years. All wells were modeled as pumping at their full water right, with the exception of domestic wells which were pumped at 0.7 AFA, in contrast to their associated water right of 2.0 AFA. Additionally, the municipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model were pumped at rates as reported by the local municipalities. Note that the 2013 estimated pumping rates shown in Table 1 are in many cases simply a percentage of the total water rights, and because their accuracy was unknown, these numbers were not used. Comparisons of water level difference plots between the transient and steady state simulations show the basin-wide drawdown effects of simple pumping versus the effects of lost recharge due to drought conditions. Plots of drawdown over time were also created for selected municipal wells and springs to assess drought vulnerability for the public water supply and to better inform recommendations for drought resiliency.

Dodge Flat / Tracy Segment / Fernley Area (Wadsworth)

The town of Wadsworth lies at the junction of three hydrographic basins – Dodge Flat (Basin 82), Tracy Segment (Basin 83), and Fernley Area (Basin 76). These basins are bound by the Pah Rah Mountains to the west, the Virginia Range to the south, the Truckee Range to the north, and the Hot Springs Mountains to the east. The Truckee River flows east through the Tracy Segment, then bends to the north to flow through Dodge Flat, ultimately terminating in Pyramid Lake, north of the Dodge Flat basin. At the eastern end of the Tracy Segment, river water is diverted into the Truckee Canal, which flows parallel to the river within the Tracy Segment, then bends to the southeast to flow through the Fernley
Area. Water in the canal is used for irrigation purposes in the southern Fernley Area. The town of Wadsworth and the surrounding area obtain water from 4 municipal wells and several quasimunicipal wells located in the Dodge Flat and Tracy Segment (Figure 2).

Steady-State Model Design

The Dodge Flat / Tracy Segment / Fernley Area model uses the results of a previously designed model as its initial condition (Pohll, 2015). It should be stated that the model incorporates only the sections of these three basins that are hydrologically relevant to the Wadsworth/Fernley area, and most notably omits a sizable portion of the Tracy Segment. This model is significantly more complicated than the others described in this report, and consists of 29,376 200 m x 200 m grid cells in 3 layers. Layers 1 and 2 are 110 m (360 ft) and 190 m (620 ft) thick, respectively. The bottommost layer (Layer 3) is defined by the bedrock surface. Surface elevations were determined by a DEM. Briefly summarized here, the model design is described in detail in Pohll, 2015.

The Pohll model was designed to simulate a steady-state condition representing the period 2000-2005. The head resulting from this simulation was then used as the initial condition for a transient model representing 2006-2010. This period was used to calibrate the storage parameters (specific yield and specific storage) and to validate the ability of the model to simulate water level trends. Groundwater sources and sinks in the Elko Segment include mountain block recharge, agricultural recharge, evapotranspiration, interbasin flow, and well pumping. Unlike the other models described in this report, both the steady state and transient calibration periods do include well pumping. The Truckee River and Truckee Canal also act as sources and sinks of groundwater.

Recharge was modeled as several specified flow arcs in layers 1 and 2 along the base of the mountain ranges bounding the basins, and was estimated to be approximately 3300 AFA. Interbasin flow was assumed to move into the model domain along the Truckee River canyon and exit in the north toward Pyramid Lake, and to the southeast toward Hazen. The hydraulic head values along these boundaries were determined by interpolation of measured water levels, or estimated from land surface elevations if no water level data were available. The head values were assumed to remain constant during all simulations and were applied to layers 1 and 2.

Evapotranspiration zones were applied to areas populated by phreatophytes, which fall primarily along the banks of the Truckee River and in irrigated areas along the Truckee Canal. The maximum groundwater ET rates were 0.0016, 0.016, and 0.016 ft/day for greasewood, playa, and cottonwood areas, respectively. The extinction depths were specified as 23, 3.3, and 16 ft for greasewood, playa, and cottonwood areas, respectively.

Interactions between the aquifer and the Truckee River and Truckee Canal were simulated using the streamflow routing package (SFR2; Niswonger and Prudic, 2005). The SFR2 package calculates flux between the surface water body and the aquifer using a number of parameters, including geometric parameters, topology of the stream network, streambed elevations, and width for each reach. Seepage from lateral canals was estimated to be approximately 3300 AFA, based on conveyance efficiencies and diversion rates. The flow budget for the steady-state model is detailed in Table 2.

Most of the hydraulic conductivity measurements within the study area were taken from Pohll et al., 2001, with a few additional measurements taken in the Wadsworth area as presented in Epstein, et al. 2007. Hydraulic testing included pumping, recovery, and packer testing and was performed

from 1997 - 2006. The model was calibrated using the pilot point method, with final hydraulic conductivities ranging from 0.3 ft/d to 164 ft/d in isolated areas of the basins.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model and using Truckee River and Truckee Canal drought condition flow rates as predicted by Pohll, 2016, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. Truckee River and Truckee Canal flow rates for the model using 100% of normal recharge were taken from the transient predictive model described in Pohll, 2015. Heads calculated by the 2006-2010 transient simulation presented in Pohll, 2015 were used as the initial condition for the transient drought model, which was run to 15 years. For both models, municipal and quasimunicipal wells were pumped at rates reported by the local municipalities. All other well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Interestingly, isolated regions in the Fernley Area show a small increase in groundwater levels under drought conditions. This occurs as a result of increased flow volumes in the Truckee Canal - while the steady state and 2006-2010 transient models were run using historical flow values, the drought model used estimated flow values for a drought under the new Truckee River Operating Agreement (TROA) regulations, which increased the volume allocated to the canal.

Two municipal wells in the Wadsworth area were selected to show the effects of drawdown over time (Figures 3 and 4). Results show a relatively insignificant effect of drought on the municipal supply. PLPT Municipal Well 3 shows an average decline of 0.1255 ft/yr (1.88 ft total) over 15 years of drought conditions, while the Stampmill 1 well actually shows an average increase of 0.0079 ft/yr (0.12 ft total) over the same time period. Fluctuations in these wells result from changes in river and canal flow volumes and seepage rates and are minimal. However, domestic wells located in or near the mountain block, where drawdown due to lost mountain block recharge is greater, may experience up to 14 feet of drawdown as a direct result of a 15-year severe drought (Figure 5).

Conclusions

- Municipal supply wells are resilient to the impact of a 15-year severe drought.
- The most significant impact of drought occurs in the mountain block.
- Domestic wells located in or near the mountain block may be impacted by a 15-year severe drought.
- Changing water regulations may result in increased groundwater elevations relative to the present, even during drought conditions.

Smoke Creek Desert (Gerlach)

The Smoke Creek Desert, referred to as basin 021, is located primarily in northwestern Nevada in Washoe County, and extends to the west into Lassen County, California. The town of Gerlach is located just east of the basin in the San Emidio Desert, but obtains its water from two mountain springs in the Granite Range at the northeastern boundary of the Smoke Creek Desert. Stream and groundwater flow discharges to the southwest-northeast trending playa located on the southeast side of the basin. The basin is sparsely populated, with no active municipal wells (Figure 6).

Steady-State Model Design

The Smoke Creek Desert model consists of 2902 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 2000 ft AMSL. Groundwater sources and sinks in the Smoke Creek Desert include mountain block recharge, spring flow, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model. Mountain streams also act as head dependent sources and sinks of groundwater.

Recharge was modeled as several zones covering higher elevation areas in the hills and mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during non-drought years to be between 13,000 and 19,000 AFA (Glancy and Rush, 1968). The average value of 16,000 AFA was used in the initial model design, then adjusted manually to improve steadystate model calibration. The same study also estimated a 200 AFA underflow from the San Emidio Desert to the east and a 180 AFA underflow from Dry Valley to the southwest, which were applied to the model as specified flow boundaries.

Evapotranspiration zones were applied to the playa and areas populated by phreatophytes, and were calibrated such that basin-wide ET fell between the estimated values of 13,000 and 19,000 AFA (Glancy and Rush, 1968). The mountain streams of Smoke Creek, Buffalo Creek, and Squaw Creek are in communication with the underlying aquifer, and were modeled as head-dependent boundaries using the River (RIV) Package in MODFLOW.

The primary focus of this model was to determine the potential effects of drought on the two mountain springs providing water to Gerlach. A recent modeling study (Aqua, 2009) attempted to determine the effect of pumping on spring flow volumes in the Smoke Creek Desert. As part of that study, data loggers were placed in the springs to determine flow volumes. From November 2007 to February 2009, the flow in Garden Spring fluctuated between 37 and 53 gpm (59.7 and 85.5 AFA), while the flow in Railroad Spring held constant at 200 gpm (322.6 AFA). The springs were modeled using the Drain (DRN) Package in MODFLOW, and the model was calibrated to the measured spring flows. Though not a source of water for the town of Gerlach, a third un-named spring in the playa south of Garden and Railroad Springs was also modeled to more accurately calibrate the model, using a flow rate equal to the water rights for that spring. The flow budget for the steady-state model is detailed in Table 3.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types,

then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.015 ft/d in the Granite Range to 30 ft/d in the stream alluvium.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

The model run with 100% of normal recharge and all wells pumping at the full water right showed no change in the flow rate of either spring servicing Gerlach. This model therefore indicates that the current rates of pumping in this basin will not affect spring flow, a finding corroborated by the 2009 Aqua study.

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in spring flow when under drought conditions. After 15 years of drought conditions, Garden Spring showed a decline of approximately 31.1 AFA (Figure 7), while Railroad Spring showed a decline of only 1.6 AFA (Figure 8). The model also indicated that wells located in Smoke Creek Basin may experience drawdown as a result of an extended drought, but that this drawdown would be less than 2 feet (Figure 9).

Conclusions

- The most significant impact of drought occurs in the mountain block.
- Springs providing water to Gerlach may be impacted. The model indicates an approximate flow reduction of 8% after 15 years of severe drought.
- Pumping in the Smoke Creek Desert does not appear to impact springs providing water to Gerlach.

Long Valley (Vya)

Long Valley, referred to as basin 009, is located in northwestern Nevada in Washoe County. The basin trends south to north, and is bound by the Hays Canyon Range to the west and various individual mountains and hills to the north, south, and east. Stream and groundwater flow discharges to playa lakes located primarily in the north basin. The basin is sparsely populated, with no active municipal wells (Figure 10).

Steady-State Model Design

The Long Valley model consists of 1161 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 4500 ft AMSL. Groundwater sources and sinks in Long Valley include mountain block recharge, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model.

Recharge was modeled as several zones covering higher elevation areas in the mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during

nondrought years to be approximately 6,000 AFA (Sinclair, 1963). This study also estimated evapotranspiration in the basin to be approximately 11,000 AFA. The study resolved this imbalance by suggesting that Long Valley may receive a significant amount of interbasin flow from Massacre Lake Valley to the east, Boulder Valley to the southwest, and Surprise Valley to the west. However, a separate study of Surprise Valley has stated that it is a closed basin (California Department of Water Resources, 1986). Additionally, Sinclair's estimated recharge rates in Massacre Lake Valley and Boulder Valley are quite low (3500 AFA and 2000 AFA, respectively), and they are therefore unlikely to contribute the apparent 5000 AFA difference between estimated recharge and evapotranspiration. As the Sinclair study provided no other evidence for this assertion beyond a mass balance error, it is likely that the estimate of evapotranspiration is high, and the perennial yield of the basin is in fact less than 11,000 AFA.

Evapotranspiration zones were applied to playas and to areas populated by phreatophytes. A maximum ET rate of 0.002 ft/d was applied to the playas with an extinction depth of 5 ft below the surface, while phreatophyte zones were assigned a maximum ET rate of 0.0007 ft/d with an extinction depth of 30 ft. A constant head boundary was placed in the largest playa zone to serve as a point of reference for the heads calculated in the steady state model, and the model was calibrated such that this boundary condition would not act as a significant source or sink of water. This boundary condition was removed before the transient simulations were performed. The flow budget for the steady-state model is detailed in Table 4.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types, then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.01 ft/d in the Hays Canyon Range to 3.5 ft/d in the alluvium of the central basin.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

Transient models show the development of cones of depression surrounding irrigation wells along the western side of the basin, with a maximum drawdown of approximately 66 ft over 15 years (Figure 11).

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge shows does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Irrigation and domestic wells located in or near the mountain block may experience up to 10 feet of drawdown as a direct result of a 15-year severe drought (Figure 12).

Conclusions

- The currently accepted value of perennial yield for this basin may be an overestimate.
- Irrigation and domestic wells located in or near the mountain block may be impacted by a 15year severe drought.
- The majority of the simulated drawdown is concentrated in the area of irrigation wells, indicating that irrigation well pumping exerts a dominant influence on water level decline in Long Valley.
- Water level decline due to pumping presents a more significant threat to resilience than a 15year severe drought.

Conclusions

In this study, the effects of persistent, severe drought on groundwater levels in three hydrographic basins in Northern Nevada were assessed. This was carried out by running two transient groundwater flow simulations: one in which the mountains receive the full volume of normal recharge, and one in which the mountains received only 50 percent of normal recharge. In each simulation, domestic wells were pumped at 0.7 AFA, which is smaller than the 2 AFA water right, but represents a more realistic value. All other wells were pumped at their full water right duty, with the exception of municipal and quasimunicipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model, which were pumped at rates as reported by local municipalities. The simulations were run over a period of 15 years, and the difference in water levels at year-15 was interpreted as the effect of the reduction in recharge in the mountains, as all other features of the simulations – besides recharge – were identical. Differences in water level between the two scenarios in year-15 were measured at the location of municipal wells, and the difference in water level was also mapped throughout the model domain to show region of greater and lesser sensitivity.

The differences in water levels between the 50 percent (drought) and 100 percent (normal) recharge scenarios in year-15 was generally small compared to the net decline in water level at a given location due to pumping. The largest difference in water level between the drought and normal recharge simulations in year-15 usually occurred in the mountains, where recharge is delivered to model. This result is not surprising because the reduction in recharge propagates through the model at a rate governed by the hydraulic diffusivity, which is the ratio of the hydraulic conductivity to the specific storage parameter (or the ratio of transmissivity to storativity). As a result regions near the recharge zone "feel" the effects of a sudden reduction in recharge much earlier than points farther from the recharge zone. A corollary to this observation is that wells located near the mountain block tend to be less resilient than wells near the center of the valley.

The reduction in recharge is not instantaneously communicated to all locations in the basin. As a result, the effect of the reduction in recharge is not evident at any of the municipal wells during the 15-year simulation period. With the values of hydraulic conductivity, K, and specific storage, S_s, used in the transient simulations, the time delay, t_{delay}, between the onset of a reduction in recharge and its expression as additional drawdown in a pumped well is approximated by:

$$t_{delay} = \frac{S_s}{K} d^2$$

where *d* is the shortest horizontal distance between the recharge zone and the well in question. A well located 10,000 feet from the recharge zone, for example, would respond to a sudden change in the recharge rate in the mountain block after approximately 5.5 years.

In the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) simulations, water levels were reduced at most by 14 feet in the 50 percent recharge scenario after 15 years, relative to the full recharge case. This difference is interpreted as an effect of the drought. However, these levels of drawdown are seen only in domestic wells located near mountain block recharge zones. Municipal wells are located at a sufficient distance from recharge zones, and are primarily affected by flow rates in the Truckee River and Truckee Canal. Assuming predicted flow rates are accurate, models indicate that municipal and quasimunicipal wells in this area are resilient to an extended drought.

Similarly, the Long Valley (Vya) simulations yielded a difference in water levels of up to 10 feet at domestic and irrigation wells located near the mountain block under the 50 percent recharge drought scenario.

In the Smoke Creek Desert, flow rates in the two springs providing water to Gerlach in the 50 percent recharge case were reduced by approximately 8%, relative to the 100 percent recharge case after 15 years of simulation. The effects of pumping in the basin did not affect spring flow.

On balance, the influence of a persistent, severe 15-years drought on groundwater elevation in the three modeled basins is relatively minimal, at least when compared to the rate of decline due to pumping.

Recommendations

The most significant impacts of the simulated drought occur first in the mountains, where groundwater is recharged. Wells and springs in and near the mountain block tend to be affected earlier and more severely by a sudden reduction in recharge. For that reason, it is recommended that new wells be drilled as close to the center of the valley as possible.

Water level records are available at varying temporal resolution for some wells. Additional water level monitoring in more extant wells and flow rate monitoring in springs would provide valuable highresolution feedback on aquifer and well performance.

While the effects of a simulated drought were small compared to the effect of pumping, the decline due to pumping alone is cause for concern, as it poses the greatest present threat to the resilience of municipal water resources.

References

Aqua Hydrogeologic Consulting, 2009, Smoke Creek Desert groundwater model and Smoke Creek hydrographic basin water rights database report.

California Department of Water Resources, 1986, Surprise Valley Ground Water Quality Study, Report. Sacramento: California State Printing Plant.

Cook, B. I., T. R. Ault, and J. E. Smerdon, 2015, Unprecedented 21st century drought risk in the American Southwest and Central Plains, *Scientific Advances*, doi: 10.1126/sciadv.1400082

Epstein, B., Pohll, G.M., Bansah, D., Makowski, A., 2007, Regional groundwater model development for the Fernley/Wadsworth hydrologic basins, Nevada.

Glancy, P. and Rush, F.E., 1968, Water-resources appraisal of Smoke Creek-San Emidio Desert area, Nevada and California. Nevada Department of Conservation and Natural Resources. Water Resources – Reconnaissance Series Report 44.

Hydrographic Area Summary, HA009, Long Valley, Nevada Division of Water Resources

Hydrographic Area Summary, HA021, Smoke Creek Desert, Nevada Division of Water Resources

Nevada State Engineer Water Level Database, http://water.nv.gov/data/waterlevel/

Niswonger, R.G., and Prudic, D.E., 2005, Documentation of the Stream flow-Routing (SFR2) Package to Include Unsaturated Flow Beneath Streams – A Modification to SFR1, U.S. Geological Survey Techniques and Methods 6-A13, Reston, Virginia.

Niswonger, R. G., Panday, Sorab, and Ibaraki, Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37, 44 p.

NOAA National Centers for Environmental Information, State of the Climate: Drought for Annual 2008, published online January 2009, retrieved on September 20, 2016 from http://www.ncdc.noaa.gov/sotc/drought/200813.

Palmer, W.C., Meteorological Drought (U.S. Weather Bureau, Washington, DC, 1965)

Pohll, G., D. McGraw, J. Ralston, B. Bohm, J. Thomas, A. McKay, M. Widmer, T. Minor, G. Lamorey, O. Dahan, R. Carroll, K. Cupp, E. Jacobson, E. McDonald, E. Stevick, and J. Huntington, 2001, Evaluation of groundwater and solute transport in the Fernley - Wadsworth Area. Publication No. 41173, Desert Research Institute, Reno, Nevada.

Pohll, G., 2015, Fernley groundwater flow model update.

Pohll, G., 2016. Water for the Seasons Annual Project Update, National Science Foundation, Water Sustainability and Climate Program, Category 2: Water Sustainability and Climate Resiliency in Snow-Fed Arid Lands, Arlington, VA, March 8-9.

Pohll, G., Schumer, R., Rybarski, S., Crews, J., and Pearson, C., 2016, Assessment of drought resiliency in rural northern Nevada.

Sinclair WC., 1963, Ground-Water Appraisal of the Long Valley-Massacre Lake Region, Washoe County, Nevada. Nevada Department of Conservation and Natural Resources. Groundwater Resources-Reconnaissance Report 15.

http://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically increase-risk-of-us

Tables

Table 1. Groundwater pumping by basin, *from* Nevada Statewide Assessment of Groundwater Pumpage, 2013. Volumes in acre-feet.

Hydrographic Area	Basin / Municipality	MM	IND	ENV	IRR	STK	MUN	QM	DOM	REC	COM	OTH	TOTAL	PY	% of PY
82 & 83	Dodge Flat & Tracy Segment / Wadsworth	657	1,175	0	0	0	66	1,030	4,506	727	0	845	9,005	13,600	66.2
21	Smoke Creek Desert / Gerlach	0	0	0	4,576	89	0	0	12	449	8	0	5,134	16,000	32.1
9	Long Valley / Vya	0	0	0	107	70	0	0	5	0	0	0	182	12,000	1.5

MM = Mining and Milling, IND = Industrial and Construction, ENV = Environmental, IRR = Irrigation, STK = Stock, MUN = Municipal, QM = Quasi-municipal, DOM = Domestic, REC = Recreation and Wildlife, COM = Commercial, OTH = Other, PY = Perennial Yield

Table 2. Flow budget for the Dodge Flat/Tracy Segment/Fernley Area (Wadworth) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	391993	3285
Interbasin Flow	176840	1482
River/Canal Seepage	1967474	16486
Agricultural Recharge	292169	2448
Sinks		
Evapotranspiration	-769389	6447
Interbasin Flow	-706305	5918
River/Canal Seepage	-1065022	8924
Pumping Wells	-680984	5706

Summary	**Sources-Sinks (ft^3/d)**	**Percent Difference**
	-1.90	-0.000059

Table 3. Flow budget for the Smoke Creek Desert (Gerlach) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1773270	14859
Creek Seepage	32395	271
Interbasin Flow	45351	380
Sinks		
Evapotranspiration	-1591526	-13336
Creek Seepage	-117249	-983
Drains (Springs)	-142239	-1192
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	1.20	0.000065

Table 4. Flow budget for the Long Valley (Vya) steady-state simulation.

	Rate (ft^3/d)	**Rate (AFA)**
Sources		
Mountain Block Recharge	714194	5984
Constant Head	9447	79
Interbasin Flow	298356	2500
Sinks		
Evapotranspiration	-1012802	-8487
Constant Head	-9196	-77
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	0.005859375	5.7332578e-007

Figures

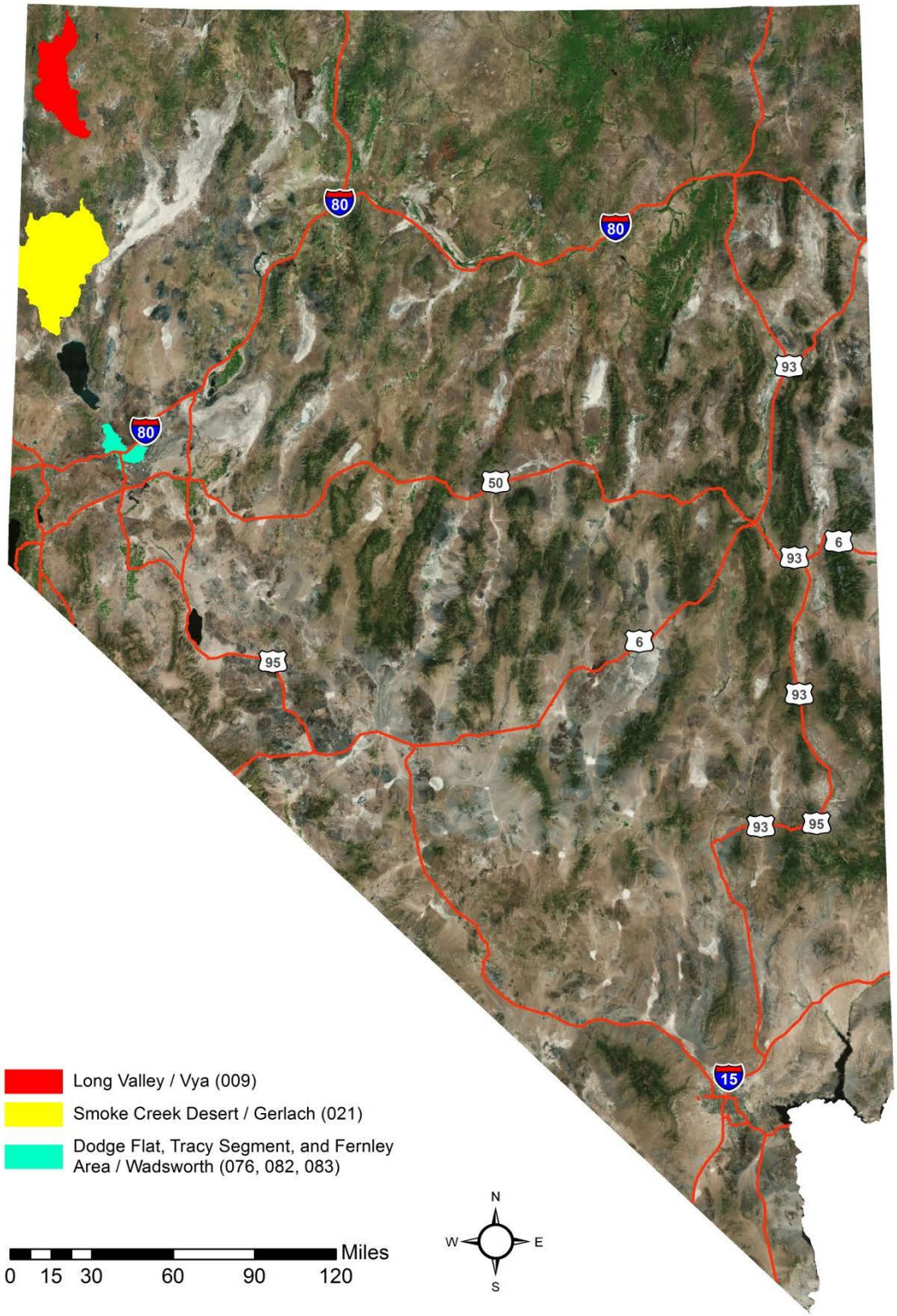


Figure 1. Hydrographic areas modeled for the study presented in this report.

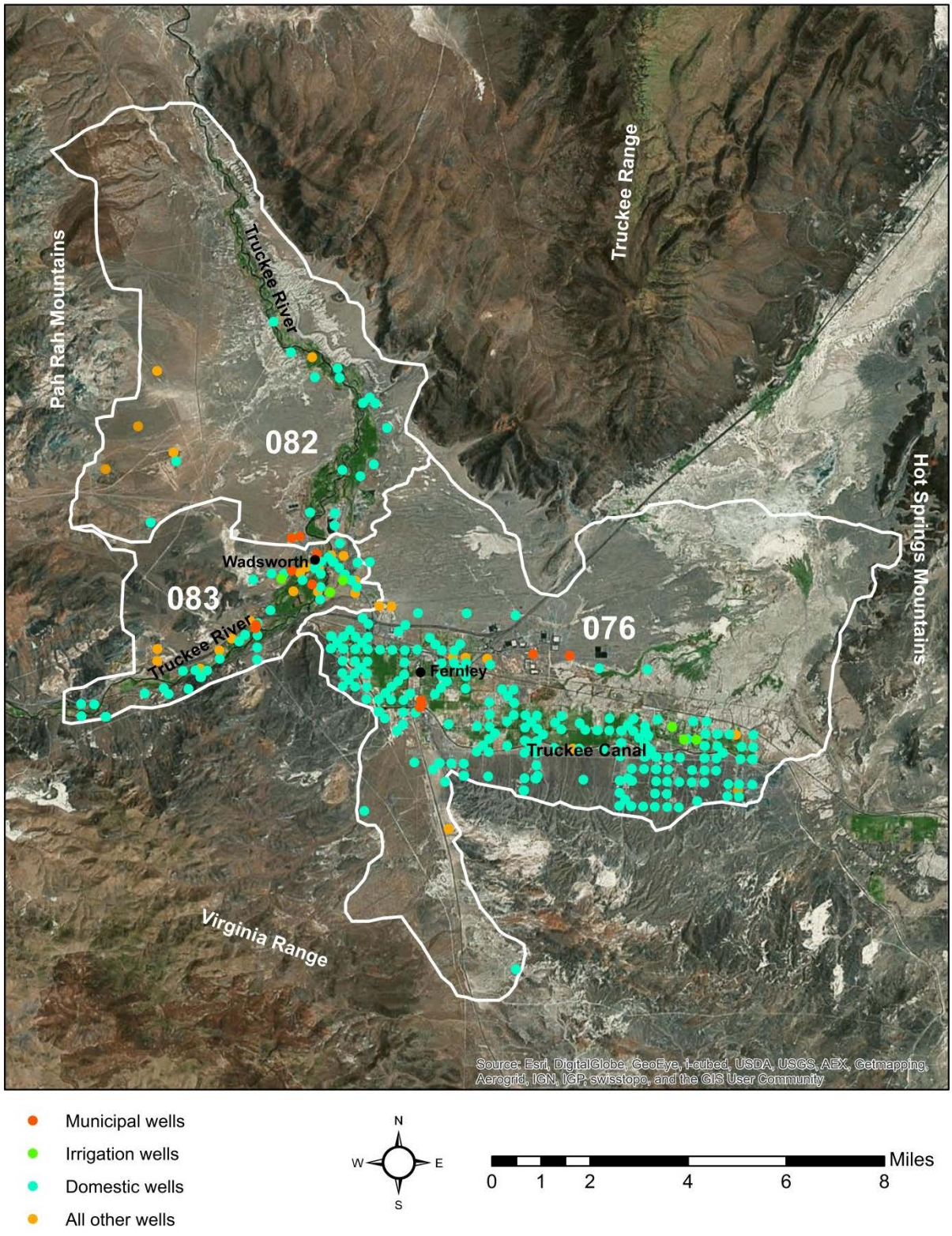


Figure 2. Dodge Flat (82), Fernley Area (76) and Tracy Segment (83) and locations of wells used in transient simulations.

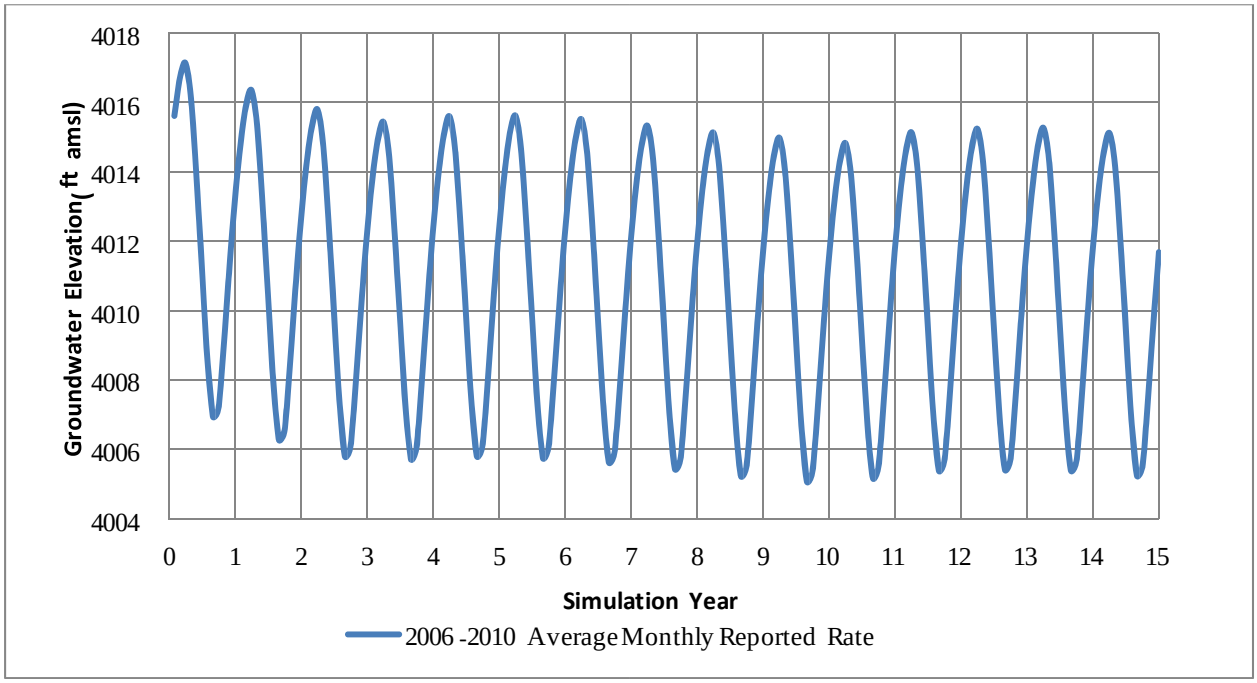


Figure 3. Groundwater levels at PLPT Municipal Well 3 over model duration.

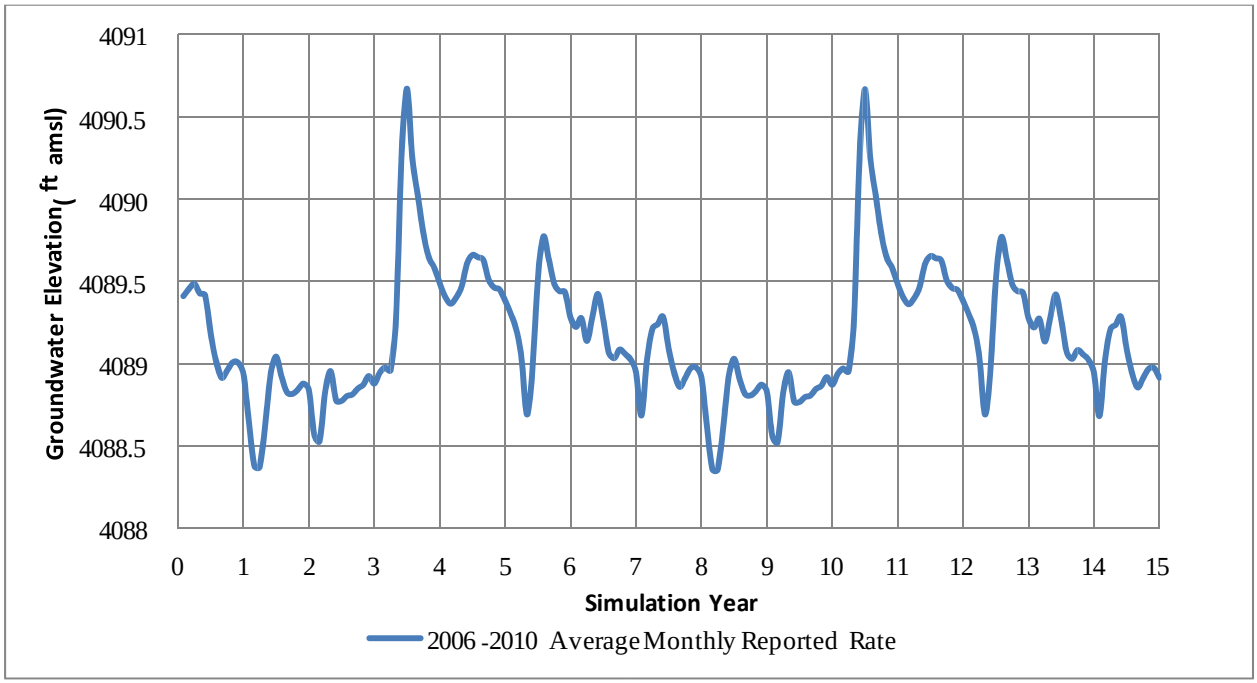


Figure 4. Groundwater levels at Stampmill 1 over model duration.

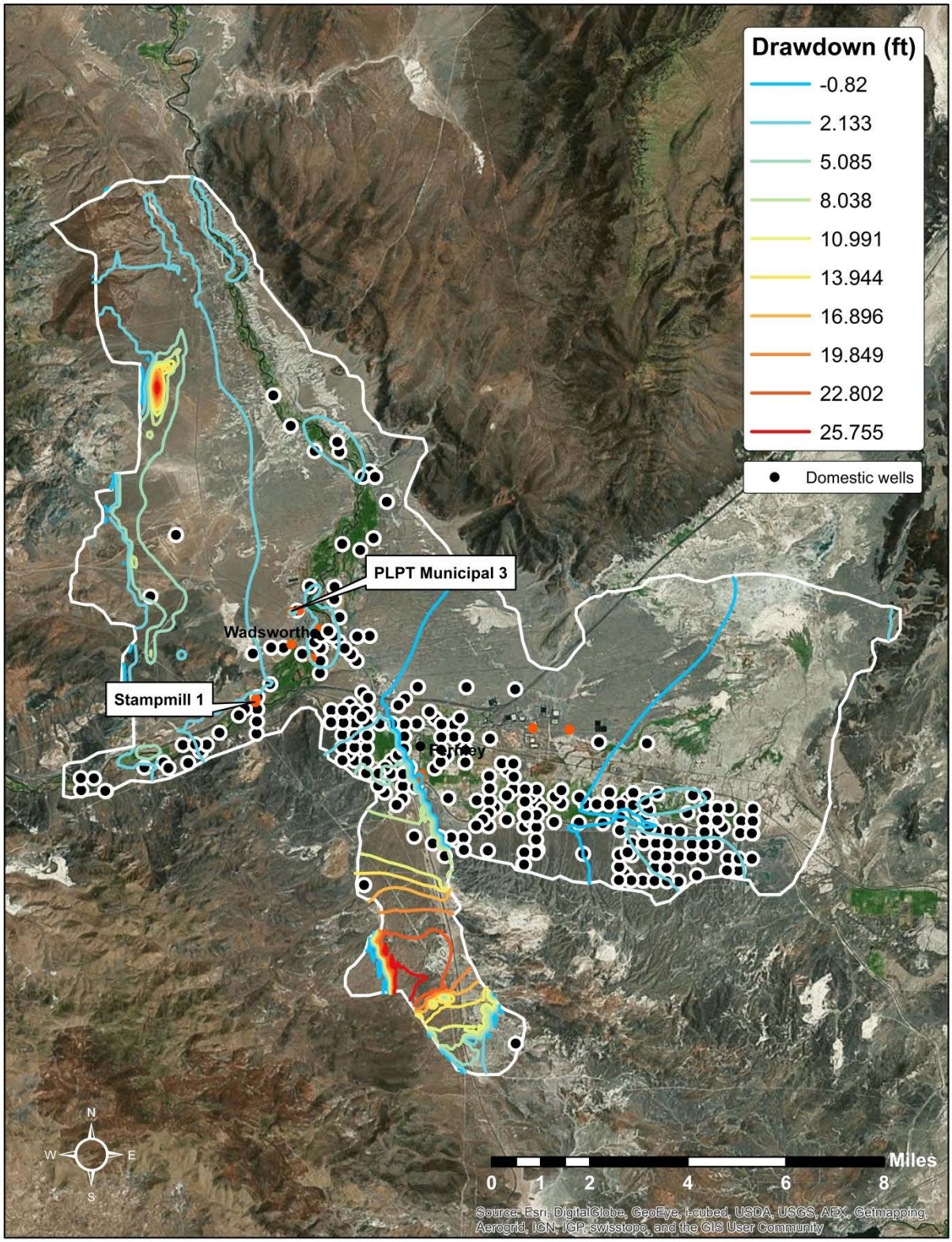


Figure 5. Difference in Dodge Flat / Fernley Area / Tracy Segment drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

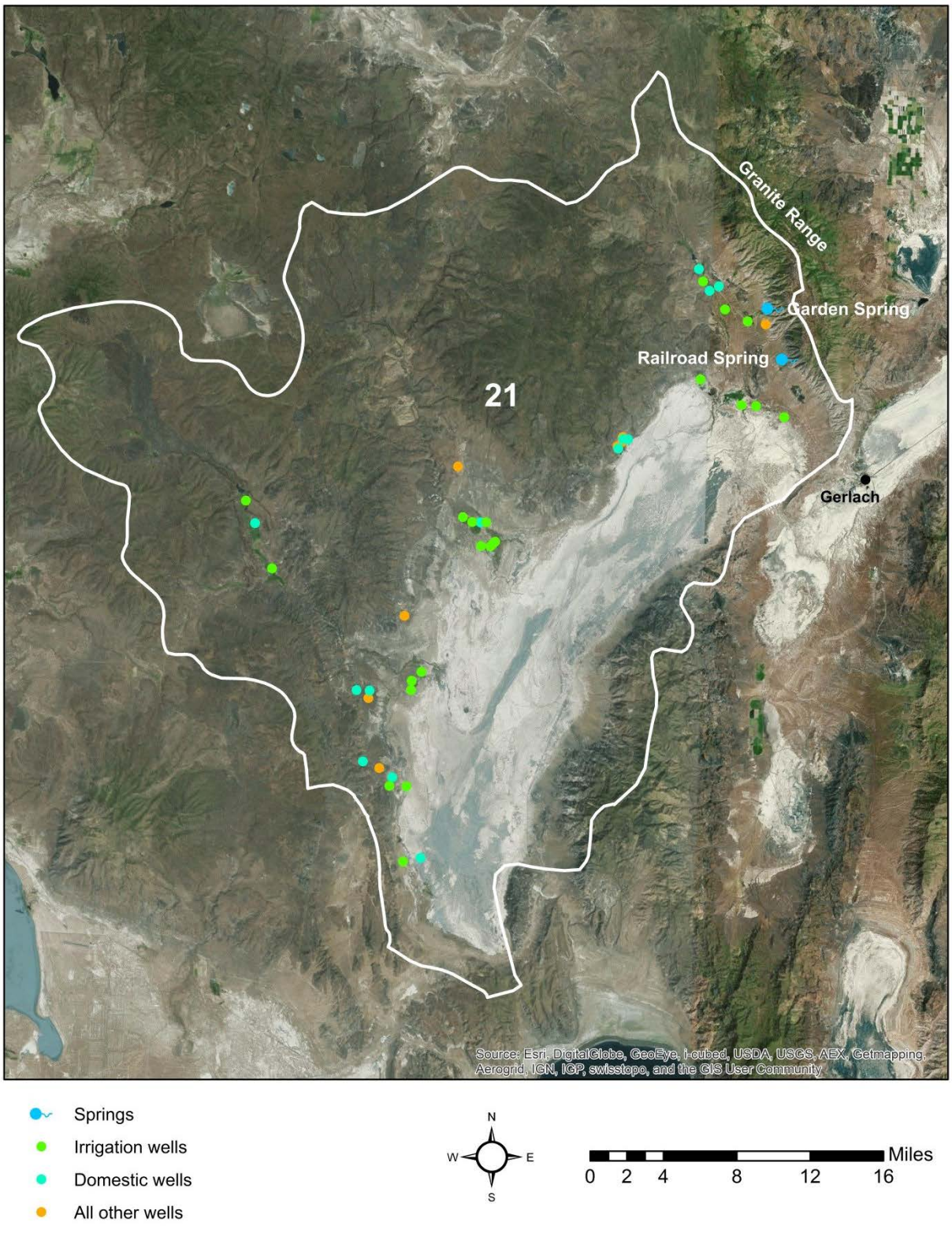


Figure 6. Smoke Creek Desert (21) and locations of wells and springs used in transient simulations.

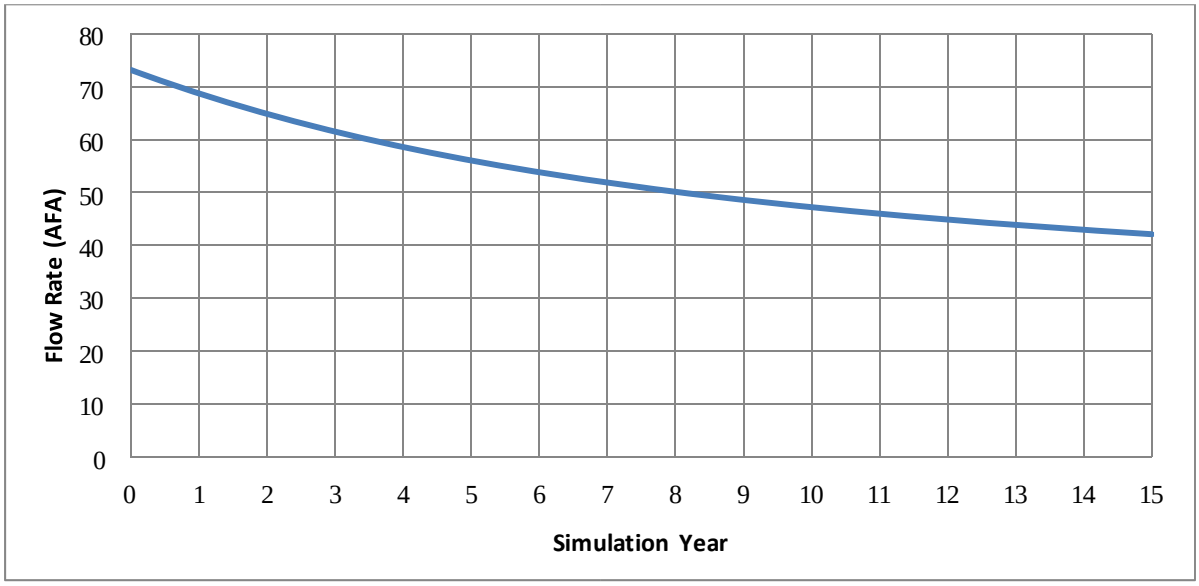


Figure 7. Declines in flow rates for Garden Spring over 15 years of drought conditions.

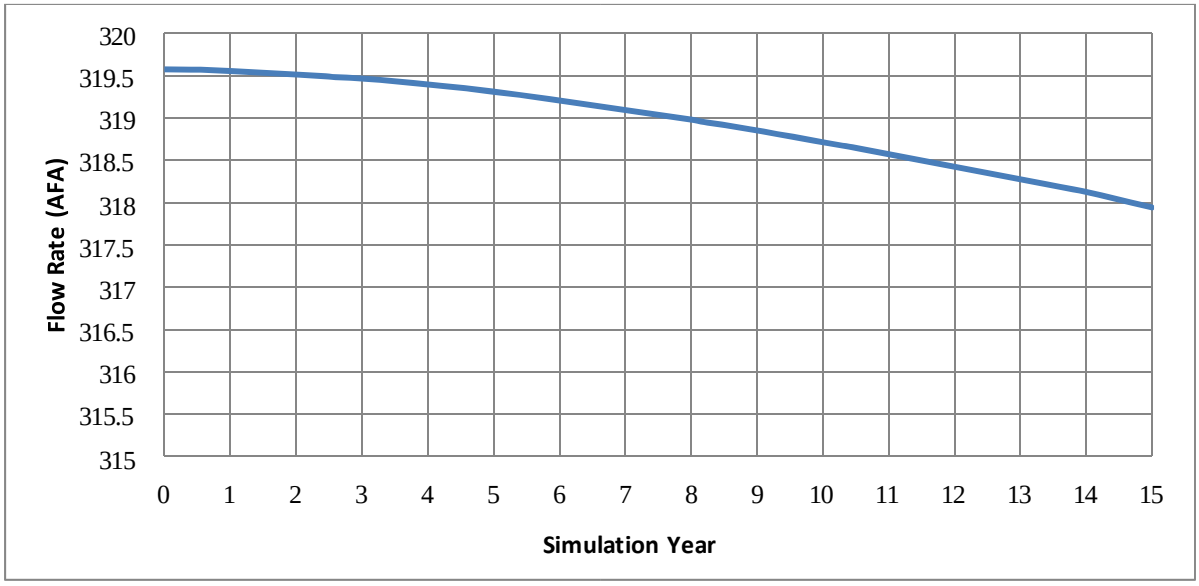


Figure 8. Declines in flow rates for Railroad Spring over 15 years of drought conditions.

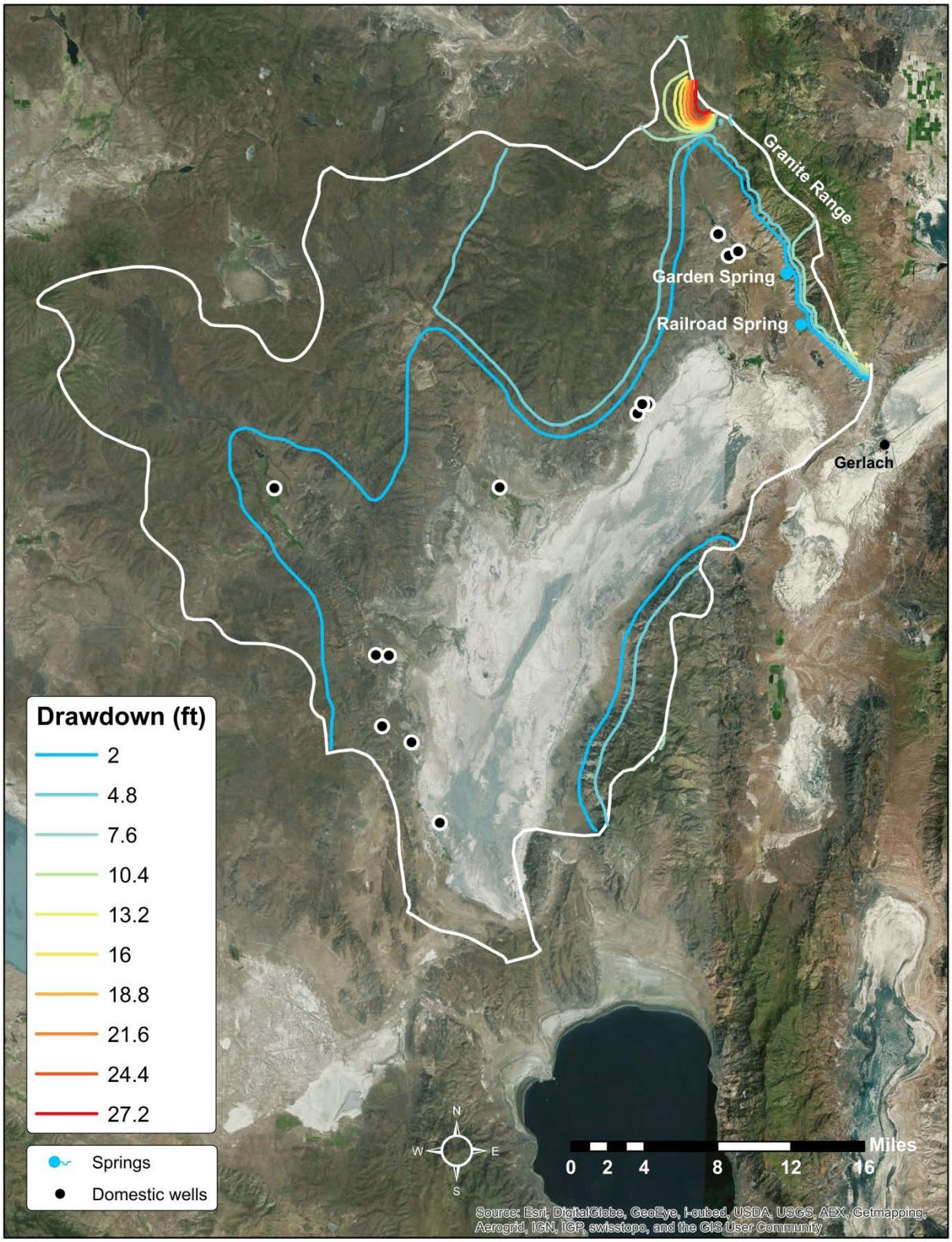


Figure 9. Difference in Smoke Creek Desert drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

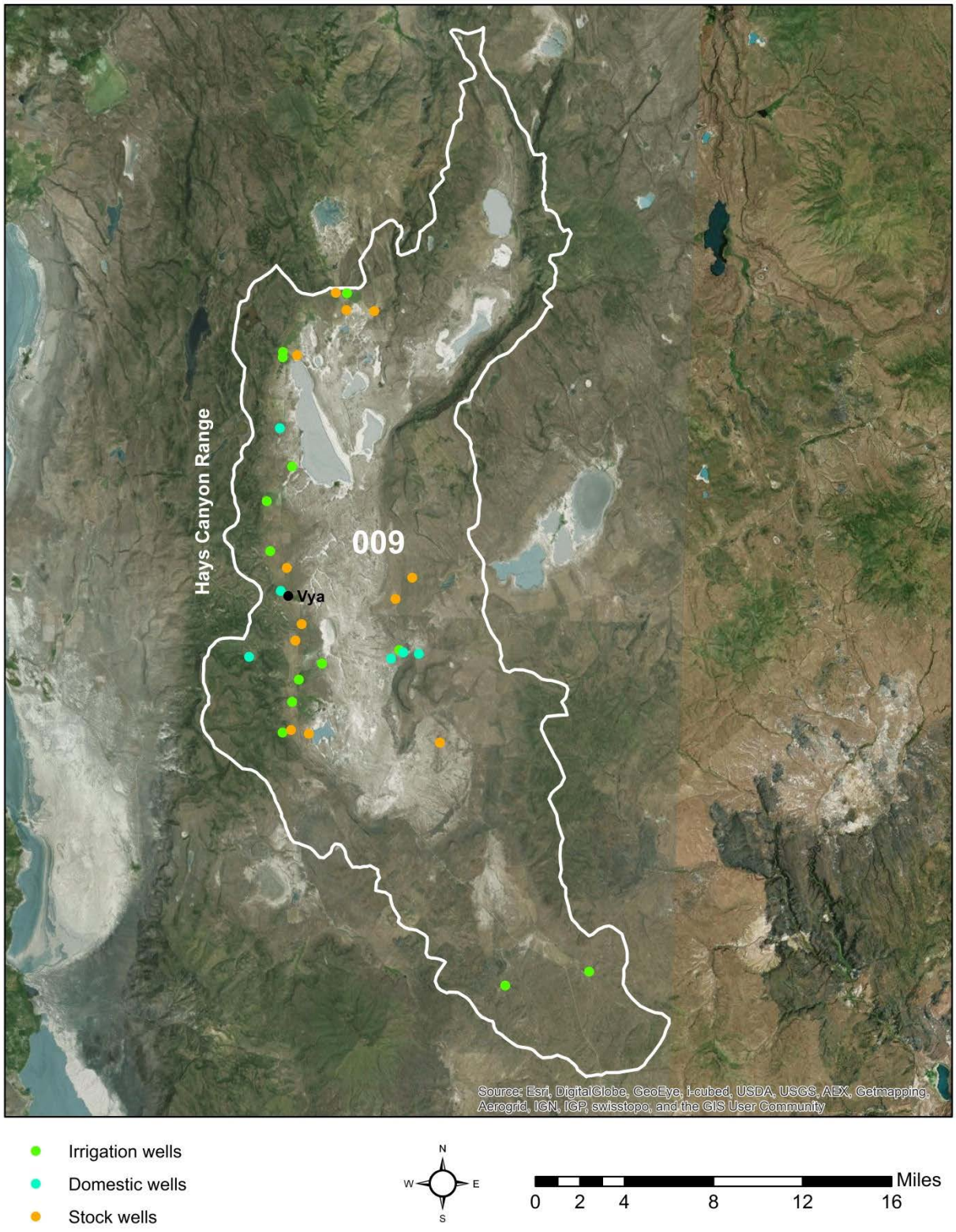


Figure 10. Long Valley (009) and locations of wells used in transient simulations.

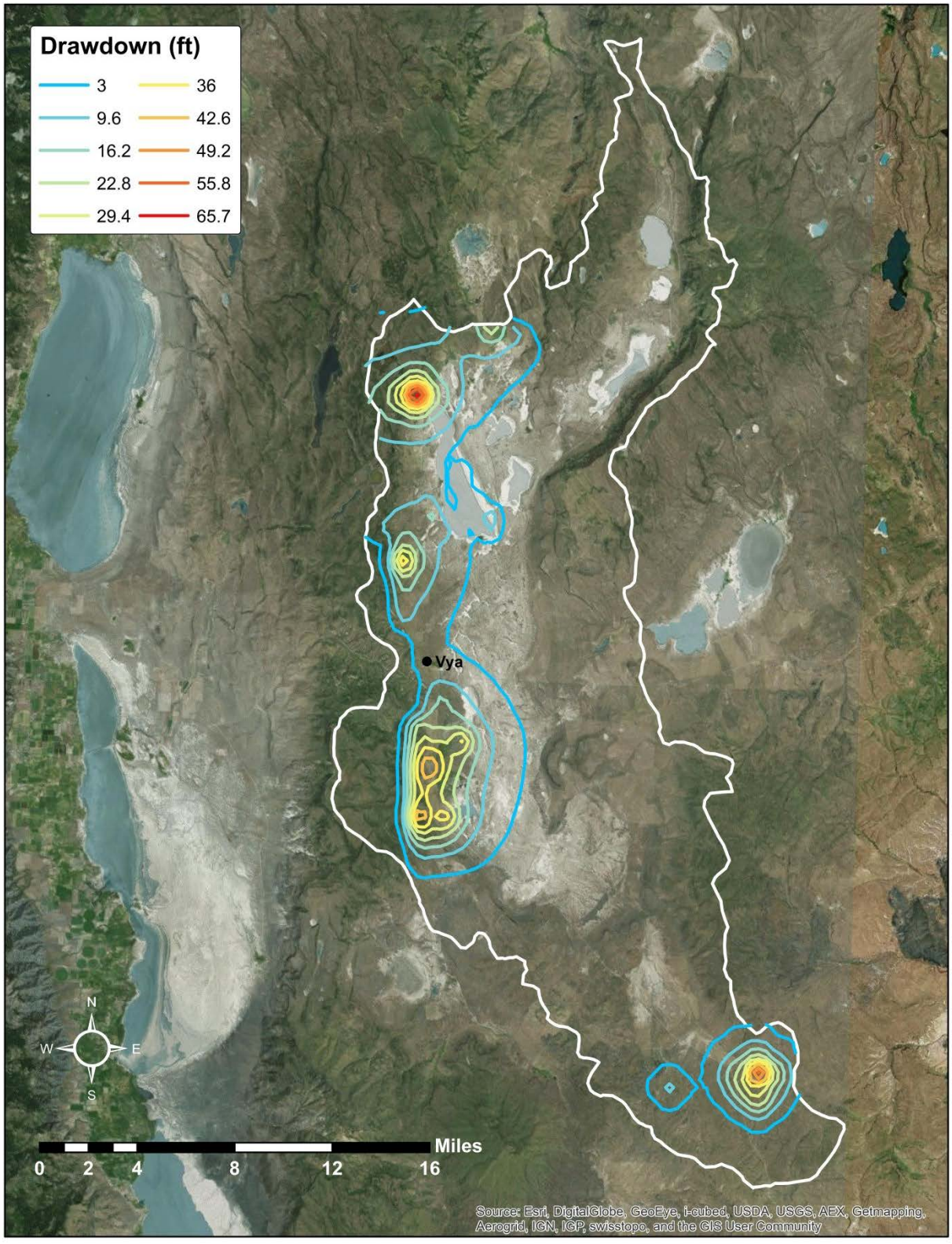


Figure 11. Drawdown in Long Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

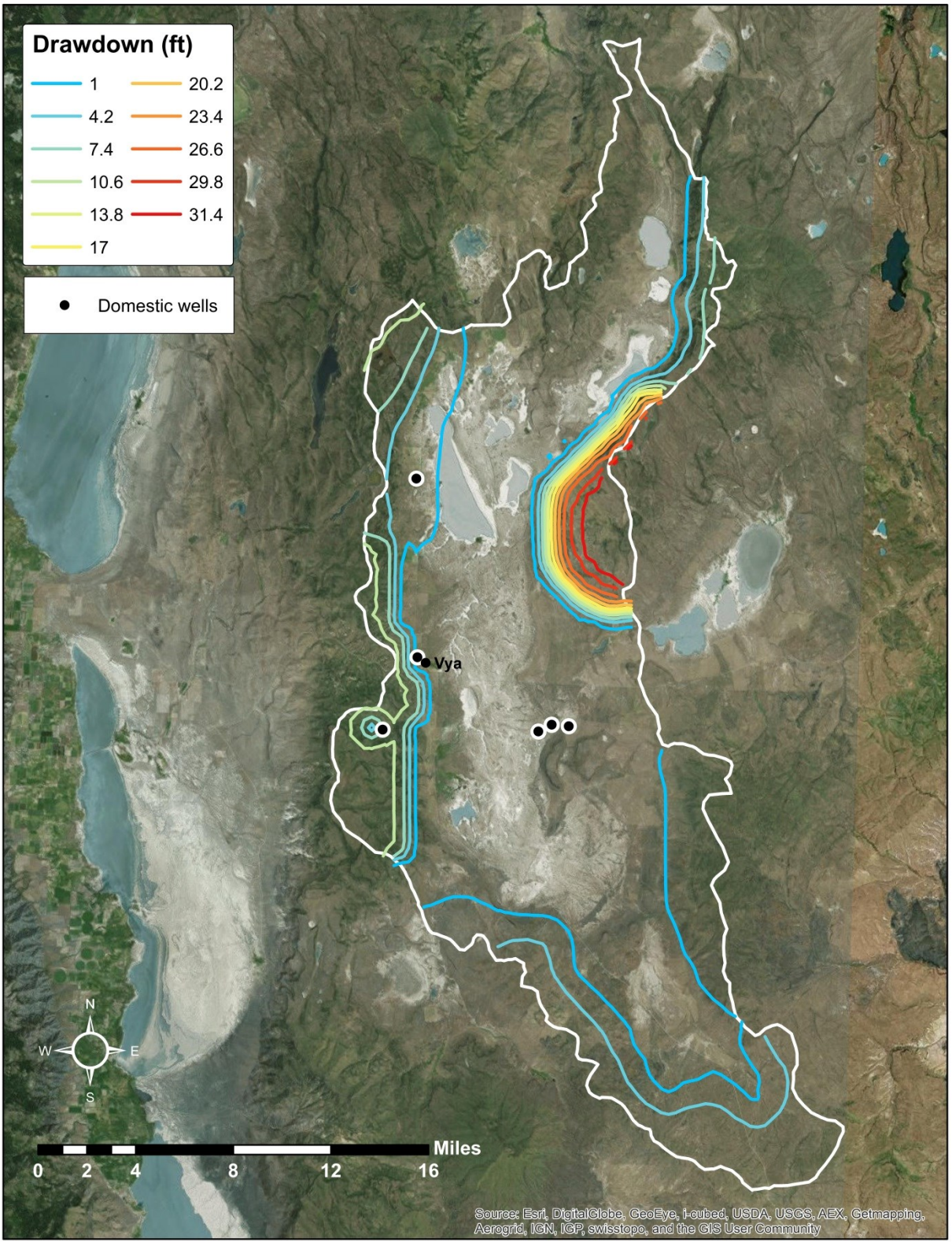


Figure 12. Difference in Long Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

Hydrographic Area Summary, HA070, Winnemucca Segment, Nevada Division of Water Resources

Hydrographic Area Summary, HA073, Lovelock Valley – Oreana Subarea, Nevada Division of Water Resources

Hydrographic Area Summary, HA110C, Walker Lake Valley – Whiskey Flat, Nevada Division of Water Resources

Hydrographic Area Summary, HA153, Diamond Valley, Nevada Division of Water Resources

Hydrographic Area Summary, HA179, Steptoe Valley, Nevada Division of Water Resources

Hydrographic Area Summary, HA192, Dixie Creek – Great Salt Lake Desert, Nevada Division of Water Resources

Lander County Water District #1, 2007, Battle Mountain Water System, Water Conservation Plan

Masbruch, M. D., 2001, Appendix 4: Current Study Groundwater Recharge Estimates for Predevelopment Conditions and Ranges of Previously Reported Estimates of Groundwater Recharge for Each Hydrographic Area within the Great Basin Carbonate and Alluvial Aquifer System Study Area. In: Conceptual Model of the Great Basin Carbonate and Alluvial Aquifer System. V.M. Heilweil and L.E. Brookes (Eds.), U.S Geological Survey Scientific Investigations Report 2010-5193.

Maxey, G. B. and Eakin, T. E., 1949, Ground water in White River Valley, White Pine, Nye, and Lincoln Counties, Nevada. No. 8, State of Nevada Office of the State Engineer prepared in cooperation with the United State Department of the Interior Geological Survey, Carson City, Nevada.

Nevada State Engineer Water Level Database, http://water.nv.gov/data/waterlevel/

Niswonger, R. G., Panday, Sorab, and Ibaraki, Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37, 44 p.

Nowlin, J.O., 1986, A ground-water-quality monitoring program for Nevada, U.S. Geological Survey Open-File Report 78-768.

Palmer, W.C., Meteorological Drought (U.S. Weather Bureau, Washington, DC, 1965)

Robinson, T. W. and Fredericks, J. C., 1946, Ground Water in Lovelock Valley, Nevada, Water Resources Bulletin No. 2, Office of the State Engineer, State of Nevada, 24 p.

Rush, F. E. and Everett, D. E., 1966, Water resources appraisal of the Huntington Valley area, Elko and White Pine Counties, Nevada, Water Resources-Reconnaissance Series Report 35, Department of Conservation and Natural Resources, Carson City, 37 p.

Sinclair WC. 1963. Ground-Water Appraisal of the Long Valley-Massacre Lake Region, Washoe County, Nevada. Nevada Department of Conservation and Natural Resources. Groundwater ResourcesReconnaissance Report 15.

Spring Creek Utilities Co., 2012, Water Conservation Plan

Welch, A. H., Bright, D. J., and Knochenmus, L. A., eds., 2007, Water resources of the Basin and Range carbonate-rock aquifer system, White Pine County, Nevada, and adjacent areas in Nevada and Utah: U.S. Geological Survey Scientific Investigations Report 2007–5261, 96 p.

http://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramaticallyincrease-risk-of-us

Tables

Table 1. Trends in groundwater elevation for the period 2010-2015.

Basin No.	Basin Name	Average Water Level Decline (ft/5 yrs)	Standard Deviation of rate (ft/5 yrs)	Maximum Decline (ft/5 yrs)	Average rate of decline (ft/yr)	Standard Deviation of Rate (ft/yr)	Number of wells in basin with records	No. of wells with complete 2010-2015 records
56	Upper Reese River Valley	4.7	2.6	10.9	0.9	0.5	33	26
64	Clovers Area	-3.0	8.2	8.0	-0.6	1.6	107	42
52	Mary's Creek Area	2.1	1.9	5.1	0.4	0.4	9	9
49	Elko Segment	-3.0	8.2	8.0	-0.6	1.6	24	17
179	Steptoe Valley	2.0	5.0	20.1	0.4	1.0	108	41
153	Diamond Valley	9.8	7.0	38.1	2.0	1.4	165	57
110C	Walker Lake Valley						0	0
73	Lovelock Valley	0.4	1.6	2.8	0.1	0.3	17	4
48	Dixie Creek - Tenmile Creek Area	1.6	1.3	3.2	0.3	0.3	48	11
192	Great Salt Lake Desert						0	0
70	Winnemucca Segment	4.3	3.4	11.2	0.9	0.7	23	13

Table 2. Groundwater pumping by basin, from Nevada Statewide Assessment of Groundwater Pumpage, 2013. Volumes in acre-feet.

Hydrographic Area	Basin / Municipality	MM	IND	ENV	IRR	STK	MUN	QM	DOM	REC	COM	OTH	TOTAL	PY	% of PY
153	**Diamond Valley / Eureka**	**1,421**	**0**	**0**	**100,893**	**857**	**1,657**	**245**	**96**	**0**	**5**	**0**	**105,173**	**30,000**	**350.6**
73 & 73A	**Lovelock Valley / Lovelock**	**1,060**	**0**	**0**	**5,816**	**61**	**1,327**	**109**	**125**	**5**	**309**	**0**	**8,811**	**4,200**	**209.8**
70 & 71	**Winnemucca Segment & Grass Valley / Winnemucca**	**85**	**1,387**	**14**	**46,414**	**146**	**3,900**	**864**	**1,366**	**414**	**124**	**49**	**54,763**	**30,000**	**182.5**
110C	Walker Lake Valley / Hawthorne	0	72	0	1,676	6	5,798	2	19	0	41	152	7,766	5,000	155.3
179	Steptoe Valley / Ely	29,137	69	0	30,761	260	3,616	1,360	437	41	20	0	65,701	70,000	93.9
48	**Dixie Creek-Tenmile Creek Area /Spring Creek**	**389**	**10**	**0**	**289**	**204**	**3,068**	**5**	**515**	**5,637**	**68**	**12**	**10,197**	**13,000**	**78.4**
49	**Elko Segment / Elko**	**1**	**26**	**41**	**218**	**177**	**7,214**	**508**	**1,117**	**45**	**693**	**0**	**10,038**	**13,000***	**77.2**
56	Upper Reese River Valley / Austin	0	0	0	18,819	64	44	499	64	0	0	0	19,490	37,000	52.7
64	Clovers Area / Battle Mountain	676	3,176	0	10,804	220	113	25	159	528	0	0	15,701	72,000	21.8
52	Marys Creek Area / Carlin	0	0	724	117	13	262	0	16	0	0	0	1,132	13,000*	8.7
192	Great Salt Lake Desert / Wendover	0	0	0	0	6	0	0	3	0	0	0	9	5,000	0.2

MM = Mining and Milling, IND = Industrial and Construction, ENV = Environmental, IRR = Irrigation, STK = Stock, MUN = Municipal, QM = Quasi-municipal, DOM = Domestic, REC = Recreation and Wildlife, COM = Commercial, OTH = Other, PY = Perennial Yield

Basins with municipal pumping rates available are listed in bold

*Combined value for hydrographic areas 49 and 52

Table 3. Flow Budget for Diamond Valley (Eureka) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	2685301	22501
Interbasin Flow	1090790	9140
Sinks		
Evapotranspiration	-3776090	-31641

Summary	Sources - Sinks (ft^3/d)	Percent Difference
	0.095	2.5E-06

Table 4. Flow budget for Lovelock Valley (Lovelock) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	339203	2842
Interbasin Flow	117430	984
River Seepage	12342	103
Sinks		
Evapotranspiration	-414464	-3473
River Seepage	-54511	-457

Summary	Sources-Sinks (ft^3/d)	Percent Difference
	0.198	4.2E-05

Table 5. Flow budget for Winnemucca Segment/Grass Valley (Winnemucca) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1938839	16246
Interbasin Flow	835397	7000
River Seepage	593591	4974

Sinks		
Evapotranspiration	-2218769	-18592
River Seepage	-774458	-6489
Drains (Spring)	-16575	-139
Interbasin Flow	-358027	-3000

Summary	Sources-Sinks (ft^3/d)	Percent Difference
	-2.80	8.3E-05

Table 6: Flow Budget for the Whiskey Flat-Hawthorne (Hawthorne) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	985241	8256
Sinks		
Evapotranspiration	-102394	-858
Specified Head (Walker Lake)	-882847	-7398

Summary	Sources-Sinks (ft^3/d)	Percent Difference
	0.017	1.7e-06

Table 7. Flow budget for Steptoe Valley (Ely) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	9171598	76851
Sinks		
Evapotranspiration	-9171601	-76851

Summary	Sources - Sinks (ft^3/d)	Percent Difference
	-3.39	-3.7E-05

Table 8. Flow budget for the Dixie Creek-Tenmile Creek (Spring Creek) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1210043	10139
Interbasin Flow	119342	1000
River Seepage	818686	6860
Sinks		
Evapotranspiration	-476976	-3997
Interbasin Flow	-1074082	-9000
River Seepage	-597007	-5002

Summary	Sources-Sinks (ft^3/d)	Percent Difference
	5.79	2.7E-04

Table 9: Flow budget for the Elko Segment (Elko) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	471709	3953
Interbasin Flow	1109890	9300
River Seepage	1595623	13370
Sinks		
Evapotranspiration	-1487313	-12463
Interbasin Flow	-11934	-100
River Seepage	-1677990	-14060

Summary	Sources-Sinks (ft^3/d)	Percent Difference
	-14.93	-4.7E-04

Table 10. Flow budget for the Upper Reese River Valley (Austin) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	4816977	40363
Sinks		
Evapotranspiration	-3468342	-29062
Drainage to creeks and river	-1348660	-11301

Summary	Sources - Sinks (ft^3/d)	Percent Difference
	-25.53	-5.3E-04

Table 11. Flow budget for the Clovers Area (Battle Mountain) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1127877	9451
River Seepage	3450	29
Sinks		
Evapotranspiration	-1075308	-9010
Drainage to creeks	-5159	-43
River Seepage	-50857	-426

Summary	Sources - Sinks (ft^3/d)	Percent Difference
	2.70	2.3E-04

Figures

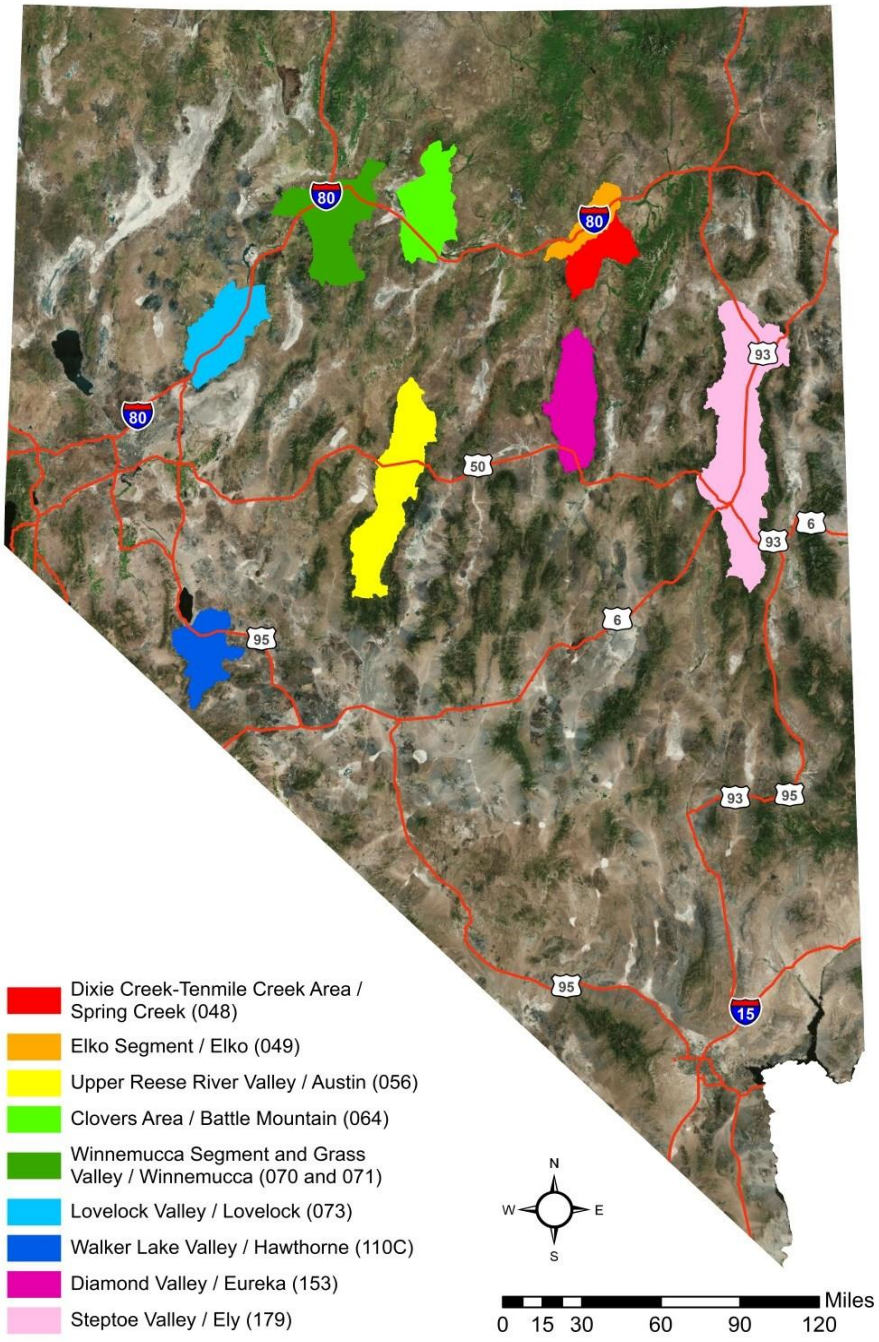


Figure 1. Hydrographic areas modeled for the study presented in this report

		Percent of Normal Recharge	
		100	50
Municipal Well Pumping Rates	Reported Rates	Case-I	Case-II
	Full Water Right	Case-III	Case-IV

Figure 2. Transient simulation scenarios

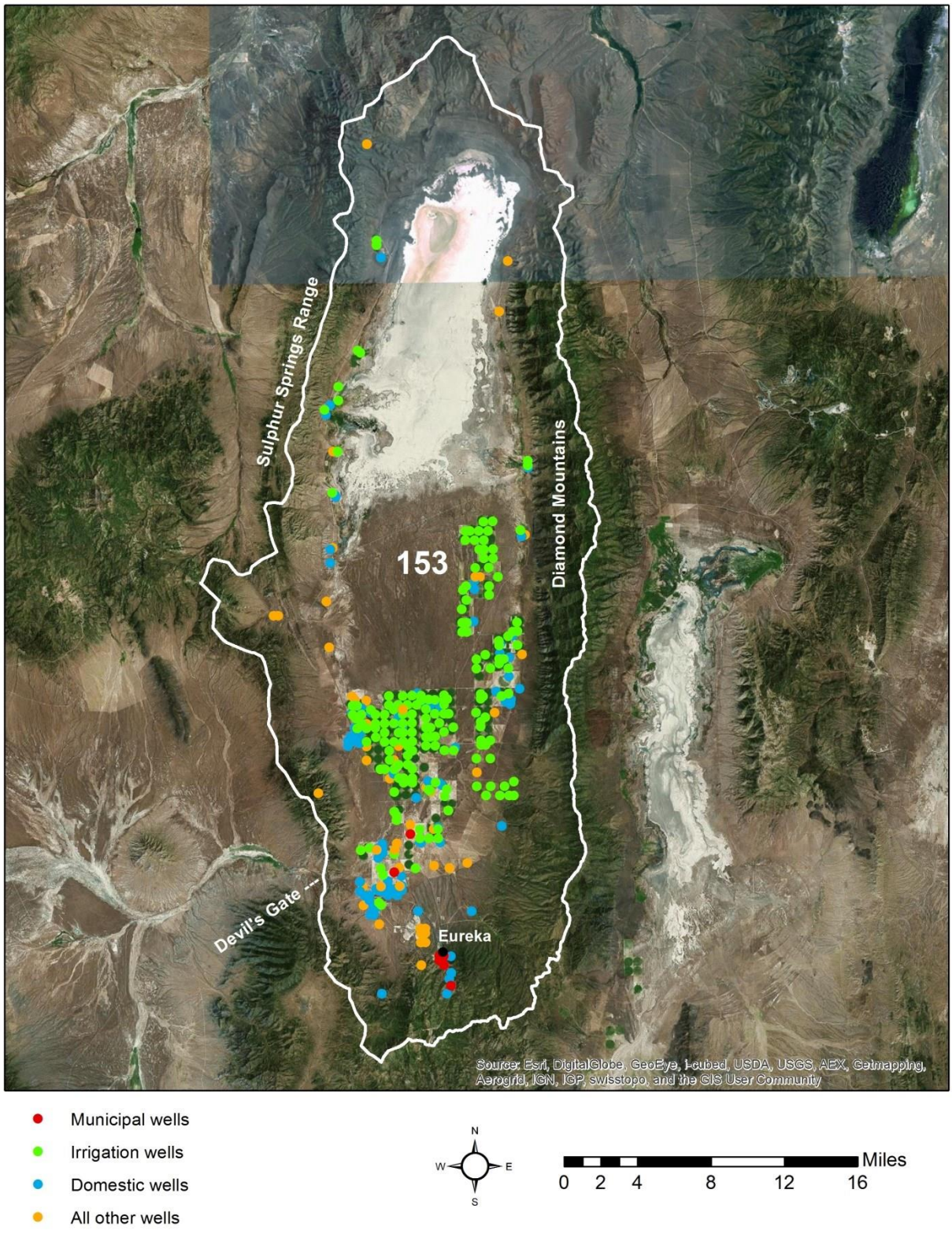


Figure 3. Diamond Valley (153), and locations of wells used in transient simulations.

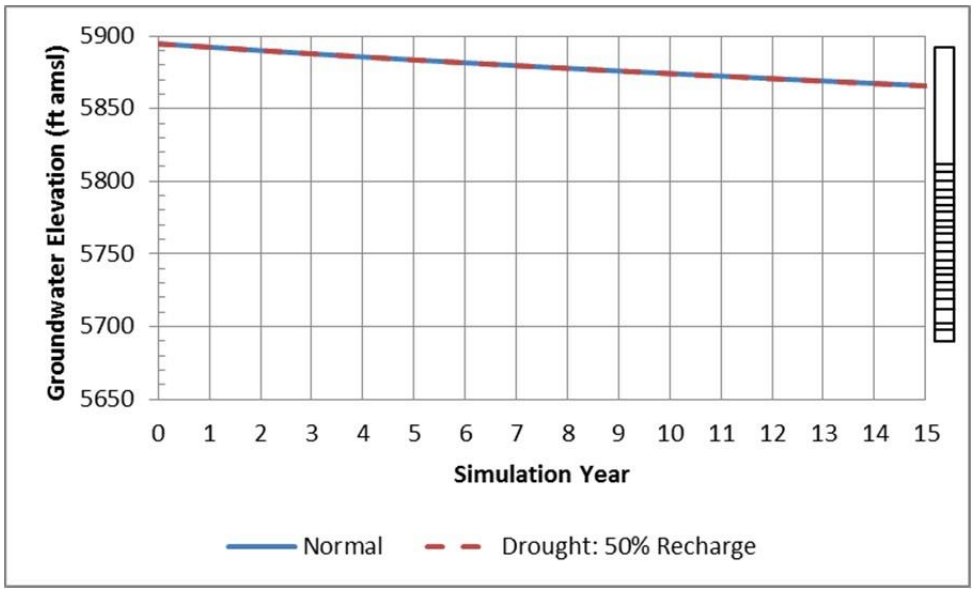


Figure 4. Plot of groundwater elevation at well DV#1 as a function of time under normal (100 percent) recharge conditions and under drought conditions represented by a 50 percent recharge scenario. The elevation of the screened interval of the well is shown on the right.

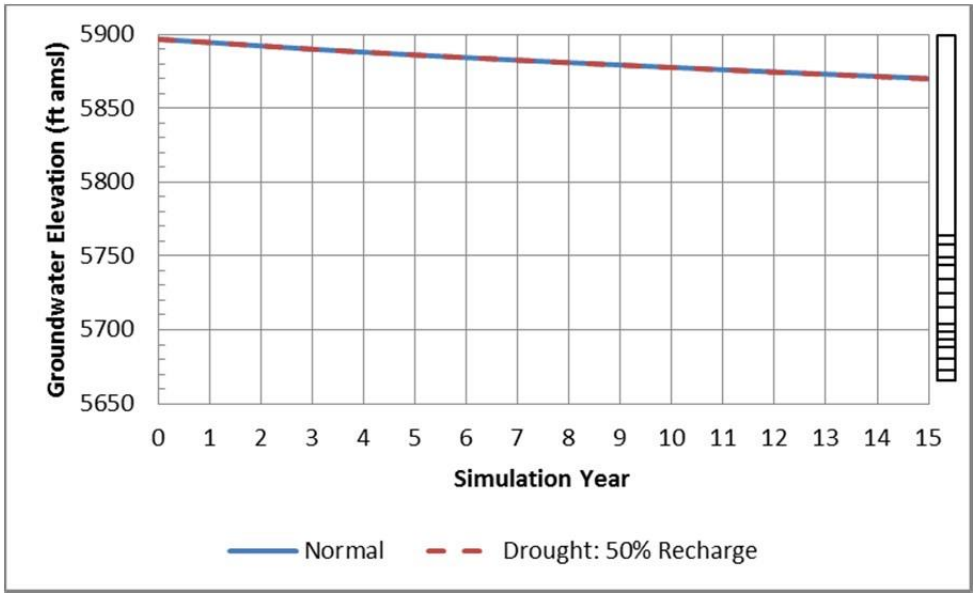


Figure 5. Plot of groundwater elevation at well DV#2 as a function of time under normal recharge conditions and under drought conditions represented by a 50 percent recharge scenario. The elevation of the screened interval of the well is shown on the right.

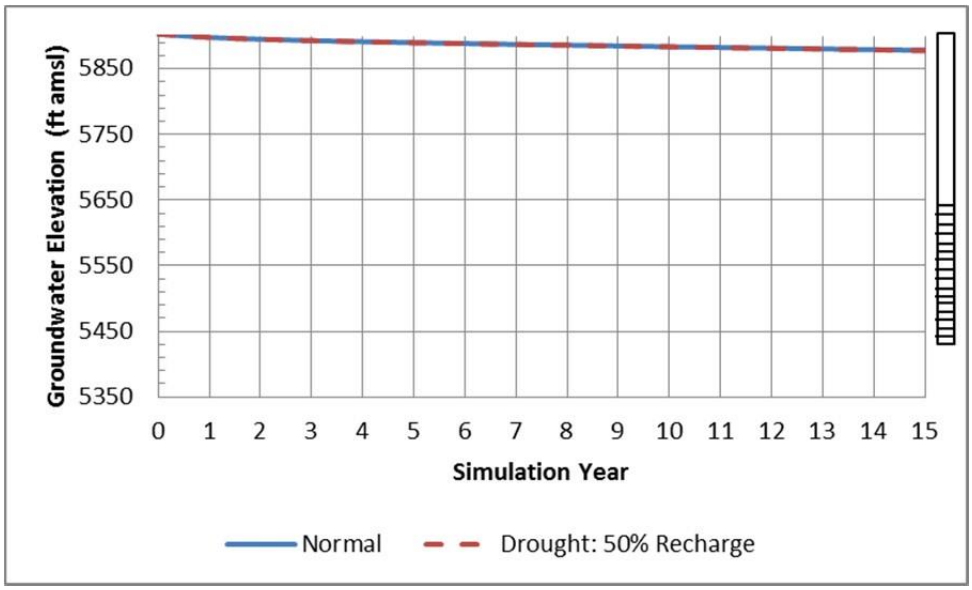


Figure 6. Plot of groundwater elevation at the DV Airport well as a function of time under normal recharge conditions and under drought conditions represented by a 50 percent recharge scenario. The elevation of the screened interval of the well is shown on the right.

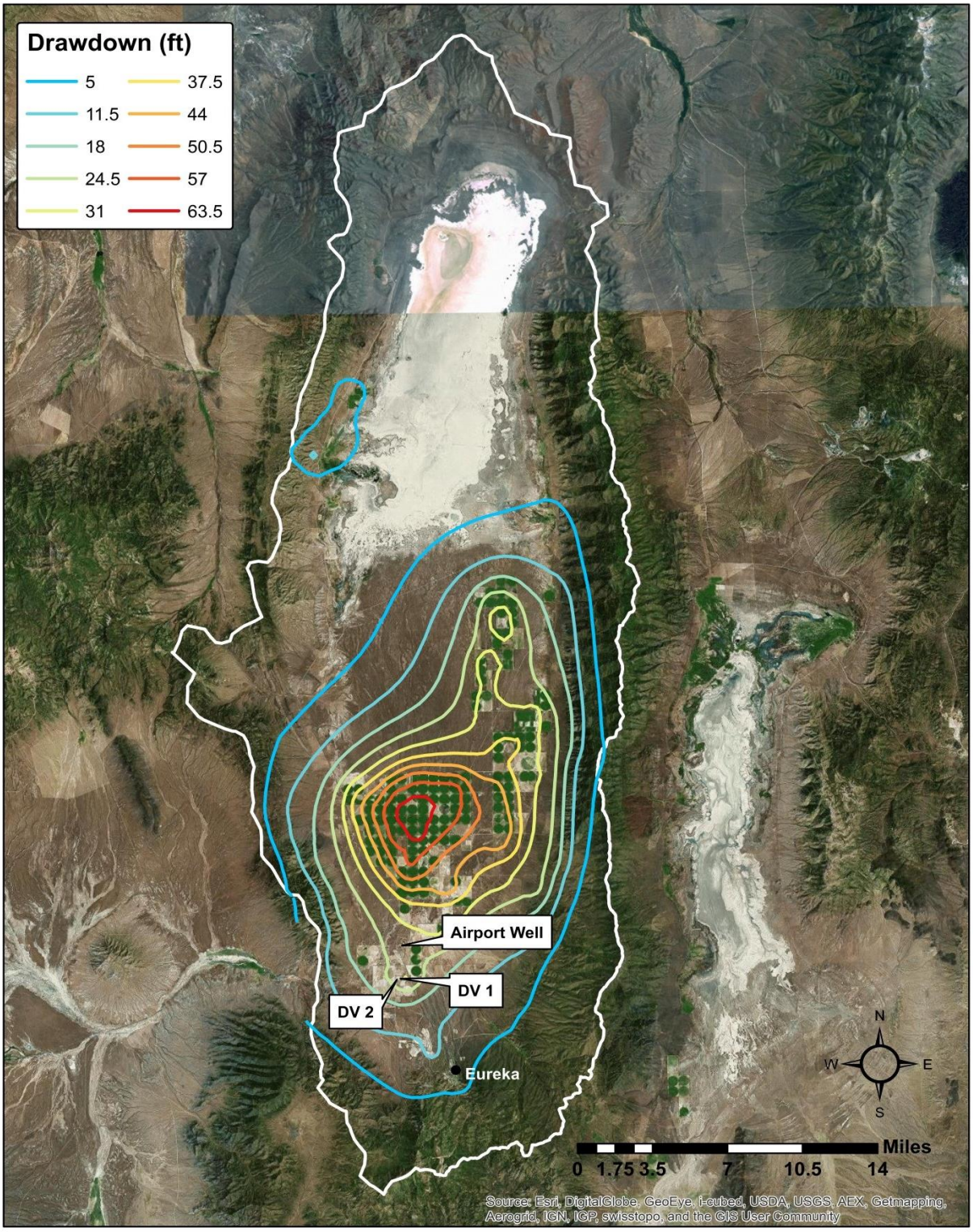


Figure 7. Drawdown in Diamond Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

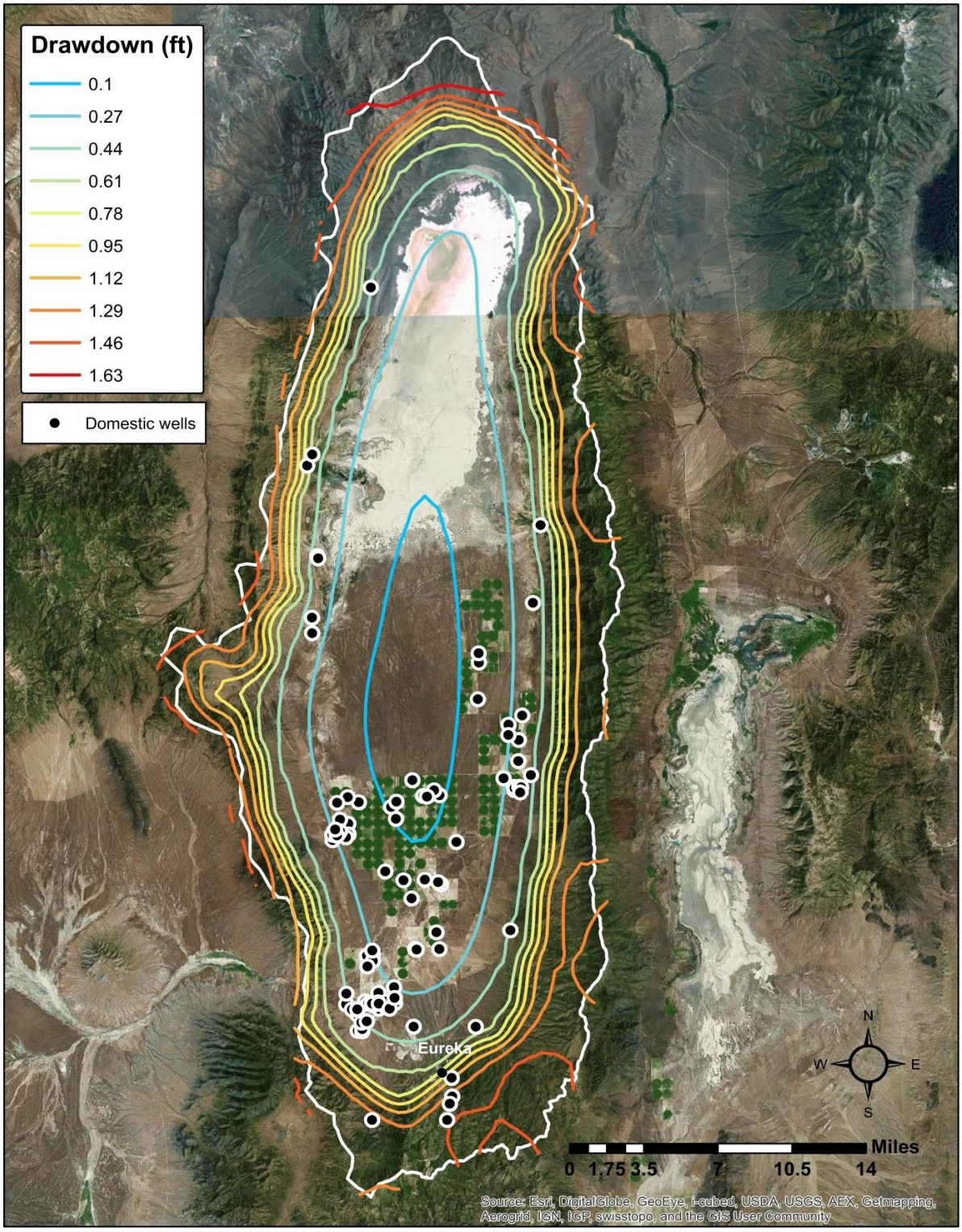


Figure 8. Difference in Diamond Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

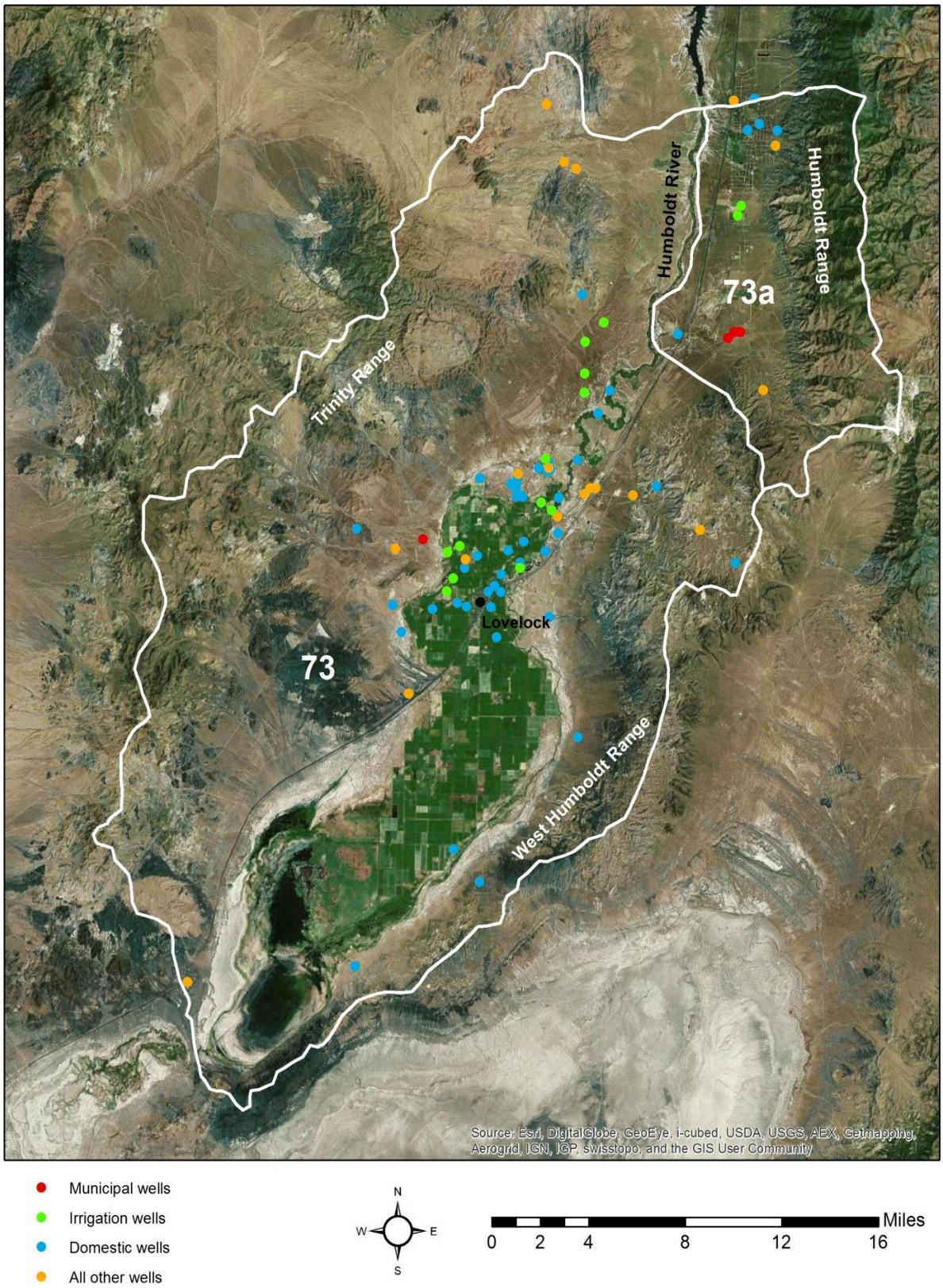


Figure 9. Lovelock Valley (73) , the Oreana sub-area (73a), and locations of wells used in transient simulations.

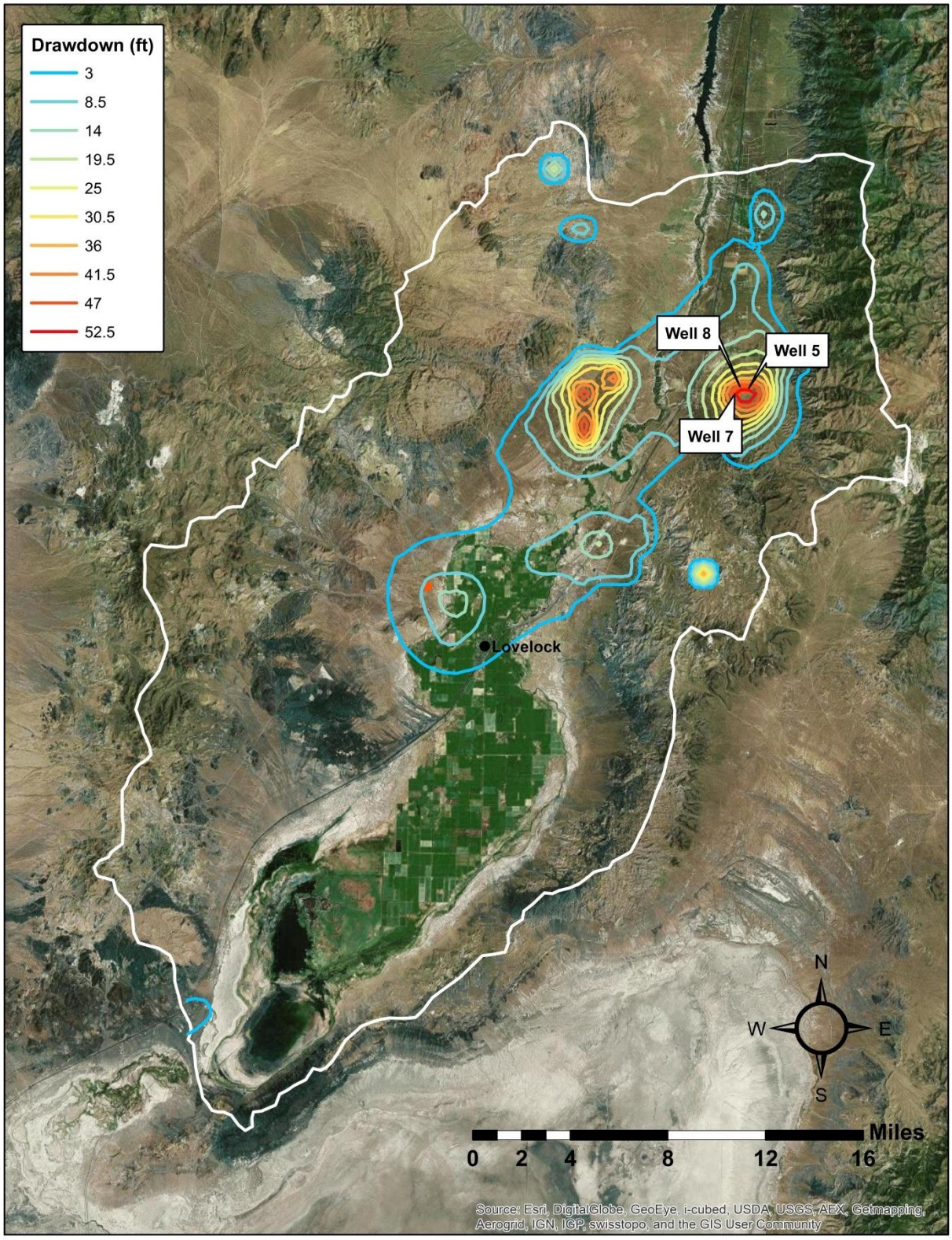


Figure 10. Drawdown in Lovelock Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

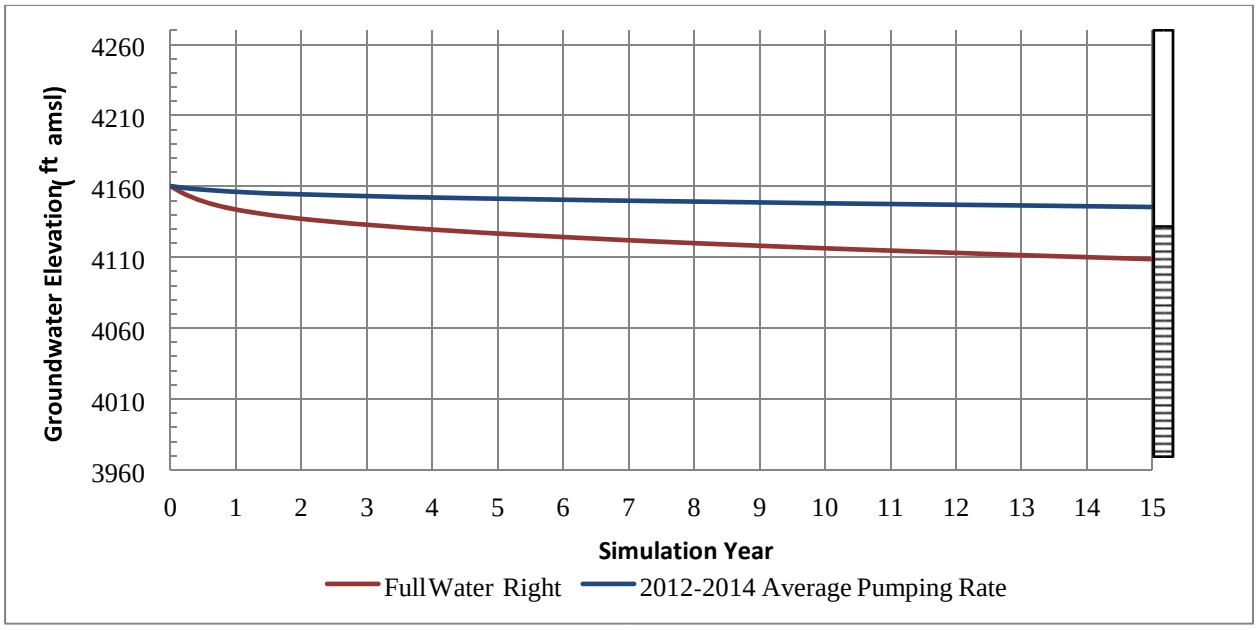


Figure 11. Declines in groundwater levels at Well 7. Total depth of well and screened interval indicated at right.

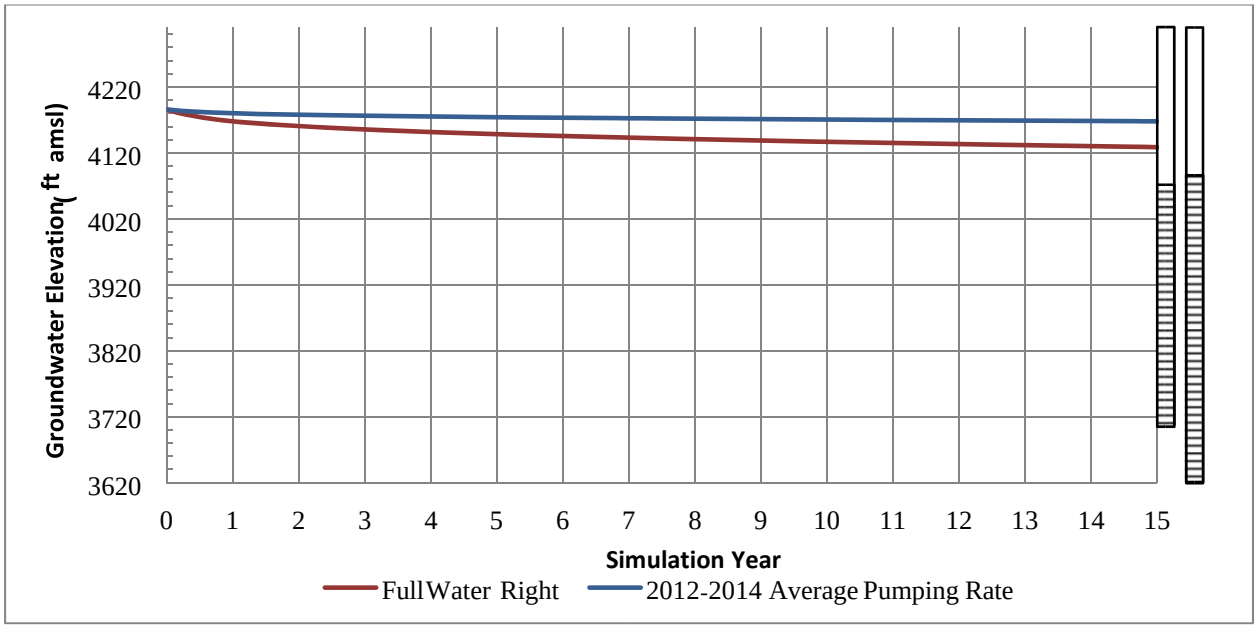


Figure 12. Declines in groundwater levels at Wells 5 and 8. Total depths of wells and screened intervals for Wells 5 and 8, respectively, indicated at right.

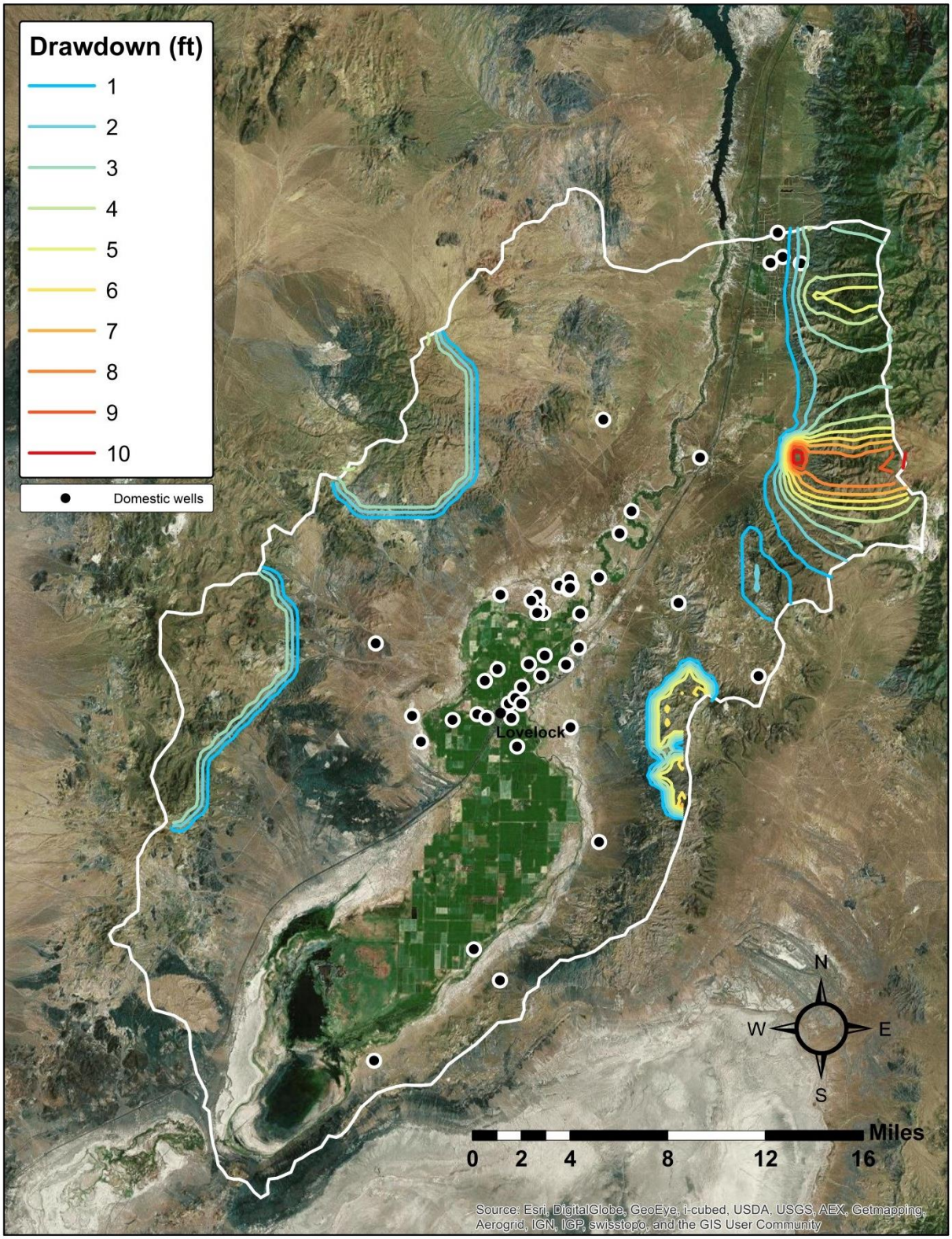


Figure 13. Difference in Lovelock Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

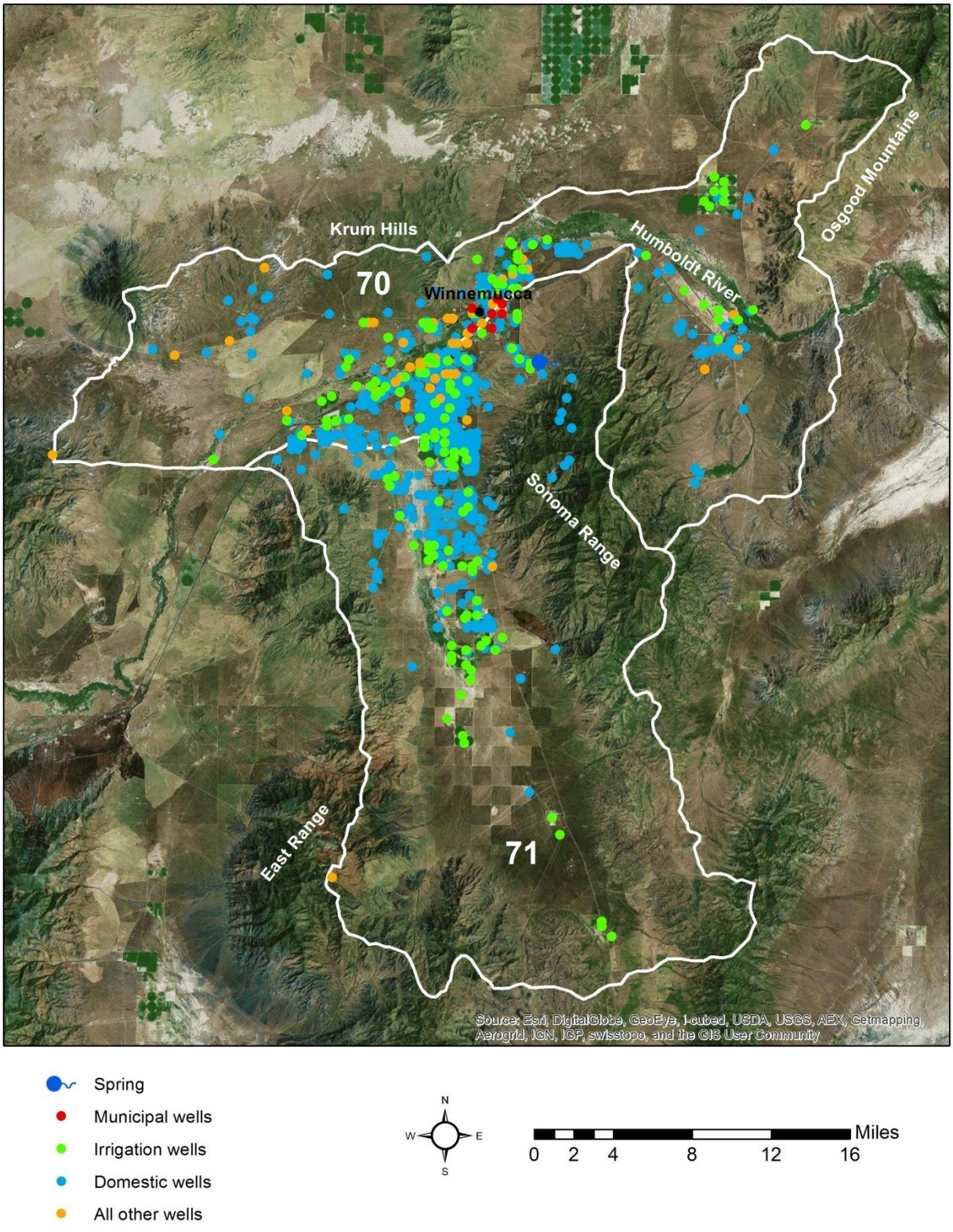


Figure 14. Winnemucca Segment (70) and Grass Valley (71) and locations of wells and springs used in transient simulations.

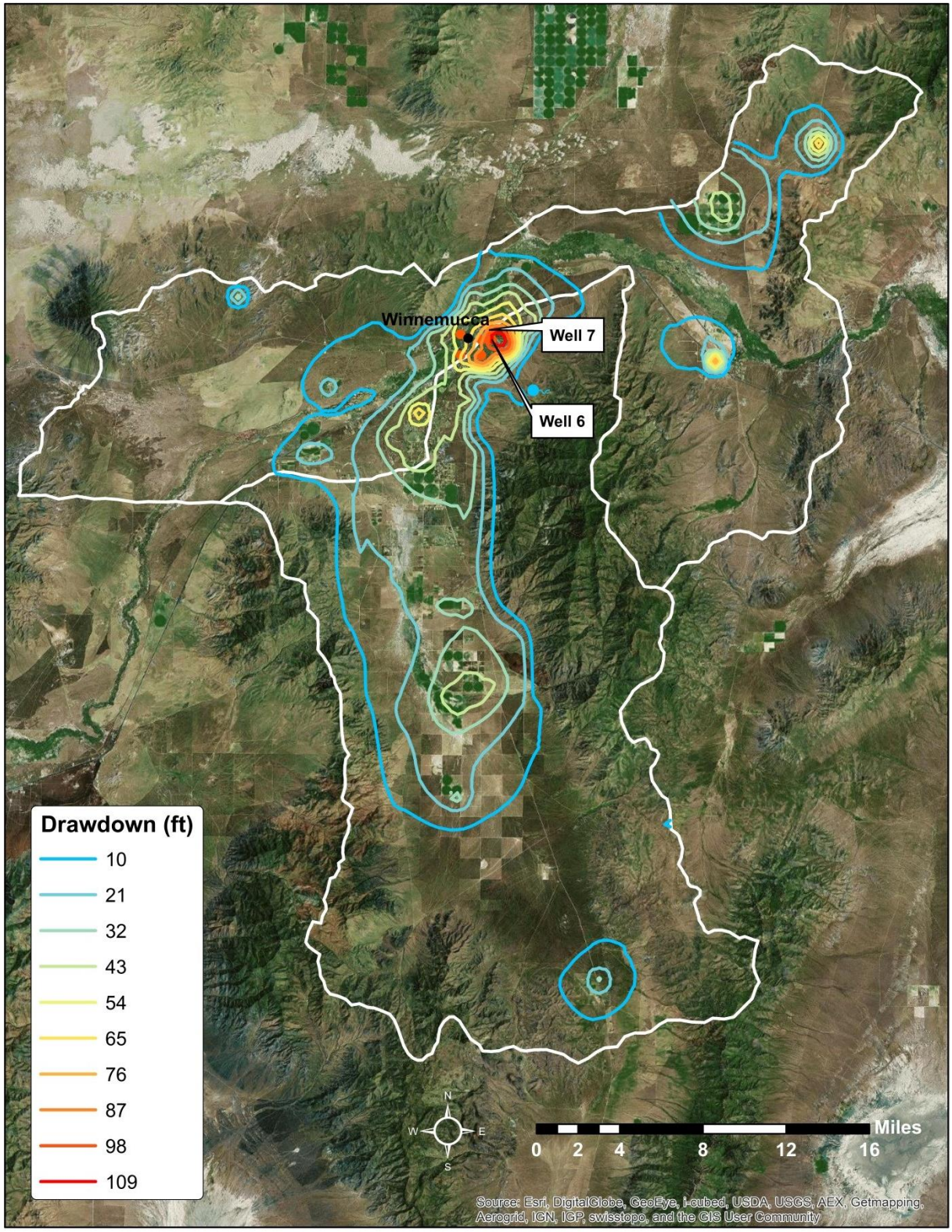


Figure 15. Drawdown in the Winnemucca Segment and Grass Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

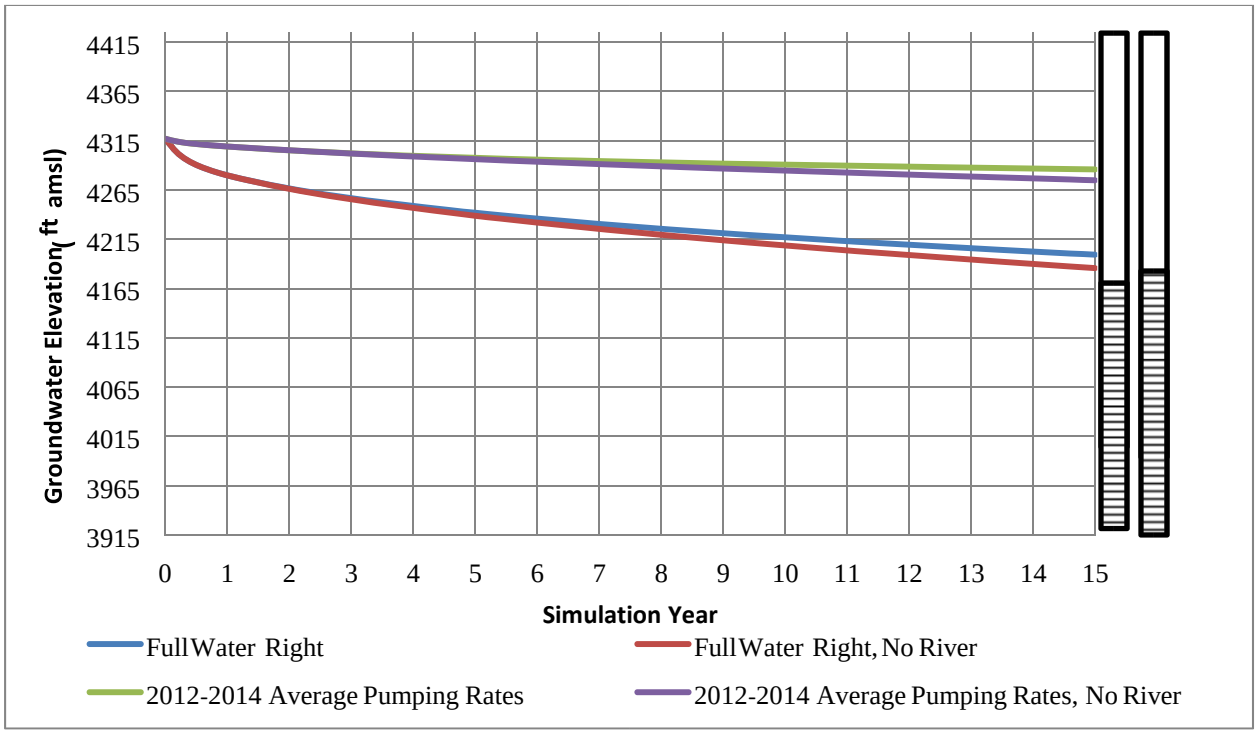


Figure 16. Declines in groundwater levels at Wells 6 and 7. Total depths of wells and screened intervals for Wells 6 and 7, respectively, indicated at right.



Figure 17. Declines in flow rate for mountain spring in the Winnemucca Segment/Grass Valley simulation.

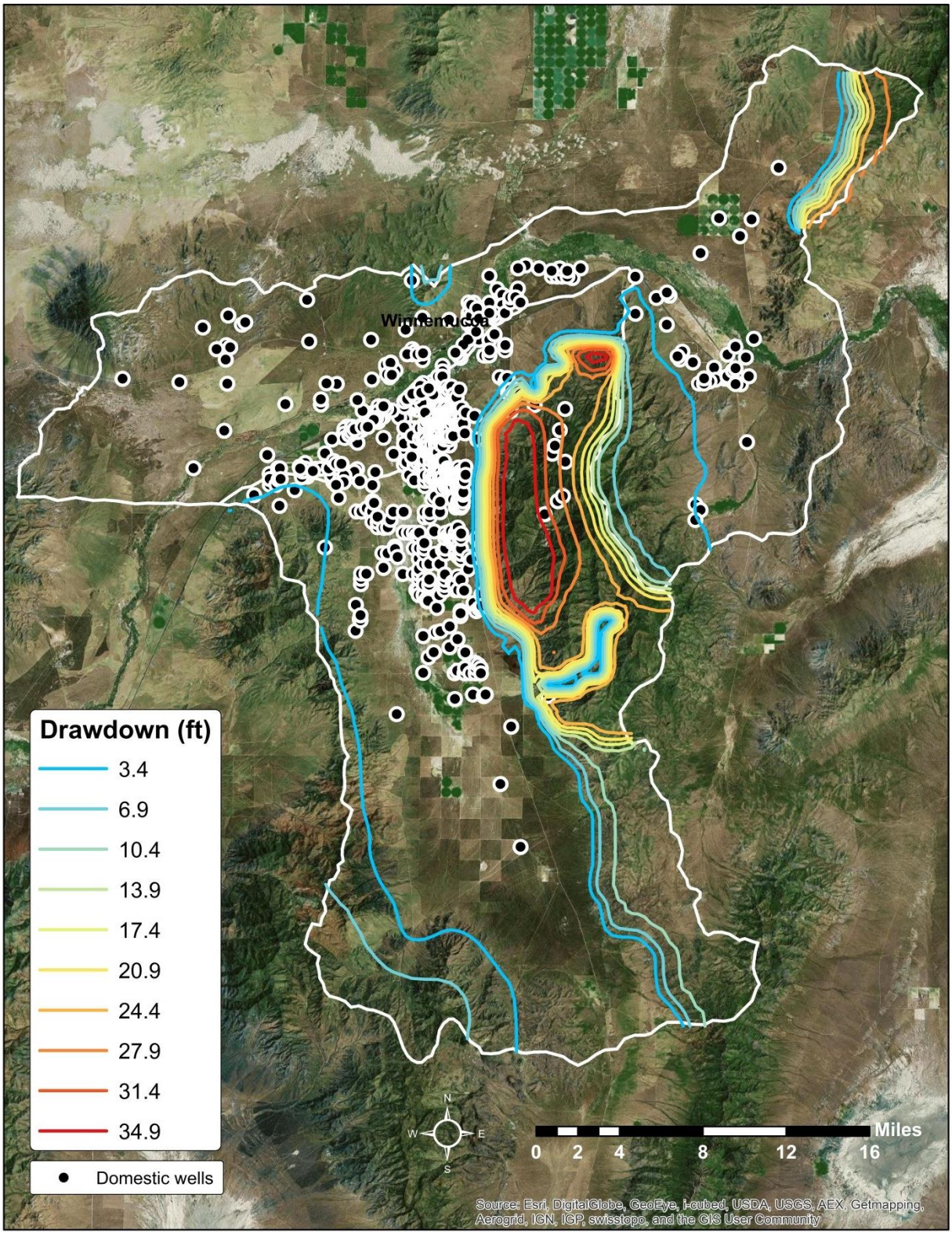


Figure 18. Difference in Winnemucca Segment / Grass Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

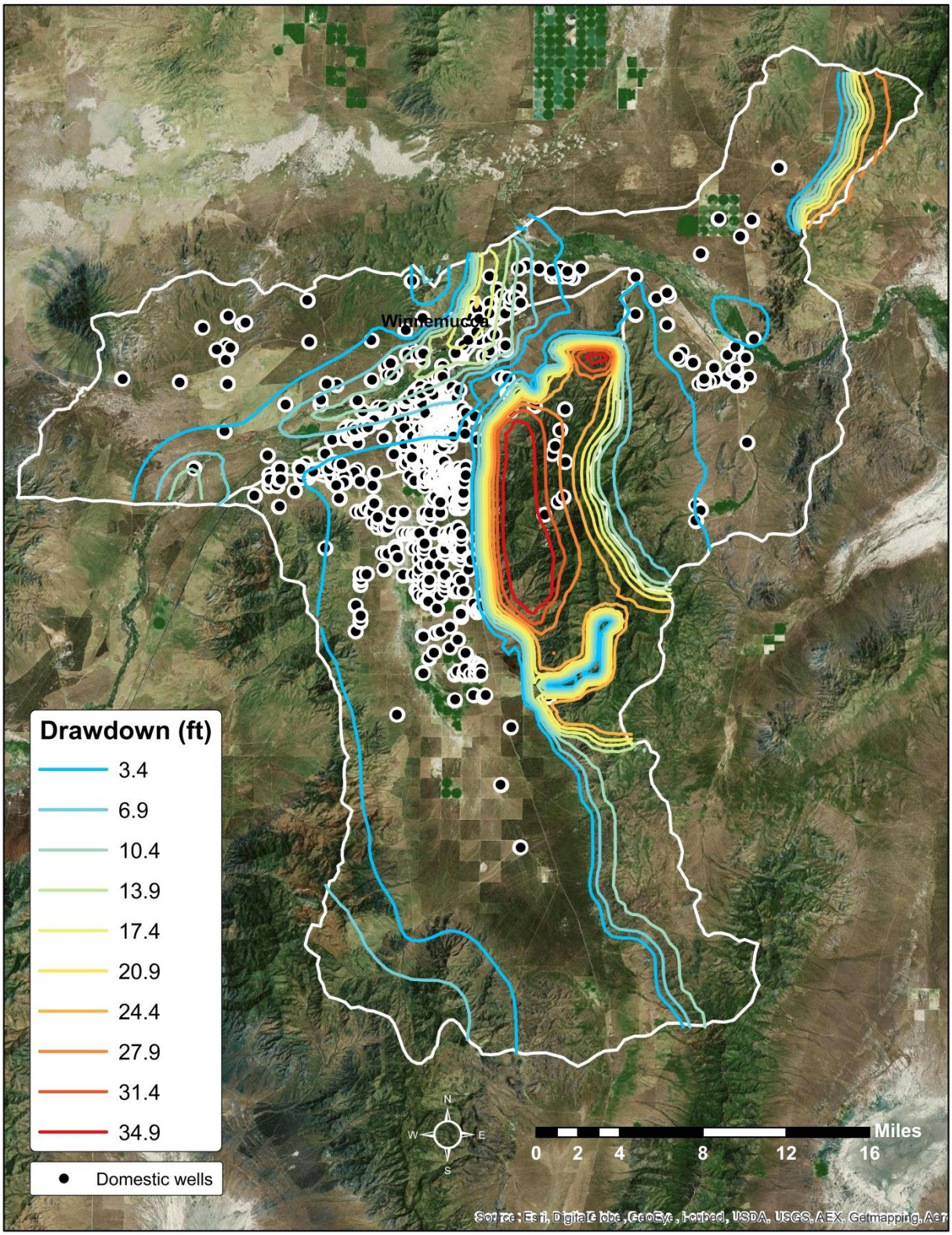


Figure 19. Difference in Winnemucca Segment / Grass Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right, and river conductance set to zero.

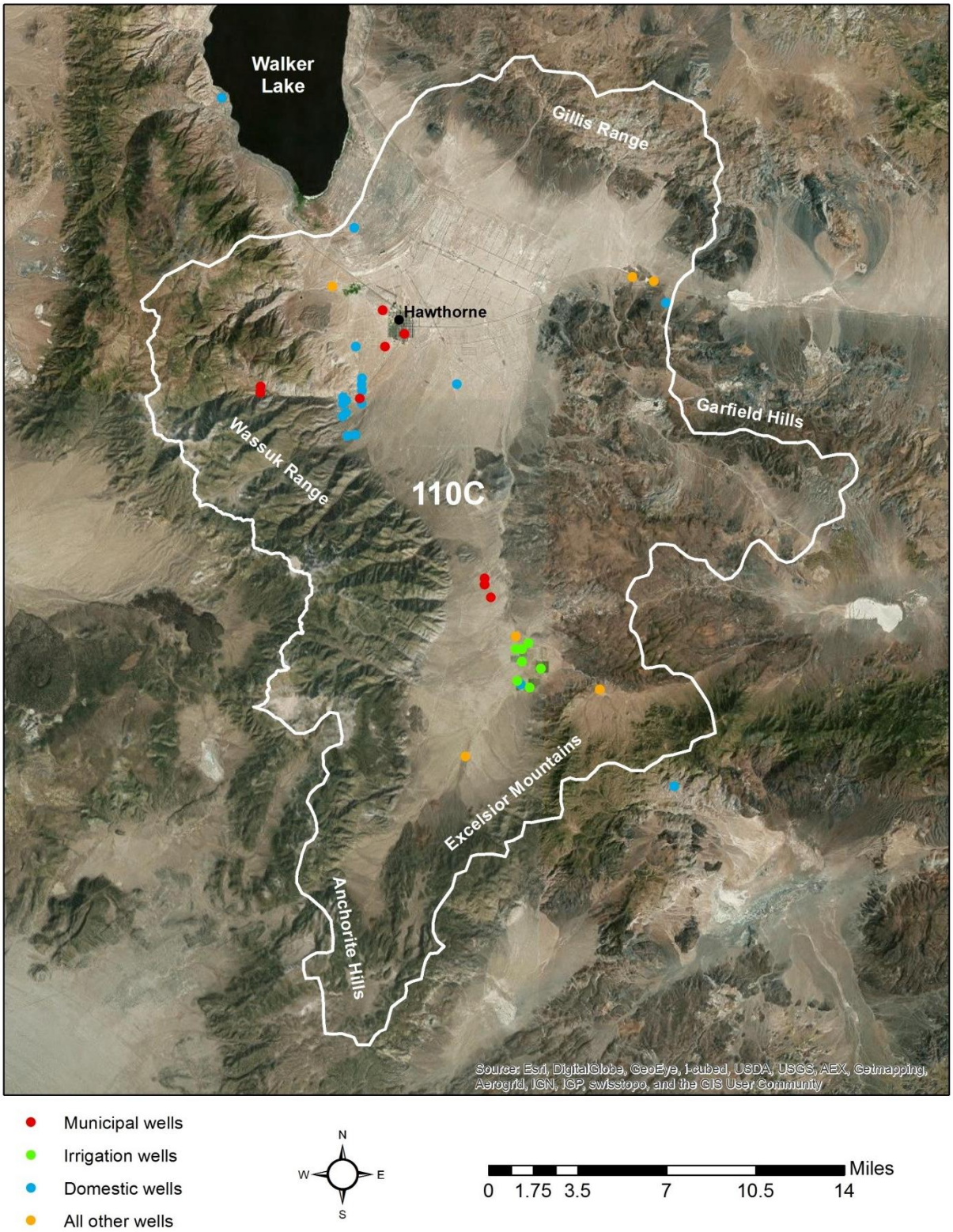


Figure 20. Whiskey Flat-Hawthorne sub-area (110C), and locations of wells used in transient simulations.

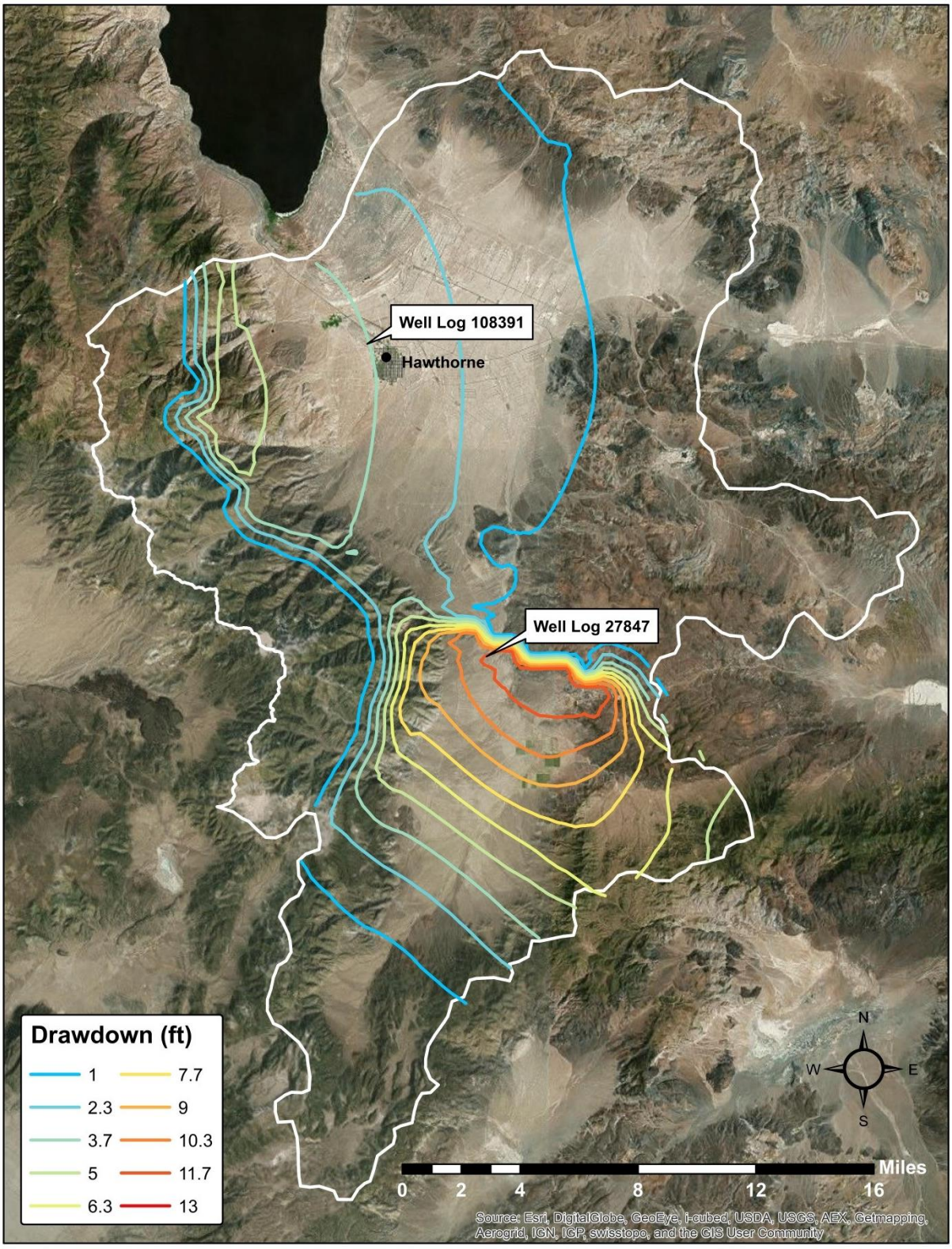


Figure 21. Drawdown in the Whiskey Flat-Hawthorne sub-area after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

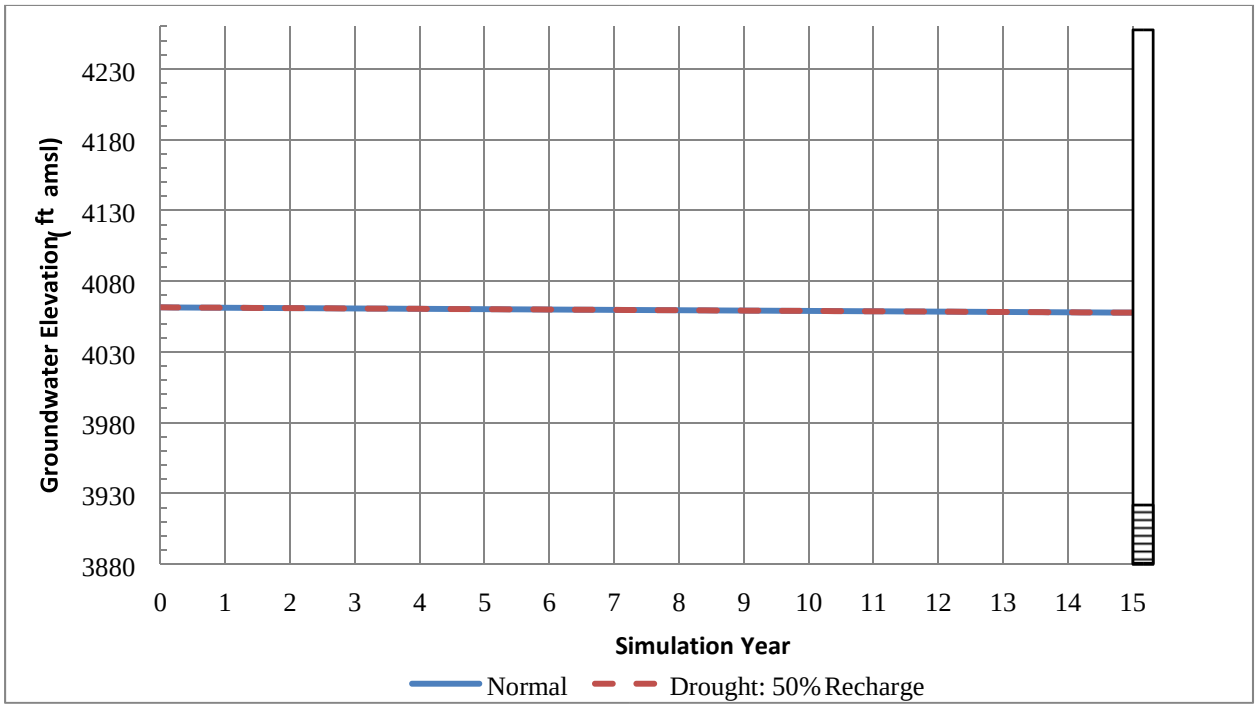


Figure 22. Declines in groundwater levels at well log 108391. Total depths of well and screened intervals indicated at right.

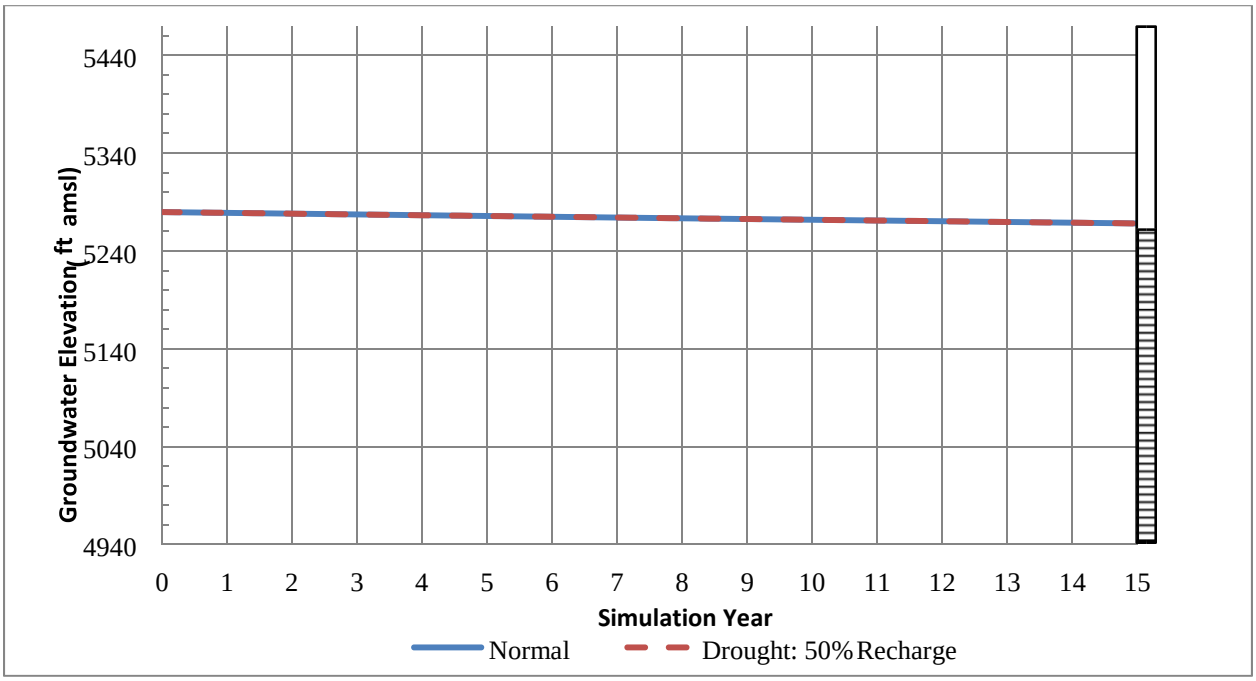


Figure 23. Declines in groundwater levels at well log 27847. Total depths of well and screened intervals indicated at right.

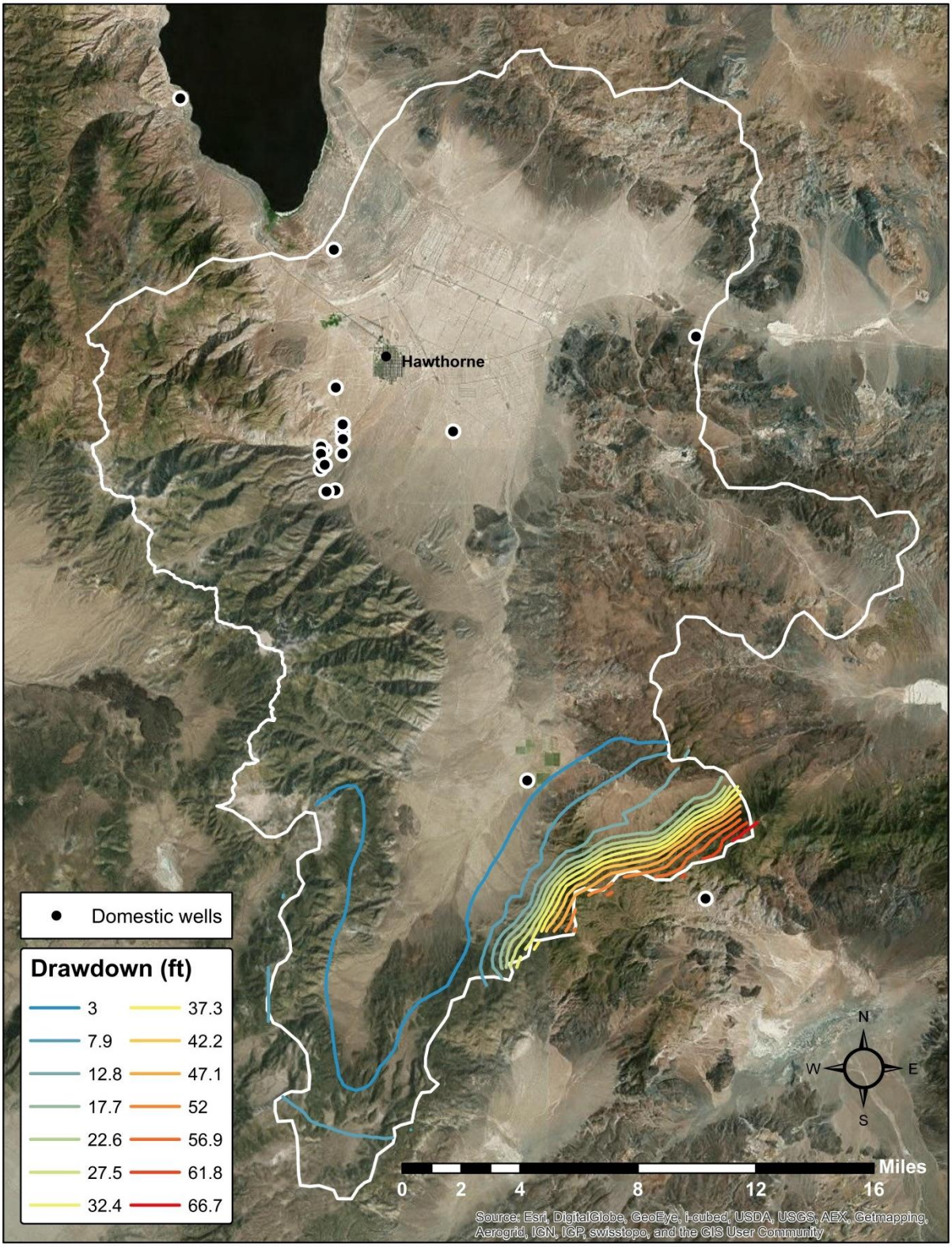


Figure 24. Difference in the Whiskey Flat-Hawthorne sub-area drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

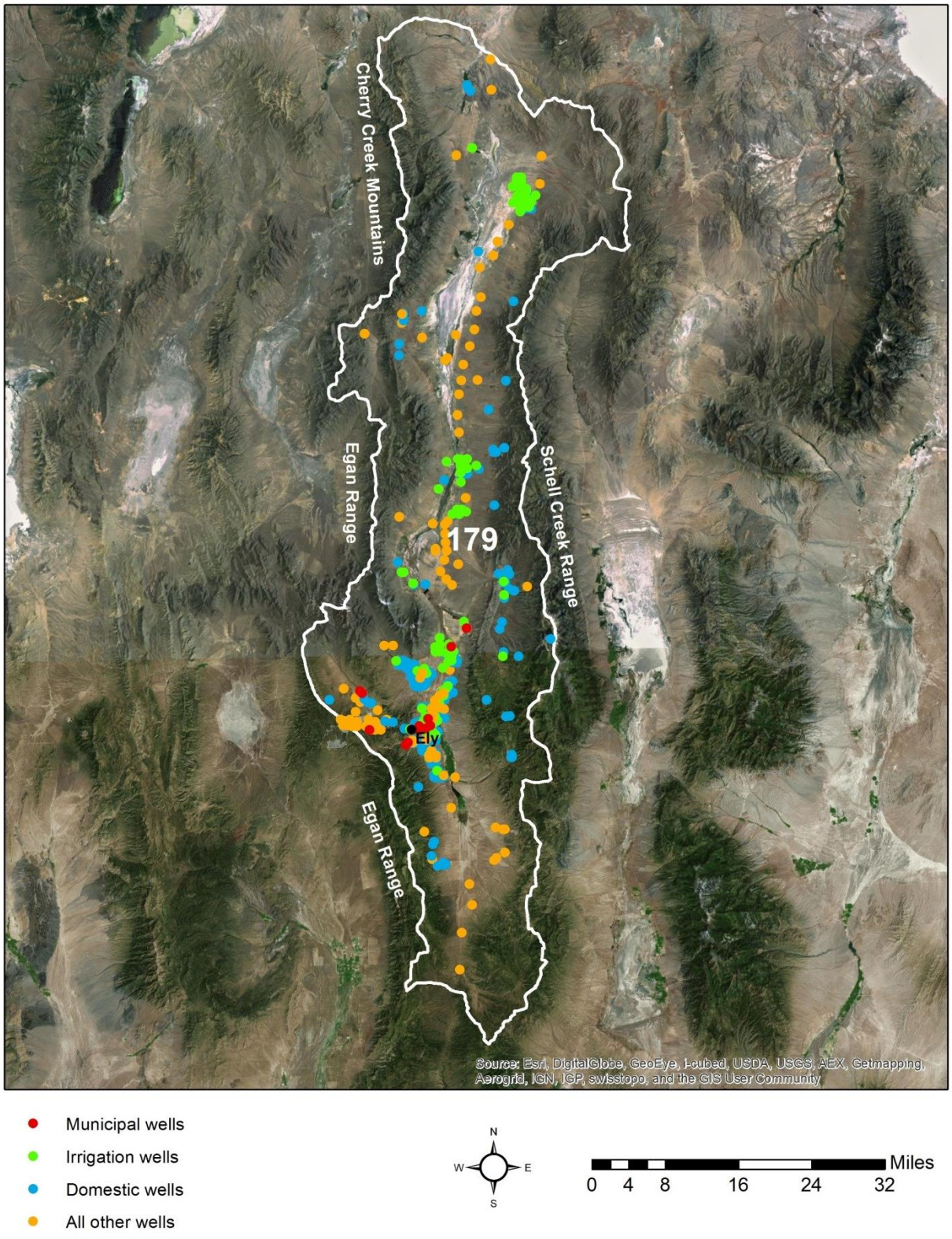


Figure 25. Steptoe Valley (179) and locations of wells used in transient simulations.

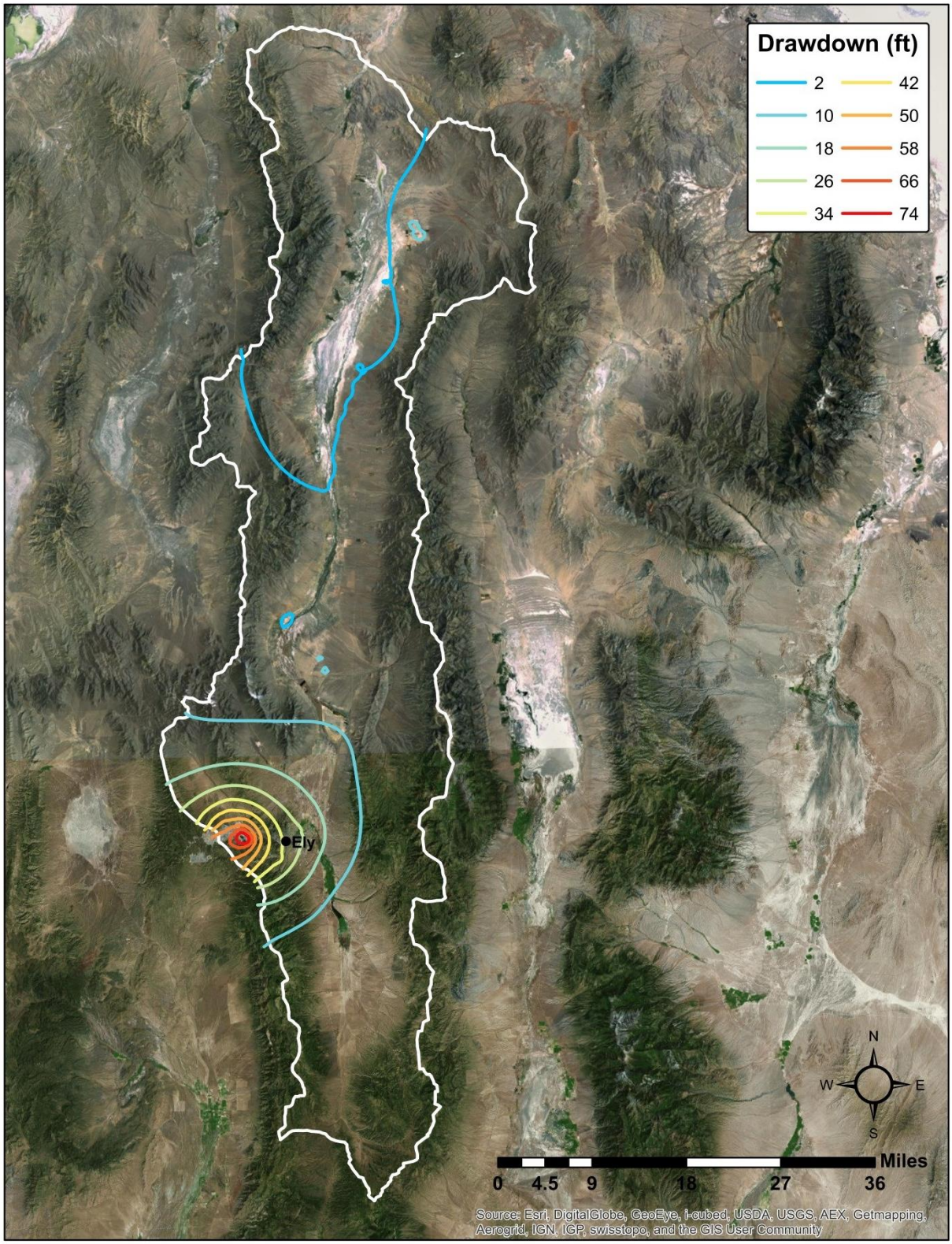


Figure 26. Drawdown in Steptoe valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

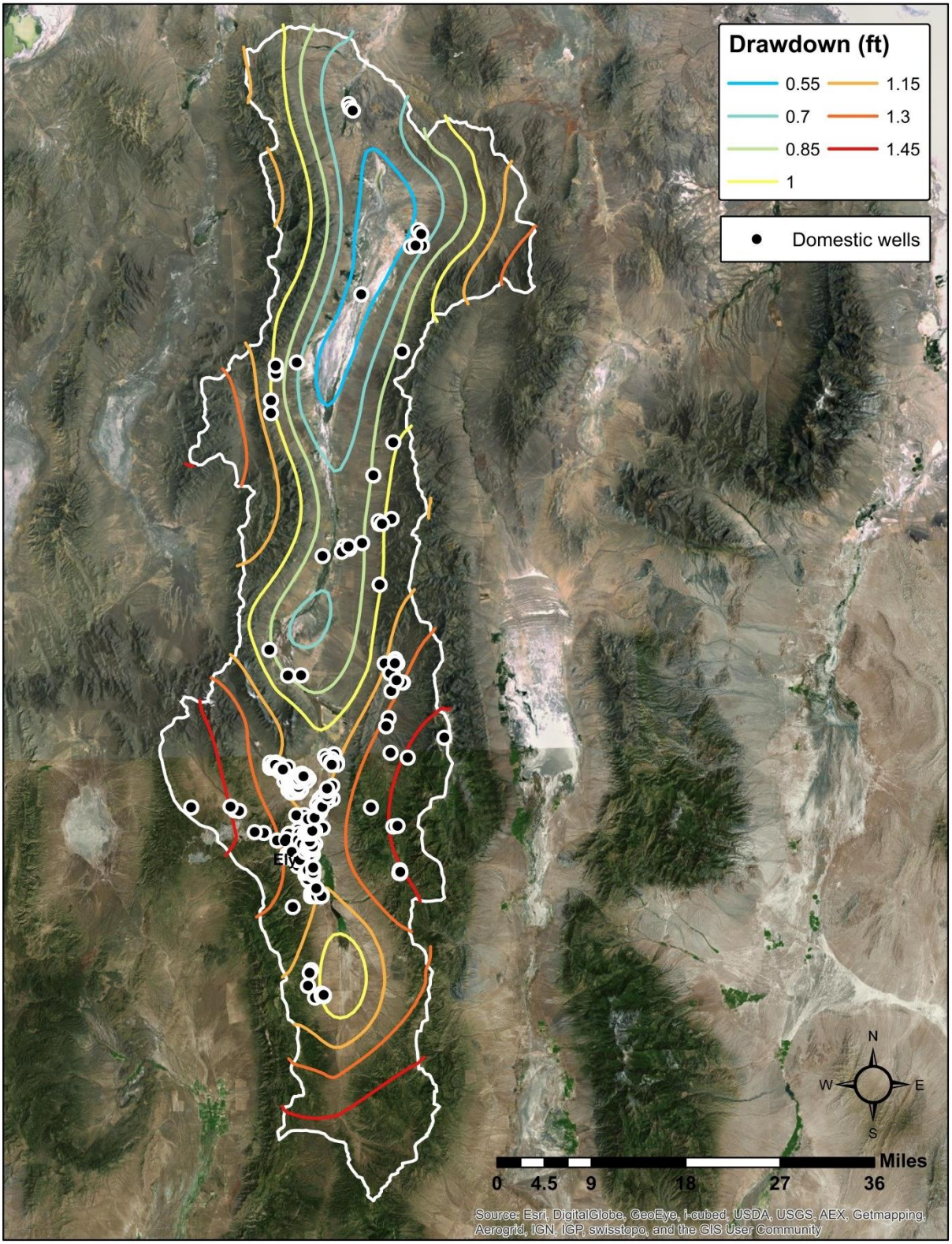


Figure 27. Difference in Steptoe Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

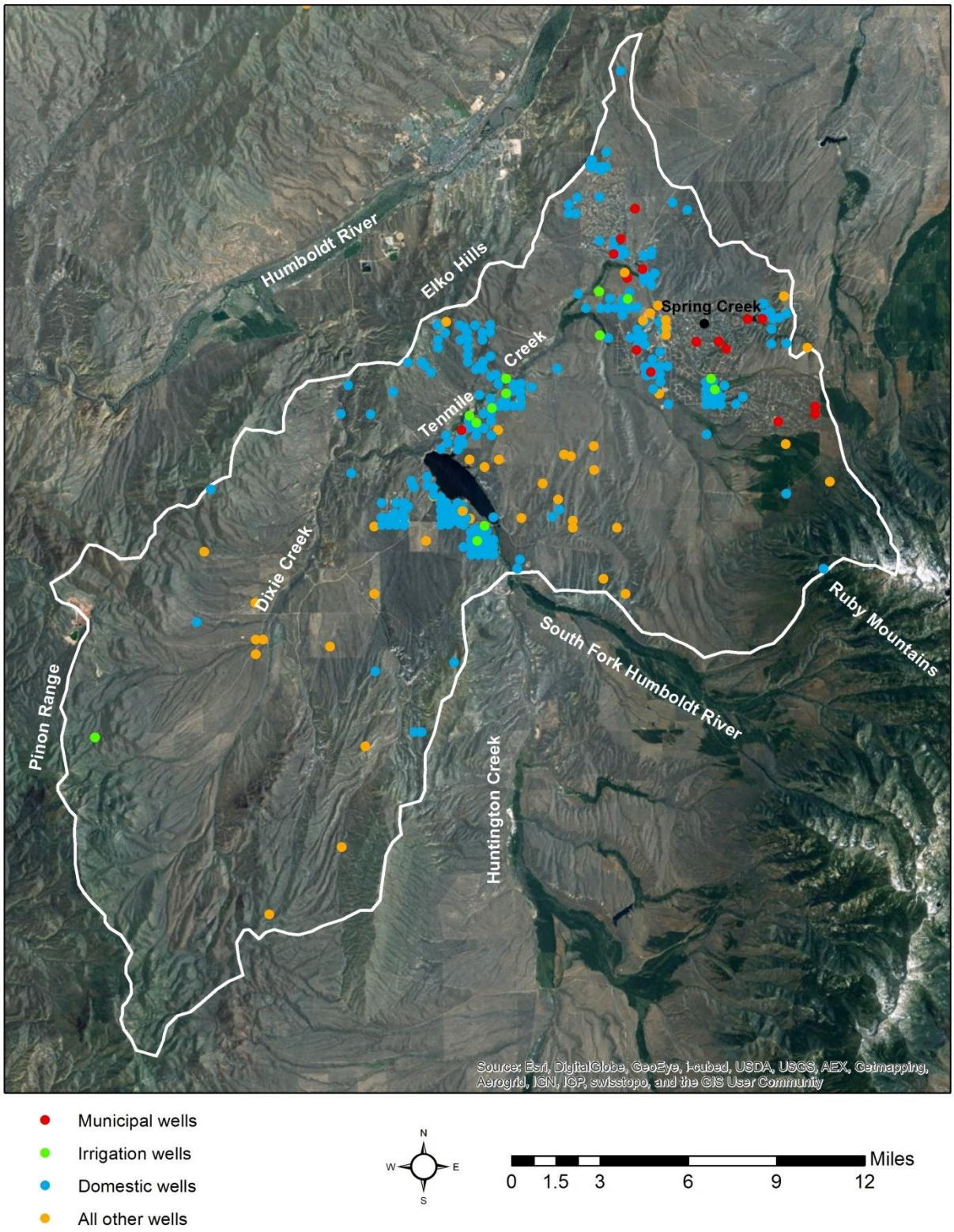


Figure 28. Dixie Creek-Tenmile Creek area (48), and locations of wells used in transient simulations.

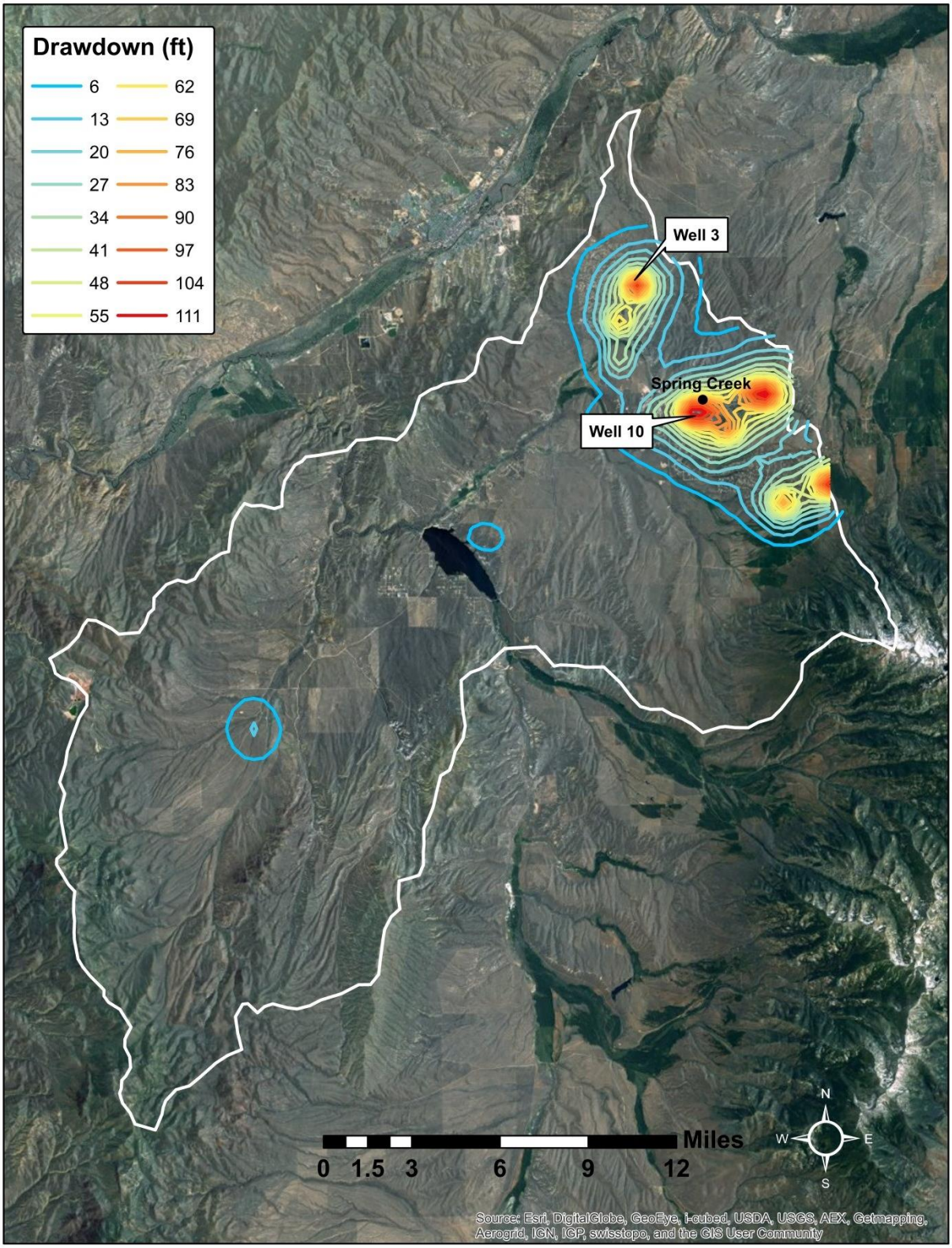


Figure 29. Drawdown in the Dixie Creek-Tenmile Creek area after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

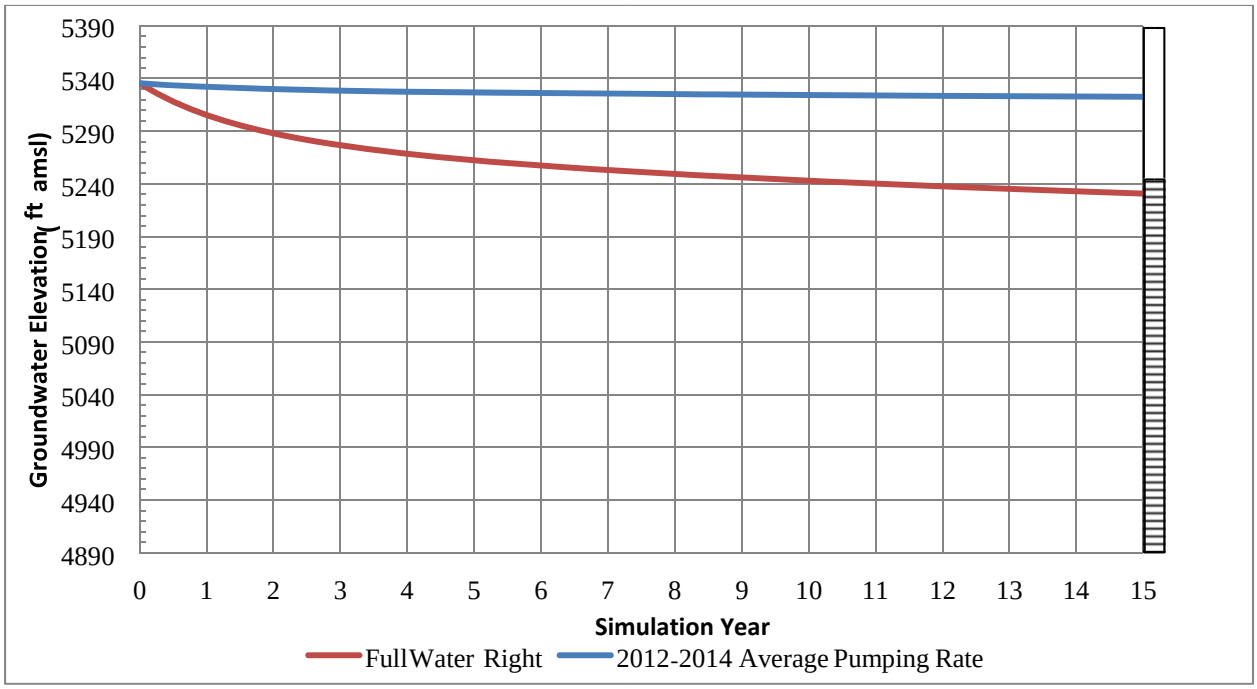


Figure 30. Declines in groundwater levels at Well 3. Total depth of well and screened interval indicated at right.

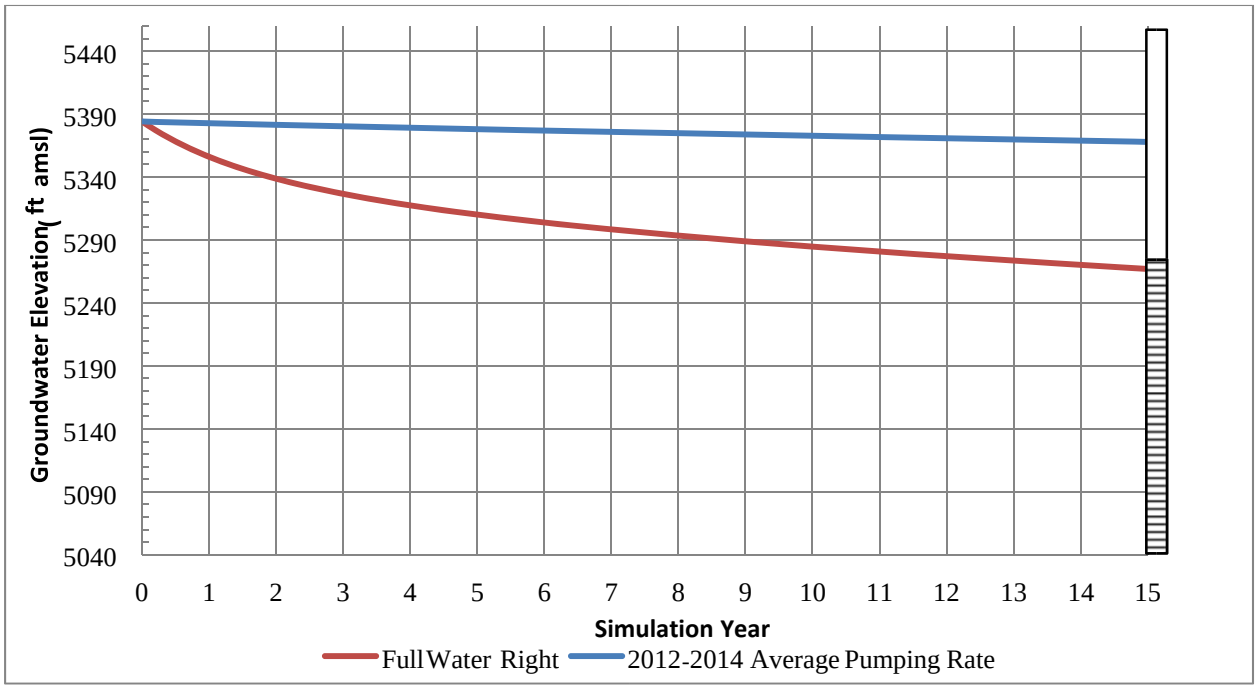


Figure 31. Declines in groundwater levels at Well 10. Total depth of well and screened interval indicated at right.

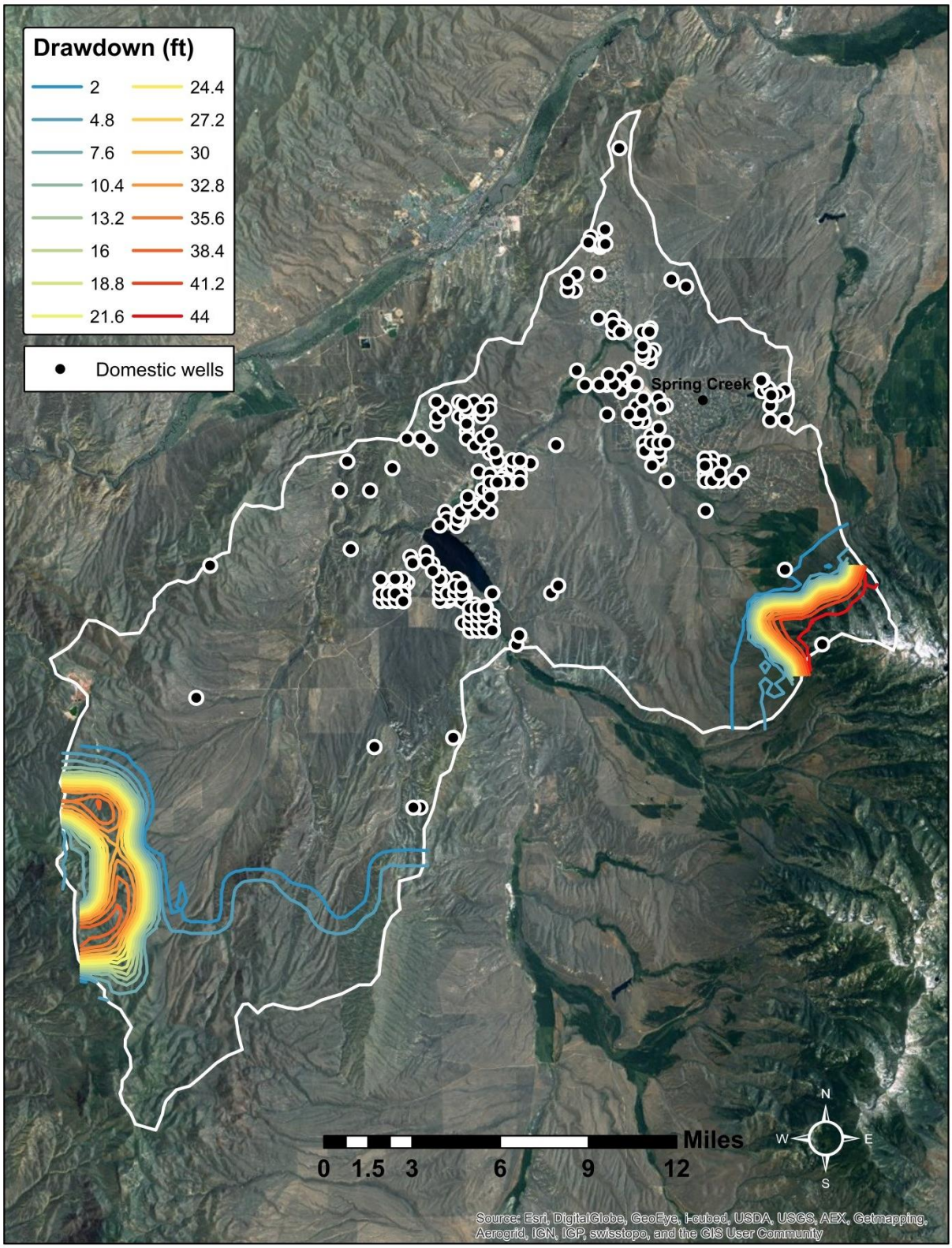


Figure 32. Difference in Dixie Creek-Tenmile Creek drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

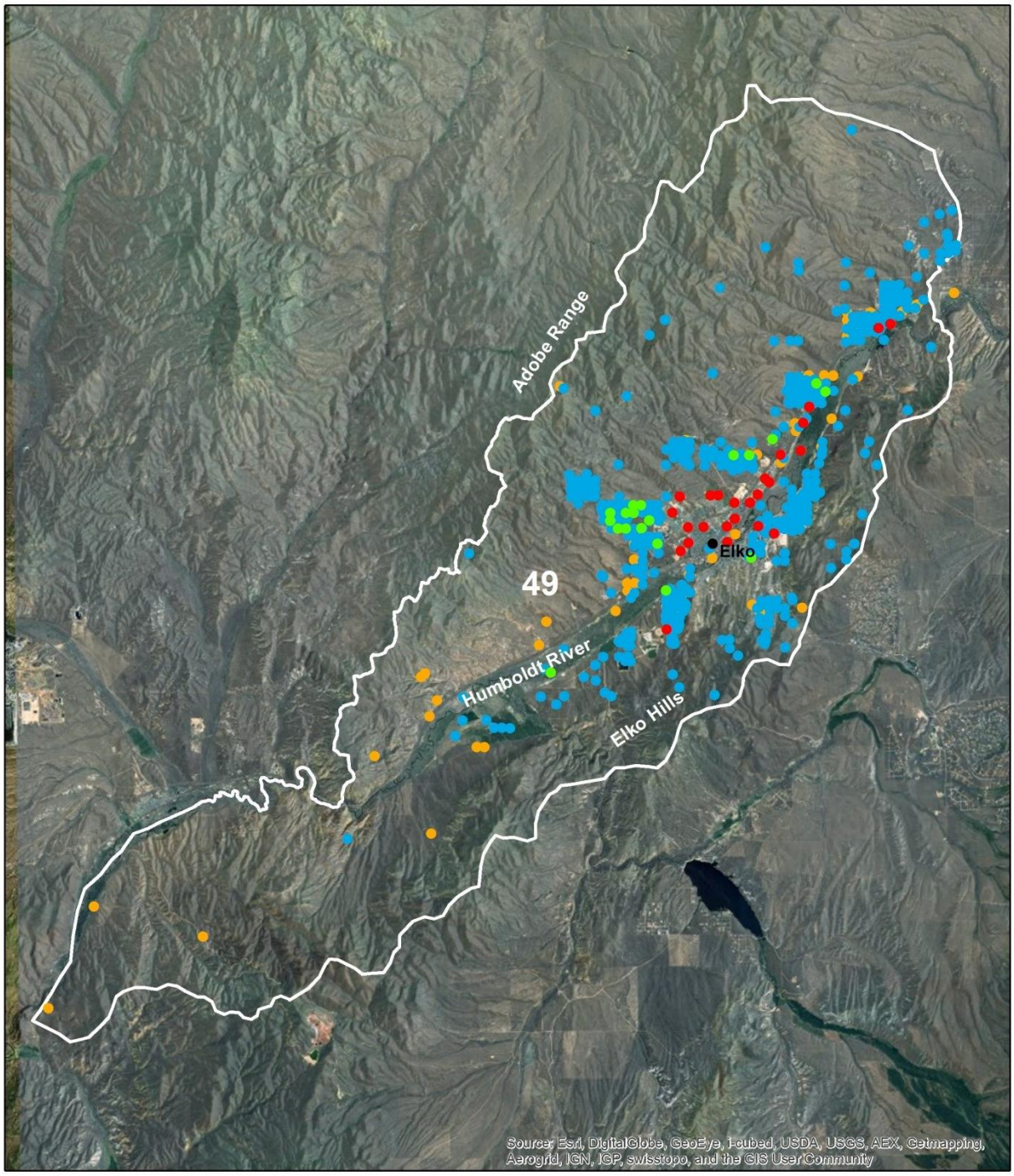


Figure 33. Elko Segment (49), and locations of wells used in transient simulations.

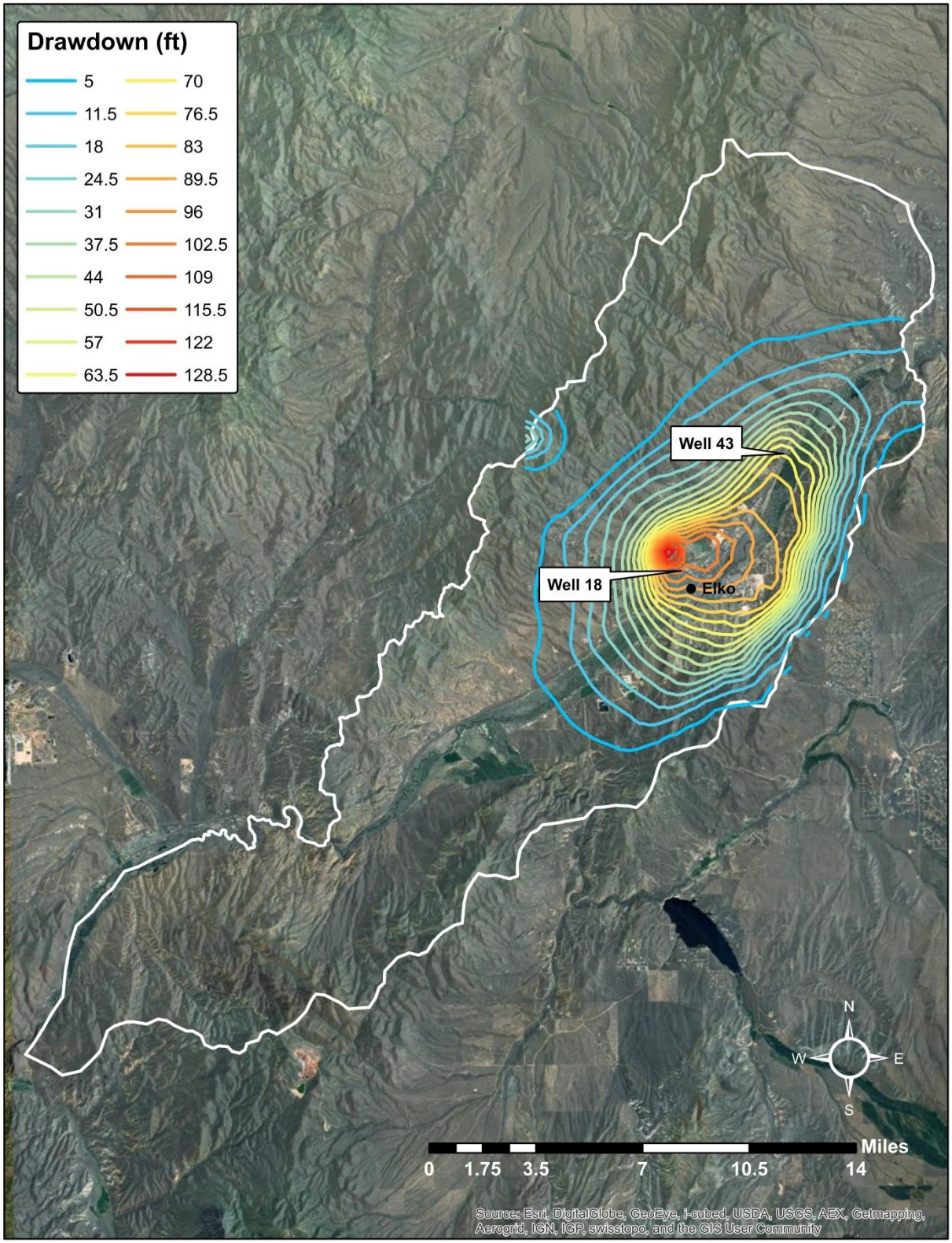


Figure 34. Drawdown in the Elko Segment after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

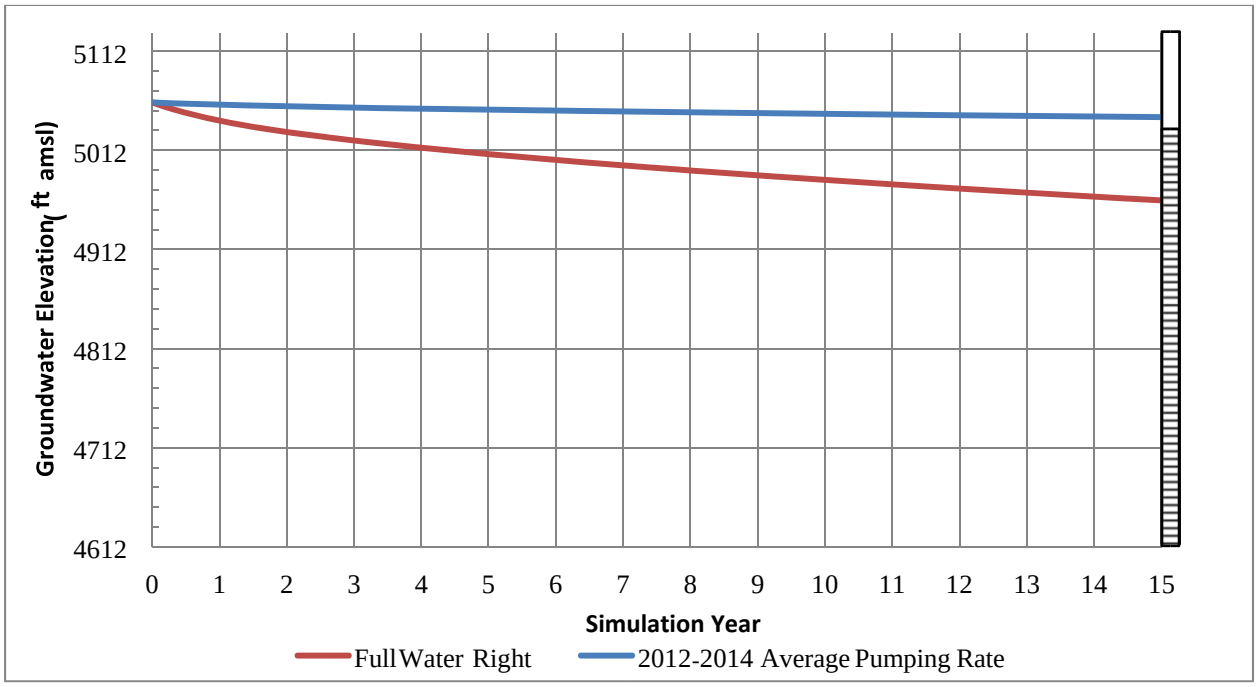


Figure 35. Declines in groundwater levels at Well 18. Total depth of well and screened interval indicated at right.

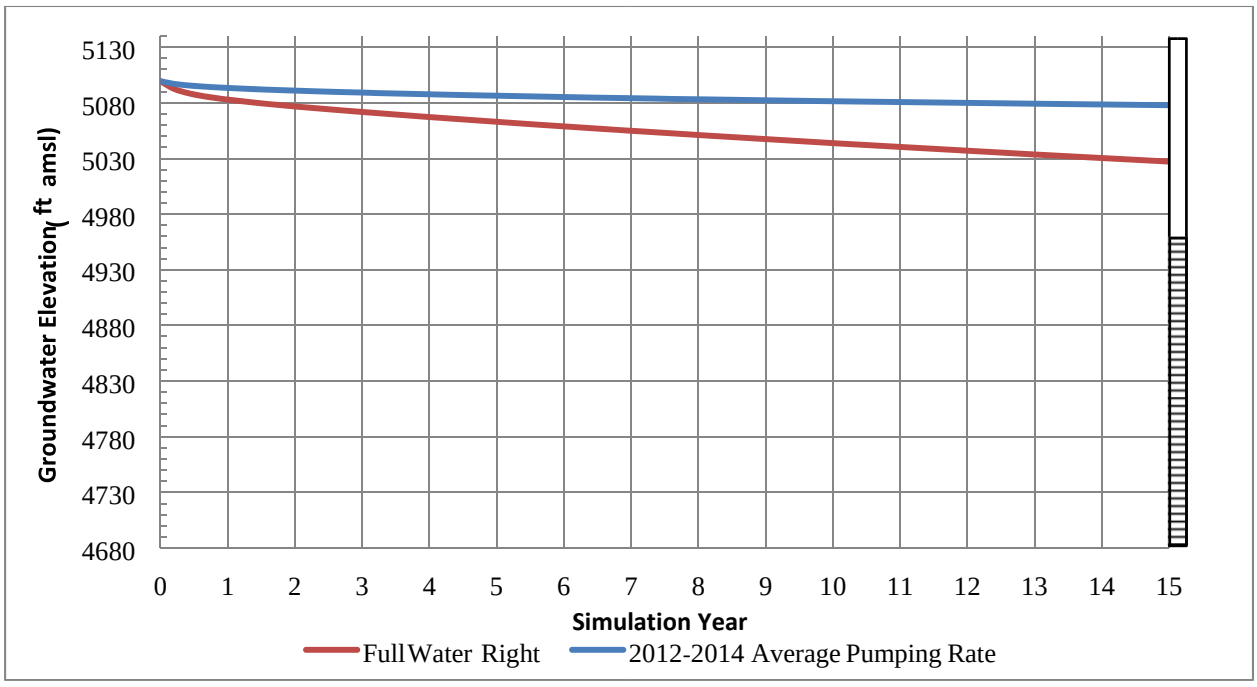


Figure 36. Declines in groundwater levels at Well 43. Total depth of well and screened interval indicated at right.

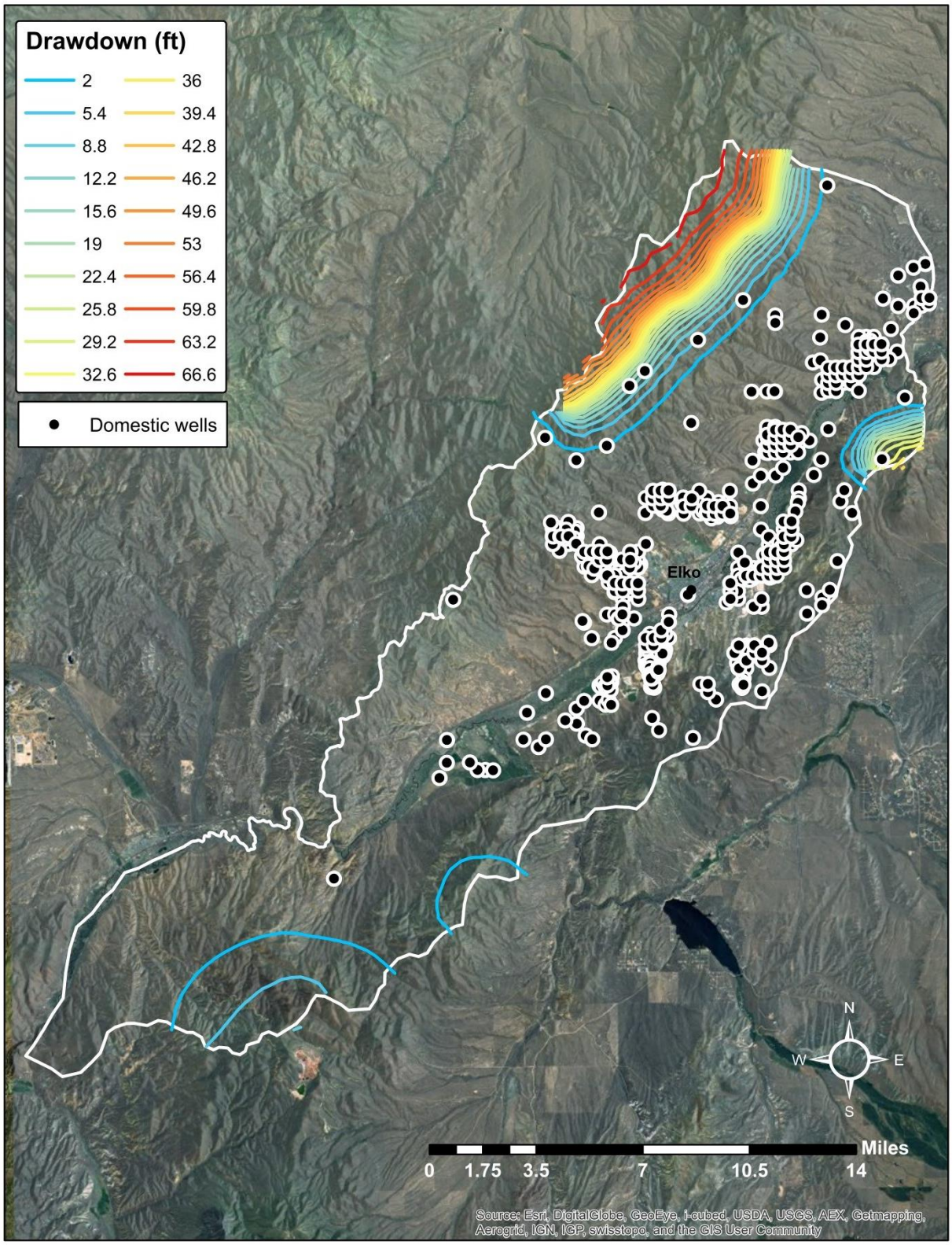


Figure 37. Difference in Elko Segment drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

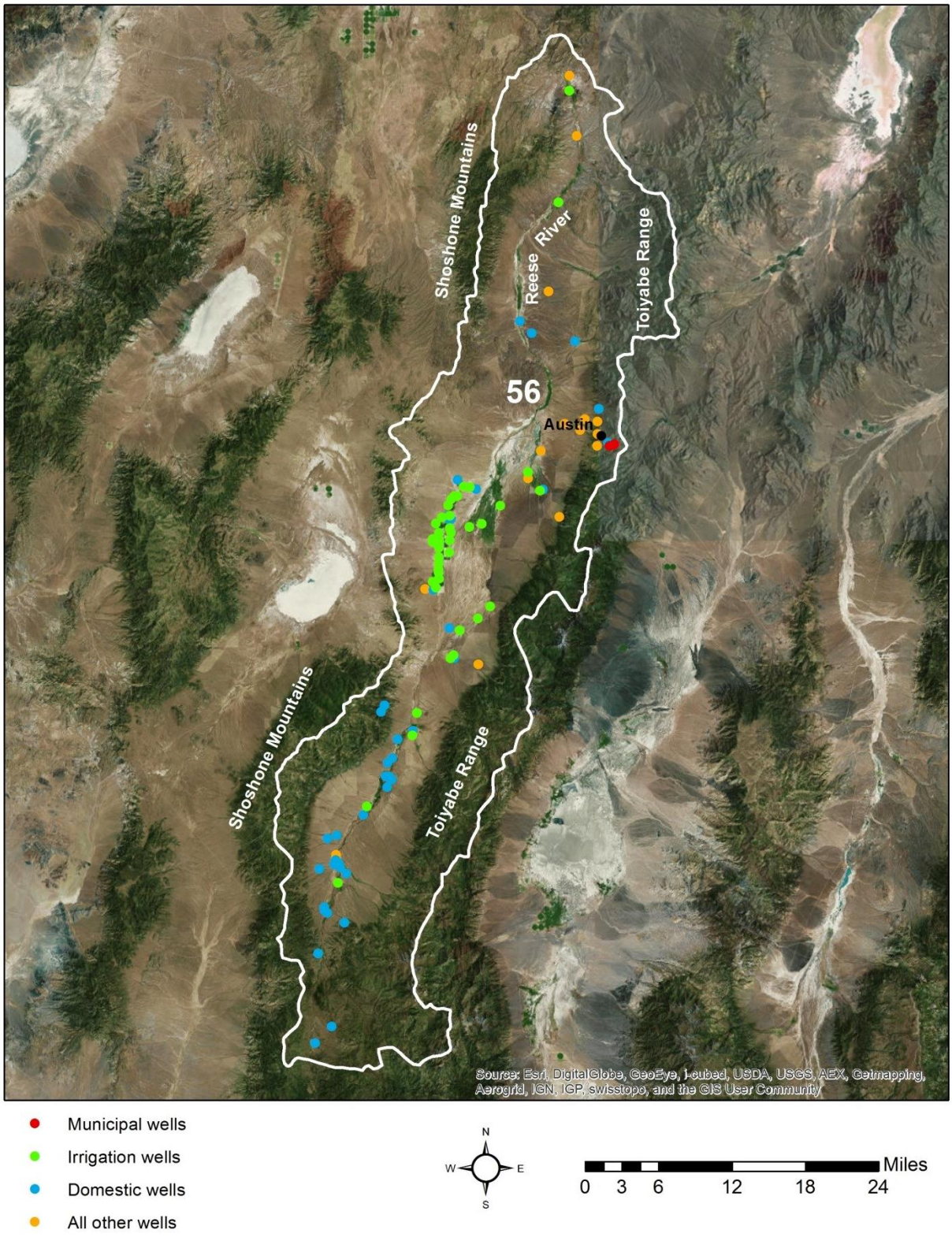


Figure 38. Upper Reese River Valley (56) and locations of wells used in transient simulations.

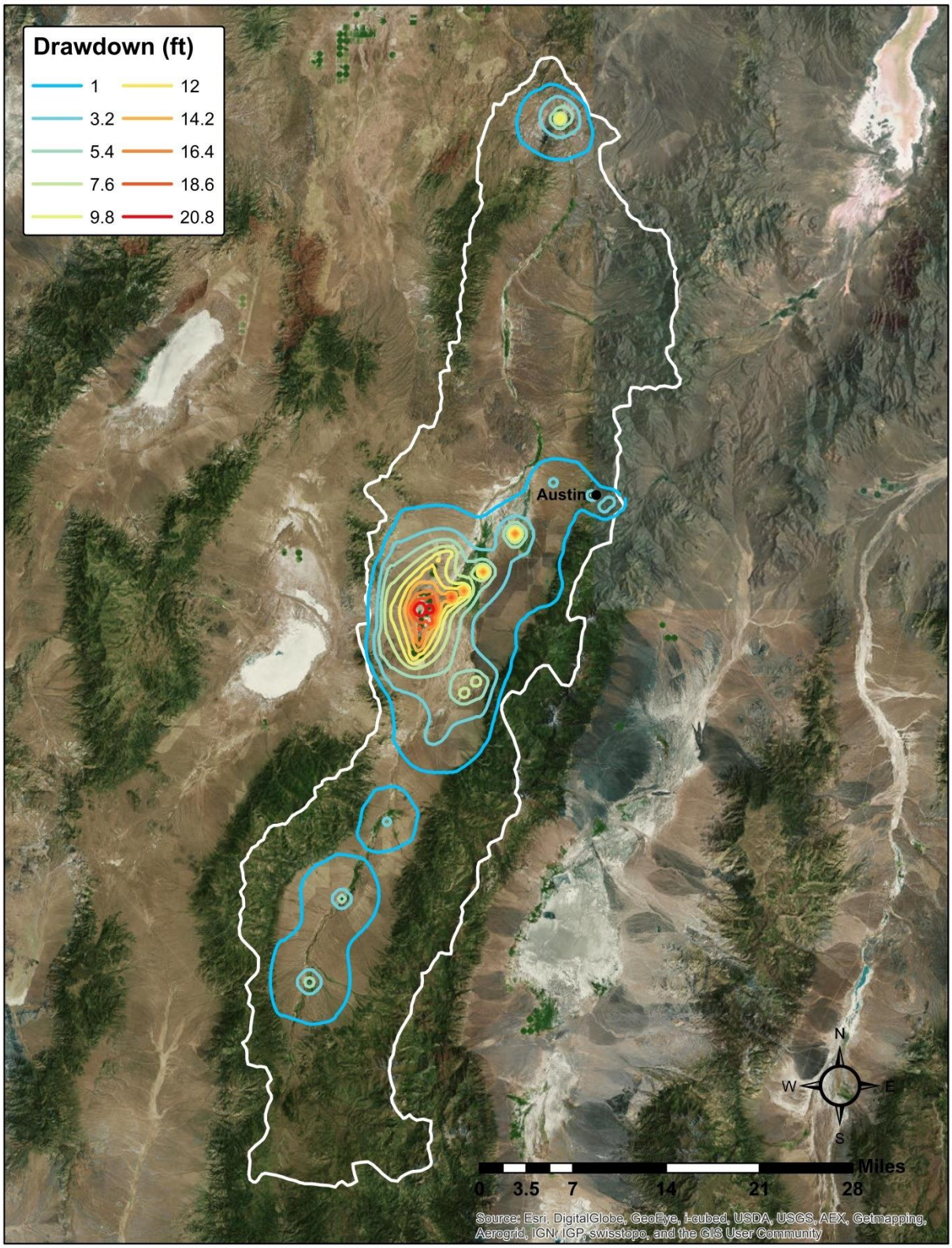


Figure 39. Drawdown in the Upper Reese River Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

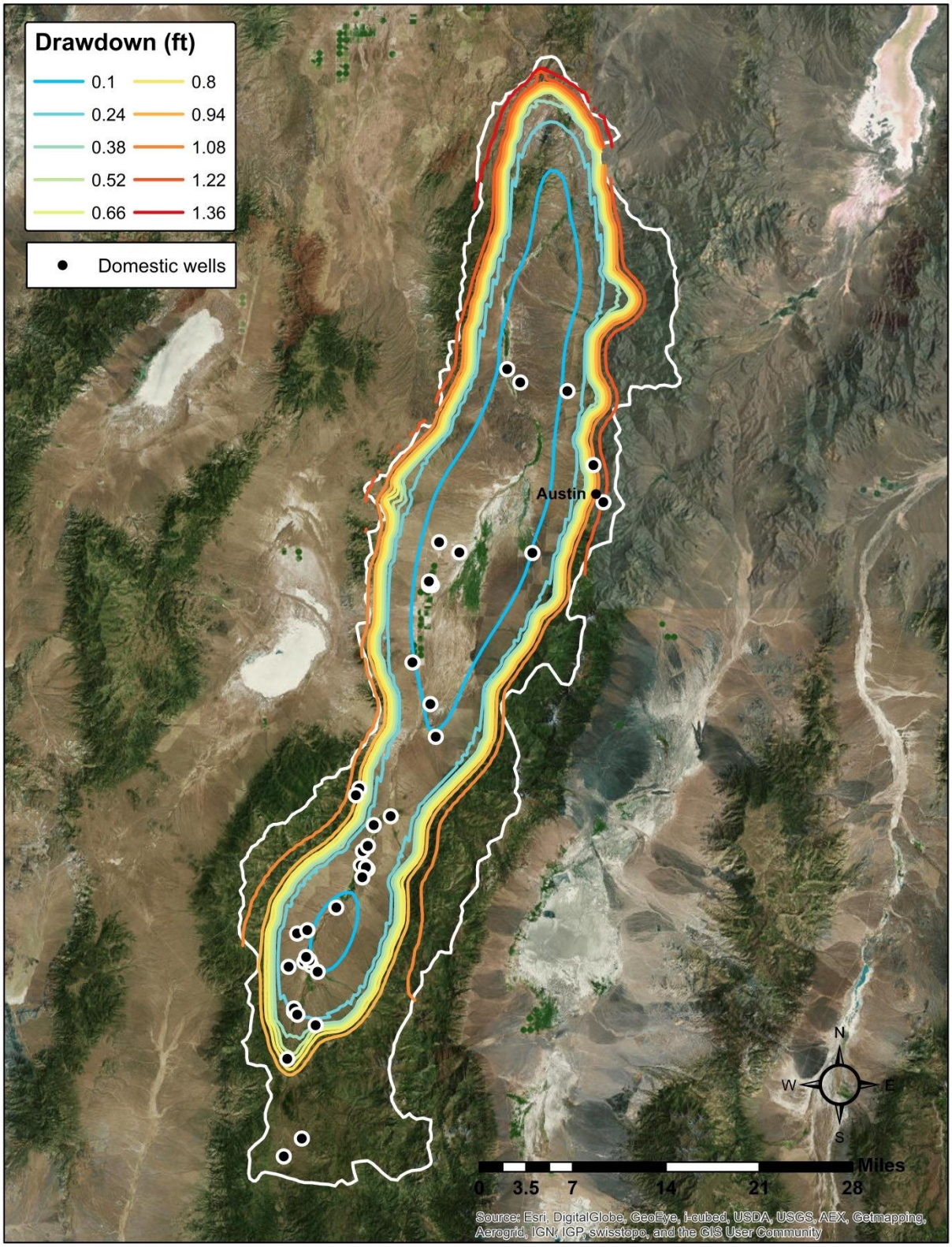


Figure 40. Difference in Upper Reese River Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

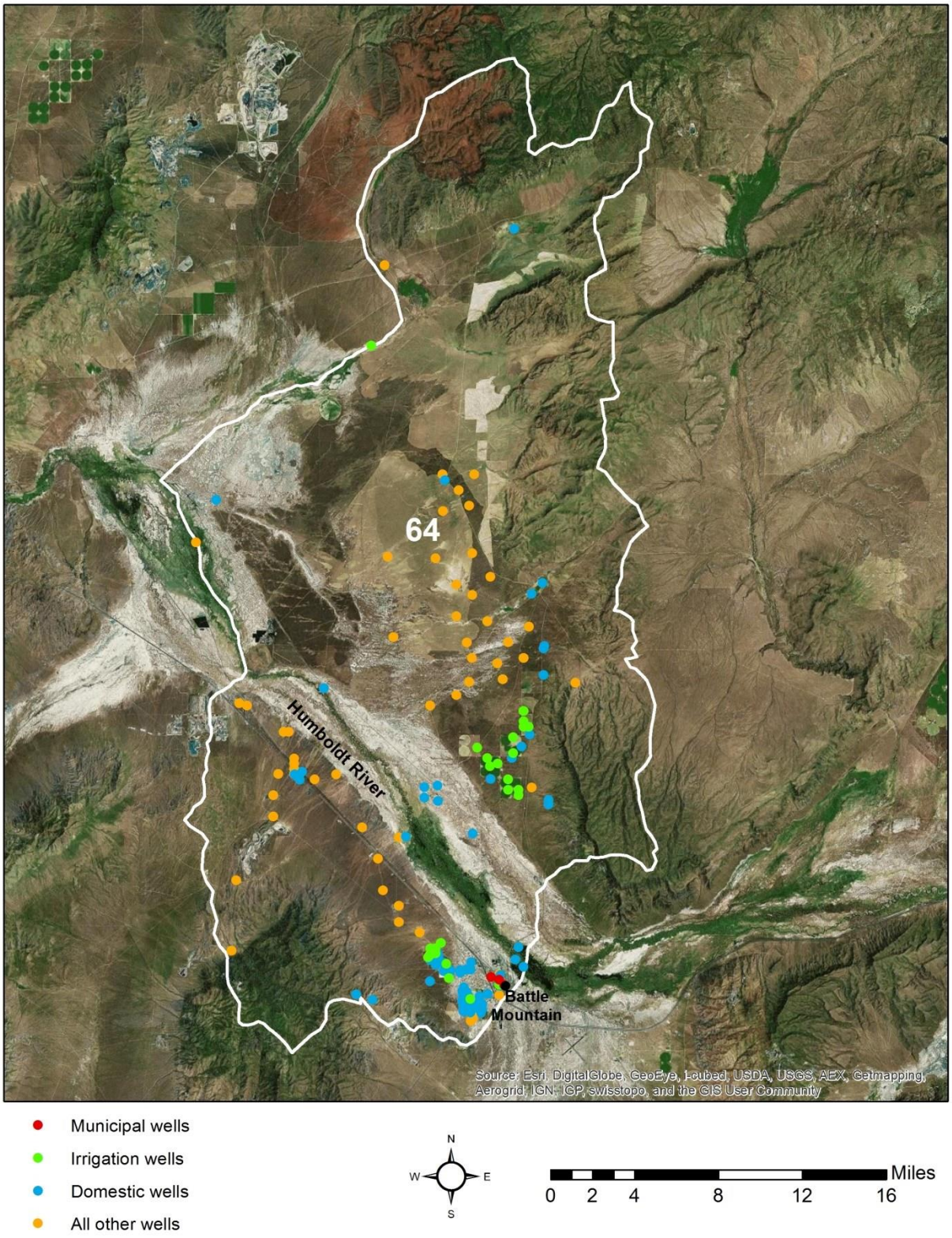


Figure 41. Clovers Area (64) and locations of wells used in transient simulations.

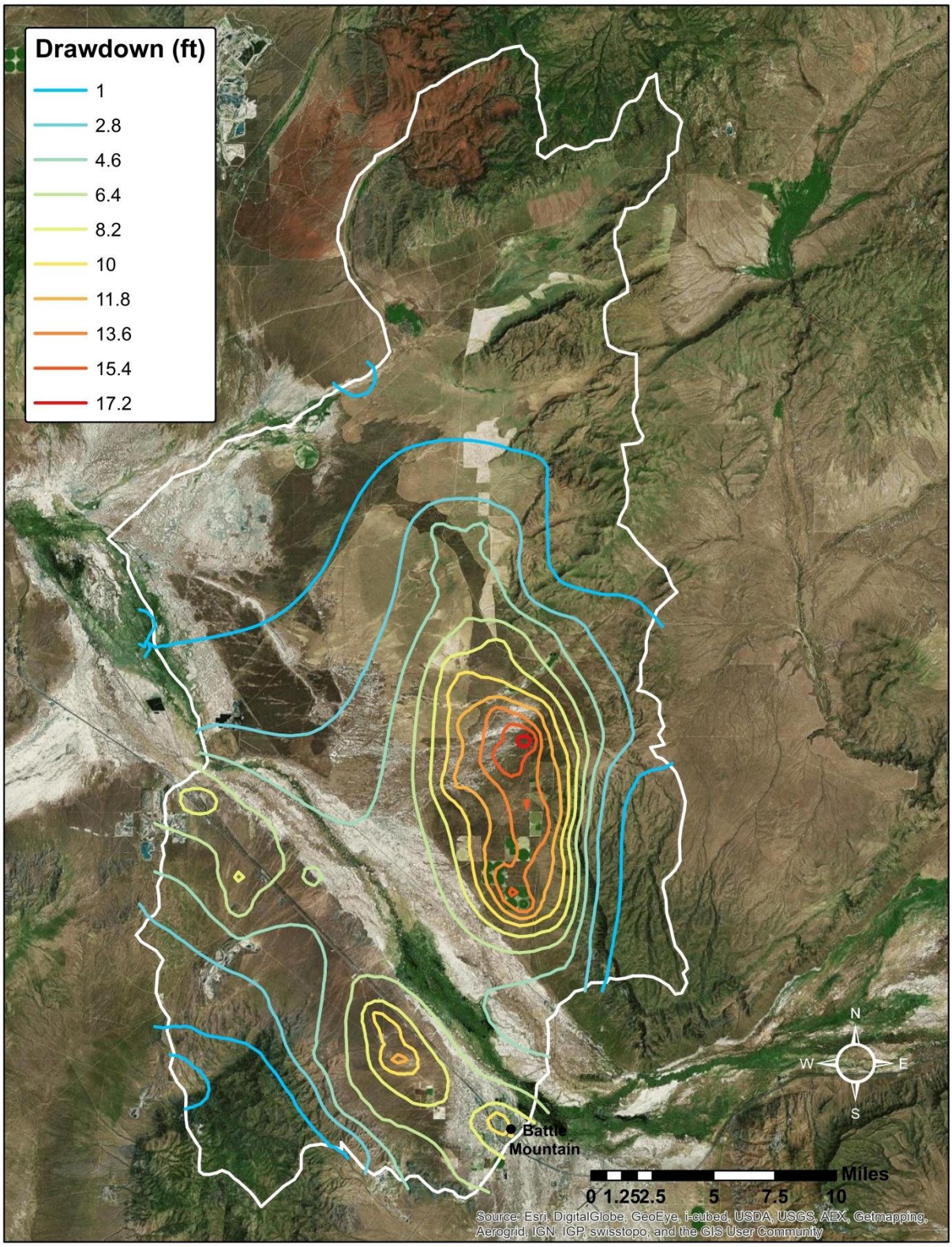


Figure 42. Drawdown in Clovers Area after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

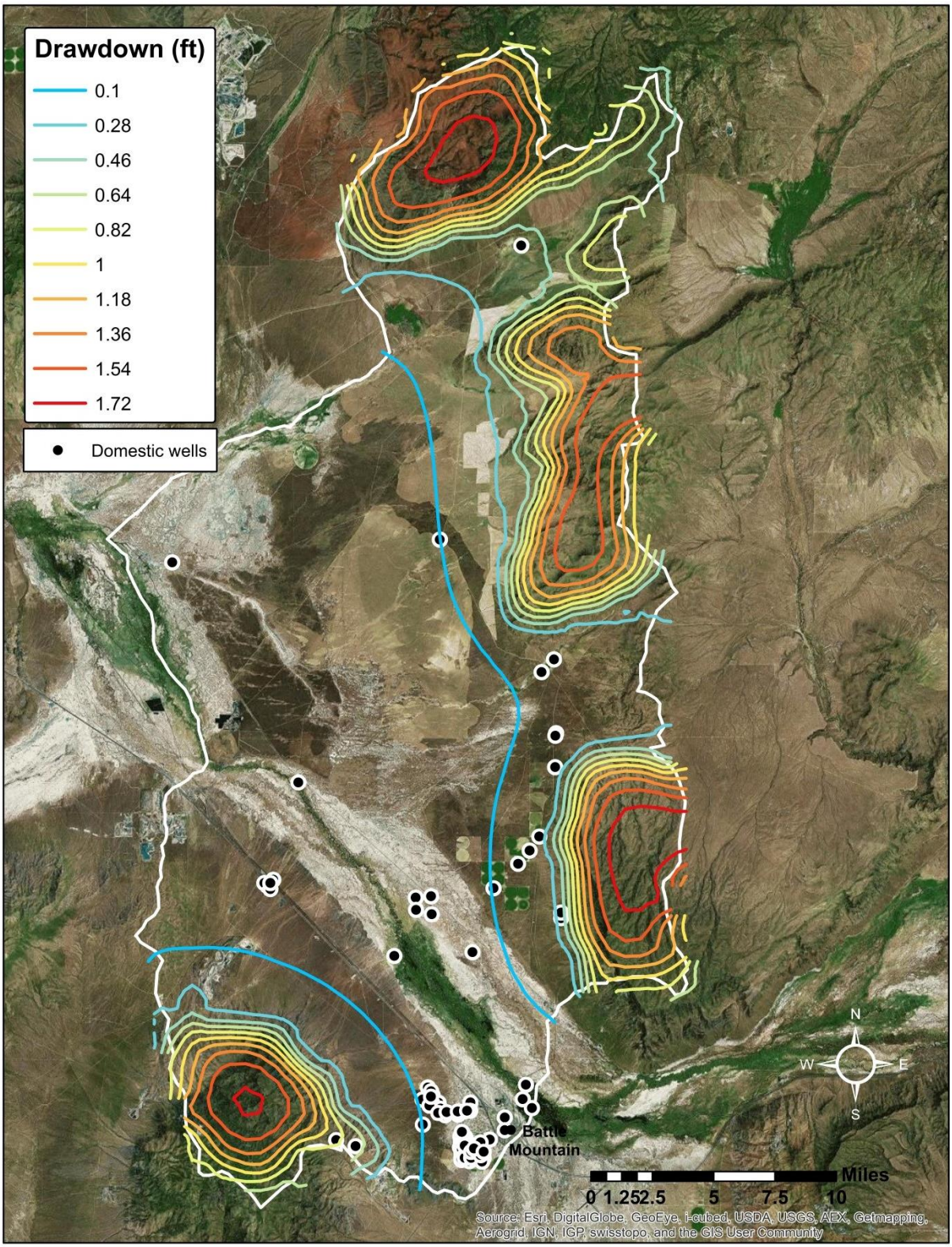


Figure 43. Difference in Clovers Area drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

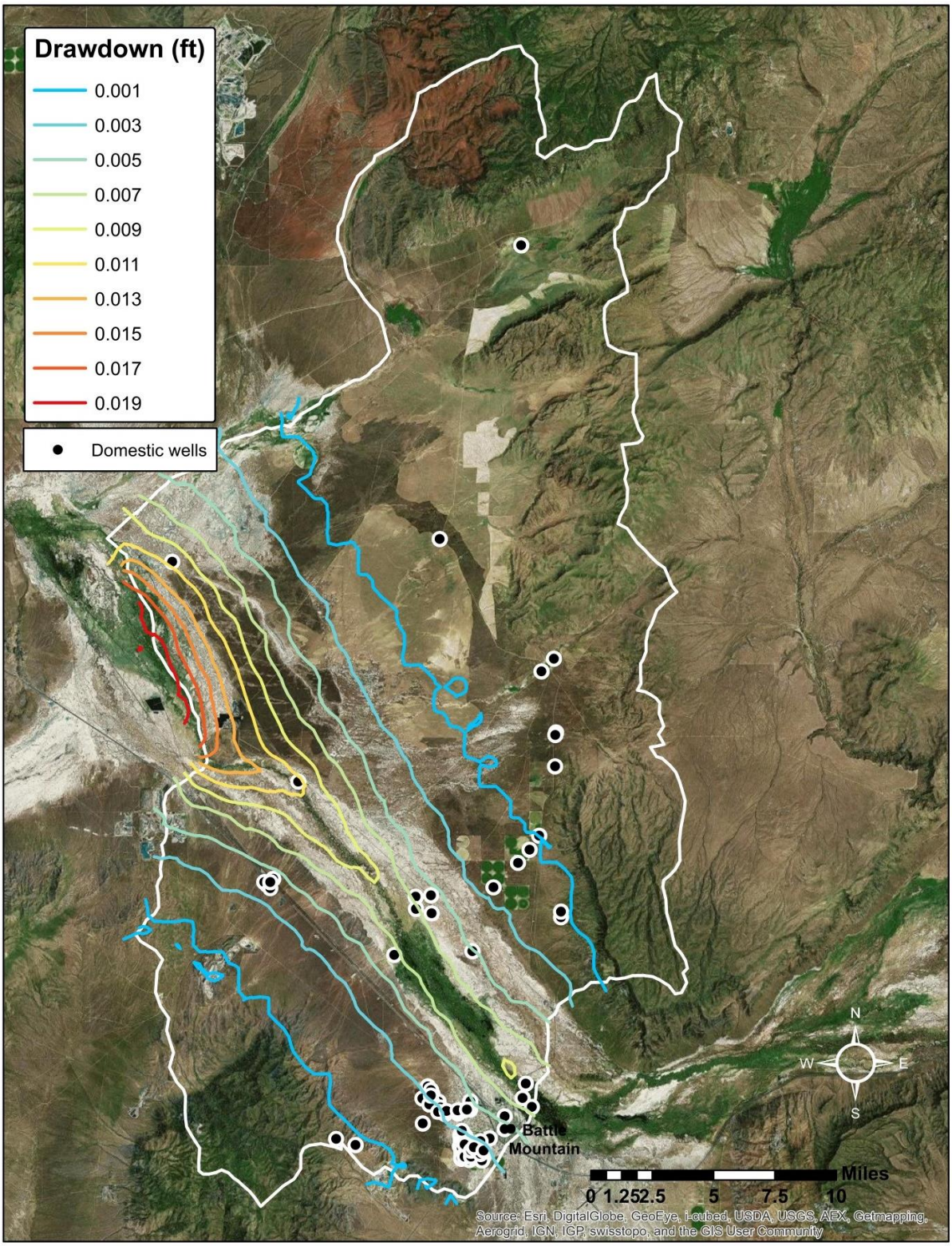


Figure 44. Difference in Clovers Area drawdown between simulation using 50% of normal recharge and simulation using 50% of normal recharge AND a 2 ft drop in river stage, all wells pumping at full water right.

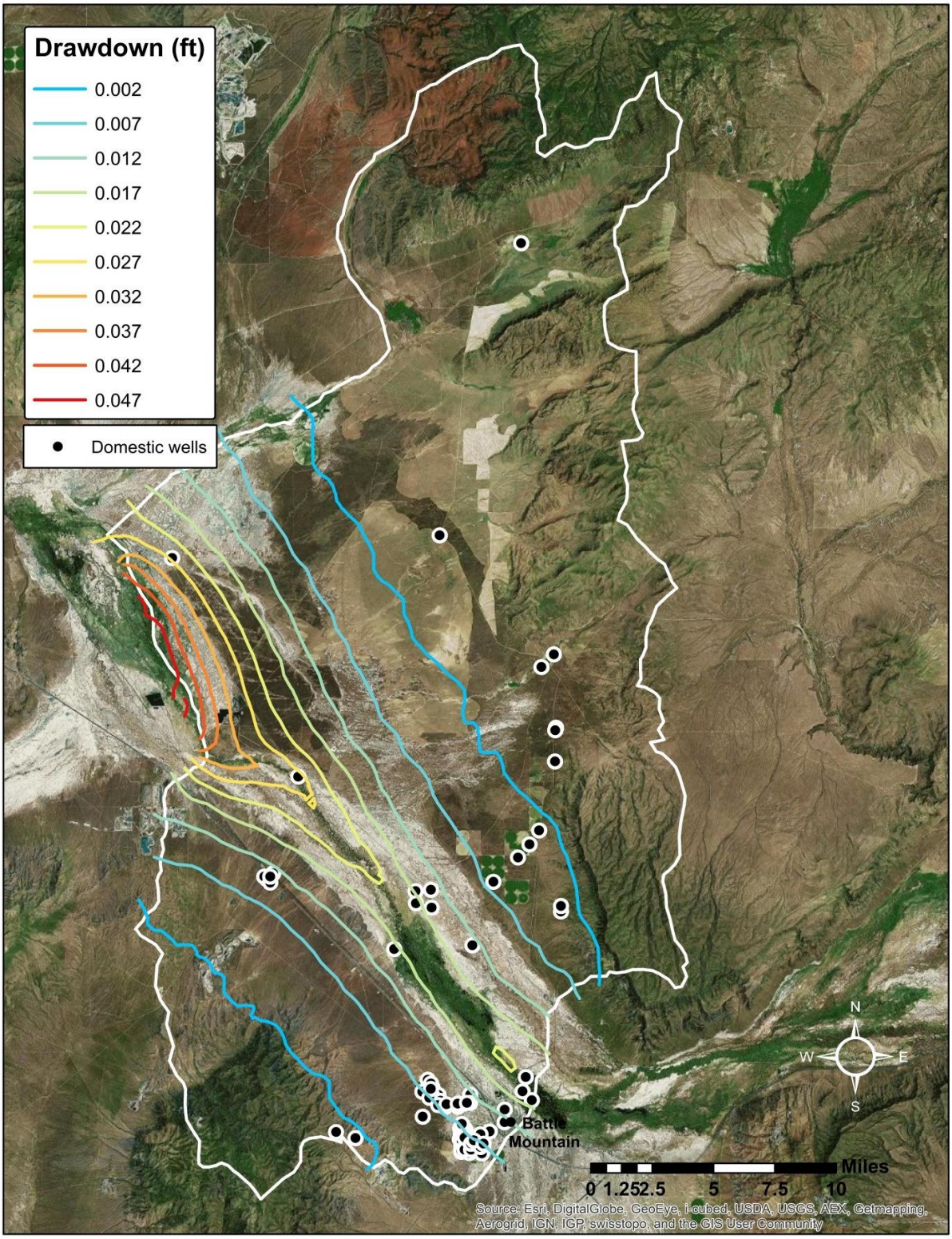
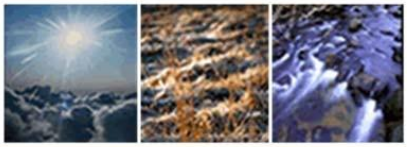


Figure 45. Difference in Clovers Area drawdown between simulation using 50% of normal recharge and simulation using 50% of normal recharge AND a 5 ft drop in river stage, all wells pumping at full water right.



Science
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Assessment of Drought Resiliency in Rural Northern Nevada – Additional Studies



Wells, NV

Investigators: Greg Pohll, Rina Schumer, Susie Rybarski, Jackson Crews, Chris Pearson
Presented to: Nevada Division of Emergency Management

Date: September 23, 2016

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Introduction

Unusually severe to exceptional multi-year droughts are not an uncommon occurrence in Nevada. Although groundwater sources tend to be more resilient to short-term droughts than surface water sources, the intensity and length of the recent drought and the increase in population in recent decades have led to questions about the vulnerability of all of the state's municipal water systems. This includes those serving areas outside of urban centers. In 2013, the Nevada Drought Response Committee (DRC) held a strategic planning workshop during which the workgroup identified a goal of strengthening the resiliency of municipal water systems. The DRC recommended the development of public water supply vulnerability studies in the 2014 strategic plan.

The Nevada Division of Emergency Management (NDEM), in accordance with its mission of providing guidance to the state of Nevada and local jurisdictions on pre-disaster mitigation issues, desires to survey public water supply systems and domestic wells in rural northern Nevada to determine the vulnerability of those systems and sources to the effect of long-term drought. The NDEM also desires to develop guidelines to promote drought resiliency for municipal water systems and develop drought mitigation recommendations for rural water systems.

Most rural communities rely on groundwater to serve their customers. Generally, groundwater systems provide more resiliencies during drought periods because groundwater storage is typically much larger than surface water systems (e.g. reservoirs). Although the groundwater does allow small communities a certain amount of relief during short drought periods, groundwater levels can be depleted during long periods of drought. This study assesses the occurrence of drought and the potential effects on groundwater systems in northern rural Nevada.

This drought resiliency analysis focuses on small communities in northern Nevada. This includes communities north of highway 50 including Gerlach, Wadsworth, and Vya. This analysis also includes a general assessment of the potential impact drought may have on domestic wells. The domestic well analysis focuses on the expected shallow water table declines within each hydrographic basin in northern Nevada.

Objectives

This report presents the results a study designed to complete the following tasks:

1. Survey northern rural Nevada municipal/community water supply systems
2. Determine criteria for drought vulnerability of public water supply systems
3. Determine drought vulnerability for domestic wells
4. Develop municipal/community water system drought resiliency recommendations
5. Review and update the NV State Hazard Mitigation Plan's Drought Risk Assessment.

Background

Three or four major droughts occurred in the U.S. during the more than 100-year period for which records are available, not including the extreme and exceptional drought currently affecting Nevada and California. Two of the major droughts in that interval include the Dust Bowl of the 1930's and another drought during the 1950's. Both of those events persisted for a duration lasting between five and seven years, and both affected very large geographic areas (NOAA, 2008).

Medieval-era (1100-1300 CE) droughts were no more severe than modern droughts, but they persisted longer than any recent drought event, lasting 30-50 years (https://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically-increase-risk-of-us). The likelihood of such persistent mega-droughts in the second half of this century may be exacerbated in the Southwest and Central Plains (Cook et al., 2015).

In designing a drought scenario for this study, a 15-year period of 50 percent recharge was selected as it represents a more severe and more persistent drought than has been recorded for the region, but still represents a fairly realistic scenario. There are several means by which drought is identified and its severity quantified, including the Palmer Drought Severity Index (Palmer, 1965), which is a comparison of current soil moisture to average soil moisture. For the present study, annual precipitation totals from each basin (wrcc.dri.edu) were compared to the mean total. In general, annual totals on the order of 50 percent of normal precipitation constitute some of the driest years on record.

Methods

The study presented here was conducted primarily through numerical modeling. While a previous report (Pohll et al., 2016) focused on more populated areas, the NDEM requested that three additional towns be included in the study: Gerlach, Wadsworth, and Vya (Figure 1). Estimations of the perennial yields for these basins are shown in Table 1. However, it should be noted that although these basins were selected based on the state's estimation of perennial yield, these values were further researched and reevaluated, and generally served only as a starting point for calibration of mountain block recharge and interbasin flow.

Modeling Methods

MODFLOW-NWT (Niswonger et al., 2011) was used to simulate the groundwater system within the selected hydrographic areas. MODFLOW is considered the industry standard and has been extensively tested and verified by numerous hydrogeologists. The model was developed within the Groundwater Modeling System (GMS) environment (version 10.0). GMS acts as a database for all of the hydrogeologic information and provides an easy to use pre- and post-processor to MODFLOW.

Model domains were defined by a 1-layer mesh of 0.386 mi^2 (1 km^2) grid cells fit to the shape of the hydrographic basin. Surface elevations were defined by a DEM, and grid cell thicknesses were determined by the difference between the surface elevation and a uniform bottom elevation. All models use the convertible layer option in MODFLOW, which allows for a variable saturated thickness as defined by the simulated water table position.

While the design of the individual basin models will be discussed later in this document, in general, models were developed to include zones of mountain block groundwater recharge, evapotranspiration (ET) over phreatophyte zones, rivers and streams, and interbasin flow where applicable. Hydraulic conductivities were determined by physical properties of the formations, analysis of aquifer test results where available, and use of the parameter estimation (PEST) function in GMS. With the exception of the municipal wells in some basins, the functionality and pumping rates of wells in these basins were not available. Therefore, each well with existing water rights as stated by the NDWR was assumed to be active and pumping at the full water right issued to that well, including those wells with only supplementary water rights.

For all modeled hydrographic basins, three simulation periods were developed. First, a steady-state model was created to represent pre-development water levels. Steady state models were calibrated to observed water levels, such that the ratio of the mean absolute error to the total simulated head drop was less than 10%. These water levels were then used as the initial conditions for two sets of transient models – one set modeling normal mountain block recharge conditions, and one set modeling drought conditions, for which recharge was reduced by 50% from normal. Each transient simulation was run for 15 years. All wells were modeled as pumping at their full water right, with the exception of domestic wells which were pumped at 0.7 AFA, in contrast to their associated water right of 2.0 AFA. Additionally, the municipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model were pumped at rates as reported by the local municipalities. Note that the 2013 estimated pumping rates shown in Table 1 are in many cases simply a percentage of the total water rights, and because their accuracy was unknown, these numbers were not used. Comparisons of water level difference plots between the transient and steady state simulations show the basin-wide drawdown effects of simple pumping versus the effects of lost recharge due to drought conditions. Plots of drawdown over time were also created for selected municipal wells and springs to assess drought vulnerability for the public water supply and to better inform recommendations for drought resiliency.

Dodge Flat / Tracy Segment / Fernley Area (Wadsworth)

The town of Wadsworth lies at the junction of three hydrographic basins – Dodge Flat (Basin 82), Tracy Segment (Basin 83), and Fernley Area (Basin 76). These basins are bound by the Pah Rah Mountains to the west, the Virginia Range to the south, the Truckee Range to the north, and the Hot Springs Mountains to the east. The Truckee River flows east through the Tracy Segment, then bends to the north to flow through Dodge Flat, ultimately terminating in Pyramid Lake, north of the Dodge Flat basin. At the eastern end of the Tracy Segment, river water is diverted into the Truckee Canal, which flows parallel to the river within the Tracy Segment, then bends to the southeast to flow through the Fernley
Area. Water in the canal is used for irrigation purposes in the southern Fernley Area. The town of Wadsworth and the surrounding area obtain water from 4 municipal wells and several quasimunicipal wells located in the Dodge Flat and Tracy Segment (Figure 2).

Steady-State Model Design

The Dodge Flat / Tracy Segment / Fernley Area model uses the results of a previously designed model as its initial condition (Pohll, 2015). It should be stated that the model incorporates only the sections of these three basins that are hydrologically relevant to the Wadsworth/Fernley area, and most notably omits a sizable portion of the Tracy Segment. This model is significantly more complicated than the others described in this report, and consists of 29,376 200 m x 200 m grid cells in 3 layers. Layers 1 and 2 are 110 m (360 ft) and 190 m (620 ft) thick, respectively. The bottommost layer (Layer 3) is defined by the bedrock surface. Surface elevations were determined by a DEM. Briefly summarized here, the model design is described in detail in Pohll, 2015.

The Pohll model was designed to simulate a steady-state condition representing the period 2000-2005. The head resulting from this simulation was then used as the initial condition for a transient model representing 2006-2010. This period was used to calibrate the storage parameters (specific yield and specific storage) and to validate the ability of the model to simulate water level trends. Groundwater sources and sinks in the Elko Segment include mountain block recharge, agricultural recharge, evapotranspiration, interbasin flow, and well pumping. Unlike the other models described in this report, both the steady state and transient calibration periods do include well pumping. The Truckee River and Truckee Canal also act as sources and sinks of groundwater.

Recharge was modeled as several specified flow arcs in layers 1 and 2 along the base of the mountain ranges bounding the basins, and was estimated to be approximately 3300 AFA. Interbasin flow was assumed to move into the model domain along the Truckee River canyon and exit in the north toward Pyramid Lake, and to the southeast toward Hazen. The hydraulic head values along these boundaries were determined by interpolation of measured water levels, or estimated from land surface elevations if no water level data were available. The head values were assumed to remain constant during all simulations and were applied to layers 1 and 2.

Evapotranspiration zones were applied to areas populated by phreatophytes, which fall primarily along the banks of the Truckee River and in irrigated areas along the Truckee Canal. The maximum groundwater ET rates were 0.0016, 0.016, and 0.016 ft/day for greasewood, playa, and cottonwood areas, respectively. The extinction depths were specified as 23, 3.3, and 16 ft for greasewood, playa, and cottonwood areas, respectively.

Interactions between the aquifer and the Truckee River and Truckee Canal were simulated using the streamflow routing package (SFR2; Niswonger and Prudic, 2005). The SFR2 package calculates flux between the surface water body and the aquifer using a number of parameters, including geometric parameters, topology of the stream network, streambed elevations, and width for each reach. Seepage from lateral canals was estimated to be approximately 3300 AFA, based on conveyance efficiencies and diversion rates. The flow budget for the steady-state model is detailed in Table 2.

Most of the hydraulic conductivity measurements within the study area were taken from Pohll et al., 2001, with a few additional measurements taken in the Wadsworth area as presented in Epstein, et al. 2007. Hydraulic testing included pumping, recovery, and packer testing and was performed

from 1997 - 2006. The model was calibrated using the pilot point method, with final hydraulic conductivities ranging from 0.3 ft/d to 164 ft/d in isolated areas of the basins.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model and using Truckee River and Truckee Canal drought condition flow rates as predicted by Pohll, 2016, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. Truckee River and Truckee Canal flow rates for the model using 100% of normal recharge were taken from the transient predictive model described in Pohll, 2015. Heads calculated by the 2006-2010 transient simulation presented in Pohll, 2015 were used as the initial condition for the transient drought model, which was run to 15 years. For both models, municipal and quasimunicipal wells were pumped at rates reported by the local municipalities. All other well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Interestingly, isolated regions in the Fernley Area show a small increase in groundwater levels under drought conditions. This occurs as a result of increased flow volumes in the Truckee Canal - while the steady state and 2006-2010 transient models were run using historical flow values, the drought model used estimated flow values for a drought under the new Truckee River Operating Agreement (TROA) regulations, which increased the volume allocated to the canal.

Two municipal wells in the Wadsworth area were selected to show the effects of drawdown over time (Figures 3 and 4). Results show a relatively insignificant effect of drought on the municipal supply. PLPT Municipal Well 3 shows an average decline of 0.1255 ft/yr (1.88 ft total) over 15 years of drought conditions, while the Stampmill 1 well actually shows an average increase of 0.0079 ft/yr (0.12 ft total) over the same time period. Fluctuations in these wells result from changes in river and canal flow volumes and seepage rates and are minimal. However, domestic wells located in or near the mountain block, where drawdown due to lost mountain block recharge is greater, may experience up to 14 feet of drawdown as a direct result of a 15-year severe drought (Figure 5).

Conclusions

- Municipal supply wells are resilient to the impact of a 15-year severe drought.
- The most significant impact of drought occurs in the mountain block.
- Domestic wells located in or near the mountain block may be impacted by a 15-year severe drought.
- Changing water regulations may result in increased groundwater elevations relative to the present, even during drought conditions.

Smoke Creek Desert (Gerlach)

The Smoke Creek Desert, referred to as basin 021, is located primarily in northwestern Nevada in Washoe County, and extends to the west into Lassen County, California. The town of Gerlach is located just east of the basin in the San Emidio Desert, but obtains its water from two mountain springs in the Granite Range at the northeastern boundary of the Smoke Creek Desert. Stream and groundwater flow discharges to the southwest-northeast trending playa located on the southeast side of the basin. The basin is sparsely populated, with no active municipal wells (Figure 6).

Steady-State Model Design

The Smoke Creek Desert model consists of 2902 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 2000 ft AMSL. Groundwater sources and sinks in the Smoke Creek Desert include mountain block recharge, spring flow, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model. Mountain streams also act as head dependent sources and sinks of groundwater.

Recharge was modeled as several zones covering higher elevation areas in the hills and mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during non-drought years to be between 13,000 and 19,000 AFA (Glancy and Rush, 1968). The average value of 16,000 AFA was used in the initial model design, then adjusted manually to improve steadystate model calibration. The same study also estimated a 200 AFA underflow from the San Emidio Desert to the east and a 180 AFA underflow from Dry Valley to the southwest, which were applied to the model as specified flow boundaries.

Evapotranspiration zones were applied to the playa and areas populated by phreatophytes, and were calibrated such that basin-wide ET fell between the estimated values of 13,000 and 19,000 AFA (Glancy and Rush, 1968). The mountain streams of Smoke Creek, Buffalo Creek, and Squaw Creek are in communication with the underlying aquifer, and were modeled as head-dependent boundaries using the River (RIV) Package in MODFLOW.

The primary focus of this model was to determine the potential effects of drought on the two mountain springs providing water to Gerlach. A recent modeling study (Aqua, 2009) attempted to determine the effect of pumping on spring flow volumes in the Smoke Creek Desert. As part of that study, data loggers were placed in the springs to determine flow volumes. From November 2007 to February 2009, the flow in Garden Spring fluctuated between 37 and 53 gpm (59.7 and 85.5 AFA), while the flow in Railroad Spring held constant at 200 gpm (322.6 AFA). The springs were modeled using the Drain (DRN) Package in MODFLOW, and the model was calibrated to the measured spring flows. Though not a source of water for the town of Gerlach, a third un-named spring in the playa south of Garden and Railroad Springs was also modeled to more accurately calibrate the model, using a flow rate equal to the water rights for that spring. The flow budget for the steady-state model is detailed in Table 3.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types,

then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.015 ft/d in the Granite Range to 30 ft/d in the stream alluvium.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

The model run with 100% of normal recharge and all wells pumping at the full water right showed no change in the flow rate of either spring servicing Gerlach. This model therefore indicates that the current rates of pumping in this basin will not affect spring flow, a finding corroborated by the 2009 Aqua study.

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge does indicate a decline in spring flow when under drought conditions. After 15 years of drought conditions, Garden Spring showed a decline of approximately 31.1 AFA (Figure 7), while Railroad Spring showed a decline of only 1.6 AFA (Figure 8). The model also indicated that wells located in Smoke Creek Basin may experience drawdown as a result of an extended drought, but that this drawdown would be less than 2 feet (Figure 9).

Conclusions

- The most significant impact of drought occurs in the mountain block.
- Springs providing water to Gerlach may be impacted. The model indicates an approximate flow reduction of 8% after 15 years of severe drought.
- Pumping in the Smoke Creek Desert does not appear to impact springs providing water to Gerlach.

Long Valley (Vya)

Long Valley, referred to as basin 009, is located in northwestern Nevada in Washoe County. The basin trends south to north, and is bound by the Hays Canyon Range to the west and various individual mountains and hills to the north, south, and east. Stream and groundwater flow discharges to playa lakes located primarily in the north basin. The basin is sparsely populated, with no active municipal wells (Figure 10).

Steady-State Model Design

The Long Valley model consists of 1161 1 km x 1 km grid cells. Cell elevations were determined by a DEM, and the base of the model was set at 4500 ft AMSL. Groundwater sources and sinks in Long Valley include mountain block recharge, evapotranspiration, interbasin flow, and well pumping – though pumping was not included in the steady-state model.

Recharge was modeled as several zones covering higher elevation areas in the mountains bounding the basin. Previous studies have estimated the total mountain block recharge in the basin during

nondrought years to be approximately 6,000 AFA (Sinclair, 1963). This study also estimated evapotranspiration in the basin to be approximately 11,000 AFA. The study resolved this imbalance by suggesting that Long Valley may receive a significant amount of interbasin flow from Massacre Lake Valley to the east, Boulder Valley to the southwest, and Surprise Valley to the west. However, a separate study of Surprise Valley has stated that it is a closed basin (California Department of Water Resources, 1986). Additionally, Sinclair's estimated recharge rates in Massacre Lake Valley and Boulder Valley are quite low (3500 AFA and 2000 AFA, respectively), and they are therefore unlikely to contribute the apparent 5000 AFA difference between estimated recharge and evapotranspiration. As the Sinclair study provided no other evidence for this assertion beyond a mass balance error, it is likely that the estimate of evapotranspiration is high, and the perennial yield of the basin is in fact less than 11,000 AFA.

Evapotranspiration zones were applied to playas and to areas populated by phreatophytes. A maximum ET rate of 0.002 ft/d was applied to the playas with an extinction depth of 5 ft below the surface, while phreatophyte zones were assigned a maximum ET rate of 0.0007 ft/d with an extinction depth of 30 ft. A constant head boundary was placed in the largest playa zone to serve as a point of reference for the heads calculated in the steady state model, and the model was calibrated such that this boundary condition would not act as a significant source or sink of water. This boundary condition was removed before the transient simulations were performed. The flow budget for the steady-state model is detailed in Table 4.

As little data was available to indicate the hydraulic conductivities of the basin materials, zonal values for the mountains and basin sediments were estimated based on rock and sediment types, then calibrated using the PEST function in GMS. The final hydraulic conductivities used in this model range from 0.01 ft/d in the Hays Canyon Range to 3.5 ft/d in the alluvium of the central basin.

Transient Model Design

Two transient models were run – one with recharge rates set to 50% of those used in the steady-state model, and one with 100% of the steady-state recharge, to assess the effect of lost mountain block recharge as opposed to simple pumping. All well types were allowed to pump at their full water right, with domestic wells pumping at a rate of 83.5 ft^3/d (0.7 AFA). Heads calculated by the steady-state simulation were used as the initial condition for the transient models, and both models were run to 15 years.

Results

Transient models show the development of cones of depression surrounding irrigation wells along the western side of the basin, with a maximum drawdown of approximately 66 ft over 15 years (Figure 11).

A comparison of drawdown resulting from transient models run at 50% and 100% of steady-state recharge shows does indicate a decline in groundwater levels in zones of mountain block recharge when under drought conditions. Irrigation and domestic wells located in or near the mountain block may experience up to 10 feet of drawdown as a direct result of a 15-year severe drought (Figure 12).

Conclusions

- The currently accepted value of perennial yield for this basin may be an overestimate.
- Irrigation and domestic wells located in or near the mountain block may be impacted by a 15year severe drought.
- The majority of the simulated drawdown is concentrated in the area of irrigation wells, indicating that irrigation well pumping exerts a dominant influence on water level decline in Long Valley.
- Water level decline due to pumping presents a more significant threat to resilience than a 15year severe drought.

Conclusions

In this study, the effects of persistent, severe drought on groundwater levels in three hydrographic basins in Northern Nevada were assessed. This was carried out by running two transient groundwater flow simulations: one in which the mountains receive the full volume of normal recharge, and one in which the mountains received only 50 percent of normal recharge. In each simulation, domestic wells were pumped at 0.7 AFA, which is smaller than the 2 AFA water right, but represents a more realistic value. All other wells were pumped at their full water right duty, with the exception of municipal and quasimunicipal wells in the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) model, which were pumped at rates as reported by local municipalities. The simulations were run over a period of 15 years, and the difference in water levels at year-15 was interpreted as the effect of the reduction in recharge in the mountains, as all other features of the simulations – besides recharge – were identical. Differences in water level between the two scenarios in year-15 were measured at the location of municipal wells, and the difference in water level was also mapped throughout the model domain to show region of greater and lesser sensitivity.

The differences in water levels between the 50 percent (drought) and 100 percent (normal) recharge scenarios in year-15 was generally small compared to the net decline in water level at a given location due to pumping. The largest difference in water level between the drought and normal recharge simulations in year-15 usually occurred in the mountains, where recharge is delivered to model. This result is not surprising because the reduction in recharge propagates through the model at a rate governed by the hydraulic diffusivity, which is the ratio of the hydraulic conductivity to the specific storage parameter (or the ratio of transmissivity to storativity). As a result regions near the recharge zone "feel" the effects of a sudden reduction in recharge much earlier than points farther from the recharge zone. A corollary to this observation is that wells located near the mountain block tend to be less resilient than wells near the center of the valley.

The reduction in recharge is not instantaneously communicated to all locations in the basin. As a result, the effect of the reduction in recharge is not evident at any of the municipal wells during the 15-year simulation period. With the values of hydraulic conductivity, K, and specific storage, S_s, used in the transient simulations, the time delay, t_{delay}, between the onset of a reduction in recharge and its expression as additional drawdown in a pumped well is approximated by:

$$t_{delay} = \frac{S_s}{K} d^2$$

where *d* is the shortest horizontal distance between the recharge zone and the well in question. A well located 10,000 feet from the recharge zone, for example, would respond to a sudden change in the recharge rate in the mountain block after approximately 5.5 years.

In the Dodge Flat/Tracy Segment/Fernley Area (Wadsworth) simulations, water levels were reduced at most by 14 feet in the 50 percent recharge scenario after 15 years, relative to the full recharge case. This difference is interpreted as an effect of the drought. However, these levels of drawdown are seen only in domestic wells located near mountain block recharge zones. Municipal wells are located at a sufficient distance from recharge zones, and are primarily affected by flow rates in the Truckee River and Truckee Canal. Assuming predicted flow rates are accurate, models indicate that municipal and quasimunicipal wells in this area are resilient to an extended drought.

Similarly, the Long Valley (Vya) simulations yielded a difference in water levels of up to 10 feet at domestic and irrigation wells located near the mountain block under the 50 percent recharge drought scenario.

In the Smoke Creek Desert, flow rates in the two springs providing water to Gerlach in the 50 percent recharge case were reduced by approximately 8%, relative to the 100 percent recharge case after 15 years of simulation. The effects of pumping in the basin did not affect spring flow.

On balance, the influence of a persistent, severe 15-years drought on groundwater elevation in the three modeled basins is relatively minimal, at least when compared to the rate of decline due to pumping.

Recommendations

The most significant impacts of the simulated drought occur first in the mountains, where groundwater is recharged. Wells and springs in and near the mountain block tend to be affected earlier and more severely by a sudden reduction in recharge. For that reason, it is recommended that new wells be drilled as close to the center of the valley as possible.

Water level records are available at varying temporal resolution for some wells. Additional water level monitoring in more extant wells and flow rate monitoring in springs would provide valuable highresolution feedback on aquifer and well performance.

While the effects of a simulated drought were small compared to the effect of pumping, the decline due to pumping alone is cause for concern, as it poses the greatest present threat to the resilience of municipal water resources.

References

Aqua Hydrogeologic Consulting, 2009, Smoke Creek Desert groundwater model and Smoke Creek hydrographic basin water rights database report.

California Department of Water Resources, 1986, Surprise Valley Ground Water Quality Study, Report. Sacramento: California State Printing Plant.

Cook, B. I., T. R. Ault, and J. E. Smerdon, 2015, Unprecedented 21st century drought risk in the American Southwest and Central Plains, *Scientific Advances*, doi: 10.1126/sciadv.1400082

Epstein, B., Pohll, G.M., Bansah, D., Makowski, A., 2007, Regional groundwater model development for the Fernley/Wadsworth hydrologic basins, Nevada.

Glancy, P. and Rush, F.E., 1968, Water-resources appraisal of Smoke Creek-San Emidio Desert area, Nevada and California. Nevada Department of Conservation and Natural Resources. Water Resources – Reconnaissance Series Report 44.

Hydrographic Area Summary, HA009, Long Valley, Nevada Division of Water Resources

Hydrographic Area Summary, HA021, Smoke Creek Desert, Nevada Division of Water Resources

Nevada State Engineer Water Level Database, http://water.nv.gov/data/waterlevel/

Niswonger, R.G., and Prudic, D.E., 2005, Documentation of the Stream flow-Routing (SFR2) Package to Include Unsaturated Flow Beneath Streams – A Modification to SFR1, U.S. Geological Survey Techniques and Methods 6-A13, Reston, Virginia.

Niswonger, R. G., Panday, Sorab, and Ibaraki, Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37, 44 p.

NOAA National Centers for Environmental Information, State of the Climate: Drought for Annual 2008, published online January 2009, retrieved on September 20, 2016 from http://www.ncdc.noaa.gov/sotc/drought/200813.

Palmer, W.C., Meteorological Drought (U.S. Weather Bureau, Washington, DC, 1965)

Pohll, G., D. McGraw, J. Ralston, B. Bohm, J. Thomas, A. McKay, M. Widmer, T. Minor, G. Lamorey, O. Dahan, R. Carroll, K. Cupp, E. Jacobson, E. McDonald, E. Stevick, and J. Huntington, 2001, Evaluation of groundwater and solute transport in the Fernley - Wadsworth Area. Publication No. 41173, Desert Research Institute, Reno, Nevada.

Pohll, G., 2015, Fernley groundwater flow model update.

Pohll, G., 2016. Water for the Seasons Annual Project Update, National Science Foundation, Water Sustainability and Climate Program, Category 2: Water Sustainability and Climate Resiliency in Snow-Fed Arid Lands, Arlington, VA, March 8-9.

Pohll, G., Schumer, R., Rybarski, S., Crews, J., and Pearson, C., 2016, Assessment of drought resiliency in rural northern Nevada.

Sinclair WC., 1963, Ground-Water Appraisal of the Long Valley-Massacre Lake Region, Washoe County, Nevada. Nevada Department of Conservation and Natural Resources. Groundwater Resources-Reconnaissance Report 15.

http://www.nasa.gov/press/2015/february/nasa-study-finds-carbon-emissions-could-dramatically increase-risk-of-us

Tables

Table 1. Groundwater pumping by basin, *from* Nevada Statewide Assessment of Groundwater Pumpage, 2013. Volumes in acre-feet.

Hydrographic Area	Basin / Municipality	MM	IND	ENV	IRR	STK	MUN	QM	DOM	REC	COM	OTH	TOTAL	PY	% of PY
82 & 83	Dodge Flat & Tracy Segment / Wadsworth	657	1,175	0	0	0	66	1,030	4,506	727	0	845	9,005	13,600	66.2
21	Smoke Creek Desert / Gerlach	0	0	0	4,576	89	0	0	12	449	8	0	5,134	16,000	32.1
9	Long Valley / Vya	0	0	0	107	70	0	0	5	0	0	0	182	12,000	1.5

MM = Mining and Milling, IND = Industrial and Construction, ENV = Environmental, IRR = Irrigation, STK = Stock, MUN = Municipal, QM = Quasi-municipal, DOM = Domestic, REC = Recreation and Wildlife, COM = Commercial, OTH = Other, PY = Perennial Yield

Table 2. Flow budget for the Dodge Flat/Tracy Segment/Fernley Area (Wadworth) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	391993	3285
Interbasin Flow	176840	1482
River/Canal Seepage	1967474	16486
Agricultural Recharge	292169	2448
Sinks		
Evapotranspiration	-769389	6447
Interbasin Flow	-706305	5918
River/Canal Seepage	-1065022	8924
Pumping Wells	-680984	5706

Summary	**Sources-Sinks (ft^3/d)**	**Percent Difference**
	-1.90	-0.000059

Table 3. Flow budget for the Smoke Creek Desert (Gerlach) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	1773270	14859
Creek Seepage	32395	271
Interbasin Flow	45351	380
Sinks		
Evapotranspiration	-1591526	-13336
Creek Seepage	-117249	-983
Drains (Springs)	-142239	-1192
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	1.20	0.000065

Table 4. Flow budget for the Long Valley (Vya) steady-state simulation.

	Rate (ft^3/d)	Rate (AFA)
Sources		
Mountain Block Recharge	714194	5984
Constant Head	9447	79
Interbasin Flow	298356	2500
Sinks		
Evapotranspiration	-1012802	-8487
Constant Head	-9196	-77
Summary	**Sources - Sinks (ft^3/d)**	**Percent Difference**
	0.005859375	5.7332578e-007

Figures

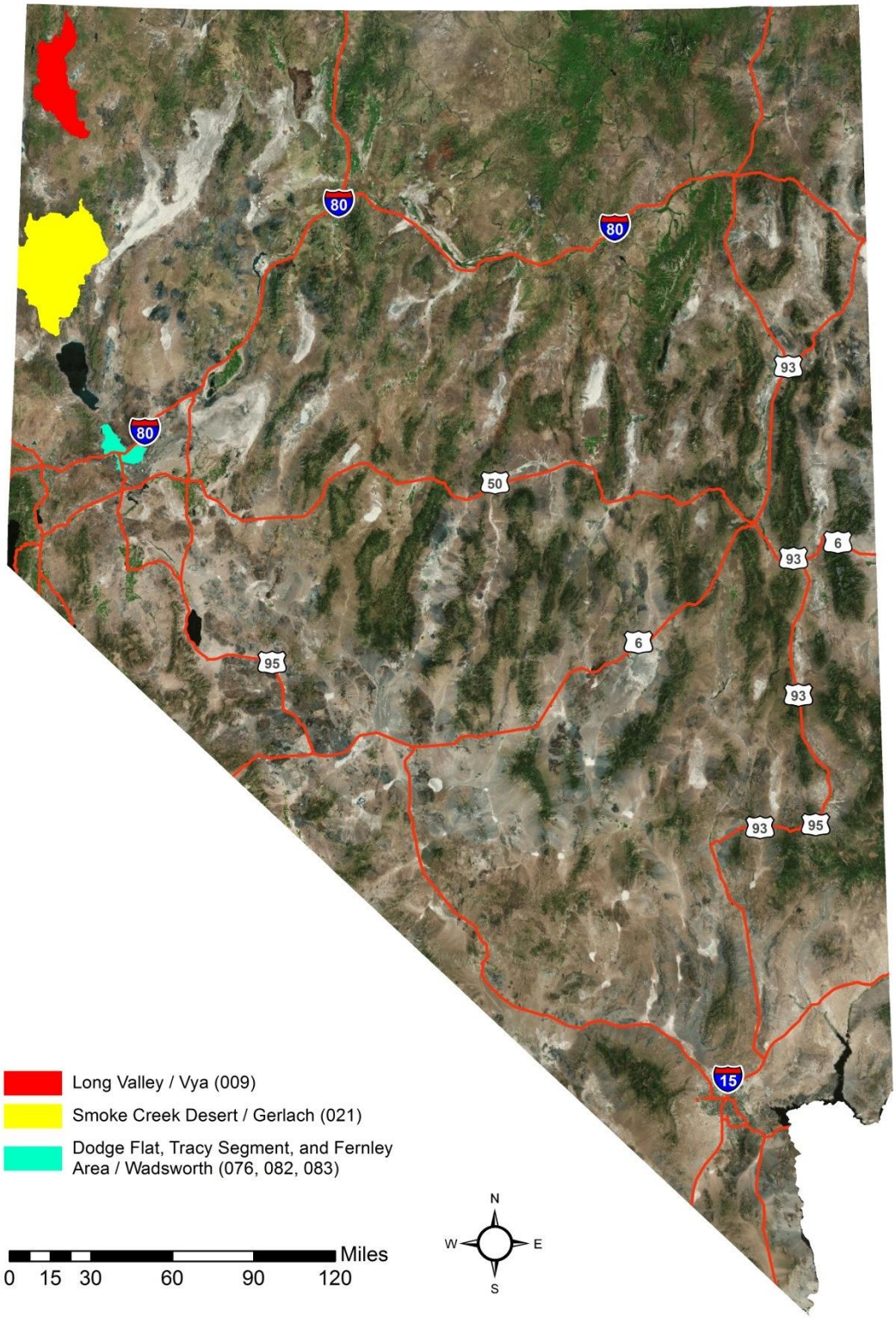


Figure 1. Hydrographic areas modeled for the study presented in this report.

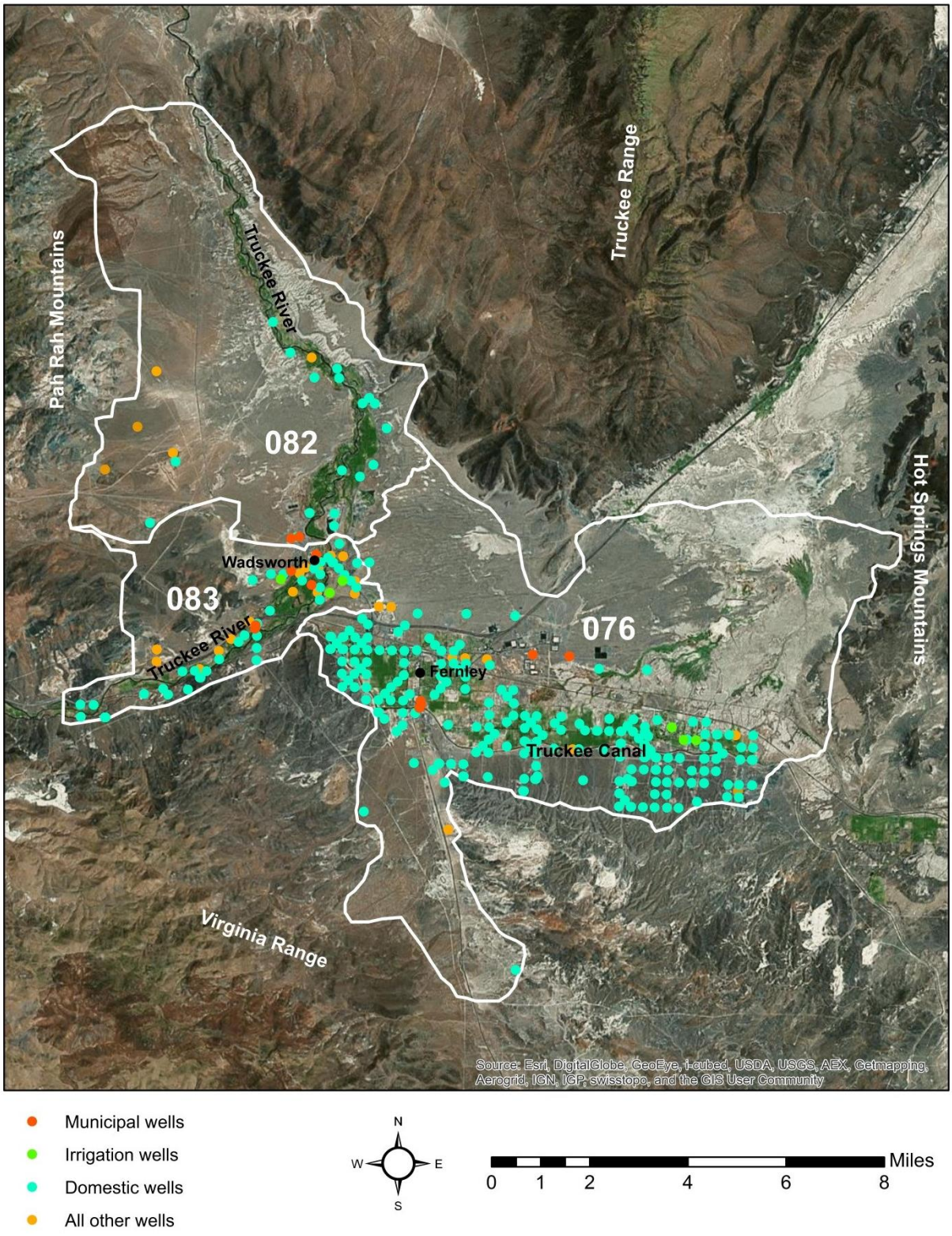


Figure 2. Dodge Flat (82), Fernley Area (76) and Tracy Segment (83) and locations of wells used in transient simulations.

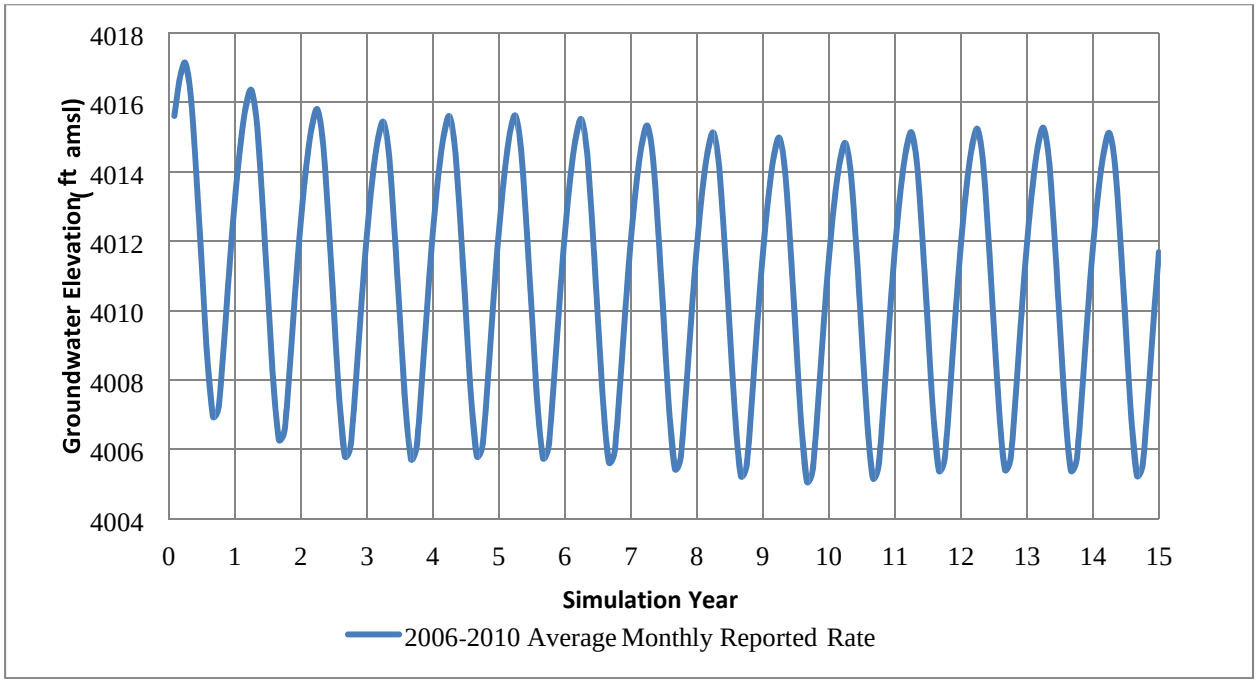


Figure 3. Groundwater levels at PLPT Municipal Well 3 over model duration.

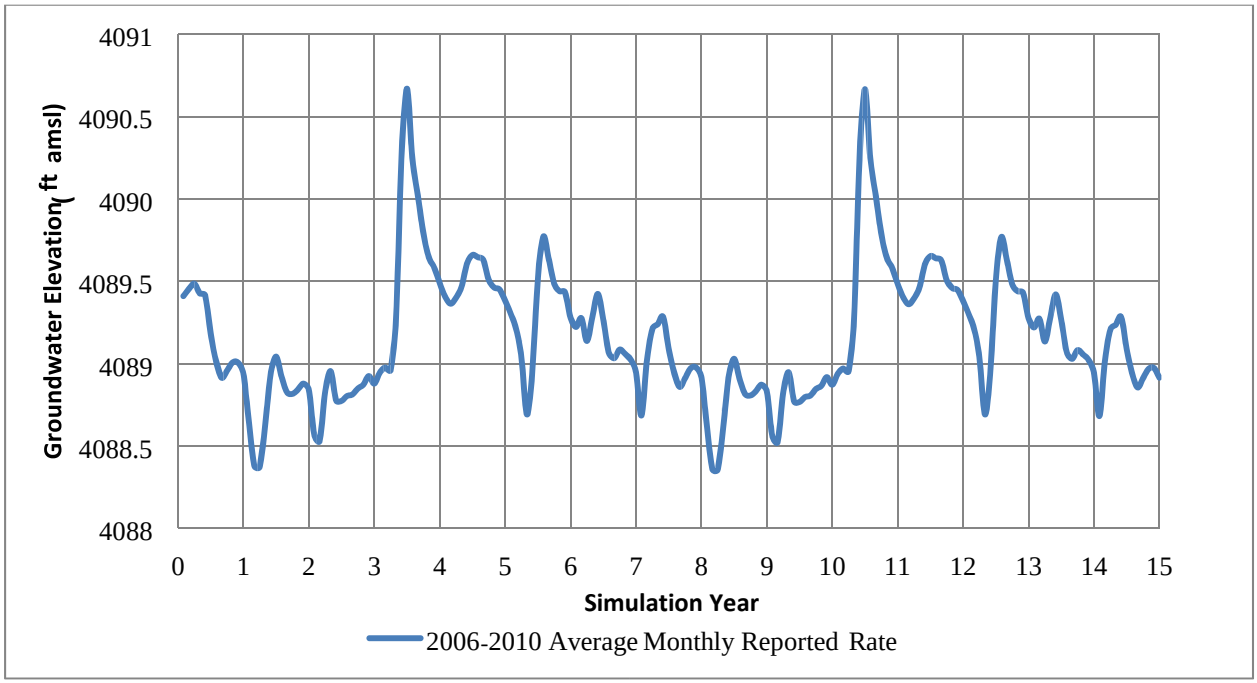


Figure 4. Groundwater levels at Stampmill 1 over model duration.

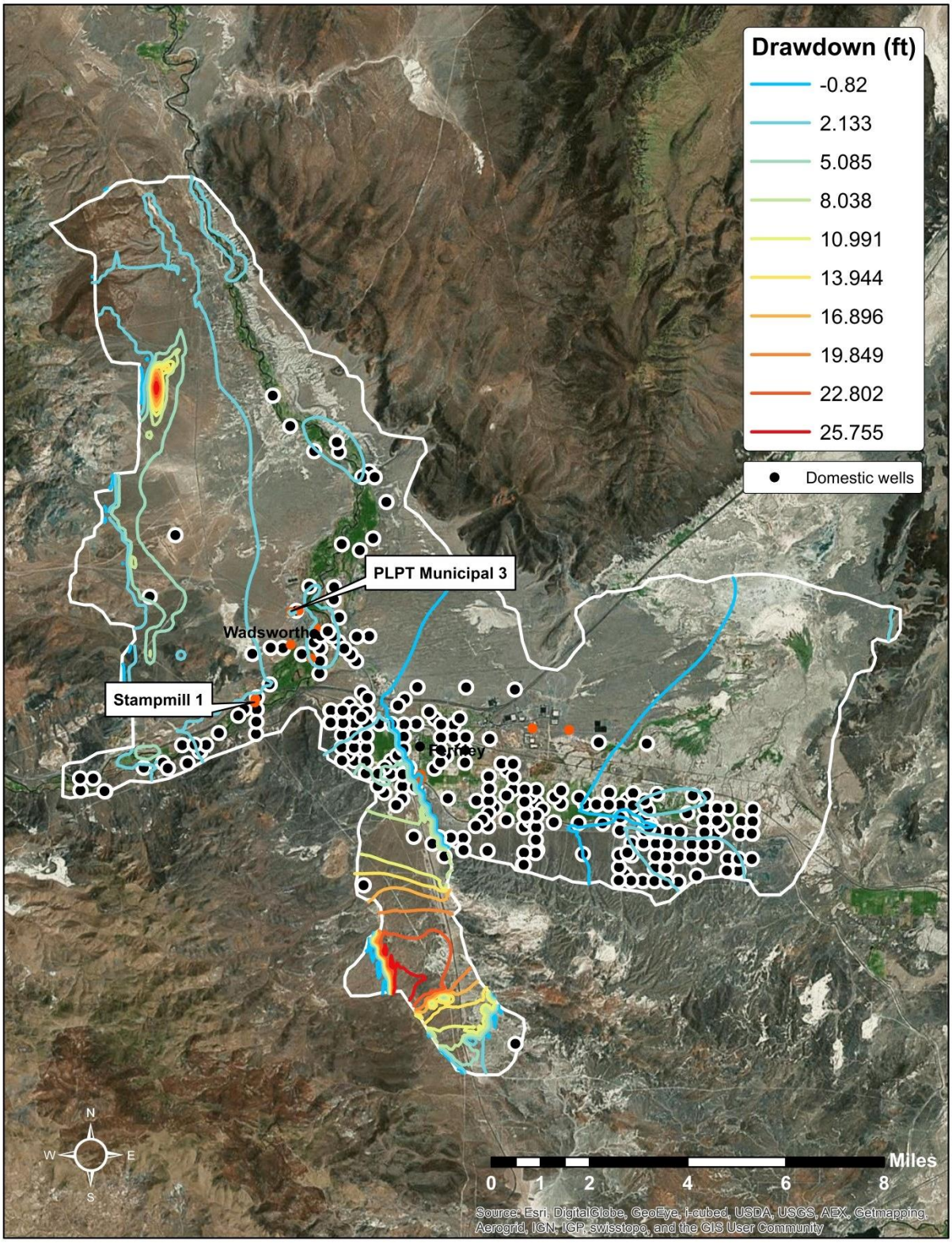


Figure 5. Difference in Dodge Flat / Fernley Area / Tracy Segment drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

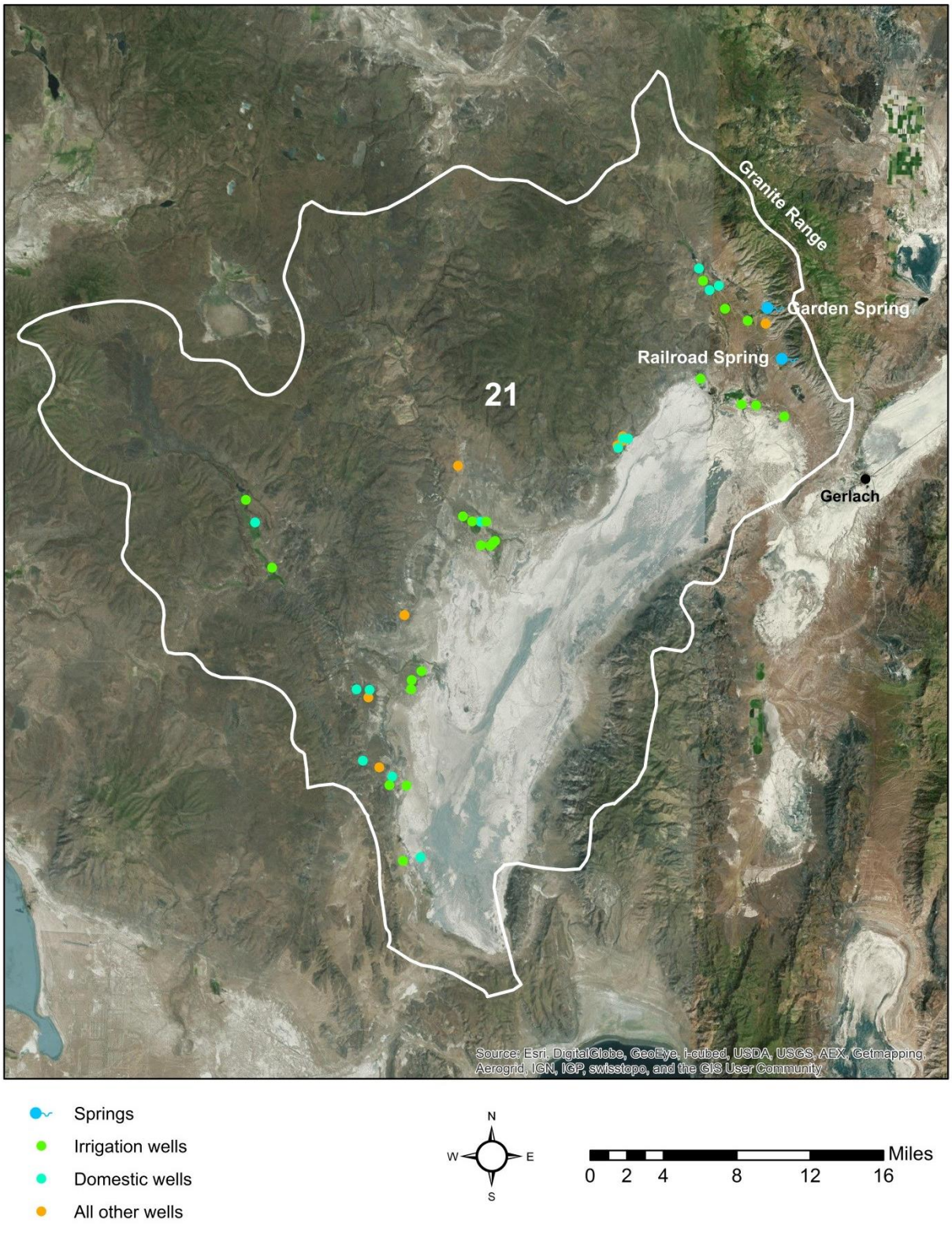


Figure 6. Smoke Creek Desert (21) and locations of wells and springs used in transient simulations.

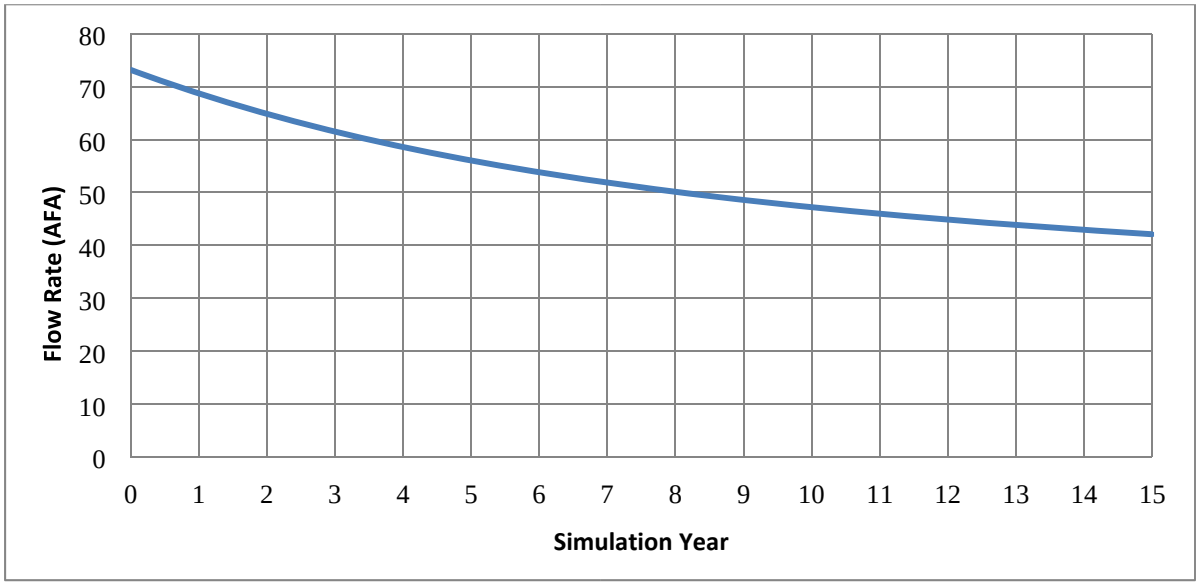


Figure 7. Declines in flow rates for Garden Spring over 15 years of drought conditions.

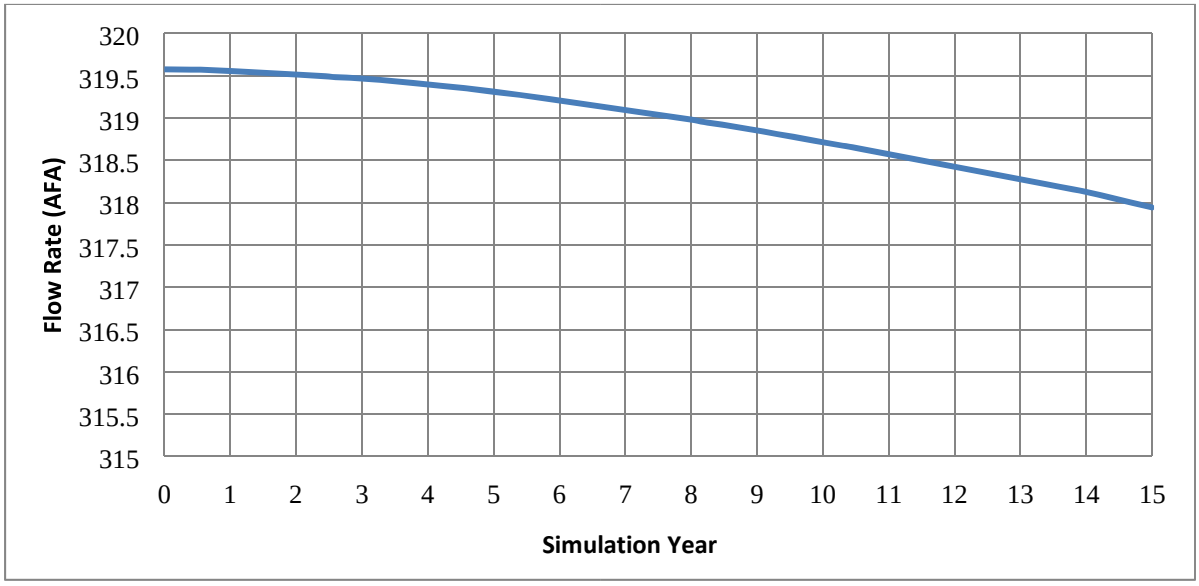


Figure 8. Declines in flow rates for Railroad Spring over 15 years of drought conditions.

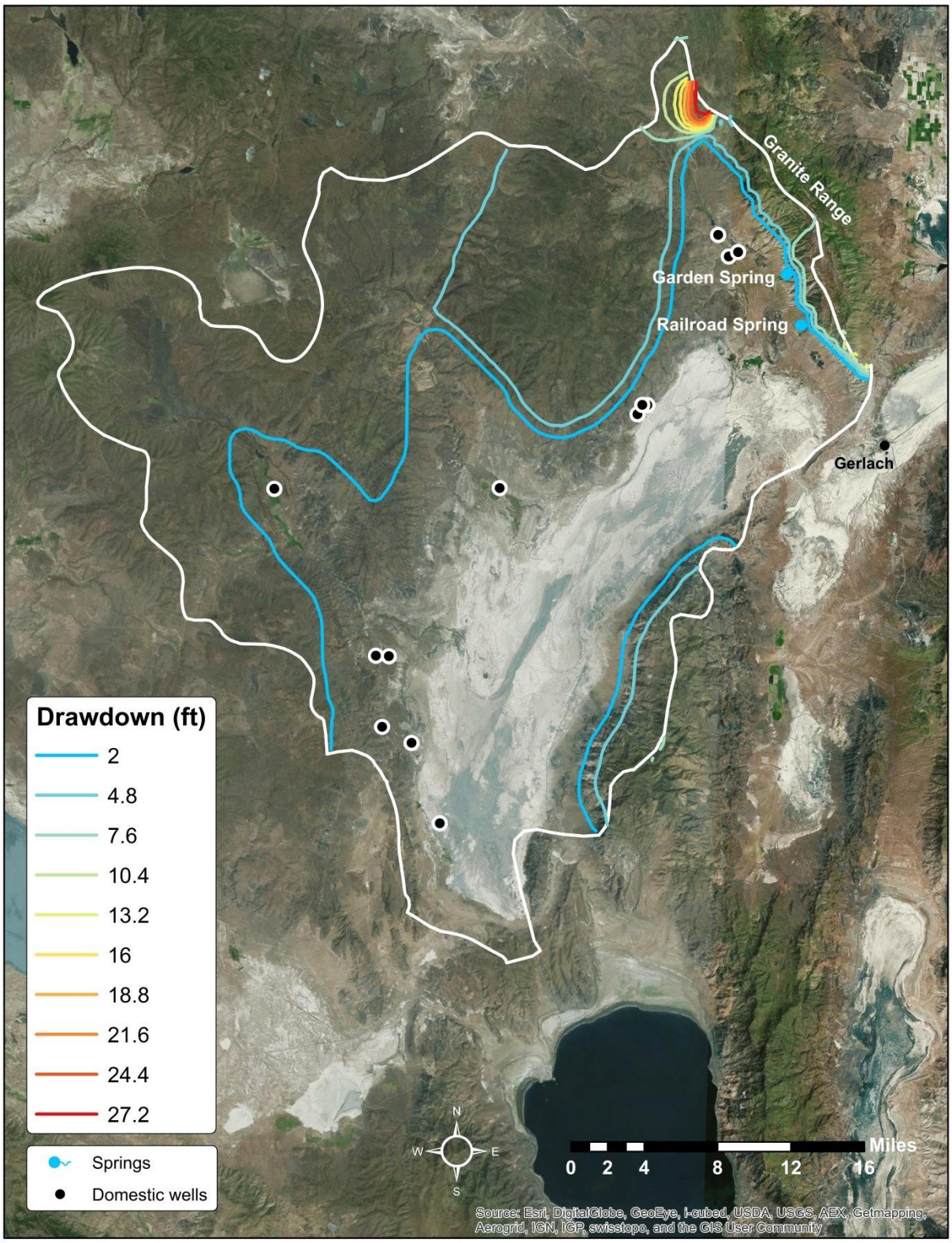


Figure 9. Difference in Smoke Creek Desert drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

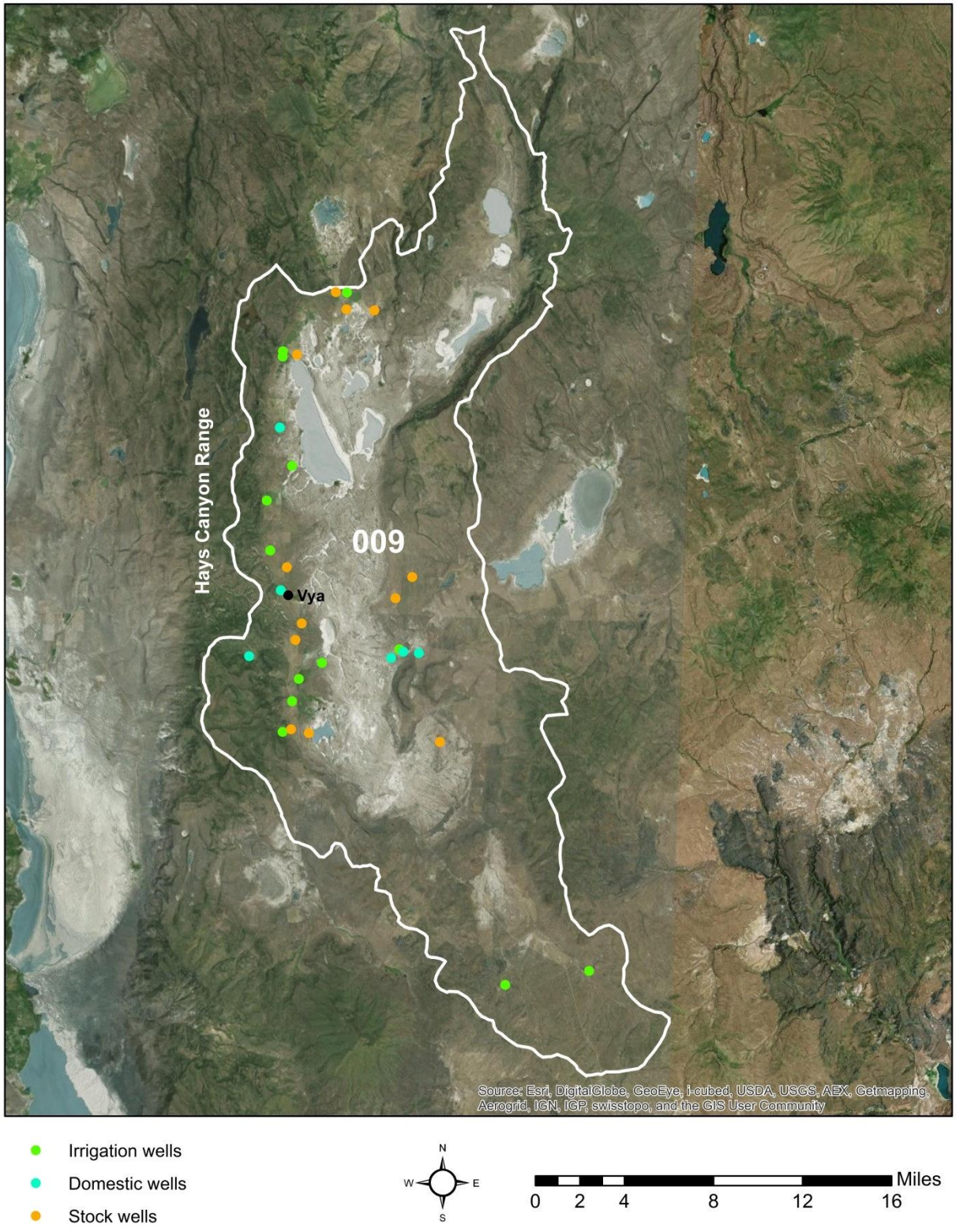


Figure 10. Long Valley (009) and locations of wells used in transient simulations.

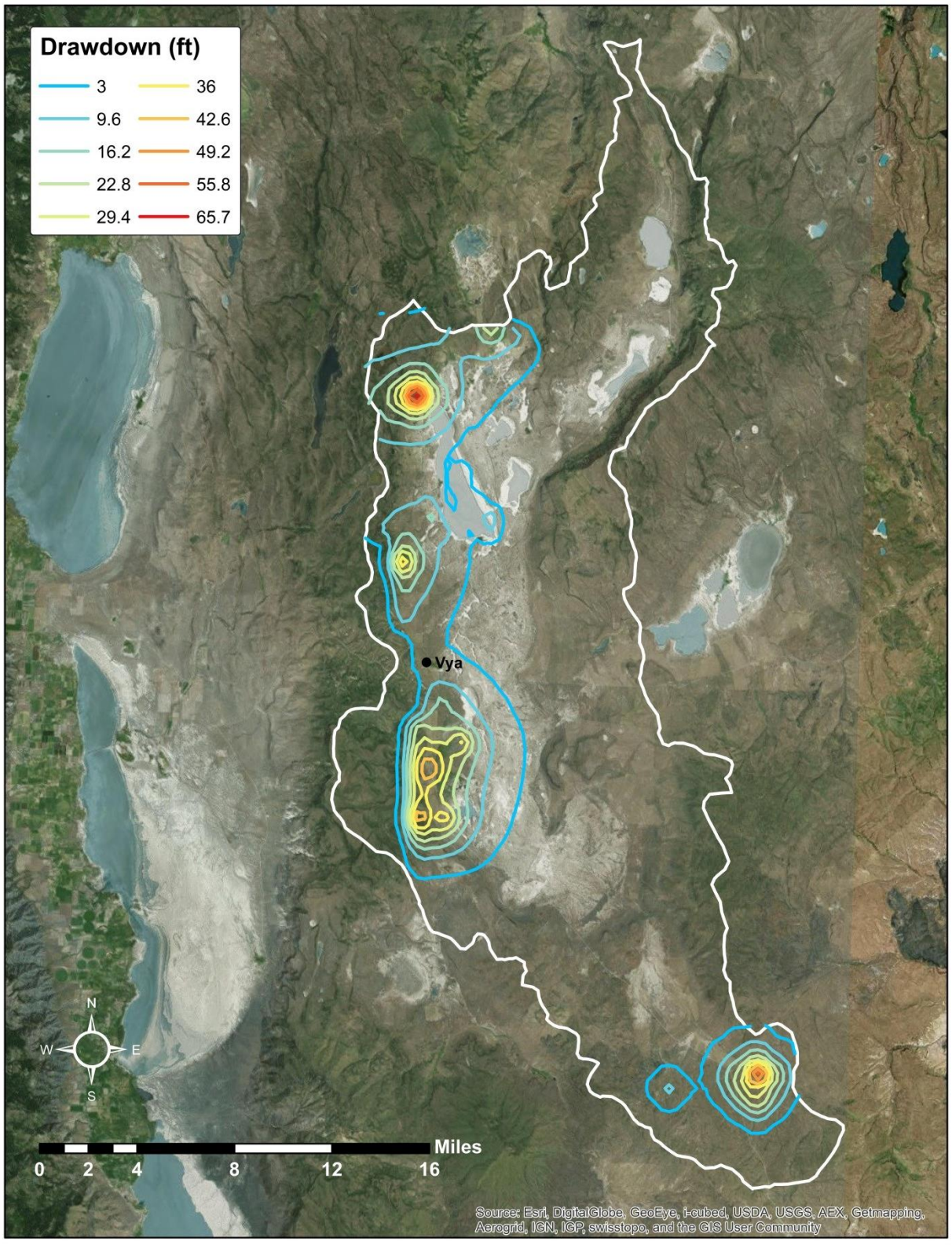


Figure 11. Drawdown in Long Valley after 15 years of mountain block recharge set to 100% of normal, all wells pumping at full water right.

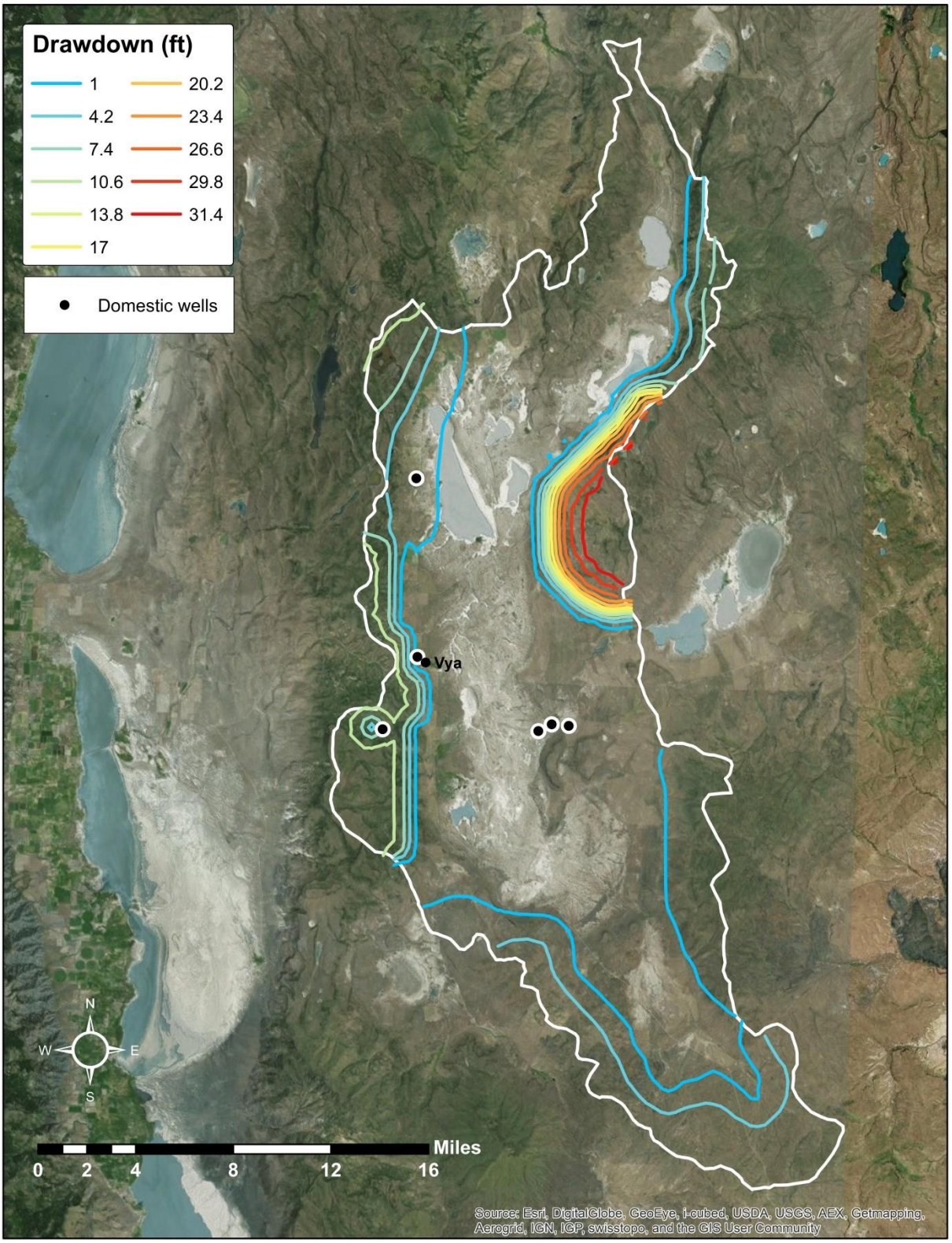


Figure 12. Difference in Long Valley drawdown between simulation using 100% of normal recharge and simulation using 50% of normal recharge, all wells pumping at full water right.

The information contained in this appendix does not reflect Nevada Hazard Mitigation Plan appendix letters or naming conventions, and has its original table of contents



Loss Avoidance Study

Severe Storms and Flooding

FEMA-4303-DR-NV January 2017
FEMA-4307-DR-NV February 2017

Hazard Mitigation Performance Analysis

Joint Field Office, Carson City, NV

July 2017

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Executive Summary

Hazard Mitigation is defined as a "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects". In order to fulfill their responsibility to the public, it is incumbent upon Federal, State, Local, and Tribal Emergency Managers to regularly review the efficacy of past mitigation projects where public funding is involved. Flooding in NW Nevada during January and February 2017 provided an opportunity to evaluate two mitigation projects initiated as a result of previous disasters in and around the Reno/Carson City area.

The following criteria were considered in selecting analysis sites:

- The project had to have been completed and in place at the time of the January and February events
- The project was located within the declared disaster area
- The project was "tested" by the recent flood event

The Truckee River Flood Project

The first project is located on Mill Street and North Edison Way in east Reno along the banks of the Truckee River. The project is part of a much larger plan managed by the Truckee River Floodplain Management Authority (TRFMA) with many facets, ranging east to west through the greater Reno/Sparks area. It is unique in that it is part of a large, on-going project that will take many years to complete, and acquisition of two remaining buildings is still under negotiation. An exception was made to the "completed project" criteria listed above because the project provides a clear "before and after mitigation" picture, in that both of the buildings that are still occupied were flooded in the recent storms. The N. Edison Way site was a retail/light industrial complex that had been subject to flooding on numerous occasions. The project boundary encompasses approximately 147 acres.

The goal of the Truckee River Management Project is the acquisition and demolition of ten retail/light industrial buildings and one building that was formerly used as a Monastery, as well as acquisition of surrounding farmlands, all of which have been subject to repeated flood loss over the years. Six of the ten buildings have been acquired and demolished. Two are scheduled for demolition, and two are still occupied. Once all the buildings have been demolished, and foundations and utilities removed, the land will be converted to a public park, *creating the only undeveloped space* along the Truckee River in Reno. While the vast majority of the funds were provided by the TRFMA, FEMA Pre-Disaster Mitigation (PDM) Grant funds subsidized the demolition of seven of the 11 buildings to date, and will likely make further contributions.

This project can be considered a success even in its transitional state. In the aftermath of the 2017 floods, the two remaining structures sustained damage due to flooding (a minimum of 1 foot of water was recorded at the site), with claims totaling $475,290. The acquisition of the remaining buildings located within project boundaries avoided losses in excess of 5 million dollars.

Project costs for business relocation and demolition totaled $1,167,347, while losses avoided totaled $3,864,207. This resulted in a loss avoidance ratio of 3.31. Thus far, FEMA has obligated at total of $561,490 to this project. The TRFMA anticipates requesting an additional $300,000 to complete the demolition of the Monastery building.

The Vicee Canyon Basin Expansion Project

The second project was located on the northwest side of Carson City and involved the reforestation of the entire Vicee Canyon watershed and the expansion of a retention basin located at the eastern end of the watershed. The project was initiated in the aftermath of the 2004 Waterfall Wildfire that consumed 8,700 acres encompassing several canyons on the western edge of the city.

Mitigation measures enacted in the Vicee Watershed fell into three general categories: soil remediation, fire control, and debris flow/runoff retention. Measures included hydro-seeding, placement of straw mulch, erosion control blankets and fiber rolls, as well as the installation of check dams, gravel bag berms, and sand bag barriers. Existing infiltration ponds were cleaned out to expand their holding capacity, and Carson City undertook an expansion project that, when completed, increased the capacity of the retention basin from 15 acre-feet to just over 200 acre-feet, more than adequate for a 500-year event.

Project costs for reforestation, infiltration pond improvement, and retention pond expansion totaled $4,625,550, while estimated losses avoided totaled $11,997,746. This resulted in a loss avoidance ratio of 3.59. The Federal share was a relatively small $793,987. (All numbers expressed in 2017 dollars.)

This study is intended for Federal, State, Tribal, and Local emergency and facilities managers, as well as anyone responsible for inspecting and repairing eligible facilities after a disaster. It is intended to be informational rather than instructional. With a better understanding of the PDM and PA grant programs and illustrated case studies, the intended audience should be in a better position to fully utilize these programs. The study's goal is to demonstrate the cost-effectiveness of mitigation actions.

Nevada Mitigation Projects Losses Avoided			
Project	Mitigation Costs	Losses Avoided	Loss Avoidance Ratio
Truckee River	$1,167,347	$3,864,207	3.31
Vicee Canyon	$4,625,550	$11,997,746	3.59

1. Introduction

Hazard Mitigation is defined as a "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects". This Loss Avoidance Study examines the effectiveness of two projects initiated in northwest Nevada; one in Reno and one in Carson City.

These projects were funded under several different authorities, including FEMA's Pre-Disaster Mitigation Grant Program (PDM), FEMA Public Assistance (PA) Grants, the State of Nevada, Carson City, the National Resources Conservation Service, and the Truckee River Flood Management Authority. The Federal grants are all part of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (The Stafford Act), which provides grants for states and communities to implement hazard mitigation measures.

Nevada's unique geography, coupled with the several major rivers that cascade down from the Sierra-Nevada Mountains in the Reno/Carson City area, contributes to the regular floods that occur. The following section of the study provides an overview of the geographic characteristics of Nevada, as well as a brief history of flooding that has occurred throughout the state.

1.1 Nevada Geography

Nevada covers 110,567 square miles of western North America. It is bordered by California to the west and south, Oregon and Idaho to the north, Utah to the east, and Arizona to the southeast. Nevada shares geographic features with all its neighbors. Most of the state is characterized by the mountain ranges and flat valleys of the Great Basin and Range Region. It is high mountain desert with a mean elevation of 5,500 feet. Denver may be the "Mile-High" city, but Nevada is the mile-high state. This altitude contributes to the extremes in climate and weather conditions experienced throughout the state. The northeastern portion of the state is supported by lava bedrock and features miles of open prairie that is part of the Columbia Plateau. The entire western/southern border is dominated by the Sierra-Nevada Mountain Range, which covers a relatively small area of the state but has an enormous impact on the state's climate. (See *Figure 1: Nevada Geography*)

Nevada is essentially a dry state; less than 1 percent of the total area is covered with water. Its major lakes are Pyramid, Mead, Mojave, Tahoe, and Walker. Major rivers include the White, the Humboldt, the Truckee, the Carson, and the Walker. The White River and two smaller rivers flow south into Lake Mead, and from there into the Colorado. Several rivers flow into the Humboldt as it winds its way from east to west across the northern portion of the state, ending in the Humboldt Sink, a large, intermittent dry lake bed, a remnant of the prehistoric Lake Lahontan. The Truckee, Carson, and Walker rivers all originate in the Sierra-Nevada Mountains and cross into Nevada near Reno and Carson City. (Nevada Geography from NETSTATE, http://www.netstate.com/states/geography/nv_geography.htm)

1.2 Flooding History of Nevada

Given its climate and geography, it can probably be said with a high degree of certainty that flooding isn't the first thing that comes to mind when people think about Nevada. Status as the driest state belies the true history of flooding in the region, but floods have been recorded in every part of the state, in nearly every month of the year. Rapidly melting snowpack, torrential rain, and isolated thunderstorms have swollen rivers and created flash floods that have created havoc, destroyed property, and taken human lives throughout Nevada's history.

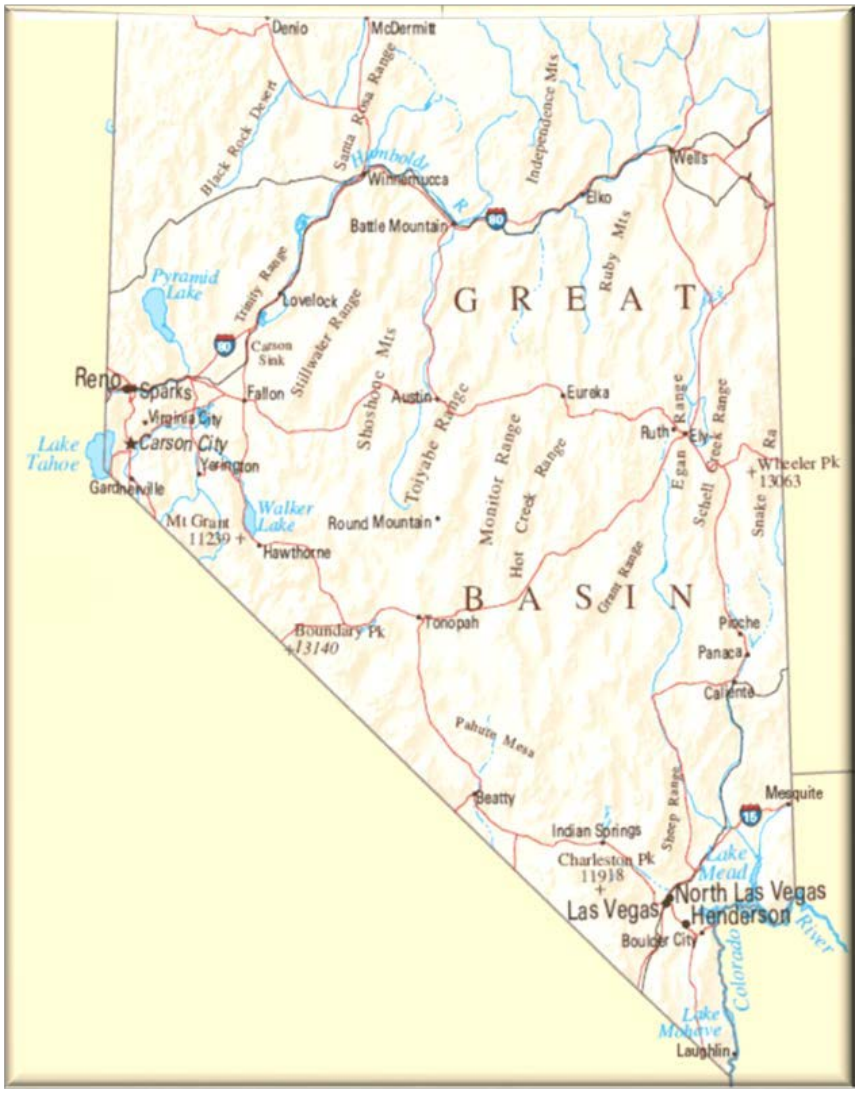


Figure 1: Nevada Geography

One of the earliest recorded events was in the winter of 1861-1862, when Nevada was still a territory. Flooding in the Carson Valley resulted in loss of both life and property. Nearly three decades later, during the winter of 1889-1890, Carson Valley flooded once again when unexpected Chinook winds caused snowmelt in January, sending a wall of ice and debris into the river channel.

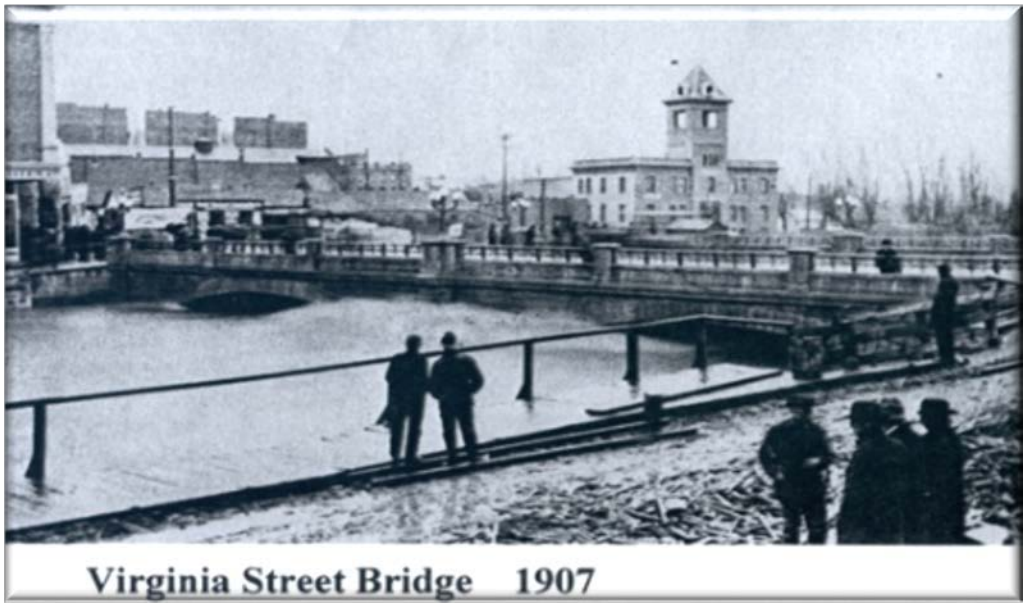


Figure 2: Flooding in Reno, Nevada, 1907

Flooding in and around Las Vegas during the winter of 1906-1907 left the town's residents cut off from supplies, while to the north, the Truckee River inundated downtown Reno. In 1910, the Meadow Valley Wash flooded, carrying away most of a train, and in 1941, when heavy thunderstorms soaked much of Nevada, a half-mile of railroad track was washed away, causing a massive trail derailment.



Figure 3: Downtown Reno, 1950

November and December 1950 saw record-breaking floods in the Walker, Carson, and Truckee River basins. Unseasonably warm temperatures melted the early snow cover and combined with a series of storms to overwhelm the northern part of the state. Estimates of damage in Reno compiled by the US Army Corps of Engineers totaled $1,982,000 ($20,050,356 in 2017 dollars). (*Floods of November-December 1950 in Western Nevada*, USGS Publications Library, Water Supply Paper 1137-H. (https://pubs.er.usgs.gov/publication/wsp1137H)

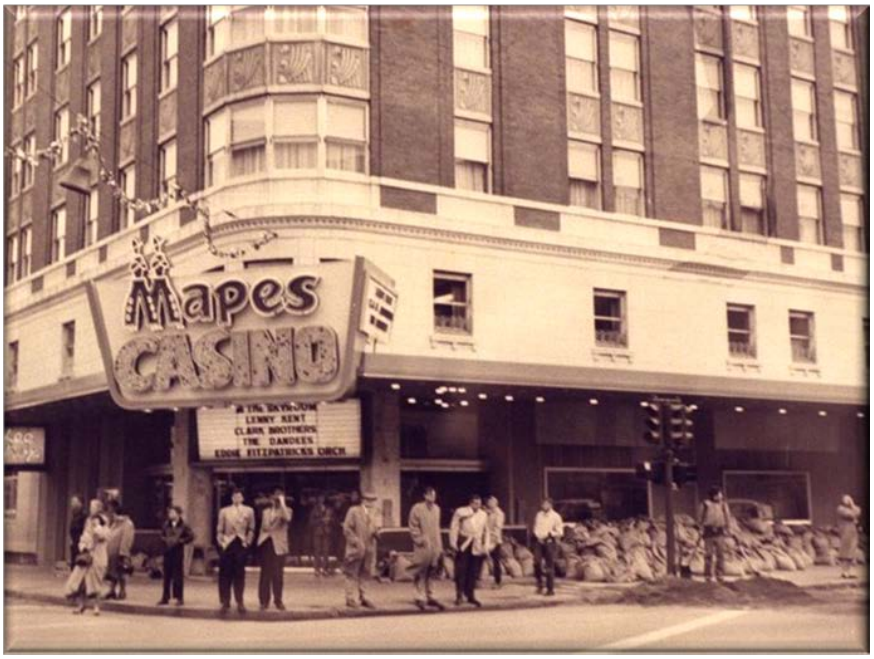


Figure 4: Mapes Casino Prior to 1955 Flooding

Called the "Storm of the Century", wet snow and heavy rain fell in the Sierras and northwest Nevada for 10 days during the Christmas season of 1955. It was reported that two inches of rain fell on Reno in the two days before Christmas. Power lines came down, bridges were destroyed, and four feet of high water poured into downtown Reno.



Figure 5: Mapes Casino in Aftermath of 1955 Flooding

In January 1962, snow storms blanketed northeastern Nevada. Because of the extremely cold temperatures that froze the ground, February rains could not penetrate the soil and the resultant flooding overwhelmed Winnemucca, Battle Mountain, Elko, and other localities in the Humboldt River Basin.



Figure 6: Flooding in Downtown Reno, 1997

Battle Mountain was flooded to a depth of three feet, and angry residents, who blamed the Southern Pacific Railroad Company's raised track bed for keeping the river water from receding, dynamited a section of the tracks to release the water. Flashfloods in the area caused severe flooding in September 1974 and July 1975, creating walls of water, some 30 to 40 feet high. (*Floods in the Driest State*, Mark McLaughlin, 2012.NevadaFloods.org. http://www.nevadafloods.org/flood_dry_state.htm)

Reno

Downtown Reno[1] Flooding History

Date	Peak Flow	Return Freq.	
Early 1862 - Ark Storm		2x 100yr	
March 18, 1907	18,500 cfs	90 yr	
January 16, 1909	10,100 cfs	30 yr	
March 26, 1928	18,800 cfs	90 yr	
December 11, 1937	17,000 cfs	80 yr	
November 21, 1950	19,900 cfs	95 yr	
December 4, 1950	11,700 cfs	35 yr	Flood Control Act of 1954
December 23, 1955	20,800 cfs	100 yr	
February 2, 1963	18,400 cfs	90 yr	
December 23, 1964	11,300 cfs	35 yr	
February 17, 1986	14,400 cfs	50 yr	WRDA 1988
January 1, 1997	23,200 cfs	117 yr	
December 31, 2005	16,400 cfs	70 yr	WRRDA 2014

[1] At the Reno Gage located just west of the Hwy 395 bridge

Figure 7: History of Flooding in Downtown Reno

The 1997 New Year's flood caused $650 million damage ($987 million in 2017 dollars), while the relatively mild storms of 2006 caused $18 million damage along the Truckee River ($27 million in 2017 dollars). After December 1996 snow storms built a snowpack that was 180 percent of normal, a subtropical storm system brought unseasonably warm rain from December 30 to January 2. Over 16 inches of rain were recorded during this period. The rain depleted the snowpack (20 percent of the high altitude snowpack and 80 percent of the snowpack below 7,000 feet) and dumped it into the Truckee River. (*Floods of January 1997 in the Carson River Basin, California and Nevada*, USGS Publications Library, Fact Sheet 183-97. https://pubs.er.usgs.gov/publication/fs18397)

Figure 8 shows the extent of flooding in the area north and south of the Truckee River on the east side of Reno. The industrial park shown in *Figure 11* can been seen in the map below, running east to west along the north side of the river. The red boundary lines indicate the location of the Truckee River Management Project discussed in *Section 3*.

For more information on the history of Nevada flooding, visit NevadaFloods.org.

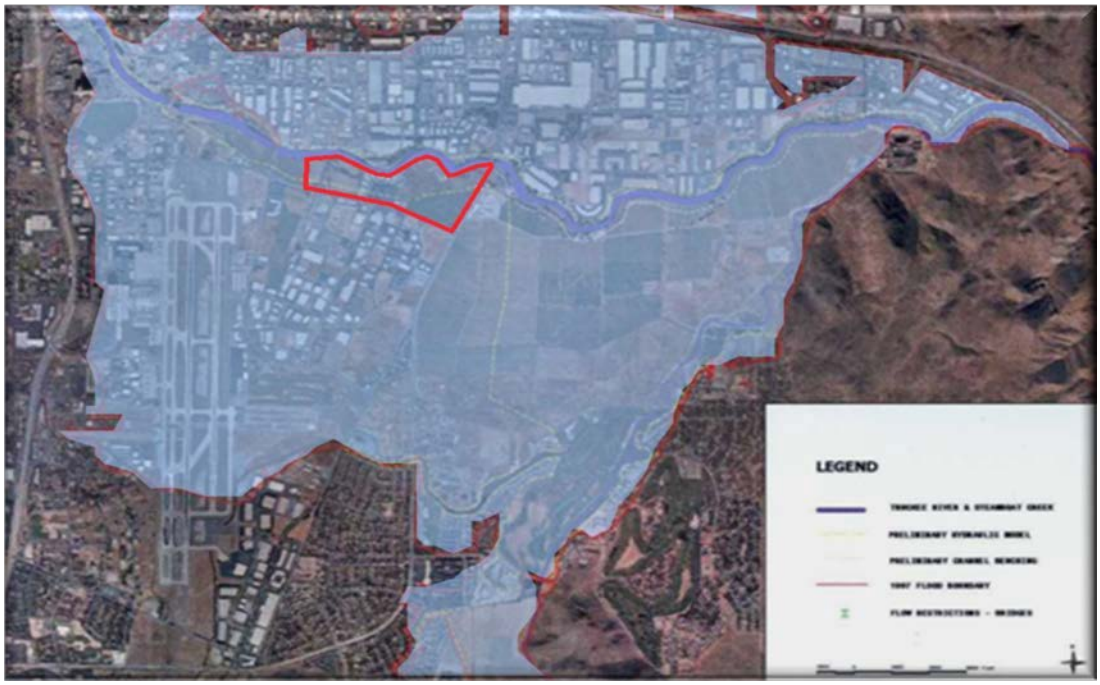


Figure 8: 1997 Flood Boundaries Surrounding N. Edison Way Project Site

Carson City

Although the flood of 1997 represented a large-scale disaster, it was not an unprecedented event in Carson City history. Records dating back to 1851 indicate that nine major flood events occurred in the 49 years to 1900. Both the Carson River and west side tributaries caused significant flooding to the city. During the next 100 years, 19 flood events were recorded. A major flood event occurred over New Year's Eve in 2005, a 25-year event, causing over $2 million in damage to private and public facilities.

Since the city was founded in 1851, 31 major flood events have occurred, one about every 5 to 7 years. Two of these, in 1955 and 1997, have been categorized as 100-year floods; all other events fell between the 10– and 50–year flood events.

(*Carson City Storm Water Management Program: Past and Recent Flood Information*. Carson City Public Works Department.
http://www.carsonsw.org/floodplain-management/past-flood-info/)



Figure 9: Carson City Flooding, 1997

1.3 Recent Northern Nevada Flooding Events

In January and February 2017, a series of severe, record-breaking rainstorms hit the snowpacked mountains and saturated foothills and basins of northwest Nevada, concentrating in the Reno/Sparks and Carson City area. After Governor Brian Sandoval issued a State of Emergency declaration, the President signed two separate disaster declarations, FEMA-4303-DR-NV and FEMA-4307-DR-NV. A total of nine counties, as well as six tribal land areas, were included in one or both declarations.

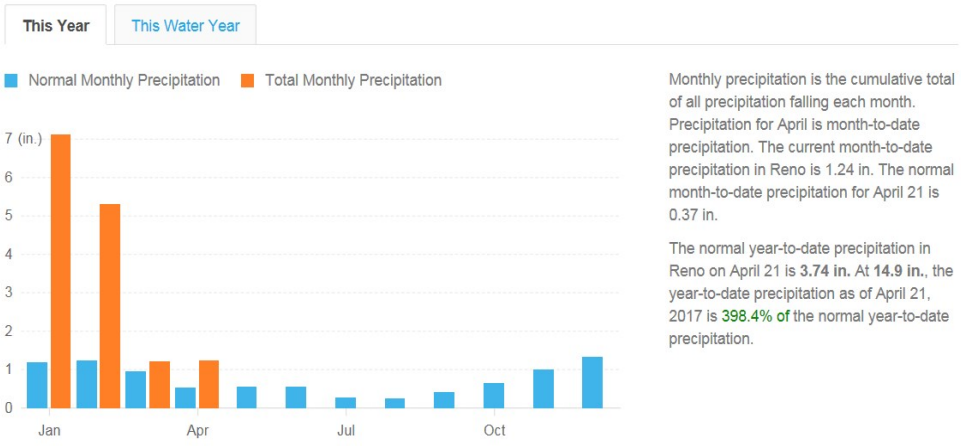


Figure 10: Average Monthly Rainfall in Reno, Nevada Compared with 2017 Totals, Year-to-Date

The contrast between normal precipitation, and the 2017 events is staggering. As shown in *Figure 10* above, normal January/February precipitation for Reno averages just over one inch per month. Precipitation for January 2017 was over *seven inches*, with February precipitation recorded at about *5.25 inches*. Normal year-to-date precipitation for April 21 in Reno is 3.74 inches. Year-to-date for April 21, 2017 was 14.9 inches, nearly four times the norm.

Fortunately, the Truckee River, which flows through downtown Reno, did not flood the downtown district as badly as expected. It did, however, overflow into east Sparks, causing significant damage to the industrial area, and the Lockwood suburb east of Reno. Drainage ditches, sloughs, and floodplains were overwhelmed, challenging homeowners and businesses, and resulting in an order for Storey County residents to boil their water before drinking. (*After rain, northern Nevada assesses flooding damage*. USA Today, January 10, 2017. https://www.usatoday.com/story/news/nationnow/2017/01/10/northern-nevada-flood-damage/96384374/)



Figure 11: Reno/Sparks Industrial Area Flooding

2. Hazards and Performance Analysis

Hazards and Performance Analysis (HPA) is a technical group within the FEMA Hazard Mitigation Branch that provides engineering, architectural, economic, and scientific assistance to Federal, State, Tribal, and Local partners in support of disaster response and recovery.

This Loss Avoidance Study (LAS) was developed by drawing on the expertise of civil engineers and HPA Specialists. The study took approximately two and a half months from initiation to completion. This LAS is significant in that it was completed entirely by FEMA employees (with significant contributions from State and Local officials) without the added time, expense, and logistics of using outside contractors, saving taxpayers hundreds of thousands of dollars and making the information available within months of the disaster, rather than years.

Because of the nature of the projects being studied, and the data available, this report may rightly be considered a hybrid between a typical 404 LAS (focusing on residential mitigation projects) and a 406 Case Study (focusing on specific public facilities projects).

2.1 Purpose of a Loss Avoidance Study

A LAS provides validation for existing and future mitigation projects and measures. The ability to assess the economic performance of mitigation projects over a period of time is important because it demonstrates the value of investing in mitigation projects rather than making repeated and costly repairs.

2.2 LAS Methodology

Losses avoided by mitigation measures are typically determined by comparing the cost of the mitigation project with the estimated cost of damage that *would have been caused* by a given event had the project not been in place.

Losses avoided by the mitigation of a property are calculated by comparing damage from inundation that would likely have been caused were the mitigation project not in place (Mitigation Project Absent [MP_A]) with damage that actually occurred with the project in place, if any (Mitigation Project Complete [MP_C]).

MP_A = Damage and expenses that would have occurred had the property not been elevated or acquired. A dollar value is placed on this Mitigation Project Absent (MP_A) scenario.

MP_C = This number may include any damage that actually occurred during the event (for elevations only), plus the cost of mitigation. If there was no damage to the structure, or in the case of acquisitions, this number simply represents the costs of mitigation. A dollar value is then placed on this Mitigation Project Complete (MP_C) scenario.

LA = Losses Avoided in Dollars

The difference between the two scenarios is calculated to determine losses avoided in dollars as shown in the following equation:

$$\$ [MP_A] - \$ [MPc] = \$LA$$

In this study, the LAS team visited two sites (one retail/commercial and one public works) where mitigation measures were applied as a result of flooding from prior events. In the first case, the Truckee River Flood Project, the study calculated the extent of damage the properties would have suffered had they not been acquired and demolished. The LAS team used a depth damage calculation that determined the dollar value of losses avoided based on depth of inundation at the building sites, had they not been mitigated. This dollar value was then compared with the actual cost to mitigate the area to determine cost-effectiveness of the measure.

The second project evaluated in this study involved the substantial expansion of the Carson City Retention Basin and restoration of the watershed's natural erosion protection. In this case, an entire subdivision, as well as the Carson Tahoe Health Center, lay in the path of the floodway. Because the area was sparsely populated when the last major flood occurred (1997), no properties in the area had been elevated or acquired as a result of past flooding. In spite of this, estimates of potential damage can be calculated based on average property values, home sizes, etc., to arrive at a realistic, conservative losses avoided total.

2.3 Data Collection

Effective and meaningful LAS reports are developed using data collected in the field in combination with measurements, structural information, and historical data obtained from any one of several Local, State, Tribal, and/or Federal websites and agencies.

Collecting usable data from the project sites is critical for the development of meaningful reports. Due to the perishable nature of the data being collected, most notably, evidence of a high-water mark (HWM), time is of the essence with site inspections.

Site visits were conducted in late April. Normally, this would not present an ideal scenario for conducting an effective LAS, since evidence of a HWM may not be easily obtained. Fortunately, in the case of the Truckee River project, photographs taken in the immediate aftermath of the storms provide ample evidence of the extent of flooding. The Carson City project assessment depends more on calculations of water storage capacity compared with a "no mitigation" scenario to evaluate the project's effectiveness.

Photographs were taken and data records were collected for each of the properties. Project records provided by State and Local agency representatives included data such as project start date, pre-mitigation First Floor Elevation (FFE), cost of mitigation, depth of flooding, and project completion date.

Completion Date

The completion date of the mitigation project is required for the calculations to be expressed in current dollar values.

Structure Type

Different numeric formulas are used to calculate losses, depending on structure type.
Replacement values vary according to whether the building was residential or commercial, and the type of foundation used in construction.

Square Footage

Square footage information is used to calculate the cost of reconstruction and content replacement. Square footage data is typically available from any one of several sources, including the State Mitigation Office, the local Tax Assessors Office, or in the case of the Truckee River project, from FEMA Public Assistance project worksheets created for a prior disaster declaration.

2.4 Calculating Losses Avoided

Losses Avoided Compared with Total Mitigation Costs

Loss avoidance studies compare the total losses avoided with the actual cost to elevate or acquire properties included in the study (or, with public works projects, the cost to complete the installation or upgrade of the project). As these numbers are calculated, the difference between the cost of mitigation and total losses avoided will be either positive or negative for any single event. The total cost of mitigation for each project is derived from grant program data records and represents actual and/or projected costs.

An acquisition typically requires a contractor to completely disconnect all utilities and demolish all standing structures, including the slab, where one exists. The property can then be repurposed to provide public land use while limiting the potential for future loss of life or property.

While the Truckee River project provided concrete examples of losses avoided, the Vicee Canyon project forced reliance on hypothetical losses, given that the successful execution of the project eliminated the possibility of locating any “tested” properties. Therefore, this report has been constructed as a hybrid between a traditional Loss Avoidance Study and a Best Practices document.

Loss Avoidance Ratio

The Loss Avoidance Ratio (LAR) is calculated by comparing the Losses Avoided (LA) to the Cost of Mitigation (CM), in today’s dollars. A LAR of greater than 1 indicates that project benefits have exceeded project costs and the mitigation activity is determined to be cost effective and performing successfully. A ratio below one indicates that mitigation benefits have not yet exceeded project costs.

The LAR is calculated as follows: LA ÷ CM = LAR

Where LA = Losses Avoided in Dollars

And CM = Cost of Mitigation in 2017 Dollars

For example:

$26,864,993.95 (LA) ÷ $24,263,106.00 (CM) = 1.11 LAR

This ratio, being greater-than-one, indicates that, overall, the mitigation benefits have exceeded project costs for the event being studied.

Note: It is important to remember that while the cost of mitigation is a one-time expense, losses avoided, and therefore, the loss avoidance ratio, will increase if a mitigated property is subjected to multiple events over time.

2.5 Project Effectiveness Analysis

Once all data is collected, it is entered into a customized spreadsheet. Formulas in the spreadsheet automate the calculation of critical numbers. The data is then reviewed and crosschecked for accuracy.

Data sets necessary for completion of this study included:

- Field measurements collected by HPA team
- U.S. Geological Survey data
- U.S. Army Corps of Engineers data
- Other primary sources as listed in *Appendix A*

To complete project analysis for a LAS, the following calculations must be performed or estimated.

- Structural damage repair costs (known and estimated)
- Content loss estimates
- Displacement costs (loss of use, one-time and recurring personal or business property costs, transfer of services, moving, and associated fees, such as inspection and licensing)
- Total Losses Avoided
- Loss Avoidance Ratio

3. Truckee River Flood Project

The Truckee River Flood Project, managed and executed by the Truckee River Floodplain Management Authority (TRFMA), is a long-term mitigation and restoration project that extends along the Truckee River from the west side of Reno to the eastern city limits, with a possible extension to Pyramid Lake, east of the metro area. Funding for the TRFMA, and the projects it has developed, comes from a .125 cent citizen-approved tax levy that was initiated in the aftermath of the 1997 flooding.



Figure 12: Truckee River Floodplain Management Project Boundaries

This study focuses on one phase of the overall Truckee River Management Plan, located on N. Edison Way and along Mill Street in east Reno. The scope of this phase includes the acquisition and demolition of eight retail/light industrial buildings, one building that housed a call center, one used as a cooperative education classroom building, and one building originally built as a Monastery (all located adjacent to the Truckee River), as well as acquisition of surrounding farmlands, all of which have been subject to repeated flood loss over the years. Six of the eleven buildings have been acquired and demolished. Three are scheduled for demolition, and two are still occupied. Once all the buildings have been demolished, and foundations and utilities removed, the land will be converted to a public park.

It is important to note that this study provides a snapshot of the Truckee River project as it stands at the time of writing. Because it is an on-going project, not all the costs or potential benefits accrued can be considered in this study.

Project Highlights

Several aspects of this project are worth highlighting. According to the TRFMA Project Manager, much of the land within the project boundaries was under consideration for sale to developers whose intent was to build apartment buildings, condos, and other for-profit business ventures. This would have caused a number of problems:

- Land prices would have increased substantially, making any future acquisition much less cost effective.
- Construction in the floodway would have created a high-density building and population area that would have increased future emergency response and mitigation costs.
- According to TRFMA estimates, the current floodplain map understates the base flood level (BFE) by as much as 6 to 12 inches, which could result in contractors building from a base level lower than actual flood levels for that area.

It cannot be overstressed that the vast majority of this project was funded by the citizens of Reno through the .125 percent sales tax, making this project a prime example of the positive benefits of cooperation between Federal and Local authorities.

The following sections provide background information on the project and details of the costs and losses avoided for the Truckee River project.

RESTORING PUBLIC LANDS

It is especially worth noting that this project creates what will be the only undeveloped open space along the Truckee River in Reno.

The project boundaries encompass a combination of grazing pasture, farmland, agricultural classrooms, fields used for agriculture student experiments and training, a commercial call center, and light industrial and retail business. (*Figure 12*)

When this project is completed, all the developed portions will be reclaimed and, along with the pasture land, converted to an open space public park spanning 147 acres

3.1 Background

The project boundaries include approximately 147 acres of land, bordered on the east by South McCarren Boulevard, on the south by Mill Street, on the west by South Rock Boulevard, and on the north by the Truckee River (*Figure 12*). The subject properties were first acquired in 2010 with funding provided through the .125 cent tax levy.

Demolition of the first six structures was completed in March 2012. Demolition of the largest structure, formerly used as a call center, is slated to begin in late summer 2017. These seven structures will be the focus of loss avoidance calculations for this study. The building used as a cooperative education classroom will be demolished sometime in the near future, but no date has been set. Two other structures are currently occupied and remain in negotiation for acquisition. The last structure, built as a Monastery, was most recently used as a meth treatment center.

Vandalism, including removal of key plumbing components, has resulted in extensive damage to the building, and, according to the TRFMA Project Manager it is no longer usable for any purpose. TRFMA plans to demolish this building at an unspecified future date.

While this project does not meet the traditional criteria for a LAS, (that the mitigation project be completed before the study is conducted), the status of this project provides the perfect opportunity to compare the results of mitigation efforts, given the recent damages that occurred in the two buildings that have not been acquired.



Figure 13: N. Edison Way Flooding 2017

All structures are located in the Truckee River floodplain, and five of the structures were previously designated as repetitive loss structures. According to FEMA National Flood Insurance Program (NFIP) claims reports, all structures experienced significant damage during the 1997, 2005, and 2017 events (*Table 1*), including loss of life in 1997 during maintenance activities required in response to an embankment failure. *Figure 13* shows the N. Edison Way location in the aftermath of the 2017 flooding once waters had begun to recede.

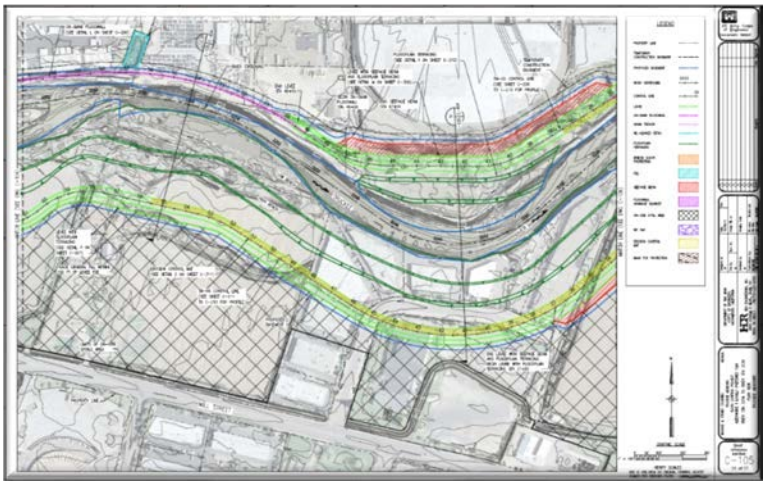


Figure 14: Truckee River Restoration Design Showing Graded Terraces

After 500 community meetings and 20,000 volunteer hours, the Truckee River Flood Management Project successfully developed a "Living River Plan" with the support of the community.

3.2 Mitigation Measures

Each year, the number of FEMA funded property acquisitions has increased. Besides being a permanent solution to hazard-related problems, property acquisition achieves many other objectives, such as protecting critical habitat, providing opportunities for recreation, increasing the capacity of a given area to withstand inundation, and/or enhancing other natural or cultural resources. New guidance for acquisitions is detailed in the Code of Federal Regulations, *44 CFR – Part 80*, which was amended in 1997.

Project Scope

The long-term Truckee River Flood Project includes:

- Acquisition of all structures within project boundaries
- Environmental impacts assessment
- Asbestos abatement activities
- Building demolition
- Removal of utilities not required for use as a park
- Expansion of the Truckee waterway to include terraced benches
- Construction of floodwalls and levees on the north side of the river
- Reclamation of the land by removal of all concrete foundations*
- Landscaping and installation of park facilities

According to FEMA guidelines, an acquired property must be deed-restricted in perpetuity to open space uses to restore and/or conserve its natural floodplain functions

* The TRMA has elected to leave the concrete foundations from the demolished buildings in place for the time being, because it is the most cost-effective and efficient means of dust and weed control.

3.3 Data Collection

For the Truckee River project, the first phase of the Loss Avoidance Study required collecting the following data:

- Cost of local commercial construction, per square foot
- Square Footage (SF) of the structure(s)
- Structure type (single or multi-story, slab on grade, or pier and beam foundation)
- Cost in dollars of the mitigation measure
- Date of mitigation project completion
- High-Water Mark at each site

3.4 Project Funding

As noted in the introductory paragraph of *Section 3*, the vast majority of funds for the Truckee River Flood Project have come from a .125 cent citizen-approved tax levy, and those funds represent only a portion of the larger Truckee River Flood Management Plan. The TRFMA has so far been approved for $828,794 in FEMA PDM grant funding to help cover demolition and relocation costs incurred for six of the N. Edison Way structures and the call center on Mill Street. Of this amount, $267,300 was de-obligated due to a combination of cost-savings realized by the TRFMA and their decision to delay removal of the concrete pads left from the six demolished structures, as noted in *Section 3.2*. At this writing, FEMA has distributed $311,490 that was used to help pay for the demolition of six of the properties on N. Edison Way. The additional $250,000 is scheduled to be distributed once the call center building has been demolished, but, according to the Project Manager, cost-savings are likely to result in a deobligation of a portion of those funds. All property acquisition funds came from the tax levy, and are therefore not included in the Loss Avoidance Ratio calculations, since no FEMA funds were involved.

Thus far, FEMA PDM Grant funds have been used solely for the demolition of the six light industrial structures. FEMA grant funds have been approved, but as of this writing, have not been distributed for the demolition of the larger call center building, scheduled for demolition in late summer/early autumn 2017. The TRFMA will cover all costs involved with demolition of the former classroom building, and are in process of completing a grant application for demolition of the Monastery.

Grant Funding to Date

Total FEMA Approved Costs	**$828,794**
FEMA Grant Amount	**$561,494**

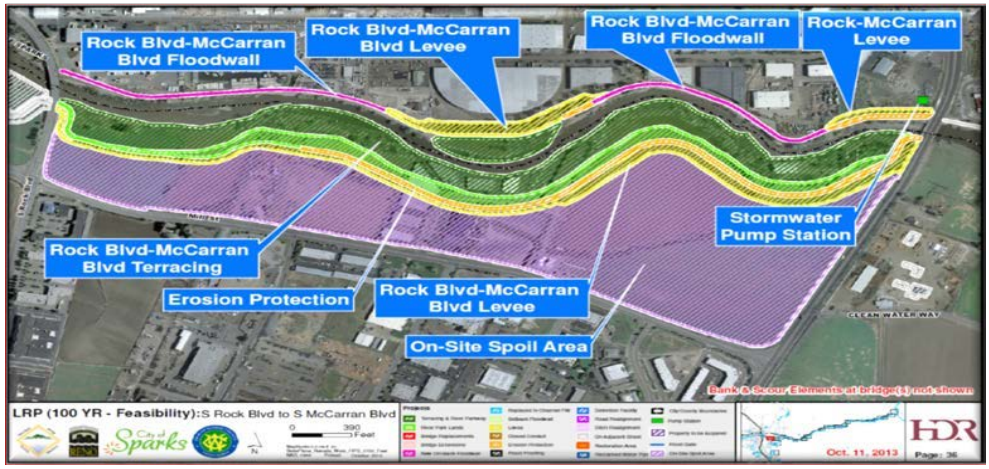


Figure 15: Edison Way Park Boundaries and Mitigation Plans

(*Edison Way BCA Report*. October 6, 2009. Truckee River Flood Management Authority, p. 1, and *Truckee River Flood Management Project Subgrant Application*, 2010, p.32)

3.5 Project Costs

For the purposes of this study, project costs include only the amount spent and/or estimated for the six N. Edison Way addresses and the call center located on Mill Street. Acquisition costs are not considered in this summary, since those costs were wrapped into the larger floodplain management plan, and no FEMA funds were used.

Asbestos abatement and building demolition for N. Edison Way properties	**$834,597**
Asbestos abatement and building demolition for Mill Street call center	**$332,750**
Total	**$1,167,347**

(*Edison Way BCA Report*. P. 1, October 6, 2009. Truckee River Flood Management Authority, and *TRFMA – Mill Street Demolition*, p. 14, Subgrant Project Application, Mill St Grant Application.pdf.)

Truckee River Damage History – Edison Way Industrial Park		
Date	Description	Amount of Damage
Jan. 1997	Building damages	$416,885
Dec. 2005	Building damages	$796,503
Mar. 2017	Content and Building Damages	$475,290
	Total	$1,688,678.00

Table 1: History of Truckee River Damages to Edison Way Industrial Park

(*North Edison Way NFIP Loss Claims Reports*, FEMA NFIP Database, July 2017.)

3.6 Project Effectiveness Analysis

3.6.1 Losses Avoided Estimation

Information on loss estimation comes from two sources, historical and projected.

Historical

Based on FEMA damage claims, losses were recorded for this site during the 1997, 2005, and 2017 floods totaling over $1.6 million.

Projected

As noted above, only the six demolished buildings and the call center will be considered in the losses avoided calculation, given that two of the buildings are still occupied, and demolition of the

two remaining abandoned buildings has not been scheduled. Note that the final figure represents building construction costs only.

The different building types and uses of the seven structures dictate that losses avoided be calculated using average building construction costs (derived from RS Means data) applied to the total square footage of the six buildings that have already been demolished, combined with the estimated cost of construction for the call center building on Mill Street.

The TRFMA conducted a loss analysis that was submitted as part of their grant application for the N. Edison Way properties. Their estimate for annualized losses came to $27,261 per structure, with a "lifetime" estimate of $388,993 per structure (2010 dollars). According to NFIP Claims reports, the two buildings on N. Edison Way that are still occupied had a combined claims total of $475,290 in 2017 alone. Their "lifetime" claims loss would likely be much higher.
(FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf and FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf)

The Mill Street grant application estimates $590,964 in losses avoided for the former call center. (*TRFMA – Mill Street Demolition*, p. 13, Subgrant Project Application, Mill St Grant Application.pdf.)

3.6.2 Losses Avoided Calculation

Project costs represent the total estimated costs for the demolition and relocation of the six businesses located on N. Edison Way combined with the estimated costs for asbestos abatement and demolition of the call center building on Mill Street. (*Edison Way BCA Report*. P. 1, October 6, 2009. Truckee River Flood Management Authority.)

Estimated losses were computed using the total square footage of the seven buildings, multiplied by the average cost of construction of similar commercial facilities found in the RS Means reference guide. Damage depth percentage was based on a flood depth of 1 foot, the minimum recorded during the 2017 flood event at this site. (*RS Means 2017 Building Construction Costs Book*, 36th Annual Edition, published by RSMeans.)

Project Cost	**$1,167,347**
Estimated Losses	**$5,031,554**
Losses Avoided	**$3,864,207**
Loss Avoidance Ratio	**3.31**

4. Carson City Retention Basin Expansion Project

The Carson City Retention Basin Project was initiated in October 2004 with a request for FEMA resources by the Public Works Department of Carson City, Nevada. Major goals of the project included restoration of the natural erosion protections offered by vegetation in the watershed and expansion of the capacity of a small basin at the foot of Vicee Canyon so that it would better protect the city water supply, the Silver Oaks neighborhood, and the Carson Tahoe Health Center, just east and southeast of the basin.



Figure 16: Waterfall Wildfire in Vicee Canyon, July 2004

The project was initiated in the aftermath of the Waterfall Wildfire in July 2004, which burned for a full week, consuming over 8,700 acres. The fire destroyed vegetation—Bitterbrush, Mountain Sagebrush, Mountain Shrub, and Jeffrey Pine—growing in the canyon, leaving behind a thick layer of ash. With groundcover gone, the potential increase in runoff was estimated to go from a pre-burn rate of 38 cubic feet per second (CFS) to a bulked flow (water and debris) of 617 CFS. (*Funding for Emergency Protective Measures – Waterfall Wildfire,* FEMA-1540-DR-NV, October 2004, p. 12). Several threats to the community and environment were identified in the initial assessment (See *Section 4.3 Risk Assessment*).

Background, needs assessment, mitigation efforts, funding and execution of the project are explained in the following sections.

4.1 Background

Carson City is located in Eagle Valley, on the eastern slope of the Sierra-Nevada Mountains. As noted in the introduction to this LAS, the combination of snowmelt and intense spring rain often results in conditions that overwhelm waterways all along the foothills. These conditions can be exacerbated by other events that alter the capacity to retain and/or channel the runoff.



Figure 17: Vicee Canyon in Summer

Two recent events demonstrated the critical value of the natural landscaping of the canyon, as well as the need to expand the existing "borrow pit" (where, over the years, dirt and rock was extracted for use in various construction projects) to create a high-capacity retention basin that would protect homes and businesses downstream of the canyon.



Figure 18: Typical Vicee Canyon Vegetation - Pre-Fire

First, in 1997, a 100-year storm event caused wide-spread flooding that resulted in tens of millions of dollars in damage throughout NW Nevada. Floodwaters rushing down Vicee Canyon overwhelmed the borrow pit, and rushed along the boundary between the Vicee Canyon and Ash Canyon watersheds, heading straight toward the city hospital at depths reported up to 2 feet. Only sandbagging saved the hospital from being flooded. It was immediately apparent that a 15 acre-foot basin was inadequate.

The 1997 flood was followed by the Waterfall Wildfire in 2004, which created an increased threat for flooding, erosion, and debris flow when it stripped the canyon of groundcover and left a deposit of ash across the entire area. A Presidential disaster declaration followed the Waterfall Wildfire, enabling local authorities to take steps to restore the natural protections provided by canyon vegetation, as well as expand the retention basin.

The Vicee Canyon has served multiple purposes for several decades. In addition to being a popular site for hiking and bicycling, Vicee Canyon is an important part of the canyon system that feeds the municipal water supply for Carson City. Since the early 1990's a series of infiltration ponds have served to slow the runoff from the top of Vicee Canyon so that, through natural gravitation forces, the water can make its way into the water table and contribute to the city water supply rather than enter the city's drainage system and be lost downstream. The borrow pit near the bottom of the watershed provided a basin where debris and excessive runoff could collect, protecting areas of the city immediately to the east and southeast of the canyon.

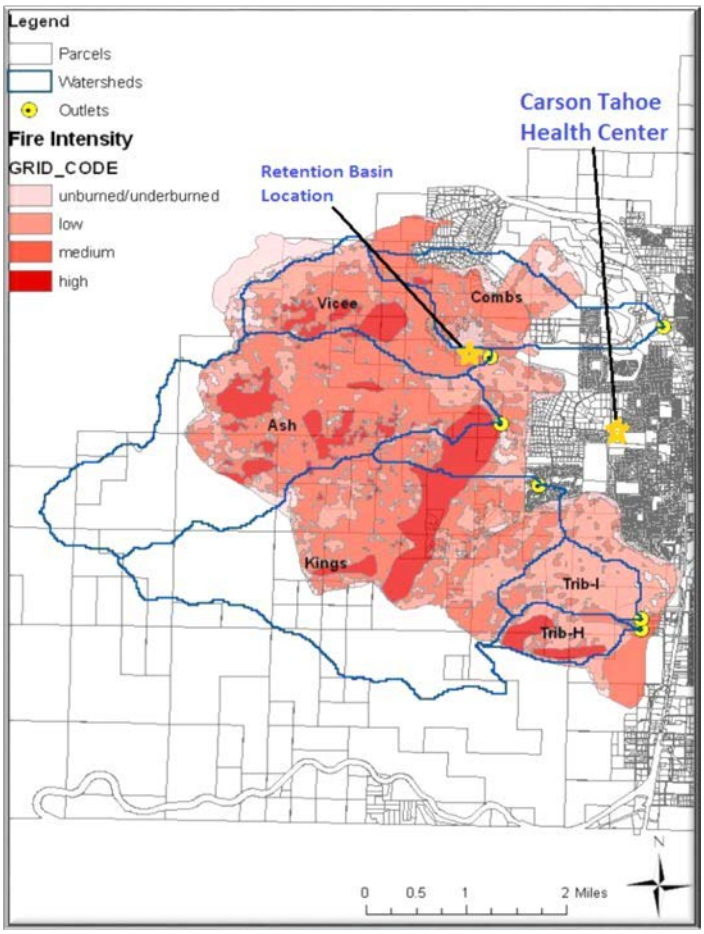


Figure 19: Waterfall Wildfire Map

Vicee Canyon is one of several that run from the upper slopes of the foothills down to the western edge of Carson City. As shown in *Figure 19*, the entire Vicee Watershed was included in the fire. The bottom of the drainage shares a boundary with the Silver Oaks subdivision containing over 500 homes. Just to the south of Silver Oaks there are approximately 100 homes at risk, as well as the site of the Carson City Hospital (now the Carson Tahoe Health Center). The safety of residents, patients, staff, and the protection of property were among the several concerns raised as a result of the compromised watershed.

Risk from flooding below Vicee Canyon did not become a major concern until the 1990s when the large farm located at the base of the watershed was developed as a suburban neighborhood. The historic 1997 floods saw the basin overwhelmed by runoff. Fortunately, the basin's overflow channel (the "natural" result of the removal of earth when the site was a borrow pit) helped divert the floodwaters away from the Silver Oaks neighborhood. Unfortunately, the water was diverted into the flats just south of Silver Oaks, inundating the hospital site, located 1.15 miles southeast of the basin, with 18-24 inches of water. Extensive sandbagging saved the hospital from being flooded, but eye-witnesses reported that water in the parking lot around the hospital reached the bottom of car windows.

Figure 20 shows the drainage basin and neighborhood in November 2004, just a few months after the Waterfall fire. It is apparent from this aerial photograph that the basin had very little depth. In fact its holding capacity was a mere 15 acre-feet.



Figure 20: Vicee Watershed and Adjacent Neighborhood- November 2004

4.2 Historical Flood Data

The following table lists the annual peak water flow recorded from 1979 to 1997 by USGS gauge #10311260 located in the Vicee Canyon. The peak CFS for 1997, which resulted in widespread flooding in the area, clearly demonstrates the critical necessity of implementing mitigation measures at in the Vicee Canyon watershed to protect against such events.

Table 2: Historical Flood Record – Vicee Canyon

Vicee Canyon Hydrology – Historical Flood Record			
Year	Peak CFS	Year	Peak CFS
January 11, 1979	2	May 4, 1993	4
January 14, 1980	10	April 16, 1994	4
February 16, 1982	200	March 28, 1995	16
December 27, 1983	1.7	February 25, 1995	9
May 30, 1984	1.5	January 2, 1997	3,800
April 26, 1992	0.8		

Source: USGS: Nevada Flood Chronology https://nevada.usgs.gov/crfld/Carson/hydrodata_gagingstation10311260.cfm

4.3 Risk Assessment

Studies conducted in 2004 by FEMA on behalf of the Public Works Department of Carson City, along with a report from the Waterfall Wildfire Burn Area Emergency Response (BAER) Team reached several conclusions.

- Threats to life and property: The Silver Oaks development is comprised of 516 homes ranging in value from $323,892 to $971,677 (2004 dollars) that sit in the path of runoff if the drainage basin were to be overwhelmed.

- Geologic instability and landslide potential: Heavy rainfall on an area of highly erodible soil can combine to create unstable conditions with the potential for very large debris flows. Sixty-four percent of the Vicee Watershed was given a HIGH soil erosion hazard rating in the aftermath of the fire.

- Increased discharge: The post-burn 5-year peak discharge was calculated to potentially reach 617 CFS. This volume is the equivalent of the FEMA Flood Insurance Study (FIS) 100-year event.

- Carson City and Virginia City municipal water supplies: In addition to concerns about debris flows and sediment buildup in streams that feed the water treatment plant,

  pipelines that run through Vicee Canyon were considered to be at "immediate risk". The pipelines were deemed vulnerable in several places where they cross streams.

- Invasive weed threat: Of the several noxious weed species identified in the area, Cheatgrass is designated as a high threat potential. It is an aggressive plant with a shallow root system that presents a high erosion potential. (This is mentioned here because, while expansion of the retention basin is the main focus of this report, revegetation of the watershed was a critical part of the overall mitigation project.)

- Infiltration ponds and sediment catchment basins: The lower portion of the Vicee Canyon Watershed includes a series of infiltration ponds (*Figure 22*) designed to capture surface water so it will work its way down to the water table and help feed the municipal water supply. Without effective mitigation measures being implemented, these ponds would be subjected to increased sedimentation with ash, silt, and debris, thereby reducing their functional discharge of water into the ground.

- Additional risks: USGS gauging stations and Carson City storm drain infrastructure, as well as roads and drainage infrastructure within the burn area, would all be subject to damage as a result of debris flows, soil deposits, flooding, and water and wind erosion if mitigation measures were not implemented.

(*DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin*, Vicee Basin DR1540 NV Analysis.pdf, (FEMA) 2005, and *Waterfall Fire*, Casey Shannon, Inyo National Forest Waterfall Fire BAER Team Hydrologist, July, 2004)

4.4 Mitigation Measures

Mitigation measures enacted in the Vicee Watershed fall into three general categories: soil remediation, fire control, and debris flow/runoff retention. These are not three distinct categories, in that steps taken to ameliorate the effects of one factor often affect the other areas. For example, steps taken to reduce the potential for future wildfires has a profound effect on debris flow moderation and runoff retention.

Soil Remediation

Remediation measures included hydro-seeding, placement of straw mulch, erosion control blankets, and fiber rolls, as well as the installation of check dams, gravel bag berms, and sand bag barriers.

Log Erosion Barriers (LEBs) were employed to trap sediment from side slopes, preventing material from entering stream channels and keeping sediment on site. This was done in combination with

contour felling of trees in areas where the wildfire killed standing trees while leaving the burned "snags". The snags were felled and installed perpendicular to the slope in high severity burn areas.

Straw wattles were installed to capture and retain sediment on slopes and reduce soil creep until vegetation could re-establish. Wattles (interwoven branches, twigs, and/or straw—often shaped into log-like rolls) were installed on hillsides behind vulnerable homes, public facilities, and on slope contours where trees were not available for installation of LEBs.

(*Funding for Emergency Protective Measures – Waterfall Wildfire,* p. 9. FEMA-1540-DR-NV, October 2004.)

Wildfire Fuel Reduction

As described above, in high severity burn areas, standing snags were felled to build LEBs. This process also served to clear the area of potential fuel for future wildfires. Wood that was not useable for LEBs was removed from the area.



Figure 21: Vicee Canyon Post-Fire

Debris Flow Moderation and Runoff Retention

Assessments conducted by the USDA Forest Service, Carson City Public Works, and the USGS all concluded that the soil composition in Vicee Canyon leads to a high degree of instability with the potential to produce a large debris flow.

Many of the steps taken to remediate the soil and reduce fuel contributed to the moderation of debris flow in the watershed. To augment these effects, existing water infiltration ponds were cleaned out to increase holding capacity (*Figure 22*). Other run-off management measures included the installation of soil-stabilizing gabions (a rock or soil-filled cage) at various places along Vicee Creek, water pipeline reinforcement, and installation of an early warning system at the top of the watershed.

Perhaps the most significant element of this project was the expansion of a retention basin at the base of the Vicee Watershed. Expansion of the basin was targeted as the best solution to help protect the homes and other structures in the immediate vicinity. The original goal of the project, to be completed in three stages, was to expand the capacity of the retention basin from 15 acrefeet to 200 acre-feet.

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo,* Carson City Nevada, Public Works Department, October 28, 2004, p. 7)

In its final analysis, FEMA concluded that the 68 acre-feet of storage created by Phase I was "sufficient to slow down and partially contain" the runoff and debris flow that might be caused by a post-fire 5-year event (roughly equivalent to a pre-fire 100-year event). (*DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin*, p. 1. [FEMA] 2005.)



Figure 22: Vicee Canyon Infiltration Ponds - 2017

4.5 Retention Basin Project Description

Carson City Public Works elected to go beyond the minimum that FEMA had approved and sought additional funding to expand the basin to a capacity of 68 acre-feet during Phase 1, and to a final capacity of 200 acre-feet in Phase 2. According to Robb Fellows, Senior Project Manager for Carson City Public Works, their thinking was that it made the most sense to achieve the greatest level of protection possible by maximizing the existing basin footprint. The basin now has a capacity of 165 acre-feet to the level of the basin outlet, and 212 acre-feet to the basin rim, and is capable of withstanding runoff from a 500-year flood event.

The initial evaluation for Phase 1 required the removal of 80,000 cubic yards (CY) of rock and soil. Once work began, the basin was surveyed and city engineers calculated the volume using specific topographic information. Taking the 6-percent slope into account, it was estimated that for Phase 1, a total of 150,000 cubic yards of material would need to be removed to achieve a

storage volume of 68 acre-feet within the existing footprint of the basin. (*DR-1540-NV Vicee Basin Analysis - Memo.pdf*, p. 2. Carson City Public Works Department, October 28, 2004.)

The diagram in *Figure 23* details the site grading plan engineered to full capacity (200 acrefeet), with down drain and discharge aprons included. The diagram also displays proposed improvements to the inlet and outlet structures that were part of the final phase of the project.

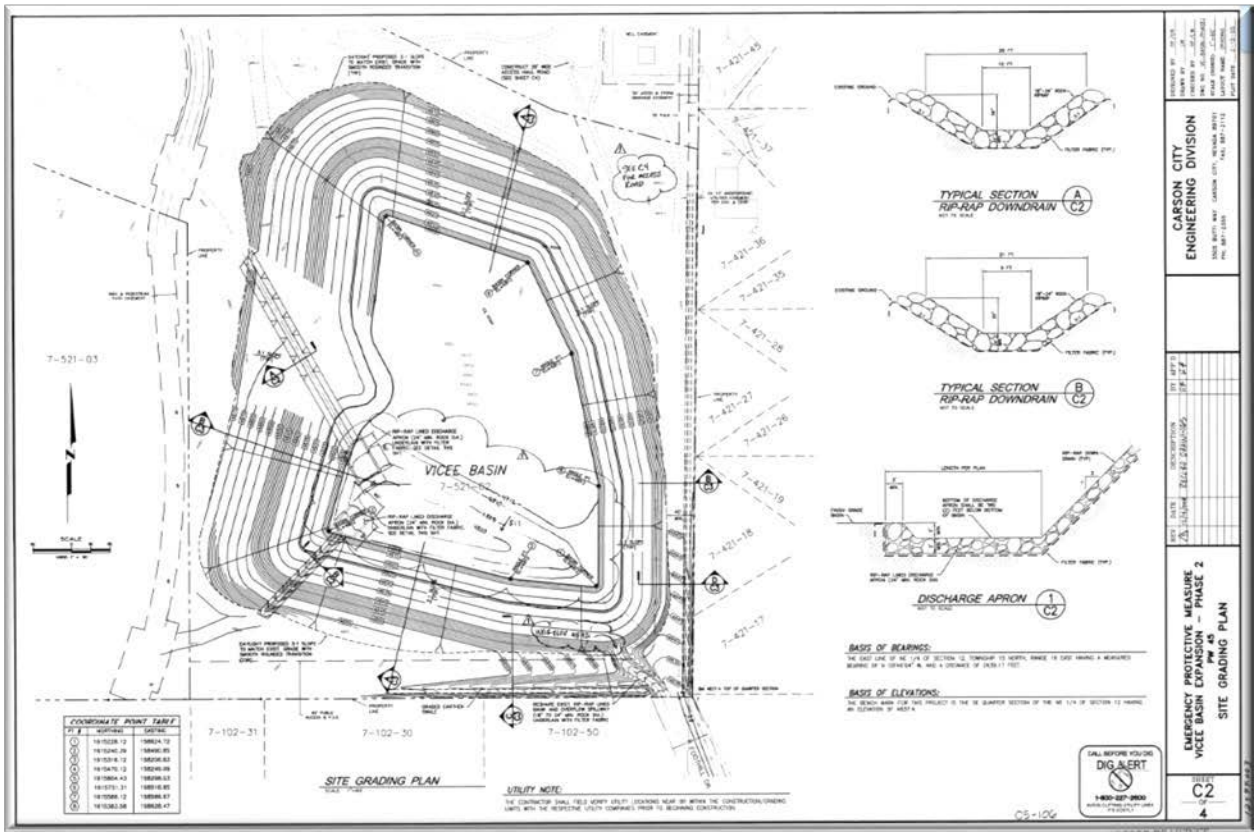


Figure 23: Engineering Diagram for Vicee Canyon Retention Basin

The existing inlet and outlet structures were initially deemed adequate for the project without modification in the first phase, but the topographical study conducted once excavation began dictated the necessity of modifying the outlet to serve as an effective overflow spillway for the retention basin. (*DR-1540-NV Vicee Basin Analysis - Memo.pdf*, p. 10, Carson City Public Works Department, October 28, 2004.)

Accordingly, the rock-lined channel connecting the two sections of the retention basin was removed during the initial phase of the project. The rock was salvaged and stored on the west side of the basin for future use. *Figure 24* shows the basin after the project was complete, filled to about 60 percent capacity. For a sense of scale, note the upper body of a person standing above the near edge of the basin, roughly forty feet above the water line.



Figure 24: Vicee Canyon Retention Basin - 2017

4.5.1 Pre-Project Processes

Once damage and risk assessments were completed, three major steps were required before work could begin on the retention basin.

- Determine potential use and disposal of basin material.

  The existing basin material was found to meet "Select Borrow" specifications, and could therefore be used for road bed material in a local freeway project. An agreement was reached with the construction contractor to use the basin material for this purpose, which then became an "in-kind" payment that covered the majority of the expansion costs for Phase 2.
- Collect bids from haul contractors for movement of the materials.

  The lowest bid to move the 80,000 cubic yards for Phase 1 was $3.30 per cubic yard (CY), plus additional costs for providing a bond, access to the basin, and dust control, for a total cost of $297,143. This part of the project was estimated to take 35 working days. Removal

of the additional 70,000 CY was rebid at $4.15 per CY. Additional costs for this phase of the project, added to the cost of hauling the material came to $321,733.
See *Appendix H* for a breakdown of all project costs.

- Coordinate with State and Federal agencies for necessary permits and sign-offs.

  The Nevada Department of Transportation (NDOT) requested an encroachment permit to approve the haul route from the basin to the freeway project. The Nevada Department of Emergency Planning (NDEP) was contacted concerning any known cultural sites (there is one in the vicinity, but lies well northwest of the project and not at risk of impact). No permits were required by the Carson City Planning Department.

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo*, p. 2, Carson City Nevada, Public Works Department, October 28, 2004)

4.5.2 Project Timeline

July 26, 2004	Waterfall Fire ends.
July 27, 2004	USDA BAER team recommends Vicee watershed major flood threat to Carson City.
October 2004	Reforestation complete.
October 28, 2004	Carson City requests the basin to be expanded as an emergency measure. Expansion broken into phases, first phase to expand to 68 acre-feet.
November 8, 2004	Phase 1 work begins.
January 19, 2005	Phase 1 scope of work amended to account for actual field conditions.
January 2005	Special Use Permit approved to expand basin.
February 2005	Freeway contractor agrees to continue to haul material from basin at no cost to city, basin expanded to final volume of 200 acre-feet.
August 23, 2005	Basin completed.
December 31, 2005	Flood disaster in Carson City.
December 15, 2006	Repairs completed on basin due to flood disaster.

4.5.3 Agencies Involved

Nevada Department of Emergency Management (NDEM)

USDA Natural Resource Conservation Service

USFS National Fire Plan

Burn Area Emergency Response Team (BAER)

FEMA PA Division

Nevada Division of Forestry

Carson City

Nevada Cooperative Extension

Nevada State Parks

Carson Colony of the Washoe Tribe of Nevada and California

Bureau of Land Management (BLM)

Nevada Fire Safety Council

4.5.4 Funding Sources

Emergency Fire Rehabilitation (EFR)

FEMA Public Assistance Program

National Resource Conservation Service (NRCS)

4.6 Project Costs

Estimated project costs are detailed in *Appendix H*. The total cost reported by the Public Works Department for the retention basin project was $2,759,300 ($3,457,715 in 2017 dollars). The cost for reforestation for the entire burn area was $6,438,619 ($8,341,676 in 2017 dollars). No records exist of the exact amount that was spent for Vicee Canyon alone, but a usable estimate can be obtained by calculating the relative size of Vicee Canyon to the entire burn area of 8,700 acres. Vicee Canyon covers 1,230 acres, or 14 percent of the total. The figures below are expressed in 2017 dollars. (USDA Forest Service Waterfall Wildfire BAER Report, pg. 8. FS 2500-8. July 26, 2004.)

Reclamation	**$1,167,835**
Infiltration system improvement and basin expansion	**$3,457,715**
Total Cost Estimate	**$4,625,550.00**

The eligible Federal share, expressed in 2017 dollars was $1,058,884. FEMA's total contribution to the project was $612,848 ($793,987 in 2017 dollars). (FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf, pg. 5, and FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf, pg. 4.)

Phase 2 of the project presents a prime example of cooperation among local entities to manage a project in a way that benefits all participants and the community at large. When the Carson City Public Works Department decided to expand the basin beyond the 68 acre-feet approved by FEMA, they were forced to find additional funding. As it happened, the contractor being used to remove the earth and rock from the basin was also a major player in the construction of the Interstate 580 loop that now skirts the eastern side of Carson City. Tests of the material were conducted to verify its use as roadbed material, and an agreement was reached whereby the contractor would keep the excavated material for use in the highway construction project in lieu of a cash payment. The bulk of the city's expenses for the final phase of the project were used to cover administrative costs only, such as overseeing the excavation and removal of material. By the time the project was completed, a total 600 CY of material was removed, and the in-kind payment of excavated material saved the city an estimated 1.7 million dollars. (*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo*, pp. 8-9, Carson City Nevada, Public Works Department, October 28, 2004.)

4.7 Project Effectiveness Analysis

4.7.1 Loss Estimation Calculation

Even though no event subsequent to the completion of this project has "tested" its effectiveness, it is an easy enough matter to estimate the potential losses that might be incurred in the event of a 100-year flood without the drainage basin in place.

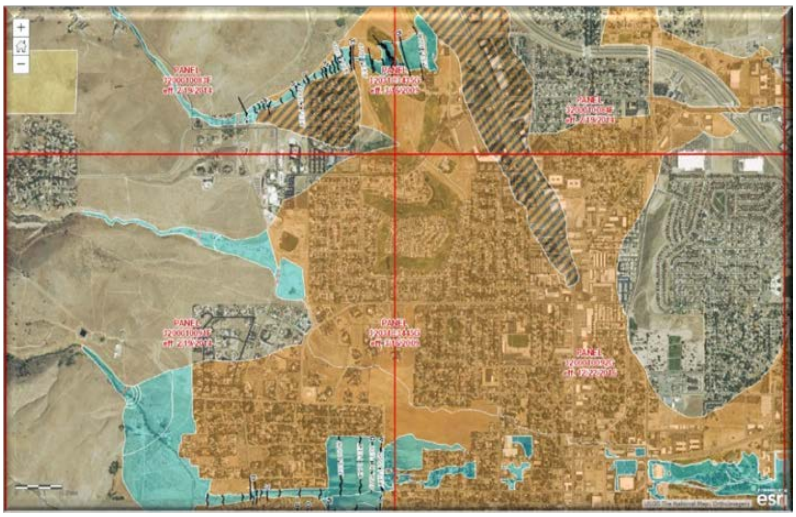


Figure 25. Vicee Canyon 500-Year Event Map

As seen in *Figure 24*, the eastern side of the retention basin is a large embankment that provides a barrier to the Silver Oaks neighborhood. This embankment has been in place since before the subdivision, having been a by-product of the site being used as a borrow pit. According to FEMA Flood Insurance Rate Maps (FIRMS), it would take a 500-year event to overwhelm this embankment and flood the entire neighborhood. The areas shaded in light brown in *Figure 25* indicate the reach of a 500-year event.

At much greater risk are the approximately 100 houses that lie just southeast of the retention basin. As noted in *Section 4.1*, this area was flooded during the 1997 flood to a depth of 2 feet well past the hospital, over a mile southeast of the retention basin. When water overwhelmed the



Figure 26: Vicee and Ash Canyon Watersheds

basin as it existed then, it was diverted to the southeast, where it followed the dividing line between the Vicee Canyon Watershed and the Ash Canyon Watershed (*Figure 19*). It is important to note that although the site of the Carson Tahoe Health Center appears to be under its greatest threat from Ash Canyon Creek, and is located in the 500-year zone, it was the 1997 flood, a 100-year event, which most recently flooded the site with runoff from the Vicee Canyon Watershed. Accordingly, this report calculates the potential losses of the neighborhood southeast of the basin and the Carson Tahoe Health Center.

Losses avoided for this study are calculated using four factors:

- Estimated depth of flooding
- The cost of building repairs, content replacement, and dislocation for a "typical" house located along the watershed boundary
- The cost of building repairs, content replacement, and loss of service for the Carson Tahoe Health Center (based on FEMA Benefit Cost Analysis (BCA) Software estimates)
- The BAER report estimate of the "cost of doing nothing"

Estimated Depth of Flooding

Studies conducted by FEMA, Carson City Public Works, the USGS, and the USFS BAER Team reveal several critical pieces of information that have a bearing on potential flood depth:

- The unique soil composition, along with the high soil erosion rating, sedimentation potential, and estimated vegetative recovery period combine to create a "high risk of debris flows and very high probability of increased ash and silt in the streams and just above the water treatment plant". (*USDA Forest Service Waterfall Wildfire BAER Report*, Pp. 2-4, FS 2500-8, July 26, 2004.)

- The post-burn 5-year peak discharge was calculated to potentially reach 617 CFS. This volume is the equivalent of the FEMA Flood Insurance Study (FIS) 100-year event. (*DR-1540-NV Vicee Basin Analysis - Memo.pdf*. Carson City Public Works Department, October 28, 2004. Pp. 1-2)

- Without the presence of the retention basin, in the event of a 100-year flood, houses in the area just southeast (including the Carson Tahoe Health Center) could be inundated with anywhere from *6 to 24 inches*, depending on the severity of the flood and the specific location of a given structure within the flooded area. (Estimate calculations based on historical data and eye-witness accounts.)

Residential Structure Losses Avoided

The calculations in *Table 3*, below, represent the most conservative picture of an incident that could affect the at-risk area without reforestation measures and the existence of the retention basin in its expanded state. The first four entries in are actual addresses in the neighborhood immediately southeast of the retention basin, randomly selected from different areas in the neighborhood. The fifth entry represents the average size and cost of construction for a new house in Carson City. (Resi-Cost Instant. http://www.home-cost.com/construction-cost-persf.html) These entries are intended as examples only, and do not represent real losses avoided.

To keep estimates conservative, the depth of flooding was limited to just 6 inches, the lower end of the range for a 100-year flood. Costs for displacement, structural repair, and content replacement are based on Depth of Damage Calculation tables used in previous FEMA Loss Avoidance Studies. As this table demonstrates, losses avoided for only 1 house of the average Carson City size (the smallest in this neighborhood), flooded to a depth of only 6 inches, would be $98,230. Minor damage to as few as 10 houses could easily reach losses of nearly $1 million.

Table 3: Estimate of Losses Avoided Southeast of Vicee Canyon

Address	Square Feet	Flood Depth in Feet	2017 Building Replacement Value	Displacement in Days	Displacement Costs	Structural % of Damage	Contents % of Damage	Structural Damage Costs	Contents Damage Costs	Total Losses Avoided
1300 Chaparrel	2,421	0.50	$ 323,445.60	23	$ 5,084.15	18.35	10.70	$ 59,352.27	$ 34,608.68	**$ 99,045.10**
1775 Chaparrel	2,678	0.50	$ 357,780.80	23	$ 5,084.15	18.35	10.70	$ 65,652.78	$ 38,282.55	**$109,019.47**
1884 Brush Dr.	3,333	0.50	$ 445,288.80	23	$ 5,084.15	18.35	10.70	$ 81,710.49	$ 47,645.90	**$134,440.55**
1920 Winne Ln.	3,875	0.50	$ 517,700.00	23	$ 5,084.15	18.35	10.70	$ 94,997.95	$ 55,393.90	**$155,476.00**
Carson City Average	2,400	0.50	$ 320,640.00	23	$ 5,084.15	18.35	10.70	$ 58,837.44	$ 34,308.48	**$ 98,230.07**

Community Facilities Losses Avoided

As previously noted, the Carson City hospital site was threatened with floodwaters during the 1997 event. Only extensive sandbagging prevented what would likely have been substantial losses.

Based on hospital construction costs of $272 per square foot (2017 dollars), structural damage costs for the 137,233 square foot building, with a 6-inch flood depth, would exceed $10.8 million. (EV Studio. Construction Cost per Square Foot for Hospitals. February 2011. http://evstudio.com/construction-cost-per-square-foot-for-hospitals/)

Using these conservative estimates, it is reasonable to conclude that a single 100-year event, in the absence of long-term mitigation measures, could easily exceed $12 million in losses to residential and community facilities with a flood depth of just 6 inches.

Infrastructure Losses Avoided

This study also draws upon the findings of a "Cost of No Action" study conducted by the USDA Forest Service BAER team in the immediate aftermath of the Waterfall Wildfire. Four parameters were used to determine the loss of resources for the entire burn area if no mitigation measures were enacted: loss of site productivity, loss of roads, impact of sediment on road drainage infrastructure, and impact of sediment on municipal water systems. It is important to note that these costs pertain to infrastructure only, and do not take into account the potential for losses in the surrounding areas, as detailed above.

Table 4: Cost of "No-Action"

Cost of No Action	
Loss of site productivity	$668,514
Loss of roads	$237,089
Impact of sediment on road drainage infrastructure	$1,727,425
Impact of sediment on municipal water systems	$2,159,281
Total cost of no-action	**$4,792,309.00**

Analysis by Carson City Public Works determined that Vicee Canyon was the most unstable of all those in the burn area, and would likely contribute one-third of the potential losses in the case of

a 100-year event. Therefore, the numbers in the preceding table represent one-third of the totals calculated in the BAER Report, and are expressed in 2017 dollars.

(*USDA Forest Service Waterfall Wildfire BAER Report*, p. 8. FS 2500-8. July 26, 2004.)

4.7.2 Summary of Vicee Canyon Losses Avoided

Combining potential losses for infrastructure, community facilities, and residential structures, a single 100-year event, in the absence of mitigation measures, could reasonably exceed $16 million.

Losses Avoided Calculation

Based on the assumptions described in the preceding section, the calculated estimate of losses avoided as a result of the canyon vegetation restoration, infiltration pond improvement, and expansion of the retention basin is just shy of $12 million. All figures are expressed in 2017 dollars.

Total Cost of Mitigation (Includes canyon restoration, infiltration improvements, and retention basin expansion)	**$4,625,550**
Estimate of Potential Losses (Total of potential infrastructure losses—the cost of no action, plus estimated residential and community facilities losses)	**$16,623,296.00**
Losses Avoided	**$11,997,746**
Loss Avoidance Ratio	**3.59**

5. Value Added Benefits of Mitigation

This report has demonstrated the extraordinary success of two recent mitigation projects initiated in Northeast Nevada through the cooperative efforts of Federal, State, and Local authorities. Loss avoidance calculations show that these projects were cost effective and beneficial.

It must be remembered that not all of the benefits of mitigation projects can be summarized in a table or calculated in a formula. The life and health of a neighborhood or community and its natural environment have value that goes far beyond the dollars spent or saved through mitigation efforts.

Strengthened Ecosystem Resilience

Public works projects often contribute to the health of a community by returning rivers and their surrounding lands to a more natural, environmentally efficient state. Absent the barriers created by building roadways, or construction of concrete pads that reduce natural absorption functionality, these areas are much better suited to withstanding the effects of storms and other natural events.

Sustained Neighborhood Values

A significant community challenge is the abandonment of homes and/or businesses that are severely damaged due to natural disaster. Abandoned structures with broken windows, surrounded by tall grass and weeds, will immediately present insurance, maintenance, and security issues that devalue a neighborhood. Relocation of vital community service facilities will also have an adverse effect on the quality of life for all residents. Public works projects that protect entire neighborhoods will have a significant impact on property values.

Improved Community Resilience

Hazard Mitigation provides a community with the ability to minimize losses, recover quickly, and be resilient in response to a natural disaster event. This strengthens the economic base and provides the residents with confidence and hope for the future.

Expanded Public Lands Use

Projects like the Truckee River Management Project help create parks and other public use areas that not only prevent future losses, but also improve quality of life for residents and visitors alike. These intangible benefits can make the difference between a good place to live and a great place to live.

Appendix A Resource and Guidance Documents

35 North Edison Way NFIP Loss Claims Report, FEMA NFIP Database, July 2017. *Appendix D*

65 North Edison Way NFIP Loss Claims Report, FEMA NFIP Database, July 2017. *Appendix E*

Carson City Storm Water Management Program: Past and Recent Flood Information. Carson City Public Works Department. http://www.carsonsw.org/floodplain-management/past-flood-info/

DR-1540-NV: Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin.pdf (FEMA) 2005. *Appendix I*

Edison Way BCA Report. October 6, 2009. Truckee River Flood Management Authority. *Appendix C*

EV Studio. Construction Cost per Square Foot for Hospitals. February 2011. http://evstudio.com/construction-cost-per-square-foot-for-hospitals/

FEMA Benefit/Cost Analysis Software. https://www.fema.gov/benefit-cost-analysis

FEMA N. Edison Way Closeout Acknowledgement, PDMC-PJ-09-NV-2010-006. Closeout Acknowledgement.pdf. *Appendix F*

FEMA Map Service Center. https://msc.fema.gov/portal/search

FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 45.pdf *Appendix N*

FEMA *Project Worksheet Report*, Vicee Canyon Project Worksheet 415.pdf *Appendix N*

Floods in the Driest State, Mark McLaughlin, 2012. NevadaFloods.org. http://www.nevadafloods.org/flood_dry_state.htm

Floods of January 1997 in the Carson River Basin, California and Nevada, USGS Publications Library, Fact Sheet 183-97. https://pubs.er.usgs.gov/publication/fs18397

Floods of November-December 1950 in Western Nevada, USGS Publications Library, Water Supply Paper 1137-H. https://pubs.er.usgs.gov/publication/wsp1137H

Funding for Emergency Protective Measures – Waterfall Wildfire. FEMA-1540-DR-NV, October 2004. *Appendix K*

Netstate.com http://www.netstate.com/states/geography/nv_geography.htm

Resi-Cost Instant. http://www.home-cost.com/construction-cost-per-sf.html

RS Means 2017 Building Construction Costs Book, 36th Annual Edition, published by RSMeans.

TRFMA – Mill Street Demolition, Subgrant Project Application, Mill St Grant Application.pdf. *Appendix G*

US Inflation Calculator http://www.usinflationcalculator.com/

After rain, northern Nevada assesses flooding damage. USA Today, January 10, 2017. https://www.usatoday.com/story/news/nation-now/2017/01/10/northern-nevada-flooddamage/96384374/

USDA Forest Service Waterfall Wildfire BAER Report. FS 2500-8. July 26, 2004. *Appendix L*

USGS: Nevada Flood Chronology https://nevada.usgs.gov/crfld/Carson/hydrodata_gagingstation10311260.cfm

Waterfall Fire. USDA BAER Hydrology Report, Casey Shannon, Inyo National Forest Waterfall Wildfire BAER Team Hydrologist. July, 2004. *Appendix M*

Waterfall Fire – Vicee Basin Emergency Protective Measures Memo, Carson City Nevada, Public Works Department, October 28, 2004. *Appendix J*

Appendix B Terminology

Acquisition – Purchase of residential property through the Hazard Mitigation Grants Program (HMGP) or of commercial property through the FEMA Public Assistance (PA) or Pre-Disaster Mitigation (PDM) programs.

BAER Team – Burned Area Emergency Response Teams represent a cooperative effort among several Federal agencies, including the U. S. Forest Service, National Resource Conservation Service, Bureau of Indian Affairs, and U. S. Geological Service, as well as State, Tribal, and Local Forestry and Emergency Management agencies.

Base Flood Elevation (BFE) – The one-percent annual chance flood level.

Building Replacement Cost (BRC) – Calculated by multiplying the BRV by the livable square footage of the subject property.

Building Replacement Value (BRV) – Based on RSMeans data, the current cost to construct a new residence, identified by U.S. region, expressed in dollars per square foot.

Cost of Mitigation – The total cost involved in completing the mitigation project, whether an elevation, acquisition, or public works infrastructure. Value expressed includes Federal funds provided through the specific grant program along with individual contribution (usually a 75/25 split).

Elevation – The process of raising a residential or commercial property, through one of several methods (raised berm, cinderblock piers, concrete pilings, etc.).

FEMA BCA Software – Enterprise software provide by FEMA to grant applicants for the purpose of conducting a benefit/cost analysis.

First Floor Elevation After Mitigation (FFE-AM) – The elevation of the first floor, expressed in NAVD88 terms, of the property after mitigation efforts have been completed.

First Floor Elevation Before Mitigation (BFE BM) – The elevation, expressed in NAVD88 terms of the main floor of the building prior to any mitigation efforts. Data derived from State Mitigation office.

Flood Depth – Level of inundation that would have occurred inside a subject property, measured from the FFE. Calculated by subtracting FFE-BM from HWM.

Gabion – A cage, cylinder, or box filled with rocks, concrete, or sometimes sand and soil for use in civil engineering, road building, military applications and landscaping.

Ground Elevation (GRE) – Height of ground level, measured from sea level. Expressed in standardized NAVD88 terms.

Hazard Mitigation (HM) – The effort to reduce loss of life and property by lessening the impact of disasters.

Hazards and Performance Analysis (HPA) – The group within the FEMA Hazard Mitigation Branch that provides engineering, architectural, economic, and scientific assistance to Federal, State, and Local (including Tribal) partners in support of disaster response and recovery.

High-Water Mark – Somewhat self-explanatory, the high-water mark represents the highest level a body of water reaches during a flood. Typically determined by finding debris residue or stains left on buildings or plants.

Loss Avoidance Ratio (LAR) – Calculated figure derived by dividing the Total Losses Avoided by the Cost of Mitigation. A LAR of 1 indicates that the losses avoided are equal to the cost of mitigation.

Loss Avoidance Study (LAS) – A cost/benefit analysis conducted by the FEMA HM HPA team. The purpose of the study is to test the effectiveness of hazard mitigation efforts and report on the findings.

Losses Avoided – Calculated dollar amount that reflects the dollars saved by implementing mitigation measures. Includes construction, content, and displacement costs.

NAVD88 – North American Vertical Datum of 1988. The standard established in 1991 for measuring the vertical distance from sea level to local ground level.

One percent annual chance flood – A 1 percent annual chance flood (or base flood) has a 1 percent chance to be equaled or exceeded in any given year.

PA Program – FEMA Public Assistance grant program, which provides assistance to State, Tribal, and Local governments, and certain types of private, nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

PDM – The Pre-Disaster Mitigation Program, authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, is designed to assist States, U.S. Territories, Federally recognized Tribes, and Local communities in implementing a sustained pre-disaster natural hazard mitigation program.

RSMeans data – Software and/or reference manuals that provide construction cost-estimating information for all phases of the construction life cycle.

Special Flood Hazard Area (SFHA) – An area identified by FEMA as an area with a special flood or mudflow, and/or flood-related erosion hazard, as shown on a flood hazard boundary map or flood insurance rate map.

Appendix C Edison Way BCA Report Excerpt

06 Oct 2009 Project: **Edison Way Demolitions** Pg 1 of 62

Total Benefits: **$1,368,168** Total Costs: **$834,597** BCR: **1.64**

Project Number: Disaster #: Program: PDM Agency: **Truckee River Flood Project**

State: **Nevada** Point of Contact: Mimi Fujii-Strickler Analyst: K McLeod

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Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$27,261	Annual:	$0	Annual:	$27,261
Present Value:	$388,993	Present Value:	$0	Present Value:	$388,993

Mitigation Benefits: $388,993 Mitigation Costs: $214,500

Benefits Minus Costs: $174,493 Benefit-Cost Ratio: 1.81

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Depth-Damage Functions Using Office One-Story (Default)

Building	Before Mitigation Values:			After Mitigation Values:		
Flood Depth (ft)	Before Mitigation (pct)	Before Mitigation User Entered (pct)	Before Mitigation ($)	After Mitigation (pct)	After Mitigation User Entered (pct)	After Mitigation ($)
-2.0	0.4%	0.0%	$8,106	0.0%	0.0%	$0
-1.0	0.4%	0.0%	$8,106	0.0%	0.0%	$0
0.0	0.9%	0.0%	$18,239	0.0%	0.0%	$0
1.0	12.3%	0.0%	$249,261	0.0%	0.0%	$0
2.0	17.5%	0.0%	$354,639	0.0%	0.0%	$0
3.0	22.2%	0.0%	$449,885	0.0%	0.0%	$0

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Appendix D NFIP Loss Claims for 35 N. Edison Way

Company Number:	18058	Policy Number :	8702894409	Dt of Loss :	01/08/2017
Open Date :	01/09/2017	Close Date :	03/07/2017	Claim Status :	Closed
Pol Eff Date :	11/22/2016	Pol Exp Dat :	11/22/2017	Org New Bus Dt:	11/22/2006
End Eff Date :	11/22/2016	Org Const Date:	07/01/1977	As of Date :	03/31/2017
Insureds Name :	JOHN HOWITT			Community :	320020
Address 1 :					
Address 2 :	35 N EDISON WAY STE 37				
City :	RENO	State :	NV	Zip Code :	89502 2352
Addr Key :	NV65 37UNWY32535				
Program :	Regular	Rate Method :	Manual	Policy Status :	Active
Condo Ind :	Non-Condo	Condo Units :	1	Catastrope Nbr:	000
Occupancy :	Unknown	Building Type :	One Floor	Bsmt/Enclosure:	None
Post Firm :	N	Flood Zone :	AE	Loc Contents :	Low floor above ground level
Course Const. :	N	Base Flood :	9999.0	Dis Assistance:	Not required
State Owned :	N	Low Floor :	9999.0	Cause of Loss :	Stream/river/lake
Elev. Bldg :	N	Elevation Diff:	999	Foundation Typ:	Not reported or invalid
Small Business:	N	Water Depth :	0	Wall Structure:	Not reported or invalid
Flood Proof :	N	Duration Water:	0	Wall Surface :	Not reported or invalid
Bldg Coverage :	0	Cont Coverage :	304,500	ICC Covg :	0
Bldg Val - ACV:	0	Cont Value :	725000		
Bldg Val - RCV:	0				
Bldg Dmg - ACV:	0	Cont Dmg - ACV:	379,396		
Bldg Dmg - RCV:	0	Cont Dmg - RCV:	435,733		
Bldg Paid :	.00	Cont Paid :	304,500.00	ICC Paid :	.00
Bldg Recovery :	.00	Cont Recovery :	.00	ICC Recovery :	.00
Bldg Reserves :	.00	Cont Reserves :	.00	ICC Reserve :	.00
CWOP Building :					
CWOP Contents :					
CWOP ICC :					
Content Remove:	0	Mobile Remove :	0	Flood Expense :	0
Salvage Amt :	.00	Subrogation :	.00		
Allocated LAE :	7,308.00			Alloc. ICC :	.00
Longitude :	-119.749599	Latitude :	39.516347		
GEO Result :	S8HPNTSCZA	GEO Census :	320319800001000		

Jump to policy
Jump to errors
Jump to txns/rejects

Company Number:	18058	Policy Number :	8702894409	Dt of Loss :	02/10/2017
Open Date :	02/10/2017	Close Date :	/ /	Claim Status :	Active/Open
Pol Eff Date :	11/22/2016	Pol Exp Dat :	11/22/2017	Org New Bus Dt:	11/22/2006
End Eff Date :	02/04/2017	Org Const Date:	07/01/1977	As of Date :	03/31/2017
Insureds Name :	JOHN HOWITT			Community :	320020
Address 1 :					
Address 2 :	35 N EDISON WAY STE 37				
City :	RENO	State :	NV	Zip Code :	89502 2352
Addr Key :	NV65 37UNWY32535				
Program :	Regular	Rate Method :	Manual	Policy Status :	Active
Condo Ind :	Non-Condo	Condo Units :	1	Catastrope Nbr:	000
Occupancy :	Unknown	Building Type :	One Floor	Bsmt/Enclosure:	None
Post Firm :	N	Flood Zone :	AE	Loc Contents :	Low floor above ground level
Course Const. :	N	Base Flood :	9999.0	Dis Assistance:	Not required
State Owned :	N	Low Floor :	9999.0	Cause of Loss :	Stream/river/lake
Elev. Bldg :	N	Elevation Diff:	999	Foundation Typ:	Not reported or invalid
Small Business:	N	Water Depth :	1	Wall Structure:	Not reported or invalid
Flood Proof :	N	Duration Water:	0	Wall Surface :	Not reported or invalid
Bldg Coverage :	0	Cont Coverage :	500,000	ICC Covg :	0
Bldg Val - ACV:	0	Cont Value :	0		
Bldg Val - RCV:	0				
Bldg Dmg - ACV:	0	Cont Dmg - ACV:	0		
Bldg Dmg - RCV:	0	Cont Dmg - RCV:	0		
Bldg Paid :	.00	Cont Paid :	.00	ICC Paid :	.00
Bldg Recovery :	.00	Cont Recovery :	.00	ICC Recovery :	.00
Bldg Reserves :	.00	Cont Reserves :	20,000.00	ICC Reserve :	.00
CWOP Building :					
CWOP Contents :					
CWOP ICC :					
Content Remove:	0	Mobile Remove :	0	Flood Expense :	0

Appendix E NFIP Loss Claims for 65 N. Edison Way

```
Company Number: 18058              Policy Number : 0020001833          Dt of Loss     : 12/31/2005
Open Date     : 01/03/2006         Close Date    : 03/13/2006          Claim Status   : Closed

Pol Eff Date  : 05/31/2005         Pol Exp Dat   : 05/31/2006          Org New Bus Dt: 05/31/2003
End Eff Date  : 05/31/2005         Org Const Date: 12/05/1983          As of Date     : 03/31/2017

Insureds Name : NCESCJ AND FERON/ R AND JDIFRA                         Community      : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                        State : NV                 Zip Code       : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular            Rate Method   : Manual              Policy Status : Active
Condo Ind     : Non-Condo          Condo Units   :     1               Catastrope Nbr: 000
Occupancy     : Non-Resident.      Building Type : One Floor           Bsmt/Enclosure: None
Post Firm     : N                  Flood Zone    : A                   Loc Contents  : Low floor above ground level
Course Const. : N                  Base Flood    :   9999.0          Dis Assistance: Not required
State Owned   : N                  Low Floor     :   9999.0          Cause of Loss : Stream/river/lake
Elev. Bldg    : N                  Elevation Diff:   999             Foundation Typ: Not reported or invalid
Small Business: N                  Water Depth   :   26              Wall Structure: Not reported or invalid
Flood Proof   : N                  Duration Water:   0               Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000   Cont Coverage :              0    ICC Covg       :        30,000
Bldg Val - ACV:          477,708   Cont Value    :              0
Bldg Val - RCV:          620,400
Bldg Dmg - ACV:          146,276   Cont Dmg - ACV:              0
Bldg Dmg - RCV:          157,397   Cont Dmg - RCV:              0
Bldg Paid     :       141,275.37   Cont Paid     :            .00    ICC Paid       :            .00
Bldg Recovery :              .00   Cont Recovery :            .00    ICC Recovery   :            .00
Bldg Reserves :              .00   Cont Reserves :            .00    ICC Reserve    :            .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:                0   Mobile Remove :              0    Flood Expense  :              0
Salvage Amt   :              .00   Subrogation   :            .00
Allocated LAE :        3,620.13                                      Alloc. ICC     :            .00

Longitude     :   -119.750506      Latitude      :     39.516012
GEO Result    : S8HPNTSCZA         GEO Census    : 320319800001000

Jump to policy
Jump to errors
Jump to txns/rejects
-------------------------------------------------------------------------------------------------------------

Company Number: 18058              Policy Number : 0020001833          Dt of Loss     : 01/08/2017
Open Date     : 01/09/2017         Close Date    : 02/22/2017          Claim Status   : Closed

Pol Eff Date  : 09/23/2016         Pol Exp Dat   : 09/23/2017          Org New Bus Dt: 05/31/2003
End Eff Date  : 09/23/2016         Org Const Date: 12/05/1983          As of Date     : 03/31/2017

Insureds Name : J AND FERON/ R AND JDIFRA                              Community      : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                        State : NV                 Zip Code       : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular            Rate Method   : Manual              Policy Status : Active
Condo Ind     : Non-Condo          Condo Units   :     1               Catastrope Nbr: 000
Occupancy     : Unknown            Building Type : One Floor           Bsmt/Enclosure: None
Post Firm     : N                  Flood Zone    : A                   Loc Contents  : Low floor above ground level
Course Const. : N                  Base Flood    :   9999.0          Dis Assistance: Not required
State Owned   : N                  Low Floor     :   9999.0          Cause of Loss : Stream/river/lake
Elev. Bldg    : N                  Elevation Diff:   999             Foundation Typ: Not reported or invalid
Small Business: N                  Water Depth   :     2             Wall Structure: Not reported or invalid
Flood Proof   : N                  Duration Water:   0               Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000   Cont Coverage :              0    ICC Covg       :        30,000
Bldg Val - ACV:          561,881   Cont Value    :              0
Bldg Val - RCV:          811,977
Bldg Dmg - ACV:          161,028   Cont Dmg - ACV:              0
Bldg Dmg - RCV:          180,852   Cont Dmg - RCV:              0
Bldg Paid     :       156,028.24   Cont Paid     :            .00    ICC Paid       :            .00
Bldg Recovery :              .00   Cont Recovery :            .00    ICC Recovery   :            .00
Bldg Reserves :              .00   Cont Reserves :            .00    ICC Reserve    :            .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:                0   Mobile Remove :              0    Flood Expense  :              0
```

```
Salvage Amt   :              .00   Subrogation   :              .00
Allocated LAE :         4,702.15                                    Alloc. ICC    :          .00

Longitude     :   -119.750506      Latitude      :     39.516012
GEO Result    : S8HPNTSCZA         GEO Census    : 320319800001000

Jump to policy
Jump to errors
Jump to txns/rejects
-------------------------------------------------------------------------------------------------------

Company Number: 18058              Policy Number : 0020001833          Dt of Loss    : 02/09/2017
Open Date     : 02/20/2017         Close Date    : 02/22/2017          Claim Status  : Closed

Pol Eff Date  : 09/23/2016         Pol Exp Dat   : 09/23/2017          Org New Bus Dt: 05/31/2003
End Eff Date  : 09/23/2016         Org Const Date: 12/05/1983          As of Date    : 03/31/2017

Insureds Name : J AND FERON/ R AND JDIFRA                              Community     : 320020
Address 1     :
Address 2     : 65 N EDISON WAY STE 1
City          : RENO                        State : NV                 Zip Code      : 89502 2371
Addr Key      : NV65  1UNWY32565

Program       : Regular            Rate Method   : Manual              Policy Status : Active
Condo Ind     : Non-Condo          Condo Units   :     1               Catastrope Nbr: 000
Occupancy     : Unknown            Building Type : One Floor           Bsmt/Enclosure: None
Post Firm     : N                  Flood Zone    : A                   Loc Contents  : Low floor above ground level
Course Const. : N                  Base Flood    :   9999.0            Dis Assistance: Not required
State Owned   : N                  Low Floor     :   9999.0            Cause of Loss : Stream/river/lake
Elev. Bldg    : N                  Elevation Diff:   999               Foundation Typ: Not reported or invalid
Small Business: N                  Water Depth   :    1              Wall Structure: Not reported or invalid
Flood Proof   : N                  Duration Water:   0                 Wall Surface  : Not reported or invalid

Bldg Coverage :          500,000   Cont Coverage :              0      ICC Covg      :        30,000
Bldg Val - ACV:          562,586   Cont Value    :              0
Bldg Val - RCV:          812,997
Bldg Dmg - ACV:           19,761   Cont Dmg - ACV:              0
Bldg Dmg - RCV:           19,761   Cont Dmg - RCV:              0
Bldg Paid     :        14,761.58   Cont Paid     :            .00      ICC Paid      :          .00
Bldg Recovery :              .00   Cont Recovery :            .00      ICC Recovery  :          .00
Bldg Reserves :              .00   Cont Reserves :            .00      ICC Reserve   :          .00
CWOP Building :
CWOP Contents :
CWOP ICC      :
Content Remove:                0   Mobile Remove :              0      Flood Expense :            0
Salvage Amt   :              .00   Subrogation   :            .00
Allocated LAE :         1,200.00                                    Alloc. ICC    :          .00

Longitude     :   -119.750506      Latitude      :     39.516012
GEO Result    : S8HPNTSCZA         GEO Census    : 320319800001000
```

Appendix F N. Edison Way Closeout Acknowledgement

U.S. Department of Homeland Security
1111 Broadway, Suite 1200
Oakland, CA 94607-4052
FEMA

December 30, 2013

Mr. Richard Martin
Emergency Management Program Officer
Nevada Division of Emergency Management (NDEM)
2478 Fairview Drive
Carson City, NV 89701

Reference: Closeout Acknowledgement, PDMC-PJ-09-NV-2010-006
Truckee River Flood Project
Edison Way Demolition

Dear Mr. Martin:

We are writing in response to your December 20, 2013, letter which forwarded closeout documentation for the above-referenced Pre-Disaster Mitigation (PDM) Program subgrant. We acknowledge receipt of the final budget summary and supporting documentation. Your closeout documentation shows:

Total approved cost of:	$ 771,725.00
Amount obligated (federal share 75%)	$ 311,490.47
Total eligible costs	$ 415,320.63
Total payments processed	$ 311,490.47
De-obligation amount	$ 267,303.28

There was a de-obligation amount listed due to the project not requiring re-vegetation due to the construction of a small levee in the project location, per U.S. Army Corps recommendation.

This subgrant is closed effective the date of this letter, however, please be advised that the grant may be subject to Federal audit. Financial and programmatic records supporting grant reimbursement claims must be retained for at least three years from the final State action, in accordance with Title 44, Code of Federal Regulations, Section 13.42. This grant's final closeout date will be when all subgrants are closed and all close-out actions identified in the Hazard Mitigation Assistance Unified Guidance are complete.

If you have any questions or need further assistance, please contact Joan Flack, Hazard Mitigation Specialist, at (510) 627-7023, or by email at joan.flack@fema.dhs.gov.

Sincerely,

Sally Ziolkowski, Director
Mitigation Division

www.fema.gov

Appendix G Mill St. Grant Application

200.1 - Acquisition of Private Real Property (Structures and Land) - Riverine					Federal Share: $ 250,000.00
Item Name	**Cost Classification**	**Unit Quantity**	**Unit of Measure**	**Unit Cost ($)**	**Cost Estimate ($)**
Env Abatement - 5205 Mill St	Demolition And Removal	1.00	Each	$ 30,000.00	$ 30,000.00
Demolition of 5205 Mill St	Demolition And Removal	1.00	Each	$ 220,000.00	$ 220,000.00
Grant Administration	Administrative Expense	1.00	Each	$ 82,750.00	$ 82,750.00
				Total Cost	$ 332,750.00

Total Project Cost Estimate: $ 332,750.00

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Cost Share		
Activity Cost Estimate	$ 332,750.00	
Federal Share Percentage	75.13148009%	
Non-Federal Share Percentage	24.86851991%	
	Dollars	Percentage
Proposed Federal Share	$ 250,000.00	75.13148009%
Proposed Non-Federal Share	$ 82,750.00	24.86851991%

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Cost Effectiveness	
Attach the Benefit Cost Analysis (BCA), if completed for this project	
TruckeeRiver_ExCondRAS_reportfiles.zip TruckeeRiver_ExCondRAS_GRANT_part1.zip TruckeeRiver_ExCondRAS_GRANT_part2.zip Edison Way BCA Report_11-30-09.pdf EdisonWayDemo_BCA.zip	
Net Present Value of Project Benefits (A)	$ 590964.0
Total Project Cost Estimate (B)	$ 332750.0
What is the Benefit Cost Ratio for the entire project (A/B)?	1.776
If you would like to make any comments, please enter them below.	
Cost estimates for demolition are based upon actual demolition costs associated with previous edison way demolitions. BCA Summary (See attached backup documentation): Net Present Value of Project Benefits: $590,964 Total Project Cost Estimate: $332,750.00 Project BCA: 1.776	
Attachments:	

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Appendix H Carson City Retention Basin Cost Detail

Description	Quantity	Price	Cost
Phase 0 (initial emergency response)			
Remove Material	80,000 CY	$3.44	$275,600.00
Labor	1	$10,293.92	$10,293.92
Equipment	1	$3,859.00	$3,859.00
Equipment Rental	1	$1,480.00	$1,480.00
Signs	1	$1,600.00	$1,600.00
Permit Fees	1	$400.00	$400.00
Bituminous Concrete Overlay	1995	$2.00	$3,910.00
		Subtotal	$297,142.92
Phase I			
Remove Material	70,000 CY	$4.15	$290,500.00
Temporary Haul Roads/Bonds	1	$15,950.00	$15,950.00
Labor	1	$8,522.40	$8,522.40
Equipment Estimate	1	$2,121.50	$2,121.50
Topo for Quantity Verification	1	$2,280.00	$2,280.00
Install 42" RCP for Haul Rd.	24	$65.00	$1,560.00
Install 15"CMP for Haul Rd.	40	$20.00	$800.00
		Subtotal	$321,733.90
Phase II			
Remove Material	320,000 CY	$5.50	$1,760,000.00
Engineering plans	1	$23,340.00	$23,340.00
Chipping and clearing	1	$31,798.20	$31,798.20
Haul Road	1	$28,621.80	$28,621.80
Construction staking	1	$3,600.00	$3,600.00
Install inlets and outlets	1	$122,760.00	$122,760.00
Finish grading	1	$24,393.60	$24,393.60
Erosion protection	1	$78,596.00	$78,596.00
Permit fee	1	$400.00	$400.00
Performance/labor bond	1	$20,000.00	$20,000.00
Labor	1	$18,076.00	$18,076.00
Equipment	1	$2,837.25	$2,837.25
Aggregate base for haul road	1	$26,000.00	$26,000.00
		Subtotal	$2,140,422.85
Project Totals			
Phase 0			$297,142.92
Phase I			$321,733.90
Phase II			$2,140,422.85
		Total	$2,759,299.67

(*Waterfall Fire – Vicee Basin Emergency Protective Measures Memo*, pp. 8-9, Carson City Nevada, Public Works Department, October 28, 2004.)

Appendix I Analysis of the Capacity Expansion Phases for the Existing Vicee Debris Basin Excerpt

DR-1540-NV: Analysis of the Capacity Expansion Phases for the existing Vicee Canyon Debris Basin

According to an email (dated 2-10-05) from Rob Fellows, Senior Project Manager for Carson City, Phase 1A of the completed expansion of the Vicee Canyon Debris Basin yields approximately **68 acre-feet** of storage and the Phase 2 expansion proposes to yield **200 acre-feet** of storage. It is our opinion that the Phase 1A expansion provides adequate storage to protect downstream points from the impact of debris flow and sedimentation from a 5-year storm event in the Vicee Canyon watershed. This opinion is supported by the following argument.

FEMA performed post-fire hydrological calculations for Vicee Canyon. The location of the point of calculation in FEMA's study (called Vicee Canyon Outlet hereinafter) is approximately 0.5 mile upstream from the location of the debris basin. However, the values estimated by FEMA for the volume of flow and sediment are applicable to the location of the debris basin because of the following reasons:

1. Given the narrow shape of the watershed in between the Vicee Canyon Outlet and the debris basin, the intermediate drainage area is relatively small and the runoff added to the stream in the intermediate drainage area is not significant.
2. There is the possibility that part of the 5-year surface runoff spreads out or branches out of the main water course and thus may reduce the flow and balance-out with the extra water running into the stream in the intermediate drainage area.
3. Although the intermediate drainage area is also burned and might contribute some additional sediment and debris to the total flow, this effect may be offset by the sediment trap capacity within the intermediate drainage area and stream segment which have a milder slope than the Vicee Canyon upstream segments.

According to FEMA's estimates the volume of the post-fire 5-year clear-water runoff from Vicee Canyon is approximately **109 acre-feet**. Considering the bulking factor of 49.7% assigned to this intensely burned drainage area (as shown in Appendix A, Table 7 of the October 2004 FEMA Summary Report), the total volume of water plus sediment and debris would be **163 acre-feet** for the post-fire 5-year event. Accordingly, the total volume of sediment and debris under post-burn conditions for the 5-year event is approximately **54 acre-feet** (163 ac-ft x 49.7%), which is approximately 20% smaller than the new Phase 1A debris basin capacity.

Previous experience with debris basins receiving runoff from burned areas include two basins used in post-fire management operations for the Cerro Grande Fire in New Mexico. Both of these basins were overrun by the runoff volume and yet were able to trap almost the entire bed load and a large portion of the suspended load. The point here is that in order for a sediment or debris basin to be effective it does not have to completely contain and infiltrate the entire runoff volume. The **68 acre-feet** of storage of the Phase 1A expansion is sufficient to slow down and partially contain the flow and provide more than enough capacity to contain the sediment produced in a 5-year event.

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Appendix J Vicee Basin Emergency Protective Measures – Memo Excerpt

Waterfall Fire
FEMA-DR-1540-NV

Summary of Peak Discharge and Sediment Yield

Basin ID	Area (sq. mi.)	Discharge Point Location	5-year Peak Discharge (cfs) Pre-burn	Post-burn (clear flow)	Post-burn (bulked flow)	ratio	5-year Peak Sediment Yield Pre-burn (ac-ft)	Post-burn (ac-ft)	ratio
Combs Canyon	1.74	At U.S. Route 395	34	121	158	4.7	2.49	5.73	2.3
Vicee Canyon	1.64	3500' U/S of Bike Trail	38	412	617	16.4	5.53	14.22	2.57
Ash Canyon	5.25	At Ash Canyon Road	117	555	658	5.6	19	19.28	2.59
Kings Canyon	6.35	At Long Ranch Park	120	533	619	5.2	16	16.38	2.12
Tributary I	0.77	At Rhodes Street	16	99	148	9.5	1.17	3.07	2.63
Tributary H	0.57	At Boyle Street	13	122	183	14.1	1.94	5.11	2.63

FEMA Flood Insurance Study Discharges (for comparison)

Basin ID	Area (sq. mi.)	Discharge Point Location	FEMA FIS DISCHARGES (cfs) 10-yr	50-yr	100-yr
Combs Canyon	3	At U.S. Highway 395	95	425	760
Vicee Canyon	2	At confluence with Ash Canyon Creek	45	250	475
Ash Canyon	6	Near Lonview Way	220	950	1660
Kings Canyon	5	Near Canyon Drive	160	765	1390

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PUBLIC WORKS DEPARTMENT

ADMINISTRATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

CONTRACTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

FLEET SERVICES
3303 Butti Way, Building 2
Carson City, NV 89701-3498
Ph: 775-887-2356
Fx: 775-887-2258

OPERATIONS
(Water, Sewer, Wastewater, Streets, Landfill, Environmental)
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

TRANSPORTATION/ CAPITAL PROJECTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

DEVELOPMENT SERVICES

BUILDING and SAFETY PERMIT CENTER
2621 Northgate Lane, Suite 6
Carson City, NV 89706-1319
Ph: 775-887-2310
Fx: 775-887-2202

DEVELOPMENT ENGINEERING
2621 Northgate Lane, Suite 54
Carson City, NV 89706-1319
Ph: 775-887-2300
Fx: 775-887-2283

PLANNING
2621 Northgate Lane, Suite 62
Carson City, NV 89706-1319
Ph: 775-887-2180
Fx: 775-887-2278

CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Al Harting - FEMA

From: Robert D. Fellows, P.E.
Senior Project Manager

Subject: Waterfall Fire - Disaster 1540 NV
Vicee Basin Emergency Protective Measures - Phase 1

Date: October 28, 2004

Due to the nature of the threat to Carson City of the Vicee Canyon watershed where the 5-year pre-burn flow of 38 cfs increases to 619 cfs post-burn, addition volume in Vicee basin is necessary. Using the pre-burn 100-year flow of 475 cfs, which resulted in a basin capacity of 150 acre feet of storage, a basic ratio between the values 475/150 and 619/X show a need to provide about 200 acre feet of ultimate storage. Since time frames are limited and expansion of the basin would involve further engineering analysis, a first phase is proposed which would provide 1/3 of the ultimate volume or about 65 acre feet. The current size (600ft x 400ft area) of the existing basin contains approximately 15 acres feet which leaves 50 acre feet needed. When 50 acre feet is converted to cubic yards the result is about 80,000 cubic yards. The existing inlet and outlet structures to the basin will not be disturbed, but the existing rock-lined connection between the small and larger areas will be removed. The rock will be salvaged and stored near the edge of the basin on the north side. All other work will be within the existing footprint of the basin. The basin is located on city property and lies northwest of Winnie Lane at the end of Foothill Road, Section 12, T15N, R19E. The existing basin lies within a "B" flood zone.

The outline below shows the emergency processes the city is using to remove the material from the existing basin.

1. Determine the material use and disposal site. The material was tested by both Lumos and Associates and NDOT for use in the Freeway road bed. The material meets the "Select Borrow" specifications and can be used by the freeway contractor.

2. Determine if the Freeway contractor will accept the material. Ames Construction was contacted and has provided a "material acceptance agreement" to the City for review and execution.

3. Collect bids from haul contractors able to move the material to the freeway project. Four contractors provided bids to move 80,000 bank yards on material from Vicee basin to the freeway project. The low bid cost per yard was $3.30. Other costs associated with the work were separated but include providing a bond (adds $3,000) and provide access to the basin and dust control, etc (adds $6,800). The total contract would be $273,700. The contract time would be 35 working days. A standard city contract being drafted for Action Crane and

(NSPO 1-06)

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DEVELOPMENT SERVICES DEPARTMENT

ADMINISTRATION
3505 Butti Way
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Fx: 775-887-2202

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Fx: 775-887-2112

CONTRACTS
3505 Butti Way
Carson City, NV 89701-3498
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Fx: 775-887-2112

ENGINEERING DIVISION
321 Northgate Lane, Suite 54
Carson City, NV 89706-1319
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Fx: 775-887-2283

FLEET SERVICES
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Fx: 775-887-2258

PLANNING DIVISION
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Carson City, NV 89706-1319
Ph: 775-887-2180
Fx: 775-887-2278

PUBLIC WORKS OPERATIONS
(Water, Sewer, Wastewater, Streets, Landfill, Environmental)
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TRANSPORTATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Paul Anderson - FEMA and Bert Prescott - NEM

From: Robert D. Fellows, P.E. and Senior Project Manager; John Flansberg, P.E. Deputy City Engineer

Subject: Version 2 to PW 45 - Vicee Basin Expansion

Date: February 23, 2005

This is the final portion of the work for this PW as setup with FEMA last Fall. FEMA instructed the City to divide the project into 2 parts, part 1 within the existing basin and part 2 expanded to the north of the existing basin. FEMA engineering analysis confirmed that the amount of 5-year post burn flow was 617 cfs (exhibit A) which the city then confirmed that 200 acre-feet of storage was necessary to contain the 617 cfs (exhibit B). **This is a very time critical project not only for the great risk to life and property but the window of opportunity is closing.** The disposal area for the basin material, the NDOT freeway, is being worked on at the same time and has accommodated the material from the basin. Within a month, the space available within the Freeway will be gone. This fact has cut the costs to remove and dispose of the material nearly in half of what the FEMA cost codes allow.

This version to PW 45 results in the expansion of the existing basin into north which required much more effort on the part of the city . Below is accounting of each item.

- Secure right of entry across WNCC for this portion - completed, (exhibit C)
- Secure NDOT approval to accept the more material - completed, (exhibit D)
- Secure acceptance from Freeway contractor, Ames Construction, to place material at no extra cost - completed, (exhibit D)
- Secure NDOT encroachment permit to haul material to Freeway - completed, (exhibit E)
- Secure City Special Use Permit - completed, (exhibit F)
- Secure Air Quality permit - completed, (exhibit G)
- Secure engineering plans - completed, (exhibit H)
- Secure cultural survey - completed with no issues, (exhibit I)
- Secure environmental survey - completed with no issues, (exhibit J)

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...LOPMENT
...ICES
DEPARTMENT

ADMINISTRATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

BUILDING and
SAFETY DIVISION
PERMIT CENTER
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Carson City, NV 89706-1319
Ph: 775-887-2310
Fx: 775-887-2202

CAPITAL PROJECTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

CONTRACTS
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

ENGINEERING DIVISION
2621 Northgate Lane, Suite 54
Carson City, NV 89706-1319
Ph: 775-887-2300
Fx: 775-887-2283

FLEET SERVICES
3303 Butti Way, Building 2
Carson City, NV 89701-3498
Ph: 775-887-2356
Fx: 775-887-2258

PLANNING DIVISION
2621 Northgate Lane, Suite 62
Carson City, NV 89706-1319
Ph: 775-887-2180
Fx: 775-887-2278

PUBLIC WORKS OPERATIONS
(Water, Sewer, Wastewater,
Streets, Landfill, Environmental)
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Ph: 775-887-2355
Fx: 775-887-2112

TRANSPORTATION
3505 Butti Way
Carson City, NV 89701-3498
Ph: 775-887-2355
Fx: 775-887-2112

CARSON CITY NEVADA

Consolidated Municipality and State Capital

Memo

To: Bert Prescott

From: Robert D. Fellows, P.E. John Flansberg, P.E.
Senior Project Manager Deputy City Engineer[2,3]

Subject: Version 1 to PW 45 - Vicee Basin Expansion Quantity Error

Date: April 7, 2005

As discussed with you recently, the City has had opportunity to more precisely determine the amount of material contained in the phase 1 portion of the Vicee Basin and include previous missed items needed to make the emergency measure functional and stable. Removing earth is only part of what is needed to make the emergency measure effective. Please forward this request on to FEMA as soon as possible.

This emergency work only removes material from the existing footprint of the basin. The original estimate (version 0) used a direct conversion of 50 acre-feet to 80,000 cubic yards plus the existing volume of 15 acre-feet to gain a total perceived storage volume of 65 acre-feet. After the work was in progress, the basin was surveyed, then city engineering staff designed and calculated the volume using actual topographic information. The ground slopes from 4875 to 4840 of which the storage volume of the basin is contained from 4840 to 4823. This approximately 6% ground slope results in a material removal of approximately 150,000 cubic yards to yield a storage volume of approximately 68 acre-feet within the existing footprint of the basin. Furthermore, the original PW scope did not know that the inlets and outlet to the existing basin would need to be altered to accommodate 68 acre-feet storage. Below is a revised scope of work for version 1.

Version 1 to the PW continues to remove all earthen material within the basin to create one large basin, provides necessary inlets/outlet, grading, and side slope erosion control. The new basin will have 3:1 side slopes with a top dimension of 600 feet E-W and 400 feet N-S (5.5 acres) and a bottom dimension of 400 feet E-W and 150 feet N-S (1.4 acres). All existing rock will be moved to the west edge of the basin to within 25 feet to 40 feet to the top of the basin for future use. The main inlet channel and smaller southerly inlet channel will be re-installed to conform to the 3:1 basin side slopes. The main inlet channel measures 324 feet long by 50 lineal feet wide and contains a 60 feet by 40 feet apron on the basin

p. 10

Appendix K Funding for Emergency Protective Measures – Waterfall Wildfire Excerpt

5. Types of Emergency Projects in Progress

Types of emergency protective measures that are currently underway and are funded under the PA Program are described below.

Soil Stabilization and Erosion Control Measures

These measures were installed to stabilize slopes and drainages, reducing runoff, flow velocity, sediment transport, and slope failure. Measures typically consisted of the application of hydroseeding; placement of straw mulch, erosion control blankets, and fiber rolls; and installation of check dams, gravel bag berms, and sand bag barriers in swales and channels. Measures were considered to be eligible if they provided protection to existing residences or other structures – for example, hydroseeding was considered eligible if it stabilized a slope that would otherwise fail and cause damage to homes located at the base of the slope.

Log Erosion Barriers (LEB) and Contour Felling of Trees. The purpose of this treatment is to trap sediments from side slopes to prevent material from entering stream channels and to keep sediment on site. Trees will be felled and installed perpendicular to the slope in areas designated on the treatment map. LEBs will be installed in high severity areas where there is timber available.

Straw Wattles. The purpose of this treatment is to capture and retain sediment on slopes, reduce soil creep and sheet rill/erosion until vegetation re-establishes. Wattles will be installed on hillsides behind vulnerable homes, public facilities and on slope contours where sufficient trees are not available for contour felling as designated on treatment map.

Scope

The analyses were completed for the six watersheds listed in Table 3 below. These watersheds, all of which were affected by the fire, drain directly into Carson City. See Figure 1 of Appendix A for the location of these watersheds.

Table 3: Watersheds Analyzed

Watershed	Drainage Area (sq mi)
Combs Canyon	1.74
Vicee Canyon	1.64
Ash Canyon	5.25
Kings Canyon	6.35
Tributary I	0.77
Tributary H	0.57

Peak Flow Analysis for the 5-Year Storm

The 5-year peak discharges for pre-burn conditions were calculated using the USACE's HEC-HMS model. Precipitation is discussed in Section 2, above. For purposes of this analysis, the 5-year, 24-hour rainfall intensity was used. The results of the HEC-HMS model matched favorably with USGS regional regression equations published for Region 5 in Nevada (USGS, 2000). These discharges were then adjusted to account for post-burn hydrologic conditions based upon the burn severity reported by the BAER team and a bulking factor. The post-burn adjustment factors were determined through comparisons of pre- and post-burn rainfall-runoff models that are calibrated based on similar fire events. Table 4 below provides the results of this analysis. Discharge values are shown in cubic feet per second (cfs).

Table 4: Summary of 5-Year Peak Discharges

Watershed			5-Year Peak Discharge (cfs)		
Basin	Drainage Area (sq mi)	Discharge Point Location	Pre-Burn	Post-Burn (Bulked)	Ratio
Combs Canyon	1.74	At U.S. Route 395	34	158	4.7
Vicee Canyon	1.64	3500 feet upstream of Bike Trail	38	617	16.4
Ash Canyon	5.25	At Ash Canyon Road	117	658	5.6
Kings Canyon	6.35	At Long Ranch Park	120	619	5.2
Tributary I	0.77	At Rhodes Street	16	148	9.5
Tributary H	0.57	At Boyle Street	13	183	14.1

As shown in the last column of the table above, the largest increase in post-fire flows occurs in Vicee Canyon. The reason for the large increase is that the entire Vicee Canyon watershed is within the burn area, as shown in Figure 1 of Appendix A.

Appendix L USDA Forest Service Waterfall Fire BAER Report Excerpt

mountain range. The igneous rock is granitic in composition (i.e., granite, granodiorite and monzonite) belonging to the Sierra Nevada batholith (Trexler, 1977; Archibold, 1969).

The metamorphic rock is more resistant to weathering than the igneous rock which weathers to what is colloquially referred to as "decomposed granite." The decomposed granite is the major source of landslide materials.

This area along the eastern side of the Sierra Nevada Mountain Range is seismically active. Several faults that are 300 years or younger lie parallel to the older faults which trend north by northeast. The older and younger faults define the boundary between the uplifted and downthrown blocks found in the basin and range province in western Nevada. Carson City lies on a downthrown block.

Geologically recent (i.e., 2 million years and younger) processes include the seismic activity and subsequent land sliding that has occurred in response to a combination of earthquakes and rainfall. This land sliding includes debris slides and debris flows. Deposits of these landslide events now blanket the area under Carson City and to the west of Carson City and include alluvial fans and aprons.

Q. Miles of Stream Channels by Order or Class: 18.6 miles of perennial stream and 23 miles of intermittent streams.

R. Transportation System

Trails: 3 miles Roads: 29.28 miles

PART III - WATERSHED CONDITION

A. Burn Severity (acres) 2,860 (33% low); 3,990 (45% moderate); 1,261 (14% high); 688 (8%) unburned
USFS (acres): 838 (low); 1,462 (moderate); 415 (high)
Other lands (acres): 2,022 (low); 2,528 (moderate); 846 (high)

B. Water-Repellent Soil (acres): 2,000

C. Soil Erosion Hazard Rating (acres):
616 (7% low) 2,552 (29% moderate) 5,631 (64% high)

D. Erosion Potential: 15-30 tons/acre

E. Sediment Potential: 2,534 cubic yards / square mile

PART IV - HYDROLOGIC DESIGN FACTORS

A. Estimated Vegetative Recovery Period, (years):	10 years, 50-100 for trees
B. Design Chance of Success, (percent):	80%
C. Equivalent Design Recurrence Interval, (years):	25 years
D. Design Storm Duration, (hours):	6 hours
E. Design Storm Magnitude, (inches):	2 inches
F. Design Flow, (cubic feet / second/ square mile):	14 cfsm
G. Estimated Reduction in Infiltration, (percent):	18% of the area
H. Adjusted Design Flow, (cfs per square mile):	16.8 cfsm

2

PART V - SUMMARY OF ANALYSIS

A. Description of Watershed Emergency:

The Waterfall Fire is located west of U.S. Highway 395 directly above Carson City, Nevada. The burned area includes areas within eleven watersheds including Kings Canyon, Ash Canyon, Coombs and Vicee Canyons. The headwaters on the burn area follow the watershed divide on the Carson Range of the Sierra Nevada. The canyons affected are headwater tributaries to the Carson River to the east. This area is prone to summer thunderstorms often resulting in flash flooding.

Landownership within the fire includes: USFS, Washoe Tribe of CA and NV, Carson City, State of Nevada, Private, Nevada State Board of Regents, and Tahoe State Park. In addition to being the scenic backdrop for the Capital City, the area generates most of the city's municipal water supply. Initial assessments indicate that post fire impacts may include excessive water run off, debris flows, mud slides and other threats to Carson City's municipal water supply and water quality, infrastructure of the municipal water system, human life and property. Also at risk are down slope subdivision drain systems, sewer systems, and roadways.

Threats to life and property: Over 516 homes ranging from $250,000 to $750,000 in value are at risk from increased run-off directly downstream of the Waterfall Fire within the Carson City. Areas where the fire burned directly above and into subdivisions are at risk of rock falls, flooding and debris flows, especially in the Ash, and Kings Canyon areas.

Geologic instability and landside potential: The combination of vegetation loss from the wildfire with rainfall may result in landsliding. Computer models were used to derive hazard ratings for management decision-making. These include predicting initiation sites of landslides using Level I Stability Analysis (Hammond et al. 1992; Koler, 1998) and estimating runout distances of debris flows (Benda and Cundy, 1990). Results from the computer modeling indicate that a moderate-high to a high probability of landsliding occurrence will take place within the fire area during the next ten years until re-vegetation takes place. The probability increases from a moderate to a high hazard rating in response to rainfall – specifically rainfall events that have a frequency of 60 minutes or greater for return intervals of 2 to 25 years. Lesser rainfall frequencies are unlikely to result in landsliding.

The highest hazard runoff areas are the existing alluvial fans/aprons located in the North King Canyon Creek, Premier Mine, and Ash Canyon Creek areas. The Ash Canyon Creek area has the greatest risk because of the likelihood of debris flow reaching housing developments. High hazard areas have also been identified in the Vicee and Coombs Canyon areas but the runout areas are not as significant because the number of buildings and houses are much less prevalent than in the other high hazard areas.

Public safety and closures: The fire area is easily accessible all along the eastern perimeter. This area receives very high use from city residents and visitors.There is an existing and continuing public safety and hazard situation on the fire. The public can gain access to the steep terrain and unstable canyons in several areas. Carson City has closed the fire to all public access at this time. USFS and the private landowners will need to work together to control use of the area for the sake of public safety. Signage, public information kiosks, media releases and barriers will be needed to meet the public safety needs for at least the next year and a half.

Wind erosion and public safety: The Waterfall Fire lies adjacent to U.S. Highway 395 and directly adjacent to Carson City. The local winds are consistant in the afternoon along the mountain front in Carson City. The dust and ash from this fire could cause public safety problems related to decreased visibility and health problems. Blowing ash could also impact the municipal water supply, as the City uses surface water supplies that lie within the burned area.

Carson City and Virginia City municipal water supplies: The Waterfall Fire occurred in a designated municipal watershed. It is the sole municipal watershed for Carson City. Potential impacts of the Waterfall Fire to surface water supplies to Carson City include increases in sediment load and turbidity in the creeks that supply surface water to Carson City, and a possible increase in pH. The increased sediment load to the surface water treatment plant will likely cause temporary shutdown of the plant during precipitation events and heavy runoff periods. Landslides and/or mudslides would likely create the same effects, but may have the potential for longer-term disruption of operations if they occur in the stream bottoms. Hydrologists have confirmed that there is a high risk of debris flows and very high probability of increased ash and silt in the streams and just above the water quality treatment plant. The highest potential comes with the first moderate

to high storm event. This would cause damage to the buildings and system infrastructure associated with the water quality treatment plant.

Sedimentation caused by the fire will also reduce the infiltration capacity of the Vicee Canyon recharge infiltration basins by plugging the bottom substrates with fine-grained material. Other debris carried downstream during major precipitation events may also interrupt recharge capabilities.

Also at immediate risk are the pipelines in Lakeview, Timberline, Vicee and Ash Canyons that supply water from Marlette/Hobart Water System to Virginia City and Carson City. These pipelines are vulnerable in several places where they cross streams. There are two pipelines, one that supplies water to the historic inverted siphon to Virginia City (which is their only source of municipal water) and another to the Ash Canyon Water Treatment Plant in Carson City. The access road to the Marlette Lake pump was within the fire and was burned. The Marlette Lake pump operates on diesel fuel and must be trucked in three times a week. The road is at risk of damage from increased flows and is not to a high enough standard to accommodate those flows. Loss of access on this road to the Marlette/Hobart Water System would inhibit system adjustments and the delivery of diesel fuel to the Marlette Lake pump, which would reduce and stop the flow to Virginia City and Carson City within a few days.

Threat to soil loss and loss of productivity: High severity burn occurred on 1,261 (14%) acres, and moderate severity burn occurred on 3,990 acres (45%). Acres of low severity burned areas are 2,860 (33%). (The remaining 8% not burned.) This level of severity has created localized hydrophobic soil conditions, removed overstory vegetation and organic duff cover. The majority of the high burn severity area is in the Kings Canyon and Ash Canyon subwatersheds. The majority of the high burn severity areas are on very steep slopes, and have a mixed moderate to fine sandy loam surface. There is as much as three inches of burnt ash on the high severity burn areas and no natural mulch on the soil surface. These soils are perched above the perennial streams in the Kings and Ash canyons. High and moderate burn severity areas have very high erosion potentials. This situation places high risks upon water quality as well as threatening long-term site productivity and quality, and could contribute to debris flow during larger watershed events, posing a potential threat to life and property.

Threat to stream and Carson River water quality: Sediment yield is expected to increase from moderate and high severity burn areas as discussed previously. Key streams considered to be at extremely high risk from increased sediment yields are Ash Canyon and Kings Canyon Creek. These creeks flow through the City's drainage system and into the Carson River. These channels and pipes are not sized to compensate for this increase in expected waterflows or filter the sediment load. Therefore the Carson River can expect an increase in ash, storm flow, sediment and debris with the first substantial thunderstorm event and with spring runoff.

Threat to aquatic ecosystem integrity: Many of the riparian zones and aspen stands were burned at moderate and high intensities. These habitats are particularly important as they provide for high biodiversity, travel corridors, and local microclimates. In addition, Kings and Ash Canyon Creeks are recreational fisheries, with brook and rainbow trout. The lack of overhead shading vegetation due to the fire, and the resulting increased sedimentation into the creeks threaten aquatic environments. Preliminary assessments by Nevada Department of Wildlife found a total loss of the recreational fisheries. The threat of overland flow, debris flows and slope failure above the actual stream beds in steep areas will overwhelm these systems with sediment and threaten the natural restoration of the woody vegetation.

Threat to terrestrial ecosystem integrity: There are no Federally listed plants or animals known to exist in the watershed. No critical habitat exists in the watershed. There are no state listed plants or habitat known to exist in the burn area.

The Waterfall Fire burned approximately 2,767 acres of forested stands. These areas were important to species such as black bear, goshawk, flammulated owl, bats, and many other types of cavity nesting birds. The long period in which it will take for this habitat to reestablish will have an adverse effect to forest dependent species. The Waterfall Fire burned nearly all of the winter range and significantly impacted the summer range for the Carson River mule deer herd. Damage to the winter range amounted to the loss of important bitterbrush, sagebrush, sagebrush/perennial grass, and Sierra mountain shrub foraging habitats. Loss of these vegetation types has created a forage deficit on the winter range. Damage to summer range amounted to the loss of overstory cover, hiding cover, and forage with the removal of almost all brush and shrubs and a substantial portion of the overstory trees. There is long-term loss of deer winter range and other wildlife habitats in the Waterfall Fire area through type conversion to a non-native cheatgrass and/or other noxious weed dominated vegetation type. This can alter the fire cycle such that some shrub/brush habitats may not return.

D. Probability of Treatment Success

Treatment	Year 1	Year 3	Year 5	Beyond BAER
Land	75	90	90	90
Channel	75	80	90	90
Roads	80	85	95	90
Cultural	80	90	90	90
Warning System	80	80	80	90

E. Cost of No-Action (Including Loss):

Four parameters were used to determine the loss of resources if no treatment were appplied. These include loss of site productivity valued at $1,550,000 and loss of roads valued at $550,000. Impacts of sediment on road drainage infrastructure $4,000,000. Impacts of sediment on Carson City and Virginia City water systems $5,000,000. Total cost of no action is $11,100,000.

A non-calculated cost of the no action alternative also includes the anticipation of cheat grass invasion into the burned areas. Much of the cost of the action alternative is associated with revegatation of native and non-native desirable species $250,000. Additional costs of the no action, which has not been is the loss of the aesthetic value to local citizens and tourists.

F. Cost of Selected Alternative (Including Loss):

The cost of implementing the proposed treatments is $6,438,619. And . Assuming an 80% treatment success, the total value of successful implementation the total cost of the alternative is the value of successful implementation $17,538,619.

G. Skills Represented on Burned-Area Survey Team:

Team Leader
Asst. Team Leader Writer/Editor
Public Information Officer
Forester, Fuels Management
Vegetation
Engineering
Water Supply
Recreation
Wildlife
Archaeology
Hydrology
Soil Scientist
Geologist
GIS, Computer Specialist
Urban Forestry
Washoe Tribe, Colony Representative
Recreation access
Implementation Specialist
Suppression Rehabilitation

Team Leaders: Genny Wilson, Jenny Scanland Asst.

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H. Treatment Narrative:

Land Treatments

Log Erosion Barriers (LEB) and Contour Felling of Trees: The purpose of this treatment is to trap sediments from side slopes to prevent material from entering stream channels and to keep sediment on site. Trees will be felled and installed perpendicular to the slope in areas designated on the treatment map. An estimated 30 to 40 LEB/acre will be installed. This treatment will vary depending on localized conditions. LEBs will be installed in high severity areas where there is timber available.

It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Straw Wattles: The purpose of this treatment is to capture and retain sediment on slopes, reduce soil creep and sheet rill/erosion until vegetation re-establishes. Wattles will be installed on hillsides behind vulnerable homes and on slope contours where sufficient trees are not available for contour felling as designated on treatment map. An estimated 30-40 wattles/acre will be installed. This treatment will occur depending on localized conditions.

It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Seeding: The purpose of this treatment is to minimize soil wind and water erosion by providing a vegetative surface cover, and to prevent the introduction and increase of noxious and invasive weeds. Seeding will be done with four different seed mixes tailored to fit specific areas of the burn. Some areas will applied by air and some will be applied with a seed drill. The seeding will overlap with the LEB's, straw wattles and with the straw mulching in some areas. Aerial seeding is necessary due to the very steep slopes in the upper elevations of the burn areas and lack of road access to this area.

Seeding of all lands with consistent seed mixes and across the entire watershed will decrease the application costs to all parties. It is extremely important that soil productivity be protected on both private and public lands. These soils are essential in ensuring that all lands are revegetated with the desired species. This will ensure decreased weed and cheat grass infestations on all lands. Wyden amendment spending authority is being requested to ensure a funding mechanism for private, State and City lands. Due to the emergency nature of this incident no funding is currently available for treatments on private, State and City lands. Partnership contributions would be made through their participation in BAER assessment and implementation which is listed in the funding table as a separate line item. The Emergency Watershed Program, through the NRCS, is unfunded at this time as that funded was totally expended in the southern CA fires.

Appendix M BAER Hydrology Report Excerpt

Waterfall Fire

July, 2004

Casey Shannon, Inyo National Forest

Waterfall fire BAER Team Hydrologist

Potential Values at Risk - Watershed

Listed are values at risk identified that could potentially be impacted as a result of post-fire watershed conditions within and downstream of the fire perimeter and are subject to hazards caused by the burn. Hydrologic values at risk for the Waterfall Fire are as follows:

- Water quality of the domestic water supply for Carson City, Nevada. The Carson City water system diverts water for domestic and culinary use from two primary sources that have watersheds within the burn area; North Fork Kings Canyon Creek and Ash Canyon Creek. Spring flow from a spring near North Fork Kings Canyon is also diverted. These sources are at risk to excessive sedimentation and likely ash contamination as a result of the fire.
- Infrastructure of the Carson City water system; primarily the diversion structures and headgates at North Fork Kings Canyon Creek and Ash Canyon Creek, the holding ponds and treatment plant at the Quill treatment plant, a spring diversion box near North Fork Kings Canyon Creek and the Vicee Canyon Aqueduct that descends the canyon from Hobart Reservoir. Water to Virginia City is also delivered through this same aqueduct system may be affected. The above items are subject to damage or destruction from potential debris flows and flooding as a result of post fire watershed conditions and an additional threat to water quality. Destruction and damage of the diversion structures and aqueduct could result in an indefinite loss of water service and supply to Carson City and Virginia City residents.
- Residential homes found within and oriented with potential flood and debris flow paths below the main drainages within the burn area. Houses have been identified as being at risk in the event of a significant post-fire precipitation event that could be damaged and may possibly have a threat to human life. Residential drainage systems may be ineffective in handling increased runoff and possibly could damage homes and surrounding property. Homes located below an unnamed drainage adjacent to the Premier Mine site and below Ash Creek Canyon are noted, homes below the North Fork Kings Canyon Creek may be affected and with a possibility of flooding to homes below the Vicee Canyon detention basins. Houses and businesses may be flooded by overwhelmed storm drains.
- Infiltration ponds and sediment catchment basins located on lower Vicee Canyon. Carson City has infiltration basins along the lower Vicee Canyon drainage designed to capture surface flows behind gabion structures and excavated storage areas in order to increase ground water supplies for wells the City uses for domestic water supply. Below the infiltration ponds, three large sediment detention basins with armored spillways are found designed to capture sediment and flood flows in order to prevent downstream flooding and sedimentation in the residential areas and city drainage infrastructure. Along this reach the channel has been armored in between the basins to reduce channel incision and to channel flows into the basins. The infiltration basins are subject to increased sedimentation with silt, ash and debris that will decrease the function of ground water recharge and possibly structural damage as a result of large debris flows and floods. The integrity of this system is important to reduce the chance of flooding and sedimentation into residential

subdivisions downstream, the Vicee Canyon drainage enters the City drainage system below the last detention basin.

- United States Geological Survey' (USGS) gauging stations. Located on Vicee Canyon, Ash Canyon Creek, North Fork Kings Canyon Creek, Kings Canyon Creek, the stations are along the canyon bottoms and are subject to damage from debris flows and flooding.
- Carson City storm drain infrastructure. If significant flooding and increased sedimentation occurs in the drainages of the burn area, the City' storm drain system may be overwhelmed with sediment and debris, possibly causing damage to homes and businesses as a result of clogged storm drains forcing flows out of the system. Sediment and ash loads that move through the City drainage system have the potential to impact the water quality of Carson River.
- Roads and drainage infrastructure within the burn area will receive increased runoff and be subject to accelerated erosion and increase sediment loads to stream channels. Additional sediment loads within the drainages pose an increased threat to deposition and debris flows downstream towards values at risk within Carson City. In addition to this potential condition, wind caused erosion will likely deposit loads of fine grained soil, silt and ash within drainage channels adding to the debris flow potential.
- Drainages into Indian Colony and adjacent areas in Carson City. Ephemeral drainages discharge onto residential areas and businesses with poor water controls, increased runoff expected from the burn area may cause flooding and sedimentation to these areas.

Resource Condition Assessment –Hydrology

The Waterfall Fire burned within four sixth order watersheds (Hydrologic Units or HUC's) named Kings Canyon Creek, Ash Canyon Creek, Vicee Canyon Creek and Combs Canyon along with small portions of adjoining watersheds. Perennial flows from Ash Canyon Creek and North Fork Kings Canyon Creek are partly diverted into the Carson City Water distribution system and these watersheds are considered important municipal watersheds. Ash Canyon and Kings Canyon comprise a high percentage of the Carson City water supply. The remainder of the surface flows from these creeks supply appropriated water uses downstream for irrigation and stock watering purposes. Beneficial uses for the waters of Ash Canyon Creek and North Fork Kings Canyon Creek are domestic and culinary use, recreation, stock watering, irrigation and fire protection. Vicee Canyon Creek is also a perennial stream and is not diverted for domestic water uses, surface flows seasonally extend to the lower reaches above Carson City where they are captured into infiltration basins to enhance local aquifers that the City extracts ground water from for water supply. Combs Canyon is an ephemeral stream that flows primarily during snow melt or from rain runoff. All of the primary watersheds in the burn area have multiple ephemeral streams as tributaries.

The watersheds range in elevation from 5000 feet above sea level to approximately 9300 feet and have a moderate to steep gradients. All drainages discharge onto typical alluvial debris type fans and then onto outwash flood plains where Carson City presently exists. Excessive flows that occur from the main drainages of the fire area are routed through the Carson City storm drain system and then directed to the Carson River, east of Carson City which also has several beneficial uses and water quality concerns.

Stream flows sustain riparian vegetation important to aquatic species and wildlife, water quality, quantity and provide channel structure and integrity. Current (as of July, 2004) base stream flows for Ash Canyon Creek, North Fork Kings Canyon Creek and Vicee Canyon Creek are as follows: Ash: 1.5 to 2.3 cubic feet per second (CFS), North Kings: 1.0 to 1.5 CFS, and Vicee < 0.10 CFS. All perennial streams are spring dominated systems and have snow driven runoff peaks in late spring/early summer. The majority of precipitation in the region occurs during the

late fall through late spring months in the form of rain and snow, primarily snow above 6000 feet elevation. A smaller percentage of precipitation occurs primarily during convective type storms during the summer months. Summer thunderstorms can be locally intense and have the potential to cause floods and debris flows.

Average annual precipitation for the burn area ranges from 12 inches (water) at Carson City to 30 inches plus in the upper watersheds. All watersheds within the fire area have histories of flood and debris flow events caused by summer convection type storms and more typically from intense winter/spring rain on snow events which can create the most significant flood events. Peak flows, predicted post fire peak flows are discussed in a separate section of this report.

Post Fire Watershed Conditions/Fire Consequences/Emergency Determinations/Water Quality Concerns

Aerial and land reconnaissance was completed of the burned watersheds and also along the wild land urban interface areas of the fire. Local information from specialists and city officials was obtained in order to better understand watershed characteristics and city infrastructure associated with the fire area. The following describes the post-fire watershed conditions by watershed (sixth field Hydrologic Units), fire consequences to values at risk and emergency determinations. Water quality concerns are discussed also.

Appendix N Vicee Canyon Project Worksheet Excerpt

PROJECT WORKSHEET REPORT

DECLARATION NO. FEMA-NV - DR1629
FIPS NO. 510-09700-00
APPLICANT NAME CARSON CITY
SUBDIVISION
FEMA PW # 415 VSN 1 REF# CC-4

PREPARED DATE 08/26/2009
REPORT DATE 12/21/2009 07:45
INF TYPE ○ INF ● NON-INF ○ REC

COST ESTIMATE

ITEM	VSN	CODE	MATERIAL AND/OR DESCRIPTION	UOM	QTY	UNIT PRICE	COST
1	0	0000	TO BE COMPLETED	LS	1	$.00	$0.00
2	0	9999	TYPE 2 ROAD BASE MATERIAL	CY	223	$10.00	$2,230.00
3	0	3020	FILL (UNCLASSIFIED)	CY	12440	$6.00	$74,640.00
4	0	3390	TOPSOIL AND SEEDING (HYDR.)	SY	14000	$1.00	$14,000.00
5	0	0909	HAZARD MITIGATION PROPOSAL	LS	1	$23,915.00	$23,915.00
6	1	9991	LESS PRIOR APPROVED COSTS	LS	1	$-114,785.00	($114,785.00)
7	1	9990	TOTAL FIR ELIGIBLE COST	LS	1	$49,767.00	$49,767.00

Eligible Amounts:	
Total (this version)	($65,018.00)
Total Oblig To Date	$49,767.00
Unobligated + Obligated	$49,767.00
Federal Share for Obligated and Unobligated	$37,325.25

PROJECT WORKSHEET REPORT

DECLARATION NO. FEMA-NV - DR1540
FIPS NO. 510-09700-00
APPLICANT NAME CARSON CITY
SUBDIVISION
FEMA PW # 45 VSN 1 REF# CC-020

PREPARED DATE 06/01/2005
REPORT DATE 07/27/2005 11:20
INF TYPE ○ INF ● NON-INF ○ REC

COST ESTIMATE

ITEM	VSN	CODE	MATERIAL AND/OR DESCRIPTION	UOM	QTY	UNIT PRICE	COST
20	1	3352	CMP 15" (FURNISH AND INSTALL)	LF	40	$20.00	$800.00

Eligible Amounts:	
Total (this version)	$470,221.70
Total Oblig To Date	$767,364.62
Unobligated + Obligated	$767,364.62
Federal Share for Obligated and Unobligated	$575,523.47

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The information contained in this appendix does not reflect Nevada Hazard Mitigation Plan appendix letters or naming conventions, and has its original table of contents

STATE OF NEVADA

RADIOLOGICAL EMERGENCY RESPONSE PLAN

DIVISION OF PUBLIC AND BEHAVIORAL HEALTH

Update November 2014

STATE OF NEVADA

RADIOLOGICAL EMERGENCY RESPONSE PLAN

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STATE OF NEVADA
RADIOLOGICAL EMERGENCY RESPONSE PLAN

I. PURPOSE

The purpose of this plan is to provide a mechanism for effective response to peacetime radiological emergencies in the State of Nevada. A radiological emergency can be any incident that results in the loss of control or potential loss of control of a radiation source so that a hazard or potential hazard to public health and safety or the environment exists.

II. DEFINITIONS

None

III. OBJECTIVES

- To identify agencies and individuals to be notified in the event of a radiological emergency in the State of Nevada.

- To provide guidance for Nevada radiological emergency response participants.

- To establish general protocols for requesting, obtaining or providing radiological response assistance.

IV. DISCUSSION

This plan is intended for use by the response agencies in Nevada and incorporation into the Nevada State Comprehensive Emergency Management Plan and the Hazardous Materials Emergency Response Plan. The plan provides the basis for state radiological emergency response assistance to state, county and local response agencies in Nevada.

The Division of Public and Behavioral Health is designated by Nevada Revised Statute 459 as the state radiation control agency. Consequently, the Division of Public and Behavioral Health, Radiation Control Program is the state agency having primary responsibility to respond, in the state, to any radiological emergency, or non-emergency incident.

The Radiation Control Program radiological emergency response personnel are located in Carson City and Las Vegas. State resources of trained radiological emergency response personnel and equipment are limited and it is anticipated during some emergencies that the resources of neighboring counties, neighboring states and/or federal agencies may be requested.

Local emergency response authorities which have "first-on-scene" responsibilities include law enforcement agencies, fire departments and other emergency first-responders. These agencies are responsible to perform radiological emergency response actions to the limits of their training as well as the associated functions such as traffic control, crowd control, fire suppression and other incident management activities. The Radiation Control Program should be notified of all radiation related incidents. Requests for on-site technical assistance or incident management should be clearly communicated in the event that the incident is expected to exceed local capabilities.

V. RADIOLOGICAL RESPONSE RESOURCES IN NEVADA

Division of Public and Behavioral Health - Radiation Control Program

1 (877) GET RAD 1 (438-7231) 24-hour Emergency Hotline
(775) 687-7550 Business Number
(775) 687-7552 FAX
(775) 687-0400 NHP Dispatch (Backup)

The Radiation Control Program may be contacted to provide radiological assistance to federal, state, county or local agencies or the general public as necessary. Radiological assistance may be obtained by calling the any of the numbers listed above. The Nevada Department of Public Safety (DPS), Highway Patrol Dispatch Center is the backup method for contacting Radiation Control Program Staff and to contact the Division of Emergency Management.

Nevada Department of Public Safety

Division of Emergency Management

(775) 687-0300 During Business Hours
(775) 687-0400 NHP Dispatch After Hours

The Nevada Division of Emergency Management (DEM) will serve as the statewide coordination resource at the state level during a radiological emergency. DEM will assist the Radiation Control Program in the event that resources are necessary from other state agencies such as transport vehicles, helicopters, aircraft and other specialized support resources. DEM also assists coordination of county/local agency resources. DEM must be notified of all radiological incidents even if they are not asked for assistance.

Highway Patrol Division
(775) 687-0400 Northern Command (Reno/Carson City)
(702) 486-5393 Southern Command (Las Vegas)
(775) 753-1171 Central Command (Elko)

The DPS Highway Patrol Division has the ability to do limited assessment of radiological emergencies and is usually the first state agency on scene, particularly for transportation related incidents. They will act as the State On-Scene Coordinator (SOSC) until the appropriate SOSC specialist arrives. DPS dispatch centers are the backup means to contact and communicate with most state response agencies.

U.S. Department of Energy - Nevada Field Office & Remote Sensing Laboratory

The U.S. Department of Energy - Nevada Field Office (DOE-NFO) is a resource that may be available to assist with radiological incidents. They have a variety of radiological assistance programs including RAP, FRMAC, NEST, & AMS. DOE-NFO should only be contacted by the Division of Public and Behavioral Health or through NDEM for Radiological Assistance. DOE-NFO may respond directly if the DOE is responsible for the material and has access to other DOE resources. The state Radiation Control Program should be involved any time Federal agencies respond to a radiological incident in Nevada.

U.S. Environmental Protection Agency
Contact through the National Response Center 1 (800) 424-8802

EPA's Radiation and Indoor Environments National Laboratory in Las Vegas is one of two national EPA radiation labs. Radiological Emergency Response Team personnel based at these labs respond to emergencies throughout the country. EPA also provides assistance with the response and disposal for orphaned sources, and with environmental mitigation and remediation. EPA assistance is requested by contacting the National Response Center and working through the assigned On Scene Coordinator.

Other State and Local Authorities

State and local agencies such as law enforcement, fire department, and other health and safety authorities are vital to evaluate and/or control some radiological emergency details due to their unique local agency authority. These agencies are encouraged to contact the Radiation Control Program as soon a radiological incident is identified, and especially if the scope of the incident is expected to exceed local capabilities.

VI. INFORMATION REQUIRED BY THE DIVISION OF PUBLIC AND BEHAVIORAL HEALTH, RADIATION CONTROL PROGRAM FOR SUSPECTED RADIATION INCIDENTS

The following information should be obtained (to the extent possible without delaying the report) and provided to the Division of Public and Behavioral Health and Nevada Division of Emergency Management.

Nevada Radiation Control Program (24hr):	1(877) 438-7231
Nevada Division of Emergency Management:	(775) 687-0300
Nevada Highway Patrol (24 hr.):	(775) 687-0400

1. Caller's Information:
   Name:
   Location / Affiliation:
   Telephone Number: ( )

2. Location and description of the radiation incident:

3. Why does the caller think a radiation source or radiation hazard is involved?

4. Has the immediate area of the incident or radiation source been isolated? Barricaded? Roped-off? Otherwise restricted to prevent public entry?

5. Name of the person, trucking company, manufacturing plant, doctor's office, etc. associated with or cause of the incident? (including phone number)

6. What kind of radiation source is involved? (radioactive material, X-ray, other) How do you know this?

7. Any indication of the quantity of radioactive material or size of radiation source involved? (amount, size of packages, quantity identified on paperwork, etc.)

8. What type of package(s) is the radioactive material/source contained in? (55-gallon drums, boxes, vials, casks, etc.) What is the condition of the packages?

9. Any measurements from radiation detection instruments? Who took the measurements (name, agency and telephone number at responder location)? What instruments were used?

VII ACTIONS TO BE CONSIDERED BY STATE AND LOCAL EMERGENCY RESPONSE AGENCIES

The assistance to be given by trained local emergency first-response personnel such as law enforcement and fire department personnel in response to a radiological incident is determined by the scope and magnitude of the incident. It is not feasible to establish rigid procedures for response to all the incident variables but the following general guidelines will apply to most response requirements.

The emergency actions listed below should be taken by first-on-scene response personnel prior to the arrival of trained radiological emergency response personnel.

1. Rescue any injured victims and administer emergency first aid. Arrange for transport of seriously injured to the nearest medical facility. Inform ambulance and hospital personnel that patient may be radioactively contaminated. Wrap patient in blanket or other light-weight covering to minimize spread of possible radioactive contamination.

2. Fire response

3. If radiation sources are suspected, notify appropriate radiological emergency response agencies immediately in accordance with the emergency notification procedure in this document. Be prepared to provide the information requested on Page 4 of this document.

4. Keep the public away from the incident site if possible. Determine if other chemical or biological hazards exist and establish the appropriate exclusion zone and protective action distance as outlined in the North American Emergency Response Guidebook and other guidance documents.

   If it is determined that only radiation sources are involved and no other hazard or suspected radiological materials, establish an exclusion zone of 150 ft. or more as determined by trained personnel using appropriate, calibrated, operational radiation instruments to determine a radiation field of 2 milliroentgens per hour (2 mR/hr).

   For an incident involving spent nuclear fuel or nuclear weapons, a radius of approximately 1,000 feet or more may be appropriate if a shipment has been opened or until qualified radiation measurements can be made.

   Avoid handling debris except to remove injured victims. Restrict public access until the extent of radiation hazard, contamination, etc. is known.

5. Obtain names and addresses of personnel involved in the incident and other response individuals. Detain and isolate any personnel who may have been exposed to the radiation hazard if they are not significantly injured (requiring evacuation to medical facilities). These uninjured persons may provide important information concerning the incident and must be surveyed for contamination radioactive material before release to return to work or home.

6. Extinguish fires from upwind and assume the fires involve toxic chemicals and/or radioactive materials until confirmed by radiological staff to be absent. Avoid fumes, smoke, or dust associated with the incident as you would with any fire involving unknown hazards. Segregate equipment and clothing used at the fire until monitored for radioactive contamination before departure from the incident scene.

7. If the incident involves a transportation route or vehicles are involved, detour traffic around the incident site. Minimize movement of vehicles involved in the incident when clearing the right-of-way. Prevent passage of personnel or vehicles through the incident area until it has been surveyed and released by radiological personnel for radioactive contamination.

8. Do not eat, drink, or smoke in the area of the incident. Outside of the incident area, take care to not consume food or water that may have been in contact with material from the incident area.

9. Conduct radiation contamination surveys only if qualified to make radiological evaluation of the incident site. Advise the incident commander of suspected radiation contamination or otherwise be prepared to advise trained radiological emergency response agencies upon their arrival at the scene.

10. If radioactive contamination is confirmed, advise participating on-scene authorities of the need to implementing decontamination procedures of personnel, equipment and other resources at the site in order to limit the source and extent of contamination.

    If radioactive contamination of injured victims is suspected, advise ambulance drivers or anyone transporting injured victims and receiving hospital personnel that the accident victims should be treated as if contaminated until actual assessment or radiological or non-radiological (chemical) contamination can be made.

    If radiological contamination is not known, treat the victim as if non-radiological agents are involved until complete assessment can be made.

    In general, radiological contamination found during most incidents does not present an immediate life-threatening condition. Remember: Your personal effects, clothing, etc. can be recovered or replaced if they are subjected to radioactive contamination; your lack of life-saving actions can never save someone from death.

    *****Any vehicle involved in the incident or that transports contaminated patients must be surveyed and released by the Radiation Control Program.

VIII. NEVADA HOSPITALS WITH LIMITED RADIOLOGICAL ASSISTANCE SUPPORT

The Nevada hospitals listed below have medical programs which may use radioactive materials including personnel and equipment that may be helpful to determine if the injured accident victims are contaminated with radioactive materials.

These facilities can be contacted for radiological assistance during an incident if injured victims will be transported for treatment or if the Radiation Control Program or other radiological assistance cannot be obtained to assist at the scene of the incident. Bear in mind these resources may only be practical if contaminated accident victims are transported to that facility. You should ask to speak to someone in the nuclear medicine or radiology department or emergency room if you decide to contact the facility for assistance at the hospital. It is suggested that contacting these facilities in the response planning phase prior to actual need during an incident would provide the best information to your agency.

LAS VEGAS

University Medical Center, 1800 W. Charleston Blvd (702) 383-2000
Sunrise Hospital Medical Center, 3186 S. Maryland Pkwy (702) 731-8000
Valley Hospital Medical Center, 620 Shadow Lane (702) 388-4000
Desert Springs Hospital, 2075 E. Flamingo Road (702) 733-8800
Summerlin Hospital Medical Center, 655 Town Center Drive (702) 233-7000
Mountain View Hospital Medical Center, 3100 N. Tenaya Way (702) 255-5000
Southern Hills Hospital Medical Center, 9300 W. Sunset Road (702) 880-2100
St. Rose Dominican Hospital San Martin, 8280 W. Warm Springs (702) 492-8000
Centennial Hills Medical Center, 6900 N. Durango Dr (702) 835-9700
Spring Valley Hospital Medical Center, 5400 S. Rainbow Blvd (702) 853-3000

NORTH LAS VEGAS

North Vista Medical Center, 1409 E. Lake Mead Blvd (702) 649-7711
VA Medical Center Mike O'Callahan Facility, 4700 N. Las Vegas Blvd (702) 653-2260

HENDERSON

St. Rose Dominican Hospital De Lima Campus, 102 E. Lake Mead Dr (702) 564-2622
St. Rose Dominican Hospital Siena Campus, 3001 St. Rose Pkwy (702) 616-5000

BOULDER CITY

Boulder City Hospital, Inc., 901 Adams Blvd, (702) 293-4111

RENO

Renown Medical Center, 77 Pringle Way (775) 328-5638
CHW St. Mary's Regional Medical Center, 235 W. Sixth St (775) 789-3177
VA Medical Center, 1000 Locust (775) 786-7200
South Meadows Medical Center, 10101 Double R Blvd. (775) 982-7000

SPARKS

Northern NV Medical Center, 2375 E. Prater Way, (775) 331-7000

CARSON CITY

Carson-Tahoe Regional Medical Center, 1600 Medical Parkway, (775) 445-8000

ELKO

Northeastern Nevada Regional Hospital, 2001 Errecart Boulevard, (775) 331-7000

FALLON

Churchill Community Hospital, 801 E Williams Ave., (775) 423-3151

IX. OTHER EMERGENCY PLANS

The following emergency plans and other documents are useful referenced for response to radiological incidents:

1. State of Nevada Comprehensive Emergency Management Plan

2. State of Nevada Hazardous Materials Emergency Response Plan

3. National Response Plan

4. 2012 Emergency Response Guidebook (ERG 2012)

5. CRCPD Handbook for Responding to a Radiological Dispersion Device