Biennial Report of the

Nevada Bureau of Mines and Geology

2004

Nevada Bureau of Mines and Geology

Jonathan G. Price, State Geologist and Director

Scientific Research Staff

Economic Geology, Geologic Mapping, and Geologic Framework

Stephen B. Castor, Research Geologist - mineral deposits & mineralogy
James E. Faulds, Research Geologist - structural geology, tectonics, & paleomagnetism
Larry J. Garside, Research Geologist - volcanic stratigraphy & energy resources
Christopher D. Henry, Research Geologist - volcanic stratigraphy & geochronology
John Muntean, Research Economic Geologist/Assistant Research Professor – joins staff on 1 January 2005

Geologic Hazards, Engineering Geology, and Geophysics

John W. Bell, Research Engineering Geologist - Quaternary stratigraphy & urban geology
Geoffrey Blewitt, Research Professor - geodesy & geodynamics
Corné Kreemer, Postdoctoral Research Fellow – geodesy & geodynamics
Hans-Peter Plag, Research Professor – geodesy & geodynamics
William Hammond, Assistant Research Professor – geodesy & geodynamics
Craig M. dePolo, Research Geologist - earthquake geology & neotectonics
P. Kyle House, Research Geologist - fluvial geomorphology & paleohydrology
Alan R. Ramelli, Research Geologist - neotectonics & Quaternary stratigraphy

Environmental Geology and Hydrogeology

Paul J. Lechler, Chief Chemist/Geochemist - analytical geochemistry & precious metals
Lisa Shevenell, Research Hydrogeologist - hydrogeology & geothermal resources

Science Education

Daphne D. LaPointe, Research Geologist - science education & mineral deposits

Support Staff

Cartography and Publications Support

Elizabeth Crouse, Publication Manager & Chief Cartographer - cartography & publishing
Christine Arritt, Cartographer – cartography, GIS, & drafting
Jack Hursh, Jr., Cartographer - drafting & publication design
Gary Johnson, Information Systems Specialist - GIS & systems administration
Jennifer Mauldin, Cartographer – cartography, drafting, & publication design
Kris R. Pizarro, Cartographic Supervisor - cartography, drafting, & publication design
Richard O. Meeuwig, Editor - editing, publication design, & Web-site management

Analytical Laboratory

Mario Desilets, Chemist and Quality Assurance Officer - analytical geochemistry
Bret Pecoraro, Laboratory Assistant - technical support on analytical & geodetic equipment

Information and Publication Sales

David Davis, Geologic Information Specialist - Nevada geology & mining history
Ron Hess, GIS Supervisor - GIS, remote sensing, & systems administration
Charlotte Stock, Sales Manager - publication sales & administrative support

Administration

Terri M. Garside, Administrative Assistant IV - finance, contract management, & administration
Laura Ruud, Administrative Assistant II - administration & publication sales backup
vacant, Administrative Aid – administration & publication sales backup

For more information about NBMG, please check the Web (www.nbmg.unr.edu).

NEVADA BUREAU OF MINES AND GEOLOGY

OPEN-FILE REPORT 2004-2

Biennial Report of the Nevada Bureau of Mines and Geology

2004

Jonathan G. Price
State Geologist and Director

PREPARED FOR

The Board of Regents of the
University and Community College System of Nevada

Contents

Cover photograph:

Mount Rose, Washoe County, in the background, and the Steamboat Springs geothermal area in the foreground (photograph by Jack Hursh).

Biennial Report
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EXECUTIVE SUMMARY

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 University and Community College System of Nevada, 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.

NBMG Research Programs Addressing Critical Issues Facing Nevada

Urban Growth - Natural Hazards and Economic Stability

- Earthquakes and volcanic hazards
- Floods
- Subsidence and fissures due to groundwater withdrawal
- Swelling and collapsing soils, landslides, and other ground failures

Mineral, Energy, and Water Resources Vital to Economic Expansion

- Precious metals
- Base metals
- Industrial minerals, including construction raw materials
- Geothermal energy
- Petroleum and natural gas
- Groundwater resources

Environmental Concerns

- Future of pit-lake water quality and other aspects of modern mining
- Mercury and other chemical hazards from historical mining
- Groundwater quality
- Radon in air
- Nuclear waste

This report provides details on the activities of NBMG scientists and support staff during the past two years. The University of Nevada, Reno is strategically planning for the future, and this report incorporates key elements of NBMG's strategic plan for the next five to ten years. As indicated in the lists of publications, research grants, and other professional activity, NBMG has been highly productive and expects to be even more valuable to the State of Nevada in the future. Recent personnel additions include internationally renowned scientists, who make NBMG’s geodesy team one of the foremost in the nation. In accordance with Nevada Revised Statute 514.070, which calls for a biennial report on NBMG activities, it is my pleasure to transmit this report on behalf of the NBMG staff.

Jonathan G. Price
State Geologist and Director

INTRODUCTION

NBMG scientists conduct research and publish reports on mineral and energy resources, engineering geology, environmental geology, earthquakes and other hazards, groundwater, and geologic mapping in Nevada. The maps and geologic reports produced by NBMG provide basic information used by a broad spectrum of individuals, including engineers involved in construction, conservationists, exploration geologists, miners, highway planners, urban planners, historians, students, professors and K-12 teachers, tourists, and Nevadans enjoying outdoor recreation.

In addition, NBMG provides special services in the areas of analytical geochemistry and assay standards, mineral and rock identification, sample curation, earth-science education and in-service teacher training, continuing education for professional geoscientists, geologic and geotechnical information, mineral- and energy-resource information, geographic information systems, electronic databases, and historical information, particularly regarding mining and natural hazards. NBMG works closely with many local, state, and federal agencies. Considerable information about NBMG can be found on the Web (www.nbmg.unr.edu).

Major research projects are being conducted throughout Nevada. Geologic maps are being produced in areas that will be undergoing urban and suburban development, in areas where environmental concerns are most critical, and in areas where the potential is high for the development of mineral and water resources. It typically takes one to two person-years of effort to complete each 7.5-minute (1:24,000-scale) quadrangle. These maps provide the basis for nearly all geological research and for many engineering applications. Significant hazards in southern Nevada include flash floods, subsidence and related open cracks in the ground (fissures), swelling and collapsing soils, and earthquakes. In northwestern Nevada, earthquake, landslide, flood, and soil-condition hazards dominate, but other concerns, including locally high concentrations of naturally occurring radon and arsenic, are also best understood from a basis of geologic maps. Geologic mapping in the Humboldt River basin is contributing to knowledge about how the river has responded to past changes in climate and stream flow, which is important information in understanding how mine dewatering may affect the river and local ecology. Geologic mapping in northeastern Nevada is also revealing much about the origin of the gold deposits that have made Nevada the nation's foremost state in mineral production and the United States the second leading producer of gold in the world.

Research on land subsidence in Las Vegas Valley continues to provide valuable information about the rates of subsidence resulting from groundwater withdrawals and the development of fissures that can cause considerable damage to buildings. NBMG researchers, in collaboration with other experts, are using some of the most current technologies to attack this problem—geodetic measurements using the global positioning system (GPS) and interferometry using synthetic aperture radar (InSAR), a remote-sensing technique. NBMG is also evaluating concerns regarding subsidence and fissures in other desert valleys, where groundwater is being pumped to supply the needs of expanding populations or for mines.

NBMG and Nevada Seismological Laboratory scientists assess earthquake hazards throughout the State. NBMG geologists evaluate the geologic record for evidence of prehistoric earthquakes. There is abundant evidence that nearly all parts of Nevada have experienced earthquakes with magnitudes in excess of 6.5 during the last several hundred thousand years. NBMG's research complements the work of the Nevada Seismological Laboratory, which monitors earthquakes ranging from magnitudes less than one to the largest earthquakes in the world. From historical and instrumental records, we know that Nevada experiences a magnitude 7.0 or greater earthquake about once every 30 years. The largest earthquakes yet recorded in the State, the magnitude 7.3 to 7.8 event in Pleasant Valley near Winnemucca, occurred in 1915. The last magnitude 7 earthquake was at Fairview Peak near Fallon in 1954.

Floods along major streams and flash floods along normally dry washes are all too common phenomena in Nevada. NBMG research is helping to understand the frequency and severity of past floods. Efforts are underway in southern, northwestern, and north-central Nevada to determine the timing, magnitude, and frequency of these events.

Geological aspects of waste disposal are being addressed with the aid of geologic maps, which are essential in understanding groundwater flow at and away from all sites, including landfills and radioactive waste sites. Other important considerations regarding nuclear waste issues that are being addressed by NBMG investigations include tectonic strain and related earthquake and volcanic hazards and the potential for mineral-resource development.

Mineral-resource assessments are routinely needed by federal agencies with land-management responsibilities. NBMG scientists with expertise in economic geology have contributed to resource assessments by the Bureau of Land Management, Department of Defense, Department of Energy, and Fish and Wildlife Service. NBMG has also evaluated environmental concerns about mining, such as potential acid-mine drainage and associated release of potentially toxic elements from abandoned and inactive mines; mercury pollution from the early days of mining on the Comstock and elsewhere, when amalgamation was the preferred method of extracting gold and silver from the ores; and predicting the future chemistry of pit lakes when modern-day open pits fill with water after mining stops.

NBMG publishes many maps and reports that assist in the exploration for and environmentally sound development of mineral, energy, and water resources. NBMG publishes geologic maps that are produced not only by NBMG geologists but also by geologists from industry and at universities throughout the country. The maps and reports are reviewed by peers with knowledge about the local geology.

NBMG scientists also routinely publish in peer-reviewed, internationally recognized scientific journals. NBMG scientists have fine reputations within the scientific community, and several have won awards for their extraordinary contributions. NBMG's research projects are led by teams with broad expertise in the geological sciences and geography. The geodesy team has made significant contributions to global geophysics and space science while also focusing on issues critical to Nevada. The scientists' efforts are supported by an excellent staff in the areas of cartography, drafting, geographic information systems (GIS), editing, publication design, publication sales, information, technology, finance, and administration.

NBMG has leadership roles in several statewide efforts. NBMG, along with the Nevada Seismological Laboratory, provides operational support for the Nevada Earthquake Safety Council (with funding from a Federal Emergency Management Agency grant that is passed through the Nevada Division of Emergency Management). The Nevada Earthquake Safety Council facilitates public input, develops consensus about seismic issues within the public and private sectors, and is the public advisory body for State seismic policy and the Nevada Earthquake Risk Reduction Program of the Division of Emergency Management. The Board of Directors of the Council, which votes on policy recommendations, has 22 members, from both southern and northern Nevada, representing business and industry; city, county, and state agencies, including the Assembly and Senate; geosciences; engineering; community organizations; universities; building officials; insurance; and primary-secondary education. The Council has made significant progress in improving earthquake awareness and preparedness, largely through a number of activities supported by NBMG and the Seismological Laboratory.

The Director, Jon Price, chairs the State Mapping Advisory Committee (SMAC), and NBMG's Geographic Information Systems (GIS) Supervisor, Ron Hess, serves as its executive secretary. In the early 1980s the Governor named the NBMG Director as the chair of SMAC. SMAC provides input to the United States Geological Survey on issues related to updating topographic maps, digital map products used in GIS, and geologic mapping. The Geologic Mapping Subcommittee of SMAC helps set priorities for geologic mapping according to the National Cooperative Geologic Mapping Program. Membership in

SMAC is open to Nevada representatives of local, state, and federal agencies, universities, and individuals from the private sector with interests in mapping. SMAC's efforts in coordinating requests to the U.S. Department of Interior have helped make many new digital products available, particularly in and near urban areas of southern and northern Nevada and in the Humboldt River basin.

Jon Price also chairs the Nevada Hazard Mitigation Planning Committee, which advises the Division of Emergency Management on the allocation of funds set aside by the Federal Emergency Management Agency for mitigation of future disasters. Because NBMG has considerable expertise in geological hazards (particularly floods, earthquakes, landslides, subsidence, and other unstable ground conditions), NBMG has much to contribute to the efforts of reducing risks from natural disasters. Jon Price and Ron Hess are also serving on an ad hoc committee that is advising the Division of Emergency Management on writing a new plan as required for federal emergency assistance and funding to reduce the risks from future disasters.

The Nevada State Board on Geographic Names, which was established by the Legislature to coordinate and approve geographic names within the State for official recommendation by the United States Board on Geographic Names, is chaired by Susan Tingley, NBMG's Emeritus Publication Manager and Chief Cartographer. The State Board has representation from NBMG, faculty of the University of Nevada, Reno and the University of Nevada, Las Vegas, the State Library and Archives, State Department of Transportation, State Department of Conservation and Natural Resources, Nevada Historical Society, U.S. Bureau of Land Management, U.S. Forest Service, and the Inter-Tribal Council of Nevada, Inc. Officially recognized geographic names must be approved by both the State and United States Boards.

STATUTORY MANDATES

Please refer to Appendix B for the wording of NBMG's statutory mandates under NRS 514 (establishing NBMG and its mission), NRS 396 (concerning the analysis of ores, minerals, soil, and water submitted by residents of Nevada), NRS 327 (concerning the Nevada State Board on Geographic Names), NRS 519A (concerning fees collected by the Nevada Division of Environmental Protection to fund cooperative agreements between NBMG and the U.S. Geological Survey), NAC 522 (concerning responsibilities to archive samples and records from oil and gas wells), NAC 534A (concerning responsibilities to archive samples and records from geothermal wells), and 43 USC Sec. 31c (concerning requirements for participation in the National Cooperative Geologic Mapping Program).

Addressing Nevada's Critical Needs - Economic Development

Geologic maps and related reports on applied research are excellent incentives for economic development. As an example, geologic mapping and related interpretation of the regional geological structures were an integral part of the discovery of the Carlin gold deposit in 1961. In the last twenty years, mining companies in Nevada have produced tens of billions of dollars worth of gold and silver from deposits of this type and have directly and indirectly provided high-paying jobs for tens of thousands of Nevadans. There is still much mineral wealth to be found in Nevada, particularly buried under volcanic rocks and alluvium in basins between the mountain ranges. In 1988, we estimated that the undiscovered mineral resources in Nevada were likely to have a value in the range of $120 billion to $1.2 trillion, and those figures still provide a reasonable estimate of the untapped mineral wealth of Nevada. In early 2002 mines on the Carlin trend, a 5- by 40-mile mining district in Elko and Eureka Counties in northeastern Nevada, reached 50 million troy ounces of gold production, a remarkable achievement that places this district among the top four gold-mining areas in the world.

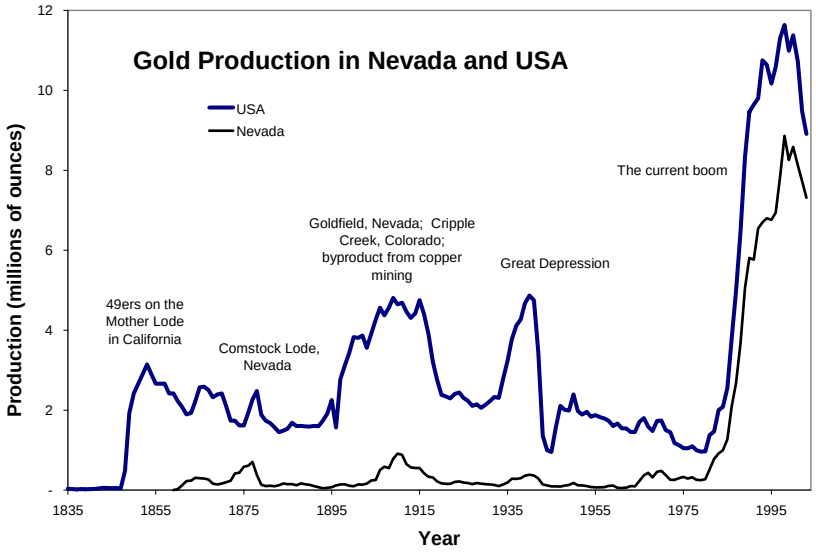
Geologic maps in urban areas help businesses avoid unstable areas (such as active faults and locations prone to liquefaction during earthquakes, flash floods, landslides, subsidence, and swelling soils) and help

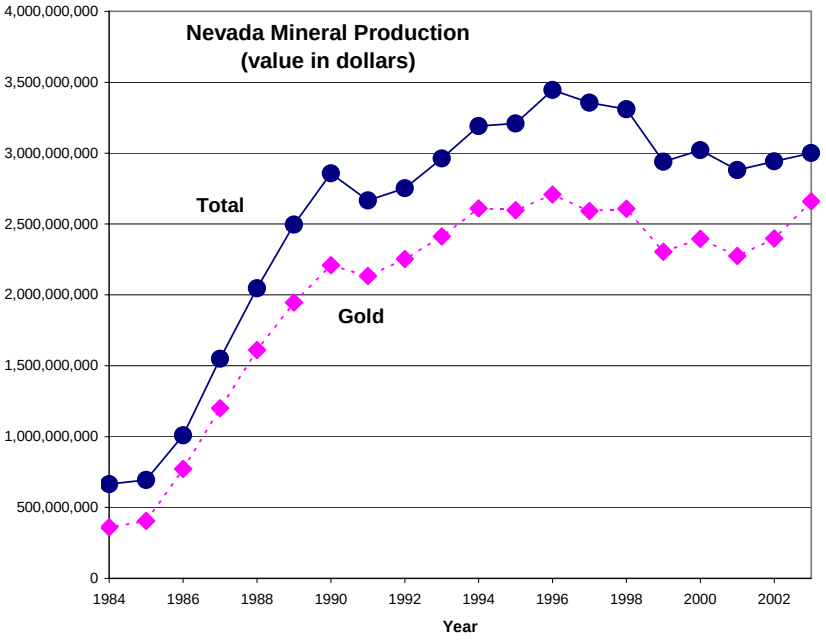
to protect valuable groundwater resources. Approximately 20% of the State is geologically mapped at a scale that is adequate for most applications in mineral, energy, and water resources; hazards; and environmental protection. At our current rate of production, including NBMG programs that encourage more geologic mapping by individuals from the U.S. Geological Survey, universities, and the private sector, we have several decades of work ahead of us in geologic mapping alone. A fact sheet explaining the work in Nevada through the National Cooperative Geological Mapping Program is appended at the end of this report.

Another activity that relates to economic development is the storage of records and rock and ore samples from various locations throughout the state. These are exceptionally valuable, in some cases practically irreplaceable, samples needed in exploration for mineral, oil and gas, geothermal, and groundwater resources. Through regulations of the Commission on Minerals Resources and the Division of Minerals, NBMG stores cuttings, core, and paper records from oil and gas and geothermal wells drilled in Nevada. NBMG also stores selected, representative samples of ores and typical rocks from active and inactive metal and industrial mineral mines. Recognizing the need for low-cost storage space, thanks largely to the efforts of Steve Castor and Bret Pecoraro of the NBMG staff, NBMG has eight containers for storage of materials on University land at Stead. David Davis, NBMG Geologic Information Specialist, is overseeing the shipment of infrequently used samples to Stead. NBMG is merging its electronic database on samples with that of the W.M. Keck Museum at the Mackay School of Earth Sciences and Engineering.

An exciting area for NBMG has been the move toward making information available free on line. We do not see the end of the era of paper maps and reports, but we do see tremendous benefits to an expanding array of users who get information on the Web. Thanks in large part to a generous donation from Mrs. Ann Burgess, the Jay A. Carpenter Fund was established in honor of her grandfather, former Director of the Nevada Bureau of Mines and Geology. This donation is being used to help convert large maps and other documents in the NBMG Information Office files into digital formats for posting on the Web. The information helps stimulate exploration for mineral and energy resources and is useful in a wide array of environmental and public safety applications.

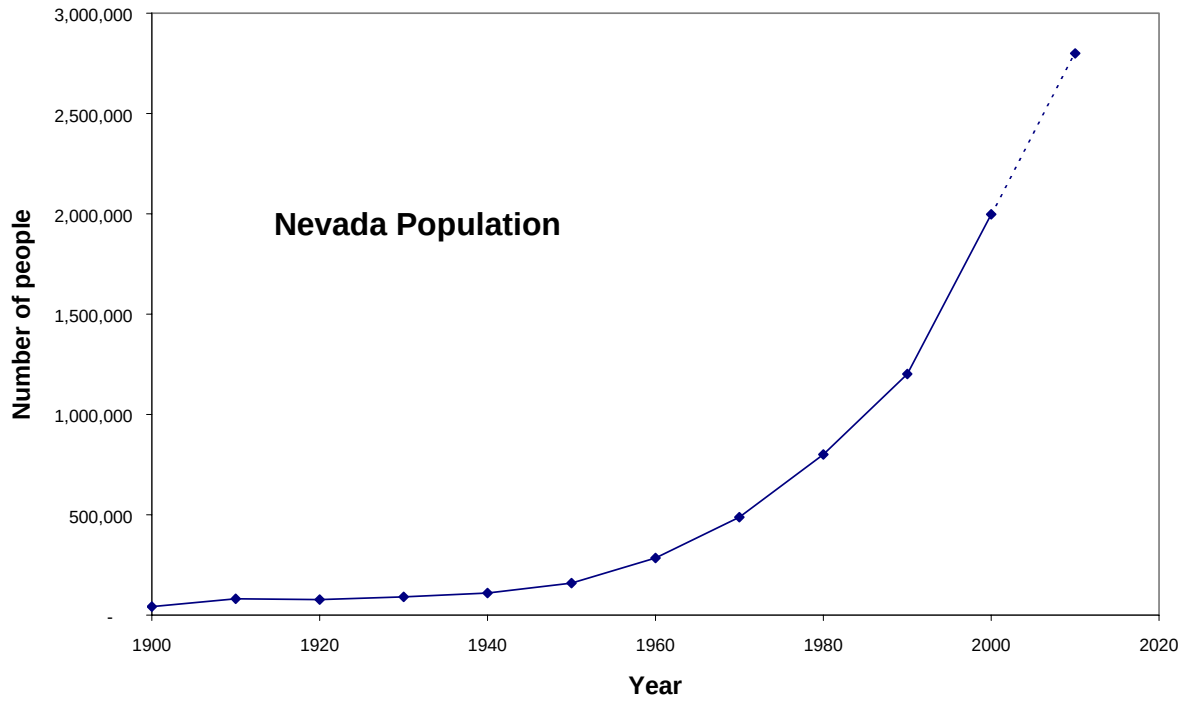
We are in the midst of the biggest gold-mining boom in American history. Nevada accounts for approximately 80% of current annual production of gold in the United States and nearly 10% of the world production. Value of mineral production in Nevada is annually about $3 billion. (Data are from NBMG, the Nevada Division of Minerals, and the U.S. Geological Survey.) A resurgence in the price of gold has resulted in increased exploration activity, which should help sustain the boom for at least 20 more years.


Gold Production in Nevada and USA
USA
Nevada
Production (millions of ounces)
Year
49ers on the Mother Lode in California
Comstock Lode, Nevada
Goldfield, Nevada; Cripple Creek, Colorado; byproduct from copper mining
Great Depression
The current boom
12
10
8
6
4
2
-
1835
1855
1875
1895
1915
1935
1955
1975
1995


Nevada Mineral Production
(value in dollars)
Total
Gold
Year
4,000,000,000
3,500,000,000
3,000,000,000
2,500,000,000
2,000,000,000
1,500,000,000
1,000,000,000
500,000,000
0
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002

Addressing Nevada's Critical Needs - Natural Hazards and Economic Stability

NBMG's urban-area geologic hazard investigations, particularly studies of earthquake hazards, land subsidence due to groundwater withdrawal, and flash-flood hazards, help all businesses be better prepared for natural disasters. Nevada's gaming economy would suffer greatly if we were not able to rapidly recover from a major disaster, such as an urban earthquake. NBMG goes well beyond the identification of geologic hazards on maps and in technical reports; we also publish planning scenarios for major disasters and a series of maps, pamphlets, brochures, and Web pages geared toward the general public. As an example, since its publication in 1996, NBMG Special Publication 20 (*Planning Scenario for a Major Earthquake in Western Nevada*) has been used repeatedly in emergency management, response, and recovery exercises by local, state, and federal officials. The probability of a magnitude 6 or greater earthquake occurring in the Reno-Carson City area within the next 50 years is significant - between 34 and 98%. Another major disaster for which we can be better prepared is flooding on alluvial fans. As Nevada's population has grown, much of the development has moved onto alluvial fans, unfortunately not always with full knowledge of the flash-flood hazards. Geologic mapping and careful evaluation of the frequencies and extents of past floods seen in the geologic record are critical to reducing the risks from these hazards.



Nevada's population will continue to rise. This will place demands on geological and other natural resources and heighten concerns regarding risks from natural hazards and environmental issues, particularly in urban areas. (Data are from the U.S. Census Bureau; the projection to 2010 is from the Nevada State Demographer.)

Addressing Nevada's Critical Needs - Education and Services for the Public

NBMG produces many scientific publications that are used in schools. A part-time, only partially State-funded effort at NBMG is dedicated to getting these materials in the hands of teachers. Sometimes the materials are translated to formats that are more useful in the classroom, including posting them on the Web. NBMG staff members have been involved in the writing of the Nevada and National Science Education Standards, and we produce standards-based content material that can be used in schools. NBMG staff members regularly participate in the highly effective and popular teacher-education workshops that are sponsored by the Nevada Mining Association and jointly supported by the Nevada Division of Minerals. In addition, NBMG staff members help coordinate field trips and other activities for the public and for K-12 teachers and students during Earth Science Week (second full week of October) and Earthquake Awareness and Preparedness Week (third week of February), and staff scientists often judge science fairs. NBMG also produces some publications specifically for the general public, such as our popular field guides on the geology and natural history of the Las Vegas, Reno-Carson City-Lake Tahoe regions, and U.S. Highway 50. A similar book on U.S. Highway 93 is in the early stages of preparation, and long-term plans include books for Highways 95 and 6 and Interstate 80.

NBMG has direct contact with the public through several venues, including thousands of customers each year visiting its Publication Sales Office and its Information Office (open Monday through Friday), participation in the exhibitions, Earth Science Week, Earthquake Awareness and Preparedness Week, and lectures at local schools and civic organizations. Frequently, professional staff members assist individual citizens with issues related to their personal property, such as location of groundwater wells, septic systems, faults, or soil stability. Increasingly, NBMG is reaching more of the public through its Web sites. Because many of the products that NBMG produces are heavily used by geological and engineering professionals, NBMG staff also make good efforts to participate in activities of the geological and professional organizations in the State, particularly the Geological Society of Nevada, Nevada Petroleum Society, Geothermal Resources Council, and local meetings of the Association of Engineering Geologists, American Institute of Professional Geologists, and Society for Mining, Metallurgy, and Exploration.

The following table provides some measures of workload in sales of publications (according to NRS 514.070), analytical services (according to NRS 396.600), and numbers of customers served by the NBMG Information Office and by NBMG scientists.

Year	Publication Sales[1]	Analytical Services	Information Office Customers Served[3]		
			Walk-in	Telephone[2]	E-mail
1998	$134,987	$20,655	1,067	1,423	142
1999	128,816	15,843	1,166	1,555	139
2000	160,240	15,116	1,051	1,401	232
2001	150,143	41,181	1,002	1,336	459
2002	130,675	65,399	905	1204	271
2003	151,321	27,910	857	1140	257

[1] These figures include sales of NBMG maps, bulletins, reports, electronic files on discs, and photocopies of open-file reports, topographic maps, and related items. The figures are updated from the last report using NBMG records
[2] Counts of walk-in customers and e-mail inquiries are kept; telephone inquiries are estimated to be about four for every three walk-in customers. Records of numbers of informational inquiries directed to individual scientists are not kept; these are estimated to be approximately 550 per year.
[3] Numbers do not reflect customers who are increasingly serving themselves through the NBMG Web sites.

NBMG has developed a user-friendly site for sale of publications on the Web (at www.nbmg.unr.edu/sales.htm). Considerable information for teachers, the general public, and technical professionals is available for free on the Web. Many publications, including most new geologic maps and reports, are available in their entirety on the Web, and good progress is being made toward putting the

non-copyrighted items in the NBMG Information Office on the Web. NBMG does not make a profit on its publication sales; revenues generated from the sales go into a revolving fund that helps pay for the production, printing, and sales of future maps and reports.

BUDGET

Nearly half of the funds expended by NBMG come from the Legislature as part of the Statewide Program funding for the University of Nevada, Reno. The bulk of these funds covers salaries and fringe benefits for NBMG employees. The State does not provide a substantial amount of operating funds (about $42,357 per year), and the amount of money required to be returned for mandated salary savings was $38,730 for the fiscal year 2003-2004 and rises to $40,535 in fiscal year 2004-2005. This results in very little operating funds at the beginning of any fiscal year, unless someone is on sabbatical leave or there is a vacancy. In part because the workforce is quite stable and few employees leave before retirement, and because other employees cannot always fill in when vacancies do occur, this forces NBMG to seek external funds from a variety of grants and contracts to help pay for the essential work. Fortunately there are a number of opportunities for cost sharing with federal, state, and local agencies, such that generating sufficient external research funds has not been a large problem. Seeking grants and contracts is a significant duty of the Director and of many of the senior staff. The University provides support through its Office of Sponsored Projects Administration.

State-funded budget item	Fiscal year 2003-2004 budget
Professional	$1,052,479
Classified	396,773
Graduate Assistants	28,000
Fringe Benefits	339,813
Operating	42,357
Subtotal	1,859,422
- Mandated Salary Savings	-38,730
Total	1,820,692

STAFFING LEVELS AND CHANGES

As of July 1, 2004, NBMG has 12.31 faculty full-time equivalent positions (FTE), 9.29 classified staff FTE, and two half-time graduate research assistants funded by the State. An additional 4.69 faculty FTE, one postdoctoral researchers, 4.71 classified staff FTE, and generally between 5 and 15 undergraduate and graduate student assistants are covered by various grants and contracts, mostly from federal and local agencies plus some from state agencies and the private sector. Wages are competitive with those at comparable universities, and we have been able to attract a staff with excellent national and international scientific reputations. Turnover has been at an acceptable level; some, but few, staff members have left before retirement.

We are delighted to report the successful hiring of several new staff members this year.

Elizabeth Crouse started July 1 as our new Publications Manager and Chief Cartographer. Liz earned bachelor's degrees in geology and astronomy from the University of Kansas and has worked for the last eight years at the Kansas Geological Survey, most recently in geographic information systems and cartography. She supervises a staff of five, including Kris Pizarro, Gary Johnson, Jack Hursh, and our two new cartographic technicians - **Christine Arritt**, who has a BS in geology and has worked with the Oregon Department of Geology and Mineral Industries, and **Jennifer Mauldin**, who has an A.A. degree in graphic design and visual communication and is working on her bachelor's degree in graphic design.

John Muntean will be our new Research Economic Geologist. John has approximately 14 years of

experience in the mining industry and has most recently been working on Carlin-type gold deposits for Placer Dome. He earned his Ph.D. in geology from Stanford (dissertation: “Magmatic-Hydrothermal Gold Deposits of the Maricunga Belt, Northern Chile”), his M.S. from Michigan (thesis: Evolution of the Monte Negro Acid Sulfate Gold-Silver Deposit, Pueblo Viejo, Dominican Republic), and his B.S. from Purdue (senior thesis: Gold Mineralization in Proterozoic Shear Zones, Medicine Bow Mountains, Wyoming). John will finish a project with Placer Dome at the Getchell mine before joining our staff in January.

We have been gaining strength in the field of geodesy, primarily through the efforts of Geoff Blewitt and John Bell, who are applying global positioning system (GPS) and interferometric synthetic aperture radar (InSAR) techniques to such issues as earthquake and volcanic hazards, land subsidence due to ground-water withdrawal in urban and mining areas, geothermal resource assessment, and global-scale phenomena. Our three new hires in geodesy will make the University of Nevada, Reno geophysical-neotectonics-engineering geology team one of the best in the world. The Nevada Seismological Laboratory has extended adjunct status to our new faculty hires in geodesy.

Hans-Peter Plag joined our staff in July as Research Geodesist/Research Professor. Hans-Peter is a world-renowned geophysicist with over 16 years of experience. He earned his doctorate (dissertation: “A Regional Study of Norwegian Coastal Long-Period Sea-Level Variations and their Causes”) and master’s equivalent degrees at the Free University of Berlin. He joins us from the Geodetic Institute of the Norwegian Mapping Authority, where he has been the head of the Global Reference Section. From 1988 to 1997 Hans-Peter led a research group in global geodynamics at the University of Kiel in his native Germany.

William Hammond joined the NBMG geodesy team, also in July, as Research Geodesist/Assistant Research Professor. Bill earned his Ph.D. in geological sciences from the University of Oregon in 2000 (dissertation: "Dynamics, Flow and Melt Content of the Southern East Pacific Rise Upper Mantle from Teleseismic Tomography") and his B.A. in applied mathematics from the University of California, Berkeley. He comes to us from the U.S. Geological Survey, where he as been working with the Earthquake Hazards Team on GPS, seismic tomography, and geodynamics with applications in the Basin and Range Province and nearby. Bill is an energetic, bright scientist with great enthusiasm for working in Nevada.

Corné Kreemer also joined the NBMG geodesy team in July, as a Postdoctoral Research Fellow. A native of The Netherlands, he earned his Ph.D. in geosciences in 2001 from the State University of New York – Stony Brook (dissertation: “A Global Strain Rate Model”) and his M.S. in geophysics at Utrecht University (thesis: “Plate Boundary Deformation in the Explorer Region”). Corné has already established himself as an accomplished scientist with his work on global and regional strain.

We are also pleased to announce that **Susan and Joe Tingley** have been awarded emeritus status and have agreed to stay with NBMG as volunteers with the State Board on Geographic Names (as chair and secretary, respectively), to help with annual publications on the Nevada mineral industry, and to assist with various other projects that they find enjoyable, such as geological and historical road logs for the general public. We wish **Robert Chaney**, an eight-year cartographic technician and GIS specialist, the best in his new ventures in Birmingham, where his spouse accepted a great job with the medical school at the University of Alabama. We also welcome the addition of **Alisha Howard** to the NBMG administrative staff. We look forward to her helping to lighten the work for Laura, Charlotte, and Terri.

A list of current NBMG staff, divided by major areas of responsibility and annotated with principal areas of expertise, is given below. Listed in parentheses are the amounts of State-funded FTE for each person. Individuals whose salaries come entirely from grants and contracts are listed with 0 FTE.

Nevada Bureau of Mines and Geology

Jonathan G. Price, State Geologist and Director

Scientific Research Staff

Economic Geology, Geologic Mapping, and Geologic Framework

Stephen B. Castor, Research Geologist - mineral deposits & mineralogy
James E. Faulds, Research Geologist - structural geology, tectonics, & paleomagnetism
Larry J. Garside, Research Geologist - volcanic stratigraphy & energy resources
Christopher D. Henry, Research Geologist - volcanic stratigraphy & geochronology
John Muntean, Research Economic Geologist/Assistant Research Professor – joins staff on 1 January 2005

Geologic Hazards, Engineering Geology, and Geophysics

John W. Bell, Research Engineering Geologist - Quaternary stratigraphy & urban geology
Geoffrey Blewitt, Research Professor - geodesy & geodynamics
Corné Kreemer, Postdoctoral Research Fellow – geodesy & geodynamics
Hans-Peter Plag, Research Professor – geodesy & geodynamics
William Hammond, Assistant Research Professor – geodesy & geodynamics
Craig M. dePolo, Research Geologist - earthquake geology & neotectonics
P. Kyle House, Research Geologist - fluvial geomorphology & paleohydrology
Alan R. Ramelli, Research Geologist - neotectonics & Quaternary stratigraphy

Environmental Geology and Hydrogeology

Paul J. Lechler, Chief Chemist/Geochemist - analytical geochemistry & precious metals
Lisa Shevenell, Research Hydrogeologist - hydrogeology & geothermal resources

Science Education

Daphne D. LaPointe, Research Geologist - science education & mineral deposits

Support Staff

Cartography and Publications Support

Elizabeth Crouse, Publication Manager & Chief Cartographer - cartography & publishing
Christine Arritt, Cartographer – cartography, GIS, & drafting
Jack Hursh, Jr., Cartographer - drafting & publication design
Gary Johnson, Information Systems Specialist - GIS & systems administration
Jennifer Mauldin, Cartographer – cartography, drafting, & publication design
Kris R. Pizarro, Cartographic Supervisor - cartography, drafting, & publication design
Richard O. Meeuwig, Editor - editing, publication design, & Web-site management

Analytical Laboratory

Mario Desilets, Chemist and Quality Assurance Officer - analytical geochemistry
Bret Pecoraro, Laboratory Assistant - technical support on analytical & geodetic equipment

Information and Publication Sales

David Davis, Geologic Information Specialist - Nevada geology & mining history
Ron Hess, GIS Supervisor - GIS, remote sensing, & systems administration
Charlotte Stock, Sales Manager - publication sales & administrative support

Administration

Terri M. Garside, Administrative Assistant IV - finance, contract management, & administration
Laura Ruud, Administrative Assistant II - administration & publication sales backup
vacant, Administrative Aid – administration & publication sales backup

For more information about NBMG, please check the Web (www.nbmg.unr.edu).

RELATIONS WITH OTHER AGENCIES

There are no alternate providers of NBMG services. NBMG works closely with several other state agencies and with some federal and local agencies, but in all cases the programs of these agencies are complementary with those of NBMG and are not overlapping. The U.S. Geological Survey (USGS) also produces geologic maps, but their priorities are established by federal needs. NBMG works closely with the USGS through the State's Mining Cooperative Fund (see NRS 514.060 and NRS 519A.260), the National Cooperative Geologic Mapping Program (see 43 USC Sec. 31c), and, along with the Federal Emergency Management Agency and the Nevada Division of Emergency Management, the National Earthquake Hazards Reduction Program.

NBMG also works closely with the Nevada Division of Minerals. The Division of Minerals regulates drilling operations of oil, gas, and geothermal wells; administers a program to identify, rank, and secure dangerous conditions at abandoned mines; and manages the State reclamation performance bond pool. NBMG does none of these activities, but our programs are complementary. NBMG co-produces with the Division of Minerals annual mineral and energy production statistics, and we jointly support educational efforts regarding mineral and energy resources. We also have worked together on projects with the Western Governors Association regarding issues of abandoned mines. NBMG's role is in scientific research and related scientific data collection. NBMG also archives and makes available to the public records and samples collected from oil, gas, and geothermal wells regulated by the Division of Minerals (according to NAC 522 and NAC 534A).

NBMG's participation in several statewide bodies helps insure that there is no unnecessary duplication of services or efforts. The Nevada Earthquake Safety Council and the Nevada Hazard Mitigation Planning Committee include representatives from a wide range of state and local governmental agencies, nonprofit groups, and the private sector; NBMG's participation in these groups helps to coordinate efforts. In addition, NBMG has an advisory committee that includes representatives of several organizations with which we interact regularly.

NBMG works with the W.M. Keck Museum at the Mackay School of Earth Sciences and Engineering to further the collection of geological and mineralogical specimens and with the DeLaMare Library to improve the collection of published and unpublished information on the geology and mineral resources of the State (see NRS 514.040). NBMG scientists often volunteer to help with university classes and frequently help graduate students with supervision, advice, and financial support. Many graduate and undergraduate students gain practical experience through work on NBMG projects.

GOALS AND OBJECTIVES

From discussions that have been ongoing over the last four years, NBMG developed the following goals and objectives for the next five to ten years.

Earth-Science Research

Our goal is **to improve the quality of life of Nevada citizens by conducting applied and basic earth-science research that encourages economic development; minimizes losses to lives, property, and businesses from natural disasters; and protects the environment.** We strive to anticipate issues, such as new areas for urban growth and new waves of mineral exploration, before they arise. NBMG’s research productivity is measured in terms of publications and grants. Other measures include recognition from peers, such as honors and awards from scientific and professional organizations. In recent years, NBMG has become an important contributor to the University's grant and contract acquisition, mainly from governmental funds. We expect to contribute even more in this arena, and to develop additional

research programs that are supported by private industry. In addition to applied research, NBMG recognizes the need for basic research in earth sciences, particularly in Nevada, and our research objectives include both types of work. Part of this goal is to maintain high levels of significant research publications, including ones released by NBMG and ones in the broader scientific literature.

Specific objectives under this goal include the following:

- Accelerate the construction and completion of fully reviewed, published **geologic maps**. Geologic maps at various scales are needed to support resource exploration and assessment, research on natural hazards, hydrogeologic investigations, environmental work, and fundamental science. With total costs to adequately map a quadrangle being on the order of $120,000 each, the task is enormous. Nonetheless, by setting priorities with the help of the State Mapping Advisory Committee and other governmental and private groups, our goal is to continue to map, and to support mapping by others, in the highest priority areas. The ultimate objective of our geologic mapping efforts is to cover the entire state with 1:24,000-scale geologic maps. Publishing five new geologic maps per year would be a laudable accomplishment for a geological survey of our size.

- Expand programs to reduce risks from **natural hazards**, particularly earthquakes and floods, in urban and rural communities in Nevada. The compilation and public communication of information on geologic and environmental hazards in Nevada, particularly in metropolitan areas but also in small communities and rural areas, is an important responsibility. Although we have accomplished much, our goal is to do even more in the following areas: earthquake hazards, flood and landslide dangers, land subsidence and other engineering-construction problems, groundwater resources, and natural and human-induced geochemical hazards. Assistance in emergency planning and mitigation efforts in these areas is an important part of this responsibility. We expect to work closely with local governments in these efforts.

- Expand programs in **natural resources**. As mandated by the Nevada Legislature, NBMG intends to continue to provide information on the natural resources needed to sustain a well-diversified State economy. This includes research in economic geology for assessment and environmentally sound development of **metal and industrial mineral resources** in Nevada. Mining of metals and industrial minerals has been, and will continue to be, important to Nevada. Participation in the development of wise land-use decisions involving natural resources is part of this objective. We also plan to expand programs in **water quality and resources**, particularly as related to geological factors, such as natural contamination from mineralized areas and structural controls on the flow of groundwater. We are developing new programs in **energy resources**, with the intent of helping Nevada to be more secure in its production of electricity and other uses of energy. We are pleased that Lisa Shevenell has taken a leadership role, as Associate Director, with the Great Basin Center for Geothermal Energy at the University of Nevada, Reno. Research funded through this center will stimulate geothermal exploration and development in Nevada and nearby states. Opportunities exist for more NBMG involvement in assessing wind, solar, uranium, oil, and gas resources and for conducting research on these resources. High prices and recent discoveries of gas in Utah may prompt increased exploration for oil and gas in eastern Nevada. Our objective is to supply, in collaboration with other governmental agencies and industry, the information that is needed to develop these resources in environmentally and economically responsible ways.

- Develop **management structures for support staff** that facilitate improved service to NBMG researchers and the public. With funding from grants we are adding additional support staff.

- Develop **project and program teams** that facilitate building of NBMG research programs, creating opportunities for funding, and being prepared to respond to emerging issues. Our geodesy team, now with four professional positions, one technician, and several collaborators within and outside NBMG, is likely

to continue to expand in response to exciting scientific opportunities and applications in GPS and InSAR.

Geological Information

Our goal is to **make information regarding geological issues in Nevada available to the public via the Internet and other means.** We want to assure that the State of Nevada is adequately integrating **geographic and geologic information** into policy decisions and government programs. To assist in this effort, our objective is to develop a **digital information office** and work closely with the University of Nevada, Reno library, federal agencies, local and state agencies, and the Geographic Information Systems Subcommittee of the State Mapping Advisory Committee to provide easily accessible, publicly available digital products. Our current information office files are progressively being converted to digital format. With available budgets, it will take us several years and considerable expense to capture all our map and report data digitally. NBMG will also work closely with the W.M. Keck Museum at MSM to build and maintain useful **sample collections,** including samples from petroleum and geothermal wells (which we are required by State regulations to curate), mineral deposits, and characteristic altered and unaltered rocks from Nevada.

Earth-Science Education

Our goal is **to translate scientific information to help the public make informed decisions regarding resources, hazards, and the environment.** NBMG has had a long tradition of providing earth-science information to not only the geological and engineering communities but also to K-12 teachers, students, and the general public. In addition, we have participated with the University of Nevada, Reno Department of Geological Sciences and Engineering and external geoscience organizations in offering short courses for continuing education of professionals. The National Science Education Standards, which were published in 1996 by the National Research Council and are being integrated into Nevada curricula, call for placing earth sciences on equal footing with chemistry, physics, and biology. Our objective is to expand our programs in educational outreach. We will continue to work with the W.M. Keck Museum at the Mackay School of Earth Sciences and Engineering, the Nevada Mining Association, the Geological Society of Nevada, the Nevada Earthquake Safety Council, and the American Geological Institute's Earth Science Week in our K-12 and general public outreach efforts.

STRATEGIES TO REACH THESE GOALS AND OBJECTIVES

Most of these objectives require adding new faculty and/or support staff in the classified ranks. We think it appropriate for the University to ask for some of these additions to come from State funds. Two new positions per biennium would be realistic. The NBMG Strategic Plan, a document prepared for use within the University and frequently updated, contains specific requests for the upcoming fiscal biennium.

NBMG's level of staffing is not adequate to meet all the demands that we have for geologic maps and applied geologic research. NBMG could more effectively carry out its mission with the addition of several new positions in both research faculty and support staff. Specifically, we have immediate needs for additional staff in the following technical (both scientific and support) areas:

- earthquake geology and neotectonics (1 FTE or full-time-equivalent position) - to assure continuity in NBMG's highly successful efforts in earthquake preparedness, including outreach to the public and non-geoscience professionals; this position would interface closely with the Nevada Seismological Laboratory; currently most of the activity in this area is supported by grants and contracts; more work is needed in both southern and northern Nevada;
- geologic mapping, with an emphasis on Mesozoic and Paleozoic stratigraphy and structural geology (2 FTE) - to cover much of southern and eastern Nevada, including areas with potentials for oil and gas, mineral, and water resources;

geologic mapping, with an emphasis on hydrothermal systems (1 FTE) - to better assess mineral and geothermal resource potentials;
science education (0.69 FTE) - to dedicate a full position to the important function of translating applied research for more immediate use by the public;
geologic mapping, with an emphasis on Quaternary and Tertiary stratigraphy (2 FTE) - to stay ahead of expanding urban development, particularly in southern Nevada;
geological and geotechnical engineering (1 FTE) - to deal with urban-area geological hazards;
geographic information systems (1.47 FTE)- to build and link statewide databases and to assist in NBMG research;
remote sensing (1 FTE) - to assist in the next generation of geologic, mineralogical, and lithologic mapping and in emerging technologies, such as interferometry using synthetic aperture radar;
hydrogeology, with an emphasis on transport modeling, evaporation, and recharge (1 FTE) - to link with geological investigations that will help protect existing groundwater resources and find new ones;
geodesy (1 FTE) - to further build expertise in the exciting area of space geodesy, which has wide applications in geological hazards and weather (0.25 FTE was added in fiscal year 2004-2005, with the funds coming from savings upon the retirement of two faculty members);
cartography (1 FTE) - to stay just behind the cutting edge of technological developments in computer-aided drafting and map production; the current staff is highly productive but stretched to the limit (0.81 FTE was added in fiscal year 2004-2005, also with savings from retirements);
marketing and publication sales (1.51 FTE) - to better reach the public with NBMG's useful publications;
geophysics, with an emphasis on gravity and electromagnetic techniques (1 FTE) - to better model the three-dimensional structures in Nevada's complicated geology;
geophysics, with an emphasis on reflection seismic techniques (1 FTE) - to better image specific areas of interest, such as petroleum fields, major ore-deposit trends, and alluvial basins that supply most of the groundwater resources in the State;
geochronology, with emphasis on isotopic and paleontological approaches (2 FTE) - to assist geologic mappers and other researchers with unraveling geological histories;
limnology (1 FTE) - to study how the chemistry and habitat-supporting characteristics of natural lakes and man-made lakes (particularly pit lakes from mining) will change over time;
grants management (2 FTE) - to free up time for scientists to devote to applied research rather than spending as much time as we currently do with research-proposal generation, budgeting, monitoring, and contract reporting.

Setting priorities for these positions and for filling of vacancies as they occur is an ongoing process with input from NBMG staff, the NBMG Advisory Committee, University administrators, and representatives of local, state, and federal agencies and the private sector who have good ideas regarding needs and opportunities for applied geological research. The full needs outlined above would add 21.67 FTE to NBMG's staff; this would about double the number of positions at NBMG. Ideally, many of the new positions would be located in Las Vegas, where issues of urban growth are creating large demands for geologic maps and applied research. Appropriate operational, travel, communications, and facilities costs would need to be added along with the increases in FTE.

NBMG currently has an efficient, flat supervisory structure. The Director directly supervises all of the scientists who are faculty members and many of the classified staff members. A significant expansion in staff would require the delegation of more supervisory responsibility to others.

The objective to develop a fully digital information office will require a one-time investment of funds to digitize existing information on maps and in paper reports. Our current estimate of cost is about $100,000 to accomplish this task, in which one-of-a-kind maps and reports would be copied digitally and on microfiche (still the best medium for long-term storage, given the rapidly evolving media for digital storage and the need to periodically transfer digital data from old to new media). The donation for the Jay A. Carpenter Fund has helped us move forward on this goal. We are on track to complete digitization of most of the mining district files in 2004, but considerable work still needs to be done with other geological information, and donations of new information from consultants and companies are made annually. We feel that the backlog of work should be considered for one-time additional State funds in the

University's budget request.

We also recognize that major additions of research faculty and research-support staff are likely to come from soft money. An important strategy for increasing research funds is to keep attuned to opportunities for research funding from all major sources, including federal, state, and local agencies, industry, and private foundations. We will continue to do so.

PERFORMANCE MEASURES FOR NBMG

Reports, maps, and special publications produced by NBMG, including articles published in scientific journals and elsewhere by the NBMG staff, serve as the best performance indicators. These publications are the chief products of research. Other measures that could be used, such as the numbers of presentations made about NBMG research or the number of research grants or dollars received for research grants and contracts, are proxies for research productivity. Yearly totals of numbers of publications are not necessarily an ideal measure, however, because with a small staff, the workload can vary considerably from year to year as large projects start and finish. Therefore, averages over a number of years are better measures.

NBMG Publications Produced

Year	Geologic Maps	Yearly Totals[1]	Average (of past three years)	Number of scientists[2]	Average number of NBMG publications per scientist per year
1991	0	15		11	
1992	2	20		11	
1993	7	16	17	11	1.5
1994	4	12	16	11	1.5
1995	6	18	15	11	1.4
1996	3	16	15	11	1.4
1997	4	14	16	11	1.5
1998	5	26	19	11	1.7
1999	21	40	27	11	2.4
2000	8	25	30	11	2.8
2001	10	24	30	11	2.7
2002	3	17	22	11	2.0
2003	26	53	31	11	2.8

[1] Numbers of NBMG publications, including geologic maps, produced during that year.
[2] NBMG has had three to four additional scientists supported on grants and contracts each year. In recent years the number of State-funded scientists has been steady at eleven.

External Publications Produced by NBMG Scientists

Year	Yearly Totals	Average (of past three years)	Number of scientists	Average number of external publications produced per scientist per year
1991	52		11	
1992	52		11	
1993	49	51	11	4.6
1994	72	58	11	5.2
1995	54	58	11	5.3
1996	66	64	11	5.8
1997	76	65	11	5.9
1998	91	78	11	7.1
1999	75	81	11	7.3

2000	72	79	11	7.2
2001	56	68	11	6.2
2002	63	64	11	5.8
2003	70	63	11	5.7

Overall Productivity (Total number of publications per State-funded scientist)

	Average of past three years	Average number of publications (NBMG and external) produced per State-funded scientist per year
1993	68	6.2
1994	74	6.7
1995	74	6.7
1996	79	7.2
1997	81	7.4
1998	96	8.8
1999	107	9.8
2000	110	10.0
2001	97	8.6
2002	86	7.8
2003	94	8.6

With only 14 full-time scientists on the NBMG staff during 2002 and 2003 (only 11 of whom were funded by State appropriations and three of whom were funded by grants and contracts), NBMG has been highly productive. Measured on a per person basis, publication productivity is outstanding.

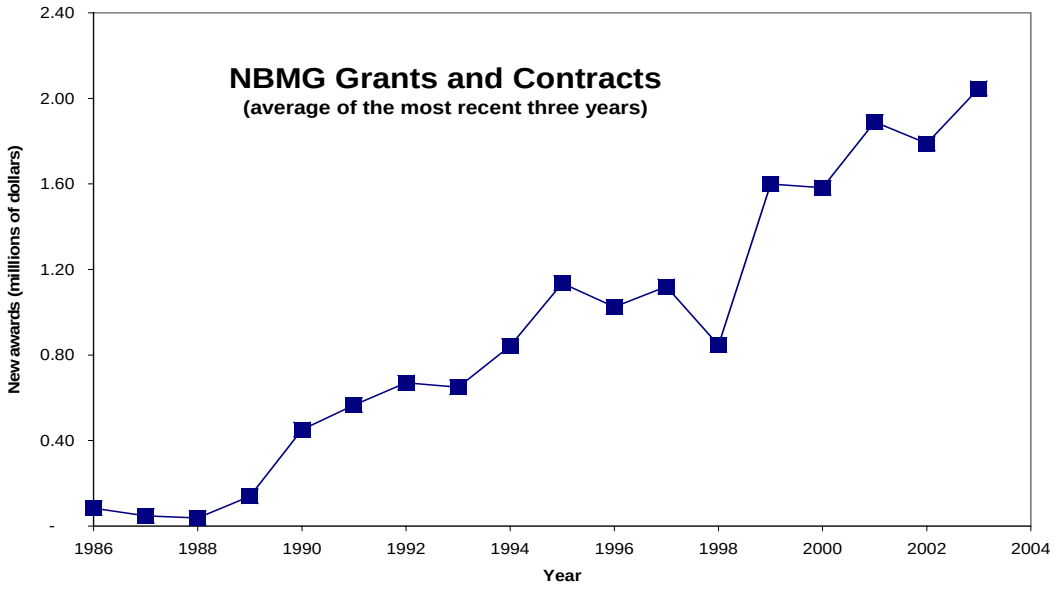
To collect new geological information and conduct geological research, operating money is needed. These funds pay for such expenses as fieldwork, base maps, aerial photographs, research equipment, and chemical analyses of rocks. Grants and contracts also pay salaries of additional researchers and support staff. NBMG also uses some grant funds and some donations to the University of Nevada, Reno Foundation to pay geologists outside the University to submit geologic maps to NBMG for review and publication. Grants and contracts bring new money into the Nevada economy, and they expand the State's research capabilities and increase knowledge about Nevada's geology; mineral, energy, and water resources; natural hazards; and environment. NBMG continues to provide many vital public services to the State with the help of these grants and contracts.

Research and Non-Research Grants and Contracts Awarded

	Number of Grants and Contracts	Total Awards	Average (of past three years)
1984	4	$182,389	
1985	3	37,970	
1986	3	32,790	$84,383
1987	3	74,450	48,403
1988	1	7,186	38,142
1989	7	337,658	139,765
1990	15	1,009,440	451,428
1991	4	351,298	566,132
1992	15	650,801	670,513
1993	23	944,687	648,929
1994	14	932,270	842,586
1995	32	1,529,343	1,135,433
1996	14	615,509	1,025,707

1997	17	1,215,298	1,120,050
1998	29	708,603	846,470
1999	32	2,873,711	1,599,204
2000	29	1,164,626	1,582,313
2001	25	1,630,994	1,889,777
2002	41	2,571,242	1,788,954
2003	22*	1,936,308*	2,046,181*

*These numbers include projects of the Great Basin Center for Geothermal Energy that are led by NBMG.



Quality of the Research and Public Service Products

NBMG faculty and some classified staff members are recognized within the state, regionally, nationally, and internationally for their contributions to science and society. Many of these contributions are listed in Appendix A, which provides some details of the activities of the NBMG staff. As examples, in 2002 and 2003 NBMG scientists:

- served on 11 advisory panels, task forces, and committees for the federal government;
- served 10 times on advisory panels and committees for the Nevada state government;
- served as officers, including elected presidents, in one international, five national, one regional, and one state scientific and technical organizations;
- served on the editorial boards of two scientific journals;
- chaired 30 committees of international, national, regional, and state scientific organizations;
- served 40 times as committee members, field trip leaders, technical session chairs, or in other

capacities for national and international scientific organizations;

- served 20 times as committee members, field trip leaders, workshop instructors, or other positions for state and regional scientific and professional organizations;
- served 43 times as advisors, field-trip leaders, science-fair judges, or in other capacities for local governmental and educational organizations;
- made 152 technical presentations, often with published abstracts, at scientific meetings and other venues;
- made over 46 presentations to K-12 school children;
- served on one National Research Council - National Academy of Sciences study committee;
- testified once before the Nevada Legislature on issues related to geology;
- received four awards for scientific achievement and contributions to the profession from national and regional organizations; and
- had their research featured five times in the popular press.

Because NBMG's primary mission is applied geologic research, most NBMG scientists focus on creating products needed by a broad base of users in the scientific, engineering, land-management/land-use planning, and regulatory professions. These products include peer-reviewed geologic maps and reports published by NBMG. The NBMG Bulletin 111, *Gold Deposits of the Carlin Trend*, edited in 2002 by Tommy Thompson (Department of Geological Sciences and Engineering), Lew Teal (Newmont), and Dick Meeuwig (NBMG), is a prime example of a publication that has direct implications for mineral exploration. In addition, NBMG scientists conduct fundamental scientific research and publish in internationally recognized journals. We are proud of the publication productivity, not only in terms of numbers of publications but also in terms of their impact. NBMG scientists are publishing highly useful geologic maps and NBMG reports, and they are publishing in leading journals in the fields of earth science, such as *Bulletin of the Seismological Society of America, Economic Geology, Environmental Geology, Environmental and Engineering Geoscience, Geological Society of America Bulletin, Geology, Geophysical Research Letters, Journal of Geophysical Research, Journal of Hydrology, Journal of Structural Geology, Science, and Water Science and Application* (please see Appendix A for details). At least four of the NBMG faculty have strong international reputations as measured by citations in refereed journals (statistics from the Institute for Scientific Information, http://isi10.isiknowledge.com/portal.cgi). NBMG scientists also contribute regularly to news in professional and trade journals, including *Mining Engineering, Geotimes, GSA Today*, and *The Professional Geologist*.

In recent years NBMG has made a concerted effort to create special publications for the general public. In addition to several new items in the Educational Series for teachers and students, books and maps added in the last two years include:

50 Millionth Ounce of Gold (NBMG Special Publication 30, a poster to celebrate a milestone in gold production on the Carlin trend, reached in 2002, designed by Kris Pizarro);

Nevada Geothermal Resources (NBMG Map 141, 1:1,000,000-scale map by Lisa Shevenell and Larry Garside, showing hot and warm springs and other geothermal features, 2003, which is nicely complemented by a Web site with useful information about specific geothermal features,

http://www.nbmg.unr.edu/geothermal/gthome.htm);

Minerals of Nevada: (NBMG Special Publication 31, co-published by the University of Nevada Press, released late in 2003, 512 p., written and edited by Steve Castor and Greg Ferdock).

Through agreements with the University of Nevada Press, several NBMG Special Publications are reaching users in bookstores throughout Nevada and other parts of the country. All publications can be ordered on line (www.nbmg.unr.edu), and selected publications, several Educational Series items, NBMG's annual publication on the *Nevada Mineral Industry*, and the joint publication with the Nevada Division of Minerals on *Major Mines of Nevada*, are provided to the public for free on the Web. As costs for data storage continue to drop, and as more people gain access through the Web at home, businesses, schools, and libraries, NBMG expects to provide more maps and reports to the professional users and general public on the Web.

For more information about the Nevada Bureau of Mines and Geology, or about the geology, resources, and environmental issues in Nevada, please feel free to contact us.

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APPENDIX A

Activities of NBMG in 2002 and 2003

This appendix includes citations of publications produced by NBMG and authored by NBMG scientists; grants awarded to principal investigators on the NBMG staff; invited lectures, public presentations, and other professional activities of the NBMG staff; and awards and honors during the past two years.

PUBLICATIONS—2002

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European Space Agency, Detection of preseismic and coseismic fault slip with interferometric data, open-ended grant for raw SAR data, **Bell, J.W.**, and Amelung, F.

Fallon Paiute Shoshone Indian Reservation, Geothermal assessment of Fallon Paiute Shoshone Indian Reservation lands, 8/02–10/03, $98,564, **Garside**, **L.**, and **Shevenell**, **L**.

Federal Emergency Management Agency (passed through the Nevada Division of Emergency Management), Earthquake risk mitigation in Nevada, 9/01–12/02, $72,106, **dePolo, C.M.**

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National Aeronautics and Space Administration, Development and transfer of InSAR and GPS applications to local government in Nevada, 3/02–2/05, $593,552, **Bell, J.W.**, and **Blewitt, G**.

National Aeronautics and Space Administration, NASA/AASG Pilot Program, Application of MASTER, ASTER, and Landsat 7 data and technology to ongoing geologic mapping projects at the Nevada Bureau of Mines and Geology, 12/02–12/03, $49,766, **House, P.K.**, **Hess, R.H.**, **and Castor, S.B.**

National Aeronautics and Space Administration (passed through the State University of New York at Stony Brook), A self-consistent global velocity gradient tensor field model, 2/00–1/02, $94,274, **G. Blewitt**.

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National Environment Research Council, UK, Global geodetic investigation of widespread intra-plate deformation, 1/99–30/02, $200,000 to NCL, **Blewitt, G.** (UNR) and Clarke, P. (NCL).

National Science Foundation, Neogene development of the northern Walker Lane, An evolving transform plate boundary, 1/02–12/04, $272,596, **Faulds, J.**, **Henry, C.**, and Cashman, P.

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National Science Foundation (passed through the Association of American State Geologists, Mentored Field Research Experience Program), Geologic mapping in the northern Walker Lane, western Nevada, 4/03–12/03, $3,700, **Faulds, J.E.**, and Delwiche, B.

National Science Foundation, Processing magma and constructing plutons in the upper crust, 1/02–6/04, $10,278, **Faulds, J.E.**

National Science Foundation, Aquifer deformation using GPS, 7/01–6/04, $97,131, **Blewitt, G.**, and **Bell, J.W.**

National Science Foundation, Surface mass transport & solid Earth mechanics, 12/01–10/04, $197,069, **G. Blewitt**.

National Science Foundation, UCAR, GPSVEL: GPS velocity synthesis project, 7/00–9/03, $82,309, **G. Blewitt**.

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National Science Foundation, Research experiences in the field with mentors from state geological surveys, Association of American State Geologists, 3/01–2/03, $204,000 plus additional $49,961 from the U.S. Geological Survey, **Price, J.G.**

National Science Foundation, Research experiences in the field with mentors from state geological surveys, Association of American State Geologists, 5/03–4/04, $130,500, Garstang, M., and **Price, J.G.**

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Nye County, Nevada, Nye County geologic mapping project, 5/02–4/03, $44,000, **dePolo, C.M.**

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Turkish research grant, Analytical support, $4,500, **Lechler, P.J.**

U.S. Bureau of Indian Affairs through the Fallon Indian Reservation, First-Stage Data Collection for Geothermal Assessment of Fallon Paiute Shoshone Indian Reservation Lands, 10/02–12/03, $39,686, **Garside, L.J.**, and **Shevenell, L.**

U.S. Bureau of Reclamation, Participatory Peer-Review of INEE paleoflood research, 10/01–10/02, $6,361, **House, P.K.**

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U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Geochemical sampling of thermal and non-thermal waters in Nevada: Evaluation of geothermal resources for electrical power generation and direct-use applications, 3/02–3/03, $117,359, **Shevenell**, **L.,** and **Garside, L.**

U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Regional assessment of exploration potential for geothermal systems in Nevada using a Geographic Information System, 3/02–9/04, $146,026, Taranik, J.V., Coolbaugh, M., Raines, G., and **Shevenell, L.**

U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Management of the research and outreach programs at the Great Basin Center for Geothermal Energy, 3/02–9/04, $113,770, **Shevenell. L.**, and Taranik, J.V.

U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Structural and geophysical analysis of the Desert Peak-Brady geothermal field: Identifying links between northeast-trending structures and geothermal anomalies in the Great Basin, 3/02–3/03, $95,810, **Faulds, J.**, **Garside, L.**, and Oppliger, G.

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U.S. Department of Energy, Idaho Operations Office, Expanding geothermal resource utilization in Nevada through directed research and public outreach, 1/02–3/03, $936,000, **Shevenell**, **L.**, and Taranik, J.V. (includes some of

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U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Management of the research and outreach programs at the Great Basin Center for Geothermal Energy, 3/02–9/04, $286,890, **Shevenell. L.**, and Long, J.

U.S. Department of Energy (passed through the Great Basin Center for Geothermal Energy), Geologic and geophysical analysis of the Desert Peak-Brady geothermal fields: Structural controls on geothermal reservoirs in the Humboldt structural zone, 10/03–9/05, $135,392, **Faulds, J.E.**, Oppliger, G., and **Garside, L**.

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U.S. Department of Energy, National Renewable Energy Laboratory, Exploratory drilling program to evaluate the lifetime and current potential of the Humboldt House geothermal system, Pershing County, Nevada, 4/03–4/04, $499,494, Tempel, G., **Shevenell**, L., Arehart, G., Poulson, S., Ellis, Waibel, and Barta, J.

U.S. Department of Energy, National Renewable Energy Laboratory, Continuation of exploratory drilling program to evaluate the lifetime and current potential of the Humboldt House geothermal system, Pershing County, Nevada, 12/03, $88,000, Tempel, G., and **Shevenell, L.**

U.S. Department of Energy, (passed through the Nevada State Energy Office), Nevada Geothermal Resources Database and Web Site, 9/01–6/04, $74,728, **Shevenell**, **L.**, and **Garside, L**.

U.S. Geological Survey, Construction of an electronic database of geothermal and mineral water and gas samples collected by the USGS in the western U.S., 6/01–8/02, $34,245, **Shevenell, L**.

U.S. Geological Survey, EDMAP portion of the National Cooperative Geologic Mapping Program, Geologic mapping of magmatic-extensional relations, Union Pass Quadrangle, northwest Arizona, 5/02–10/03, $15,000, **Faulds, J.E.**, and Murphy, R.

U.S. Geological Survey, Mineral Resources Program, Funding to update existing age data base and create new one, $20,000, period undetermined, **Henry, C.D.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, InSAR studies in the central Nevada seismic belt, 3/01–12/02, $107,754, Amelung, F., and **Bell, J.W**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Paleoseismic studies of the Peavine fault, 4/01–3/03, $69,745, **Ramelli, A.R.**, **Bell, J.W.**, and **dePolo, C.M**.

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Paleoseismic studies of the Little Valley fault, 5/02–4/03, $71,151, **Ramelli, A.R., dePolo, C.M.** and **Bell, J.W.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Paleoseismic studies of the Warm Springs fault, 4/01–3/03, $68,962, **dePolo, C.M.**, and **Ramelli, A.R.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Quaternary active faults of Nevada, 8/01–1/02, $37,250, **dePolo, C.M.**

U.S. Geological Survey, National Earthquake Hazards Reduction Program, Paleoseismic studies along the Eastern Carson Valley fault system, $72,330, **dePolo, C.M**. and **Ramelli, A.R.**

U.S. Geological Survey, Statemap portion of the National Cooperative Geologic Mapping Program, Geologic Mapping in Urban and Rural Nevada, 3/01–9/02, $196,289, **Price, J.G., Henry, C.D., Faulds, J.E., Garside, L.J., dePolo, C.M., Ramelli, A.R., Bell, J.W., Castor, S.B., Hess, R.,** and **Johnson, G**.; 5/02–9/03, $213,597, **Price, J.G., House, P.K., dePolo, C.M., Ramelli, A.R., Bell, J.W., Hess, R.,** and **Johnson, G.**; 5/03–9/04, $183,231, **Price, J.G., House, P.K., Ramelli, A.R., Bell, J.W., Hess, R.,** and **Johnson, G.** Individual projects include:

Surficial geology of Ivanpah Valley, 5/02–4/03, $85,600, **House, P.K**., **Ramelli, A.R.**, and **Bell, J.W**.; 5/03–4/04, $69,634, **House, P.K.**, **Ramelli, A.R.**, and **Bell, J.W.**

Geologic mapping in Pahrump Valley, 5/02–4/03, $33,493, **dePolo, C.M.**, and **Bell, J.W.**
Geologic map of the east half of the Last Chance Range Quadrangle, 5/01–9/02, $20,143, **dePolo, C.M.**, and **Ramelli, A.R.**
Geologic map of the north half of the Horse Springs Quadrangle, 8/01–9/02, $19,949, **Ramelli, A.R.**, and **dePolo, C.M.**
Geologic map of the Minden Quadrangle, 5/01–9/02, $39,727, **Ramelli, A.R.**, **Garside, L.J.**, and **dePolo, C.M.**
Geologic Mapping of the Mt. Manchester 7.5' Quad, Nevada, 5/03–4/04, $29,136, **House, P.K.**, **Faulds, J.,** and **Bell, J.W.**
Geologic Mapping of the Pah Rah Mountain 7.5' Quad, Nevada, 5/03–4/04, $23,554, **House, P.K.**, and **Bell, J.W.**
Geologic mapping of the Nixon Quadrangle, 5/02–4/03, $15,623, **Bell, J.W**., and **House, P.K**.
Geologic mapping of the Iceberg Canyon Quadrangle, 5/01–8/02, $18,102, **Faulds, J.** and Brady, R.
Geologic mapping of the Sutcliffe Quadrangle, 5/01 to 8/02, $29,242, **Faulds, J.** and **dePolo, C.M.**
Geologic mapping of the west half of the Dogskin Mountain Quadrangle, 5/01–8/02, $22,313, **Faulds, J.**, **dePolo, C.**, and **Henry, C.**
Geologic mapping of the Russells 7.5-minute Quadrangle, 5/02–9/03, $32,462, **Ramelli, A.R.**, and **House, P.K.**
Geologic mapping of the north half of the Virginia City Quadrangle, 5/01–4/02, $20,000, **Castor, S.** AND **Garside, L.**

Western Carolina University, Analytical support to the MSESE ICP-MS lab, $11,000, **Lechler, P.J.**

OTHER PROFESSIONAL ACTIVITIES—2002 AND 2003

NBMG scientists are active professionally at local, state, regional, national, and international levels. Many frequently serve as peer reviewers of manuscripts published in refereed journals and of proposals submitted to funding agencies. NBMG employees also serve on numerous committees and assignments within the University of Nevada, Reno, College of Science, Mackay School of Earth Sciences and Engineering, and NBMG. Below is a partial list of additional professional service provided by NBMG staff.

Bell, J.W.

2002

Institutional representative, Western North America InSAR (WinSAR) Consortium.
Contributor to ongoing efforts by city and county agencies in the Las Vegas area to mitigate land subsidence and fault and earth fissure hazards. Efforts contributed to an Award in Excellence given to the Clark County Building Department and NBMG by the Western States Seismic Policy Council in 2002.
Co-leader, Three day field trip for the Friends of the Pleistocene, Pacific cell: Historical faulting, chronostratigraphy, and paleoseismicity of the central Nevada seismic belt.
Leader, Mini-field trip for the annual meeting of the Association of Engineering Geologists in Reno: Field trip to the Mt. Rose fan—active faults in the Reno area.
Reviewer, U.S. Geological Survey National Seismic Hazard Maps.
Consultant (unpaid), Nevada geotechnical industry, public agencies, teachers, and general public.

2003

Institutional representative, Western North America InSAR (WinSAR) Consortium.
Contributor, efforts by city and county agencies in the Las Vegas area to mitigate land subsidence and fault and earth fissure hazards.
Leader, field trip, Quaternary history of lower Truckee River and pluvial Lake Lahontan, XVIth International Quaternary Association Congress.
Leader, field trip, Geology, hydrology, and land subsidence in Pahrump Valley, Association of Engineering Geologists, Las Vegas section.
Consultant, Nevada geotechnical industry, public agencies, teachers, and general public.

Blewitt, G.

2002

Chairman of the Board, UNAVCO Inc., re-elected February 2002 (June 2002–June 2003).
Visiting Professorship, University of Newcastle, UK (re-awarded for 2002–2007).
Governing Board, International Association of Geodesy Commission XIV: Crustal Deformation.
Vice Chairman, Global Strain Rate Map, International Lithosphere Program (under Int. Council for Science).
Governing Board, International Association of Geodesy Special Commission VI (WEGENER).
Chair, Scientific Committee of "Workshop on the State of GPS Vertical Positioning Precision: Separation of Earth Processes by Space Geodesy" sponsored by the European Center for Geodynamics and Seismology (ECGS), and Fonds National de la Recherch (Luxembourg), scheduled April 2-4, 2003, Luxembourg, http://www.ecgs.lu.
Chair, Rotational Datum subgroup of the International Earth Rotation Service Working Group on the International Terrestrial Reference Frame Datum.
Chair, UNAVCO, commissioned a joint IRIS-UNAVCO Yosemite workshop.
Invited scientific advisor, Jet Propulsion Laboratory's NASA proposal "Inter-Service Data Integration for Geodetic Networks."
Special Edition Editor, Journal of Global and Planetary Change, Volume 34, September 2002.

2003

Interview published in "Silver and Blue," University of Nevada, Reno.
Interview published in "Nevada News," University of Nevada, Reno.
Quoted in lead article "Season of Fire," Discover Magazine.
Governing Board, International GPS Service (IGS).
NSF EarthScope Proposal Review Panel.
Chairman of the Board, UNAVCO Inc.
Co-author of successful Plate Boundary Observatory component ($91,280,000) of the NSF EarthScope Major Research Equipment Proposal submitted by UNAVCO Inc.
UK Engineering and Physical Sciences Research Council (EPSRC) Research Panel.
Invited No-Fee Consultant on Natural Resources Canada Strategic Plan.
Chair, IAG Working Group on the ITRF Datum.
Chair, PBO Stable North America Reference Frame Working Group, funded by successful workshop proposal to NSF in Oct 2003 through UNAVCO Inc., under the auspices of UNAVCO and IAG Commission on Reference Frames.
Member, Interagency Committee on the North American Reference Stations.
Member, PBO Siting Committee for the Basin and Range Province.
Member, UNAVCO elections committee.
Chair, UNAVCO membership committee.
Chair, Scientific Organizing Committee, Workshop on the State of GPS Vertical Positioning Precision: Separation of Earth Processes by Space Geodesy, European Center for Geodynamics and Seismology, Luxembourg.
Session Convener, "Signal versus Noise in GPS Height Time Series," AGU Fall Meeting.
Session Convener, "Seasonal Signals in Space Geodetic Solutions," AGU Fall Meeting.
Session Convener, "Advancing the Cutting Edge of Geodesy II: Dynamics of the Earth," AGU Fall Meeting.
Joint Council, IRIS and UNAVCO.
Founding Member of Special Bureau for Loading, Global Geophysical Fluids Center, International Earth Rotation Service.
Governing Board, International Association of Geodesy Special Commission VI, Working Group of European Geo-scientists for the Establishment of Networks for Earth-Science Research (WEGENER).
Governing Board, International Association of Geodesy Commission XIV: Crustal Deformation.

Castor, S.B.

2002

Co-chair, Industrial Minerals Forum 2003 organizing committee.
Member, GSN Education Committee.
Presenter, "Geologists," elementary school Career Day.

2003

Co-chair, Industrial Minerals Forum 2003 organizing committee, edited and compiled the program and abstracts, put together the technical program, gave two papers, chaired a session, helped arrange three field trips, and was co-leader on a field trip.
Member, Education Committee, Geological Society of Nevada.

dePolo, C.M.

2002

Chair, Basin and Range Committee, Western States Seismic Policy Council.
Member, Seismic hazards oversight group, Los Alamos National Laboratory.
Presenter, Earthquakes, earthquake preparedness, and earthquake risk mitigation: Project Impact, Surviving Disaster; What to Know and How to Prepare, Carson City.
Co-Chair, Research Committee, Nevada Earthquake Safety Council.
Author, Operating manual for putting together a post-earthquake technical information clearinghouse in Nevada.
Co-convener, Quaternary Faulting, Annual Meeting of the Association of Engineering Geologists and the American Institute of Professional Geologists, Reno.
Field trip co-leader, geology of Pahrump Valley and earth fissures in Pahrump Valley, Devils Hole Workshop.
Reviewer, Utah Geological Survey Standards for Surface Fault Rupture.

2003

Chair, Basin and Range Province Committee, Western States Seismic Policy Council.
Developer, Nevada Earthquake Safety Council, earthquake preparedness message *Beat the Quake*.
Co-chair, Research Committee, Nevada Earthquake Safety Council.
Conceptualizer and manager for a nonstructural mitigation conference for Nevada in 2004.
Planner, Basin and Range Province Seismic Hazard Summit, May of 2004.

Desilets, M.

2002

Science Fair Judge, Western Regional Science Fair, Reno, Nevada.
Facilities Committee Chairman, Window on the World: Geological Society of Nevada Symposium 2005.
Chair, Web Committee, Geological Society of Nevada.

2003

Science Fair Judge, Western Regional Science Fair, Reno, Nevada.
Facilities Committee Chairman, Window on the World: Geological Society of Nevada Symposium 2005.
Chair, Web Committee, Geological Society of Nevada.

Faulds, J.E.

2002

Organizer, Nevada Petroleum Society Annual Field Conference.
Teacher, Geology 451, Geology Summer Field Course (6 weeks); Geology 702G, Extensional Tectonics (3-credit course for entire semester); Geology 450, Field Methods (3 days).

2003

Teacher, Geology 451, Geology Summer Field Course (6 weeks); Geology 702G, Extensional Tectonics (3-credit course for entire semester); Geology 450, Field Methods (1 day).
Leader, Nevada Petroleum Society Annual Field Conference.
Chair, Scholarship committee, Nevada Petroleum Society.
Presenter, Regional geology, Great Basin National Park.
Presenter, Recruit at University of Nevada, Reno, ExxonMobil Corporation, Houston.
Leader, field trip, Stratigraphic and structural framework of the Lake Mohave region in southern Nevada and northwest Arizona, U.S. Geological Survey.

Garside, L.J.

2002

Member, Potential Gas Committee (Institute for Energy Resource Studies, Colorado School of Mines).
Presenter, GeoPowering the West meeting, Reno.
Field trip co-chairman, 2003 Industrial Minerals Forum, Reno.
Exhibits coordinator, Geothermal Opportunities in Nevada .
Quoted, Reno Gazette Journal regarding the geology of the Virginia Mountains.
Quoted, New York Times, article on hot springs.

2003

Field Trip Leader and Organizing Committee Member, The 39th Forum on the Geology of Industrial Minerals, Reno.
Field Trip Co-Leader, Geothermal Resources of the Empire-Gerlach area, Nevada Division of Minerals Field Trip.

Henry, D.C.

2003

Student Mentor, Geological Society of America, Cordilleran and National meetings.
Editor, Revista Mexicana de Ciencias Geologicas, the publication of all geologic branches of the Universidad Nacional Autonoma de Mexico.

Hess, R.H.

2002

Executive Secretary, Nevada State Mapping Advisory Committee.
Nevada representative, Western Governors Association Geographic Information Council.
Nevada representative, National States Geographic Information Council.

2003

Executive Secretary, Nevada State Mapping Advisory Committee.
Nevada representative, Western Governors Association Geographic Information Council.
Nevada representative, National States Geographic Information Council.
Chair, Risk Assessment Subcommittee of the Nevada Hazard Mitigation Planning Committee.

House, P.K.

2002

Field reviewer, U.S. Bureau of Reclamation Paleoflood studies at INEEL, Twin Falls, ID.
Co-leader, Interagency Paleoflood Field Project on the Owyhee River.
Co-organizer, Third International Paleoflood Conference.
Peer Reviewer, U.S. Bureau of Reclamation paleoflood study, North Platte River.

2003

Teacher, Quaternary geology and Quaternary mapping for the University of Nevada, Reno, Department of Geological Science's field camp.
Co-convener, Third International Paleoflood Conference, Hood River, Oregon.
Co-leader, XVI INQUA Congress Field Trip, Quaternary History of the Lower Truckee River and pluvial Lake Lahontan.

2003

Speaker, NBMG GIS efforts in Nevada, PEO organization.
Speaker, Usages of GIS in the Reno Community, Lion's Club meeting.
Instructor in GIS, Geography Department, University of Nevada, Reno

LaPointe, D.D.

2002

Presenter, minerals education workshops, Nevada Mining Association and Nevada Division of Minerals, Las Vegas, Nevada.
Presenter, AEG-AIPG Annual Conference: Gambling with Geologic Hazards, Reno.
Leader, Nevada Earth Science Week field trips.
Leader, field trip for 120 Washoe County School District 5th graders to the California gold country on mining history and gold mining.
Leader, field trip for about 80 Washoe County School District 6th graders along part of the Tahoe Rim Trail, gave brief presentation on general geology, erosion, and geologic processes.
Leader, field trip for about 30 Washoe County School District Science Talent Academy students to collect copper ore in Cold Springs and perform copper extraction activity.
Co-chair, Education Committee, Geological Society of Nevada.
Chair, Scholarship/Loan committee, Nevada-Reno Section of the Women's Auxillary of the American Institute of Mining, Metallurgical, and Petroleum Engineers.
Member, Education Committee, Nevada Mining Association.
Member, Steering Committee, Great Basin Adventure Mine Building.
Member, Awareness Committee, Nevada Earthquake Education.
Member, Great Basin Outdoor School Board of Directors.
Member, Nevada Math-Science Partnership National Science Foundation-grant-writing team.
Speaker on minerals, rocks, maps, earthquakes, careers, and geology to Nevada public and private school classes at the following schools: Pleasant Valley, Mendive, Prosser, Huffaker, Caughlin Ranch, Elmcrest, Katharine Dunn, Veterans, Fernley, Peavine, Hidden Valley, Westergard, Sun Valley, Lemmon Valley, Roger Corbett, Roger Mitchell, Bernice Martin Matthews, Hunsberger and Legacy Christian schools.
Speaker on minerals, rocks, maps, earthquakes, careers, and geology to Girl Scout, Boy Scout, 4-H, and Cub Scout groups.
Resource for Earth Science educational for teachers.
Judge, Nevada Science Olympiad competition, Reno.
Coordinator for the Reno, Nevada office of the U.S. Geological Survey State Earth Science Information Center.
Assistant to Partners in Science outreach program between University of Nevada, Reno Medical School and local elementary school classrooms for hands-on Earth science activities.

2003

Co-chair, Geological Society of Nevada Education Committee.
Co-Chair, Geological Society of Nevada Foundation director.
Chair, Scholarship/Loan Committee, Nevada-Reno Section of the Women's Auxillary of the American Institute of Mining, Metallurgical, and Petroleum Engineers.
Member, Forum on the Geology of Industrial Minerals Annual Meeting organizing committee,
Member, Nevada Mining Association Education Committee.
Member, Great Basin Adventure Mine Building Steering Committee,
Member, Great Basin Outdoor School Advisory Board.
Presenter, two, three-day workshop sessions, semiannual teacher workshops of the Nevada Mining Association and Nevada Division of Minerals, Las Vegas.
Leader, 3 field trips to mines and geological sites, semiannual teacher workshops of the Nevada Mining Association and Nevada Division of Minerals, Las Vegas.
Co-leader, Nevada Earth Science Week field trips.
Co-leader, field trip, 39th Forum on the Geology of Industrial Minerals, J.A. Nugget, Sparks, Nevada.
Co-led field trip, National Association of Geoscience Teachers, Far-West Section field Conference, Western Nevada Community College.
Speaker, Learning in the Woods, University of Nevada, Reno Geography Department summer session.
Leader, Gaining Early Awareness and Readiness for Undergraduate Programs Camp.
Coordinated the filming of "The Right Tuff" a Wild Nevada KNPB Public Broadcasting television series episode.
Leader, Kids' University Simply Science session activities.
Organizer, Free Rocks and Minerals for Teachers event
Presenter, hands-on earth science activities to 12 classes at the following preschools and schools: St. John's Pre-school, Fundamentals Pre-School, Brown Elementary School , Hidden Valley Elementary School, Donner Springs Elementary School, Westergard Elementary School, Reed High School, Hunsberger Elementary School.
Presenter, Hands-on activities on minerals, rocks, maps, earthquakes, and geology to K-12 classes from the following schools: Roger Corbett, Westergard, Sun Valley, Bernice Martin Mathews, Hunsberger, Whitehead, Mariposa Academy, Carson Middle, Incline, Silver Stage, and Alyce Taylor Schools as well as Girl Scout, Boy Scout, and Cub Scout groups.
Coordinated, fundraising silent auction at the 39th Forum on the Geology of Industrial Minerals to benefit the Robert L. Bates Foundation scholarship fund.
Coordinator, National Science Teachers Association meeting, minerals education booth.

Lechler, P.J.

2002

Member, BLM Abandoned Mine Lands task force.
Member, Nevada Attorney General's Mining Fraud Task Force.
Consultant, Expert witness, Arsenic contamination, Grass Valley, California.

2003

Member, BLM Abandoned Mine Lands task force.

Price, J.G.

2002

President-Elect, Society of Economic Geologists.
Member, Scientific Earthquake Studies Advisory Committee, U.S. Department of Interior, U.S. Geological Survey.
Member, EarthScope Science and Education Committee, National Science Foundation.
General Co-Chair, Geological Society of Nevada Symposium 2005, Window to the World.
Chair, State Mapping Advisory Committee.
Chair, Government Affairs, Mineral and Energy Resources Section, National Association of State Universities and Land Grant Colleges.

Secretary, Nevada Earthquake Safety Council.
Administrator, Mining Cooperative Fund, State of Nevada.
Trustee, Society for Mining, Metallurgy, and Exploration Foundation.
Member, Investment Committee, Society for Mining, Metallurgy, and Exploration Foundation.
Member, State Hazard Mitigation Plan Steering Committee.
Chair, Budget Committee, 39th Forum on the Geology of Industrial Minerals.
President and Chair, Board of Directors, Western States Seismic Policy Council.
Member, All Hazard Mitigation Advisory Committee, State of Nevada.
Vice-Chair, Joint American Institute of Professional Geologists—Association of Engineering Geologists Annual Meeting Organizing Committee.
Field Trip Co-Leader, two Earth Science Week Field trips.
Field Trip Co-Leader, Nevada Mining Association Teachers Conference, Lamoille Canyon.
Field Trip Co-Leader, Buena Vista mine, for University of Nevada, Reno economic geology and mineralogy classes.
Instructor, Nevada Mining Association Teachers Conferences, Las Vegas and Elko.
Moderator, Symposium on Solving Real-World Problems with Geology and Geologic Maps, joint annual meeting of the American Institute of Professional Geologists—Association of Engineering Geologists.
Chair, FEMA-AASG MOU Implementation Committee and Nominating Committee, Association of American State Geologists.
Member, Earth Science Education Committee, Energy and Mineral Policy Committee, Association of American State Geologists.
Member, National Cooperative Geologic Mapping Program Reauthorization Committee, Association of American State Geologists.

2003

Secretary-Treasurer, Society for Mining, Metallurgy, and Exploration Foundation.
President, Society of Economic Geologists.
Chair, State Hazard Mitigation Planning Committee.
Member, Federal Advisory Committee for the National Cooperative Geologic Mapping Program, U.S. Department of Interior, U.S. Geological Survey.
Member, Scientific Earthquake Studies Advisory Committee, U.S. Department of Interior, U.S. Geological Survey.
Member, EarthScope Science and Education Committee, National Science Foundation.
General Co-Chair, Geological Society of Nevada Symposium 2005, Window to the World.
Chair, State Mapping Advisory Committee.
Chair, Government Affairs, Mineral and Energy Resources Section, National Association of State Universities and Land Grant Colleges.
Secretary, Nevada Earthquake Safety Council.
Administrator, Mining Cooperative Fund, State of Nevada.
Trustee, Society for Mining, Metallurgy, and Exploration Foundation.
Member, Investment Committee, Society for Mining, Metallurgy, and Exploration Foundation.
Chair, Natural Hazard Policy Committee, Nominating Committee, and FEMA-AASG MOU Implementation Committee; and Member, Earth Science Education Committee, Energy and Mineral Policy Committee, and National Cooperative Geologic Mapping Program Reauthorization Committee, Association of American State Geologists.
Member, State Hazard Mitigation Plan Steering Committee.
Chair, Budget Committee, 39th Forum on the Geology of Industrial Minerals.
Instructor, Integrated Emergency Management Course for the City of Las Vegas, Federal Emergency Management Agency, Emmitsburg, Maryland.
Instructor, Nevada Mining Association Teachers Conferences, Las Vegas.
Field Trip Co-Leader, two Earth Science Week Field trips.
Field Trip Co-Leader, 39th Forum on the Geology of Industrial Minerals.
Field Trip Co-Leader, National Association of Geoscience Teachers Far Western Section, Fall Field Conference.
Field Trip Co-Leader, Buena Vista mine, for University of Nevada, Reno mineralogy classes.
Judge, California-Nevada Lions Student Speakers Program.

Citationist, John T. Galey, Sr. Memorial Public Service Award to Vicki J. Cowart, American Institute of Professional Geologists.

Pizarro, K.R.

2002

Publication graphic illustrator, *A Passion for Gold*: An Autobiography, Ralph J. Roberts, University of Nevada Press, Reno, 2002.
Publication graphic illustrator, *Playa Works*: The Myth of the Empty, W.L. Fox, University of Nevada Press, Reno, 2002.

Ramelli, A.R.

2002

Leader, field trip, Paleoseismicity and Lake Lahontan shoreline fluctuations along the Rainbow Mountain fault, *in* Historical Faulting, Chronostratigraphy, and Paleoseismicity of the Central Nevada Seismic Belt, Friends of the Pleistocene, Pacific Cell Field Trip.
Leader, field trip, Seismic Hazards of the Carson Range fault system, 2002 Joint AEG-AIPG Annual Meeting Field Trip.
GPS surveyor, Late Pleistocene pluvial shorelines in Dixie Valley, central Nevada to measure crustal deformation.

2003

Field Trip Leader, Paleoseismology of the Carson Range Frontal Fault System, XVI INQUA Congress, Reno, Nevada.
Field Trip Leader, The Carson Range Frontal Fault System: Principal Seismic Hazard in Western Nevada, National Association of Geoscience Teachers–Far Western Section, Western Nevada Community College, Carson City, Nevada.

Shevenell, L.

2002

Associate Director, Great Basin Center for Geothermal Energy.
Speaker, Geothermal Opportunities in Nevada Workshop, Reno.
Member, Geothermal Resources Council Paper Review Committee.
Co-chair, Great Basin Studies session for the 2003 Geothermal Resources Council meeting.
Organizer, Workshop on U.S. Department of Energy sponsored Research at Dixie Valley.
Co-chair, annual Geothermal Resources Council Meeting.
Member, Interagency Abandoned Mine Lands Environmental Task Force.
Steering committee member, Acid Drainage Technology Initiative, Metal Mining Sector.
Chair, committee, Acid Drainage Technology Initiative, Metal Mining Sector.

2003

Associate Director, Great Basin Center for Geothermal Energy.
Organizer, Great Basin Studies session for the 2003 Geothermal Resources Council meeting in Morelia, Mexico.
Session co-chair, “Geochemistry, Other I: From Hydrothermal Fluids to Hot Rocks” at the annual Geological Society of America meeting, Seattle, Washington.
Technical Program Co-Chair, 2004 Annual Geothermal Resources Council Meeting, Reno.
Member, Interagency Abandoned Mine Lands Environmental Task Force.
Member, U.S. Army Corps of Engineers AML working group.

Tingley, J.V.

2002

Reviewer, Nevada State Clearinghouse documents for comment on mineral issues.
Executive Secretary, Nevada State Board of Geographic Names.

2003

Executive Secretary, Nevada State Board on Geographic Names.
Field trip co-organizer and co-leader, Field Trip 8, Southern Nevada industrial minerals: 39th Forum on the Geology of Industrial Minerals.

Tingley, S.L.

2002

Chair, Nevada State Board on Geographic Names.

2003

Chair, Nevada State Board on Geographic Names.

INVITED PAPERS AND PRESENTATIONS—2002

Bell, J.W., 2002, Watching Nevada deform from space: Talk presented to the Association of Engineering Geologists, Great Basin Section.

Bell, J.W., Caskey, S.J., and **Ramelli, A.R.**, 2002, The 1954 Rainbow Mountain fault, central Nevada: Another moderate-slip rate fault in the western Basin and Range: Geological Society of America Abstracts with Program, v. 34, no. 4, p. A-11.

Bell, J.W., **Ramelli, A.R.**, and Caskey, S.J., 2002, Uncertainties associated with active faults mapped in the Lake Tahoe basin: Association of Engineering Geologists Program with Abstracts, v. 45, p. 55.

Blewitt, G., 2002, GPS, the interdisciplinary chameleon: how does it do that? Eos, Transactions American Geophysical Union, v. 83, no. 47.

Blewitt, G., and Clarke, P., 2002, Inversion of solid Earth's varying shape 2: Using self-consistency to infer static ocean topography: Eos, Transactions American Geophysical Union, v. 83 no. 47, Fall Meeting Suppl., Abstract G11A-02, p. 370.

Blewitt, G., Coolbaugh, M., Holt, W., Kreemer, C., Davis, J., and Bennett, R., 2002, Targeting of potential geothermal resources in the Great Basin from regional relationships between geodetic strain and geological structures: Transactions Geothermal Resources Council, v. 26, p. 523–526.

Blewitt, G., Invited closing plenary research seminar at the Annual UNAVCO Members Meeting, Feb. 2002.

Blewitt, G., Invited opening plenary “Union Tutorial” webcast by agu.org (45 min), AGU Meeting, Dec. 2002.

Castor, S.B., and Ferdock, G., Minerals of Nevada: Geological Society of Nevada Meeting, December 18, 2002.

Castor, S.B., **Garside, L.J.**, **Henry, C.D.**, Hudson, D.M., McIntosh, W.C., and Vikre, P.G., 2002, Multiple episodes of volcanism and mineralization in the Comstock district, Nevada: Geological Society of America Abstracts With Programs, v. 34, no. 7, p. 185.

Clarke, P., and **Blewitt, G.**, 2002, Inversion of solid Earth's varying shape 1: Global mean sea level variations: Eos, Transactions American Geophysical Union, v. 83, no. 47, Fall Meeting Suppl., Abstract G11A-01, p. 370.

Coolbaugh M., Taranik, J., Raines, G., **Shevenell, L.**, Sawatzky, D., Bedell, R., Minor, T., 2002, A geothermal GIS for Nevada: Defining regional controls and favorable exploration terrain for extensional geothermal systems. Transactions Geothermal Resources Council 26, p. 485–490.

Coolbaugh, M., Raines, G., and **Shevenell, L.**, 2002, Regional controls on the distribution of geothermal systems in Nevada: Workshop "Geothermal Opportunities in Nevada" Jan. 11, 2002, University of Nevada, Reno, USA. For PowerPoint talk: http://www.unr.edu/geothermal/meetingsandpresentations/meetings_pres.html

dePolo, C.M., Borron, S., **Bell, J.W.**, and Slemmons, D.B., 2002, Evidence for earthquakes along the Las Vegas Valley fault system, Southern Nevada: Geological Society of America, Rocky Mountain Section annual meeting, Abstracts with Programs, v. 34, no. 4, p. A-4.

dePolo, C.M., **Ramelli, A.R.**, and **Bell, J.W**., 2002, The eastern Carson Valley fault system, western Nevada: Association of Engineering Geologists Program with Abstracts, v. 45, p. 61.

Enzel, Y., Redmond, K.R., **House, P.K.**, and Biondi, F., 2002, Climate variability and flood frequency at decadal to millennial time scales: Presented at the Annual Meeting of the Geological Society of America, Denver, CO, October, 2002.

Faulds, J.E., and **Henry, C.D.**, 2002, Tertiary stratigraphy and structure of the Virginia Mountains, western Nevada: Implications for development of the northern Walker Lane: Geological Society of America Abstracts with Programs, v. 34, no. 5, p. A84.

Faulds, J.E., and Trexler, J.H., Jr., 2002, Field camp pedagogy: From geologic maps to geologic mappers: Association of Engineering Geologists News, Program with Abstracts, v. 45, p. 63.

Faulds, J.E., **Garside, L.J.**, **Johnson, G.L.**, Muehlberg, J., Oppliger, G.L., 2002, Geologic setting and preliminary analysis of the Desert Peak-Brady Geothermal Field, western Nevada: Geothermal Resources Council Transactions, v. 26, p. 491–494.

Faulds, J.E., Gonzalez, L.A., Perkins, M.E., **House, P.K.**, Pearthree, P.A., **Castor, S.B.**, and Patchett, P.J., 2002, Late Miocene-early Pliocene transition from lacustrine to fluvial deposition: Inception of the lower Colorado River in southern Nevada and northwest Arizona: Geological Society of America Abstracts with Programs, v. 34, no. 4, p. 60.

Faulds, J.E., Late Miocene-early Pliocene transition from lacustrine to fluvial deposition, Inception of the lower Colorado River in southern Nevada and northwest Arizona: Geological Society of America Rocky Mountain Section Meeting, Cedar City, Utah.

Faulds, J.E., Research opportunities in the Basin and Range province and northern Walker Lane: Graduate Seminar in the Department of Geological Sciences.

Garside, L.J., Geology of geothermal resources, Geothermal Resources Council.

Garside, L.J., Geology of the Silver Saddle Ranch area: Friends of Silver Saddle Ranch.

Garside, L.J., Henry, C.D., and Boden, D.R., 2002, Far-flung ash-flow tuffs of Yerington, western Nevada erupted from calderas in the Toquima Range, central Nevada: Geological Society of America Abstracts with Program, v. 34, no. 6, p. 44.

Garside, L.J., History of Nevada geothermal resource assessment, GeoPowering the West.

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HONORS AND AWARDS

Bell, J.W.

Featured article: Past and current subsidence research in the Las Vegas area, October, 2002 issue of Geotimes: "When Cities Face Geologic Forces: Las Vegas, A thirsty, sinking city."
Publication of the Year Award from the Association of Engineering Geologists for the journal paper: **Bell, J.W.**, Amelung, F., **Ramelli, A.R.**, and **Blewitt, G.**, 2002, Land subsidence in Las Vegas, Nevada, 1935–2000: New geodetic data show evolution, revised spatial patterns, and reduced rates: Environmental and Engineering Geoscience.
Award for Excellence from the Nevada Earthquake Safety Council for research efforts on faults and earth fissures in Las Vegas, Nevada.

Blewitt, G.

Visiting Professorship for the period 2002–2007 at University of Newcastle, U.K.
Elected Chairman of the Board, UNAVCO Inc., a university consortium in space geodesy, 2002.
Geothermal Resources Council Best Paper Award, Great Basin Session, 2003.

Lechler, P.J.

Appointed adjunct professor in Department of Biology, Western Carolina University.

Price, J.G.

Excellence Award for Mitigation Efforts, Western States Seismic Policy Council, 2002.
Elected President of the Society of Economic Geologists for the year 2003.
Leadership Award, Western States Seismic Policy Council, 2003.

APPENDIX B

STATUTORY MANDATES OF THE NEVADA BUREAU OF MINES AND GEOLOGY

Nevada Revised Statutes related to the Nevada Bureau of Mines and Geology

CHAPTER 514 - BUREAU OF MINES AND GEOLOGY

NRS 514.002 Definitions. As used in this chapter, unless the context otherwise requires, the words and terms defined in NRS 514.005 and 514.007 have the meanings ascribed to them in those sections.
(Added to NRS by 1997, 2977)

NRS 514.005 "Professional geologist" defined. "Professional geologist" means a person who:
1. Possesses a baccalaureate or higher degree from an accredited college or university with at least 30 semester hours or 45 quarter hours of course work in the science of geology and has at least 5 years of experience in the science of geology, which may include no more than 2 years of postgraduate course work in the science of geology;
2. Has at least 12 years of experience in the science of geology, at least 3 years of which must have been completed under the supervision of a professional geologist; or
3. Is currently licensed or certified as a professional geologist:
(a) In another state; or
(b) By a national nonprofit geological organization with members in at least 10 states who are licensed or certified, if the requirements for his current licensure or certification included requirements at least equal to those set forth in either subsection 1 or 2.
(Added to NRS by 1997, 2978)

NRS 514.007 "Science of geology" defined. "Science of geology" means the:
1. General study of the earth, including its origin, processes and history;
2. Collection and investigation of specimens of the constituent rocks, minerals, fossils, solids, mineralizing fluids, gasses and other materials of the earth that are located from the center of the core of the earth to the surface of the earth; and
3. Application of the knowledge set forth in subsections 1 and 2 for the benefit of the general public and the general welfare of this state.
(Added to NRS by 1997, 2978)

NRS 514.010 Establishment. There is hereby established a bureau of mines and geology of the State of Nevada which shall be in the public service division of the University and Community College System of Nevada.
[Part 1:127:1935; 1931 NCL § 4311.01]-(NRS A 1971, 368; 1993, 411)

NRS 514.020 Compensation and expenses of board of regents. Members of the board of regents shall serve without compensation, but shall be reimbursed for the actual expenses incurred in the performance of their official duties.
[Part 1:127:1935; 1931 NCL § 4311.01]

NRS 514.030 Employment and compensation of director and other employees.
1. The board of regents of the University of Nevada shall appoint as director a competent scientist or engineer, to be known as the director of the bureau of mines and geology, who must be a:
(a) Graduate of a recognized college or university with a degree in some branch of earth science or mineral engineering; and
(b) Professional geologist with expertise in the science of geology.
2. Upon the director's nomination, the board of regents of the University of Nevada shall employ such assistants and employees as the board deems necessary.
3. The board of regents of the University of Nevada may also determine the compensation of all persons employed by the bureau of mines and geology and may remove them at will.
[Part 1:127:1935; 1931 NCL § 4311.01]-(NRS A 1971, 369; 1993, 411; 1997, 2978)

NRS 514.040 Duties. The bureau of mines and geology shall:

1. Serve as a bureau of information and exchange on Nevada mineral industry, mineral resources and geology.
2. By questionnaire, field investigations, laboratory studies or otherwise, conduct a thorough survey of the mineral resources and geology of the state.
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.
4. Make studies of mineral materials to determine the most economical and practical methods of concentrating and processing these resources and to promote their conservation.
5. Collect, in collaboration with the Mackay school of mines, a library and bibliography of all literature pertaining to Nevada mineral industry, geology and mineral resources.
6. Collect, in collaboration with the Mackay school of mines, typical geological and mineralogical specimens and models, drawings and descriptions of appliances used in the mineral industry and earth science. Collections of these materials may be maintained and displayed elsewhere within or without the state.
7. Provide for the dissemination of information on the mineral industry, geology and mineral resources of the state through lectures and publications.
8. Consult with, advise and assist state and local governmental agencies on geological problems of importance to the citizens of Nevada.
9. Consider such other kindred scientific and economic questions as in the judgment of the board of regents shall be deemed of value to the people of the state.

[2:127:1935; 1931 NCL § 4311.02]-(NRS A 1971, 369)

NRS 514.050 Cooperation of state departments. All departments of the state government shall render full cooperation to the bureau of mines and geology in the acquisition and compilation of all data required by NRS 514.040

[3:127:1935; 1931 NCL § 4311.03]-(NRS A 1971, 370)

NRS 514.060 Agreements with United States Geological Survey.

1. The director of the bureau of mines and geology, for and on behalf of the State of Nevada, with the approval of the governor, is authorized to enter into agreements with the United States Geological Survey for cooperation in investigating mineral and geological conditions within the state and in the topographic and geologic mapping of Nevada. The expenses of such work must be divided between the parties upon a basis whereby the State of Nevada will not pay more than 50 percent of such expenses.
2. Money necessary to carry out the provisions of this section must be provided pursuant to NRS 519A.260.
3. All claims against such money must be approved by the director of the bureau of mines and geology, and, when thereafter approved by the state board of examiners, must be paid in the same manner as other claims against the state.

[1:40:1953] + [2:40:1953] + [3:40:1953]-(NRS A 1971, 370; 1995, 828)

NRS 514.070 Reports: Distribution and sale.

1. The board of regents shall cause to be prepared before September 1 of each even-numbered year a report covering the biennium ending June 30 of such year, showing the progress and condition of the bureau of mines and geology, together with such other information as the board may deem necessary or useful, or as the board may require.
2. The regular and special reports of the bureau of mines and geology shall be printed as the board of regents may direct, and the reports may be distributed or sold by the board as the interest of the state or science may demand. All moneys obtained by the sale of such reports shall be retained by the bureau of mines and geology to be used for costs of printing and distribution as the board of regents may direct.

[5:127:1935; 1931 NCL § 4311.05] + [6:127:1935; 1931 NCL § 4311.06]-(NRS A 1969, 1458; 1971, 370)

NRS 514.080 Unlawful acts. It shall be unlawful for the director or any attaché of the bureau of mines and geology:

1. To receive a commission or to act as agent or broker of or for any purchaser, owner, or his or their agents, of a mining property.
2. To act in any other than a wholly impartial way while so employed.

[4:127:1935; 1931 NCL § 4311.04]-(NRS A 1971, 370)

CHAPTER 396 - UNIVERSITY AND COMMUNITY COLLEGE SYSTEM OF NEVADA

PUBLIC SERVICE DIVISION

In General

NRS 396.600 Composition. The public service division of the system consists of the following public service departments:

1. Agricultural extension.
2. Agricultural experiment station.
3. Bureau of mines and geology.
4. Such other departments as the board of regents may designate.

[1:98:1915; 1919 RL p. 3209; NCL § 7765] + [Part 2:98:1915; 1919 RL p. 3210; NCL § 7766] + [3:98:1915; 1919 RL p. 3210; NCL § 7767] + [5:98:1915; 1919 RL p. 3210; NCL § 7769]-(NRS A 1957, 766; 1959, 618; 1969, 1437; 1971, 368; 1985, 1125; 1993, 352)

NRS 396.610 Rules and regulations. All rules and regulations necessary for the proper administration and enforcement of the public service division of the system must be made by the presidents, the chancellor and the board of regents.

[4:98:1915; 1919 RL p. 3210; NCL § 7768]-(NRS A 1969, 1438; 1993, 352)

BUREAU OF MINES AND GEOLOGY

NRS 396.620 Analyses of ores, minerals, soil and water: Submission of samples by residents of this state; fee; maintenance of records and samples.

1. Subject to the limitations specified in NRS 396.620 to 396.660, inclusive, the chancellor shall cause to be analyzed by an appropriate employee of the system any ores, minerals, soil or water taken from within the boundaries of the State of Nevada and sent by any resident of the state for that purpose. Persons sending samples from post offices in states bordering Nevada may be required to furnish evidence that their samples are taken in Nevada and that they are Nevada residents. Any resident of the state may send any such substance for analysis. The report of the results of the analysis must be mailed to him within 10 working days after it has been received if he has supplied the information for the maintenance of records as provided in this section. The report sent to him must also contain as nearly as possible an explanation of the uses and market value of the substance.
2. For each sample sent for analysis, the system shall charge a fee of $5 which must be used to defray the expense of conducting the analysis and storing the sample.
3. The system shall keep a record, open for inspection, under such rules as may be made by the board of regents, of all minerals, ores or other matters so sent, with a history of the minerals or other matters, stating the name and residence of the person from whom received, as nearly as possible the location from which the material was taken, including the district and county, and any other relevant information. This information for the records may be required to be filed with the system before any work is done on the material sent, and the 10-day limit for reports will count from the time the information is received by the system. Forms for providing the information must be printed by the state printing division of the department of administration and distributed at no charge.
4. A portion of the sample analyzed must be kept by the system for 3 months after the report is sent out, in case any question should arise in relation to the report or additional information be desired. After that time expires, samples may be destroyed or used for any desirable purpose.

[1:84:1895; A 1931, 229; 1933, 147; 1931 NCL § 7754]-(NRS A 1969, 1526; 1981, 1715; 1985, 466; 1993, 352, 1597; 1995, 579; 1997, 20)

NRS 396.630 Assay to be run when same material sent from same district. If the same general kind of matter for analysis is sent from the same district and previous analyses have shown its character and values, it shall not be necessary to analyze the same, but an assay shall be run to determine the value thereof, and shall be sent by mail to the person desiring the same.

[2:84:1895; A 1933, 147; 1931 NCL § 7755]

NRS 396.640 Analyses of samples in order received. Samples for analysis shall be analyzed in the order received, as far as possible.

[3:84:1895; A 1933, 147; 1931 NCL § 7756]

NRS 396.650 Limitations on number of samples and quantitative analyses.
1. Gold and silver samples requiring assays and exact quantitative determinations are limited to two in any 30-day period; and of the so-called strategic or war minerals, such as antimony, arsenic, beryllium, manganese, magnesium, tungsten, molybdenum, quicksilver, zinc, lead, copper, tin, chromium, cadmium, or other strategic minerals for the assaying of which the average assay office is not equipped, there shall be run up to five assays or quantitative determinations for any single person or associated group of persons. Samples sent for ordinary rock and mineral determinations are limited to 10 in any 30-day period.
2. In order to save the state unnecessary expense, if preliminary examinations by microscope and qualitative tests indicate material of no economic value, exact quantitative analyses are not to be run on such samples, and reports on such material will indicate why such material has no commercial value.

[Part 4:84:1895; A 1897, 91; 1925, 29; 1931, 229; 1933, 147; 1943, 180; 1943 NCL § 7757]

NRS 396.660 Purpose and applicability of NRS 396.620 to 396.660 inclusive.
1. The main object of NRS 396.620 to 396.660, inclusive, as it relates to ore samples, is to aid the prospector in the discovery of new mineral deposits.
2. NRS 396.620 to 396.660, inclusive, shall not apply in the following cases:
(a) To operating mines. The term "operating mines" as used in this subsection means those properties milling or shipping ore or being worked by hired labor.
(b) To engineers sampling mines or prospects for purposes of valuation.
(c) To so-called "control assays" to check other assayers on ore known to be of value.

[Part 4:84:1895; A 1897, 91; 1925, 29; 1931, 229; 1933, 147; 1943, 180; 1943 NCL § 7757]

CHAPTER 327 - NEVADA COORDINATE SYSTEM; GEOGRAPHIC NAMES

NRS 327.100 “Board” defined. As used in NRS 327.110 to 327.150, inclusive, unless the context otherwise requires, the term “board” means the Nevada state board on geographic names.
(Added to NRS by 1985, 588)

NRS 327.110 Nevada state board on geographic names: Creation; purpose. The Nevada state board on geographic names is hereby created to coordinate and approve geographic names within the state for official recommendation to the United States Board on Geographic Names.
(Added to NRS by 1985, 588)

NRS 327.120 Nevada state board on geographic names: Composition. The board consists of:
1. One representative of each of the following agencies or organizations:
(a) **Bureau of mines and geology of the State of Nevada.**
(b) Faculty of the University of Nevada, Reno.
(c) Faculty of the University of Nevada, Las Vegas.
(d) State library and archives.
(e) Department of transportation of the state.
(f) State department of conservation and natural resources.
(g) Nevada historical society.
(h) United States Bureau of Land Management.
(i) United States Forest Service.
(j) Inter-Tribal Council of Nevada, Inc.

Each agency or organization shall designate a representative and one alternative representative for this purpose.

2. An executive secretary who is a nonvoting member of the board. The state resident cartographer shall serve in this position. If there is not such a cartographer, the voting members of the board shall select the executive secretary.

(Added to NRS by 1985, 588; A 1993, 507)

NRS 327.130 Nevada state board on geographic names: Officers; rules; quorum; meetings; compensation.

1. The board shall designate from among its members a chairman and a vice chairman and shall adopt rules for its own management.
2. A majority of the voting members of the board constitutes a quorum for the transaction of business.
3. The board shall meet at such times and places as are specified by the chairman, but may not hold more than four meetings in any 1 year.
4. Members of the board shall serve without compensation, travel expenses or subsistence allowances except as they may be provided by the members' respective agencies and organizations.

(Added to NRS by 1985, 588)

NRS 327.140 Nevada state board on geographic names: Powers and duties.

1. The board shall:
(a) Receive and evaluate all proposals for changes in or additions to names of geographic features and places in the state to determine the most appropriate and acceptable names for use in maps and official documents of all levels of government.
(b) Make official recommendations on behalf of the state with respect to each proposal.
(c) Assist and cooperate with the United States Board on Geographic Names in matters relating to names of geographic features and places in Nevada.
(d) Maintain a list of advisers who have special knowledge of or expertise in Nevada history, geography or culture and consult with those advisers on a regular basis in the course of its work.
2. The board may:
(a) Adopt regulations to assist in carrying out the functions and duties assigned to it by law.
(b) Initiate proposals for changes in or additions to geographic names in the state. Any proposal initiated by the board must be evaluated in accordance with the same procedures prescribed for the consideration of other proposals.

(Added to NRS by 1985, 588)

NRS 327.150 Changes in or additions of geographic names: Submission of proposal; preliminary consideration; final action and notice.

1. Any person, group or agency of federal, state or local government may propose a change in or the addition of any geographic name within the state by submitting it to the board for evaluation and recommendation.
2. Upon receipt of any such proposal, together with sufficient supporting information, the board shall:
(a) Place the proposal on the agenda for preliminary consideration at its next meeting.
(b) Give appropriate notice to persons and groups who are affected by the proposal or might have an interest in it.
(c) Provide opportunities for public comment.
(d) Conduct such research and field investigations as it deems necessary.
3. The board may not take final action on any proposal until it has been given preliminary consideration at one or more previous meetings.
4. Whenever the board takes final action on a proposal, it shall notify the person, group or agency who submitted the proposal and shall transmit the official recommendation to the United States Board on Geographic Names.

(Added to NRS by 1985, 589)

CHAPTER 519A - RECLAMATION OF LAND SUBJECT TO MINING OPERATIONS OR EXPLORATION PROJECTS (under the Division of Environmental Protection of the Department of Conservation and Natural Resources)

NRS 519A.260 Annual submission of reports and payment of fees by operator; disposition of money received.

1. Each operator shall, on or before April 15 of each year, submit to the administrator a report relating to the status and production of all mining operations and exploration projects in which he has engaged and identifying each acre of land affected and land reclaimed by that mining operation or exploration project through the preceding calendar year, and shall pay to the division a fee of:

(a) One dollar and fifty cents for each acre of public land administered by a federal agency; and

(b) Five dollars and fifty cents for each acre of privately owned land, which has been disturbed by mining operations or exploration projects engaged in by the operator and not reclaimed.

2. **All money received by the state treasurer pursuant to paragraph (a) of subsection 1 together with three-elevenths of all money received by the state treasurer pursuant to paragraph (b) of subsection 1, up to a maximum of $100,000 annually, must be distributed directly to the bureau of mines and geology of the State of Nevada to be used to carry out the provisions of NRS 514.060.** Any money in excess of the maximum and the balance collected pursuant to paragraph (b) of subsection 1 must be credited to the appropriate account for the division and used to administer the provisions of this chapter.

(Added to NRS by 1989, 1287; A 1991, 201)

Nevada Administrative Code related to the Nevada Bureau of Mines and Geology

CHAPTER 522 - OIL AND GAS (under the Division of Minerals, Commission on Mineral Resources)

NAC 522.215 Cuttings: Requirements for permit; availability and use; notification of shortage. The taking of cuttings and the filing thereof is a condition for approval of the drilling permit, and this condition will be stated on the permit. **A minimum of two 15-milliliter sets of cuttings per sampling interval must be cleaned, dried and placed in sample envelopes, and the cuttings and a split of any core submitted to the bureau of mines and geology as soon as the drilling of the well is complete. The bureau shall remove a 15-milliliter set and place the set in permanent storage. The rest of the cuttings must be made available for public inspection and testing at that time or, if the records concerning the well are to be kept confidential pursuant to NAC 522.540, upon the expiration of the period of confidentiality. Destructive tests may be performed on the cuttings made available for public inspection and testing. The administrator of the division must be notified by the bureau of any sample envelopes containing less than 5 milliliters of cuttings.**

[Div. of Mineral Res., § 204, eff. 12-20-79]—(NAC A by Dep't of Minerals, 9-16-92)

NAC 522.510 Form 5: Well completion report.

1. Form 5, the well completion report, must be filed for all wells drilled in Nevada. In the case of a dry hole, this report may accompany Form 4. In the case of a well placed in commercial production, Form 5 must be filed with the division within 30 days after the well is placed in production. Only one Form 5 is required for each well. A second Form 5 is not required upon the abandonment of any producing well.
2. Two copies of all logging surveys run in the wellbore by the operator must be filed with the division. **The division will file one of the sets with the bureau of mines and geology. The copy at the bureau will be available for public inspection when the records are no longer confidential.**

[Div. of Mineral Res., § 707, eff. 12-20-79]—(NAC A by Dep't of Minerals, 7-22-87)

NAC 522.540 Confidentiality of well records.

1. Records concerning a well will not be kept confidential by the division unless the owner of the well requests confidentiality in writing or marks "confidential" on the logs of an exploratory well. Upon receiving such a request or log, the division will keep the records confidential for 6 months after their receipt unless the owner provides a written authorization for an earlier release.
2. An operator who plans to drill a series of exploratory wells within a given region or area may apply to the division to have the records for all his exploratory wells kept confidential. Such an application must specifically describe the area to be explored and the number and location of exploratory wells contemplated. Upon approval of the application, the administrator will keep all records of the project confidential for 6 months after receipt of the record. The operator may amend the plan of the project with the written approval of the administrator.

(Added to NAC by Dep't of Minerals, eff. 7-22-87)

CHAPTER 534A - GEOTHERMAL RESOURCES (under the Division of Minerals, Commission on Mineral Resources)

NAC 534A.310 Taking of cuttings is condition for approval; submission to bureau of mines and geology. The taking of cuttings at least every 30 feet, and filing thereof, is a condition for approval of the drilling permit. The cuttings must be cleaned, dried, marked for location and depth and placed in envelopes. **The cuttings and a split of any core must be submitted to the bureau of mines and geology of the State of Nevada within 30 days after the well is completed.**

(Added to NAC by Comm'n on Mineral Resources, eff. 11-12-85)

NAC 534A.550 Filing of report of completion and well logs.

1. Within 30 days after the completion of the construction of a well, the owner of the geothermal resource or the operator shall file with the division:

(a) A report setting forth the manner in which the well was completed.
(b) Two sets of all well logs.

2. **The division shall file one set of the well logs with the bureau of mines and geology of the State of Nevada.**

(Added to NAC by Comm'n on Mineral Resources, eff. 11-12-85; A 12-16-92)

NAC 534A.140 Hole logs: Subsurface information; confidentiality. Information about the subsurface obtained as a result of exploration drilling disclosed on hole logs as required by NAC 534A.130 must be filed with the state engineer within 30 days after it is acquired. **Such information together with other information concerning the exploration appearing on the logs and the cards containing the notice of intent to drill is confidential for a period of 5 years from the date of filing the cards or logs and must not be disclosed during that time without the express written consent of the driller's client.**

[St. Engineer, Exploration Drilling Reg. Art. VIII, eff. 12-13-77]

United States Code (Federal Laws) related to the Nevada Bureau of Mines and Geology

43 USC Sec. 31c 01/26/98

TITLE 43 - PUBLIC LANDS

CHAPTER 2 - UNITED STATES GEOLOGICAL SURVEY

Sec. 31c. **Geologic mapping program**

STATUTE

(a) Establishment

(1) In general

There is established a national cooperative geologic mapping program between the United States Geological Survey and the State geological surveys, acting through the Association.

(2) Design, development, and administration

The cooperative geologic mapping program shall be -

(A) designed and administered to achieve the objectives set forth in subsection (c) of this section;

(B) developed in consultation with the advisory committee;

and

(C) administered through the Survey.

(b) Responsibilities of the Survey

(1) Lead agency

The Survey shall be the lead Federal agency responsible for planning, developing priorities, coordinating, and managing the geologic mapping program. In carrying out this paragraph, the Secretary, acting through the Director, shall -

(A) develop a geologic mapping program implementation plan in accordance with section 31e of this title, which plan shall be submitted to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate within 300 days after August 5, 1997;

(B) appoint, with the advice and consultation of the Association, the advisory committee within 90 days after August 5, 1997, in accordance with section 31d of this title; and

(C) within 210 days after August 5, 1997, submit a report to the Committee on Energy and Natural Resources of the United States Senate and to the Committee on Resources of the House of Representatives identifying -

(i) how the Survey and the Association will coordinate the development and implementation of the geologic mapping program;

(ii) how the Survey and the Association will establish goals, mapping priorities, and target dates for implementation of the geologic mapping program; and

(iii) how long-term staffing plans for the various components of the geologic mapping program will lead to successful implementation of the geologic mapping program.

(2) Responsibilities of the Secretary

In addition to paragraph (1), the Secretary, acting through the Director, shall be responsible for developing, as soon as practicable -

(A) in cooperation with the Association, other Federal and State agencies, public and private sector organizations and academia, the geologic-map data base; and

(B) maps and mapping techniques which achieve the objectives specified in subsection (c) of this section.

(c) Program objectives

The objectives of the geologic mapping program shall include -

(1) determining the Nation's geologic framework through systematic development of geologic maps at scales appropriate to the geologic setting and the perceived applications, such maps to be contributed to the national geologic map (FOOTNOTE 1) database;

(FOOTNOTE 1) So in original. Probably should be “geologic-map.”

(2) development of a complementary national geophysical-map data base, geochemical-map data base, and a geochronologic and paleontologic data base that provide value-added descriptive and interpretative information to the geologic-map data base;

(3) application of cost-effective mapping techniques that assemble, produce, translate and disseminate geologic-map information and that render such information of greater application and benefit to the public; and

(4) development of public awareness of the role and application of geologic-map information to the resolution of national issues of land use management.

(d) Program components

The geologic mapping program shall include the following components:

(1) Federal component

A Federal geologic mapping component, whose objective shall be determining the geologic framework of areas determined to be vital to the economic, social, or scientific welfare of the Nation. Mapping priorities shall be based on -

(A) national requirements for geologic-map information in areas of multiple-issue need or areas of compelling single-issue need; and

(B) national requirements for geologic-map information in areas where mapping is required to solve critical earth-science problems.

(2) Support component

A geologic mapping support component, whose objective shall be providing interdisciplinary support for the Federal Geologic Mapping Component. Representative categories of interdisciplinary support shall include -

(A) establishment of a national geologic-map data base, established pursuant to section 31f of this title;

(B) studies that lead to the implementation of cost-effective digital methods for the acquisition, compilation, analysis, cartographic production, and dissemination of geologic-map information;

(C) paleontologic investigations that provide information critical to understanding the age and depositional environment of fossil-bearing geologic-map units, which investigations shall be contributed to a national paleontologic data base;

(D) geochronologic and isotopic investigations that -

(i) provide radiometric age dates for geologic-map units; and

(ii) fingerprint the geothermometry, geobarometry, and alteration history of geologic-map units, which investigations shall be contributed to a national geochronologic data base;

(E) geophysical investigations that assist in delineating and mapping the physical characteristics and three-dimensional distribution of geologic materials and geologic structures, which investigations shall be contributed to a national geophysical-map data base; and

(F) geochemical investigations and analytical operations that characterize the major- and minor-element composition of geologic-map units, and that lead to the recognition of stable and anomalous geochemical signatures for geologic terrains, which investigations shall be contributed to a national geochemical-map data base.

(3) State component

A State geologic mapping component, whose objective shall be determining the geologic framework of areas that the State geological surveys determine to be vital to the economic, social, or scientific welfare of individual States. Mapping priorities shall be determined by multirepresentational State panels and shall be integrated with national priorities. Federal funding for the State component shall be matched on a one-to-one basis with non-Federal funds.

(4) Education component

A geologic mapping education component -

(A) the objectives of which shall be -

(i) to develop the academic programs that teach earth-science students the fundamental principles of geologic mapping and field analysis; and

(ii) to provide for broad education in geologic mapping and field analysis through support of field studies;

(B) investigations under which shall be integrated with the other mapping components of the geologic mapping program and shall respond to priorities identified for those components; and

(C) Federal funding for which shall be matched by non-Federal sources on a 1-to-1 basis.

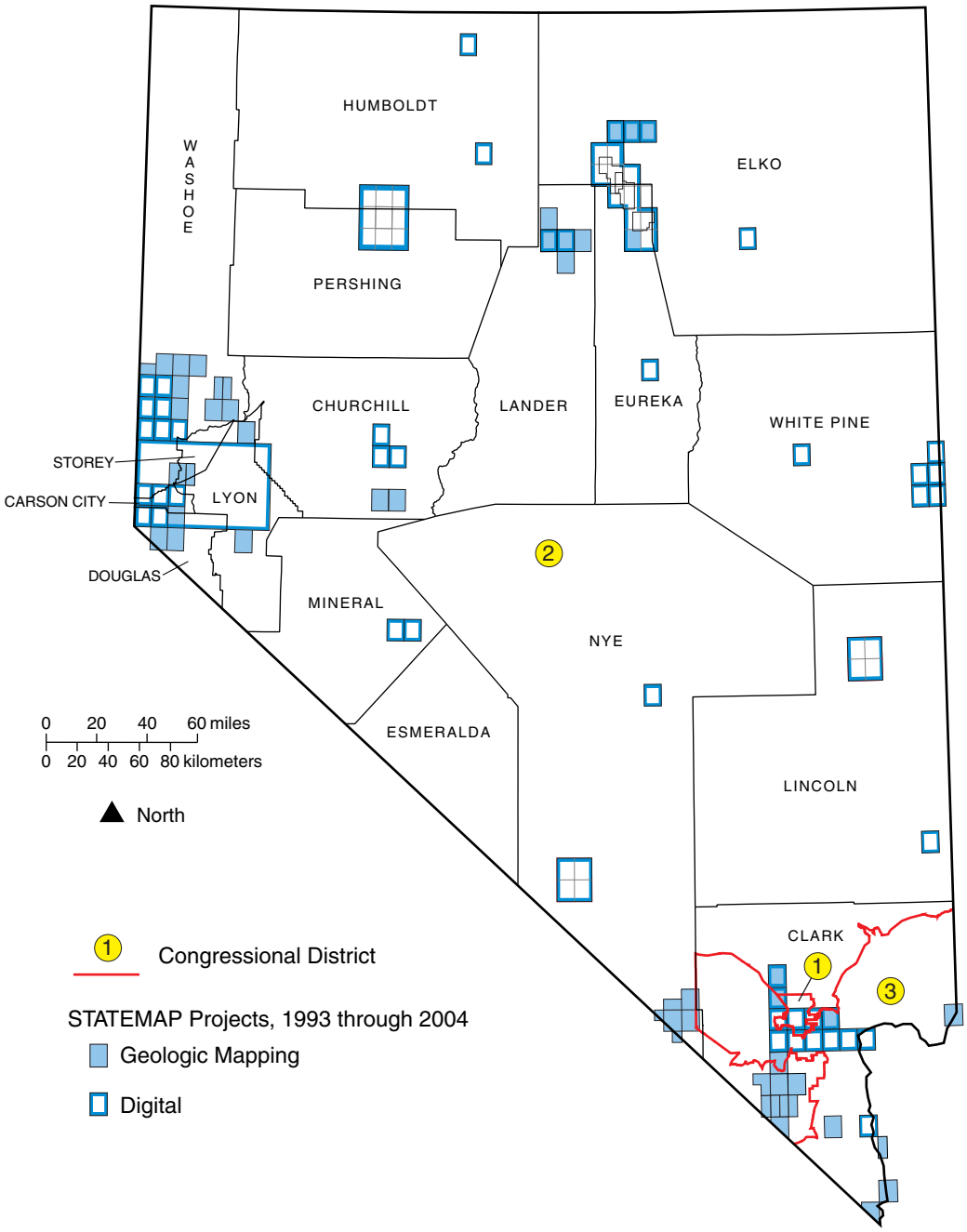
-SOURCE- (Pub. L. 102-285, Sec. 4, May 18, 1992, 106 Stat. 167; Pub. L. 103-437, Sec. 16(a)(1), Nov. 2, 1994, 108 Stat. 4594; Pub. L. 105-36, Sec. 3(b), Aug. 5, 1997, 111 Stat. 1108.)

Association of American State Geologists

United States Geological Survey

National Cooperative Geologic Mapping Program

NEVADA



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USGS Geologic Mapping Program Office
Program Coordinator: Peter T. Lyttle (703/648-6943)
http://ncgmp.usgs.gov/

SUMMARY OF STATEMAP GEOLOGIC MAPPING PROGRAM IN NEVADA

Las Vegas Area

New geologic maps of 7.5-minute quadrangles at 1:24,000 scale

- Bird Spring (2004)
- Corn Creek Springs (1997)
- Davis Dam (1999)
- NV part of Desert (2003)
- Frenchman Mountain (1994)
- E1/2 of Goodsprings (2002)
- NW1/4 of Goodsprings (2004)
- W1/2 of Hidden Valley (2003)
- E1/2 of Hidden Valley (2004)
- Horse Springs (2000)
- Iceberg Canyon (2001)
- Jean (2002)
- Last Chance Range (2001)
- W1/2 McCullough Pass (2003)
- W1/2 Mount Manchester (2003)
- Nelson SW (1998)
- NE1/4 Nopah Peak (2002)
- Pahrump (1998)
- E1/2 of Roach (2003)
- W1/2 of Roach (2002)
- W1/2 of Spirit Mtn NE (2004)
- Sixmile Spring (2000)
- E1/2 of State Line Pass (2002)
- NE1/4 Stewart Valley (2002)
- Tule Springs Park (1996)

Digital versions of previously published 7.5-minute geologic quadrangle maps

- Blue Diamond NE (2001)
- Blue Diamond SE (2001)
- Boulder Beach (2000)
- Corn Creek Springs (2001)
- Fire Mountain (2001)
- Frenchman Mountain (2002)
- Henderson (2000)
- Hoover Dam (2000)
- Las Vegas NE (2000)
- Las Vegas NW (2000)
- Las Vegas SE (2000)
- Las Vegas SW (2000)
- Mount Davis (2002)
- Tule Springs Park (2001)

Reno Area

New geologic maps of 7.5-minute quadrangles at 1:24,000 scale

- Dogskin Mountain (2000)
- Fernley East (2004)
- W1/2 of Flowery Peak (2004)
- Fraser Flat (1998)
- Gardnerville (1999)
- Griffith Canyon (1996)
- McTarnahan Hill (1997)
- Minden (2001)
- Olinghouse (1993)
- W1/2 of Nixon (2002)
- E1/2 Pah Rah Mtn (2003)
- S1/2 Seven Lakes Mtn (2004)
- Sutcliffe (2001)
- Tule Peak (1999)
- Virginia City (2000)
- Wadsworth (1993)
- Yerington (2000)

Digital versions of previously published 7.5-minute geologic quadrangle maps

- Bedell Flat (2001)
- Carson City (2001)
- Genoa (2001)
- Glenbrook (2001)
- Granite Peak (2001)
- Marlette Lake (2001)
- New Empire (2001)
- Reno (2000)
- Reno NE (2000)
- Reno NW (2000)
- Verdi (2000)
- Vista (2000)

Digital versions of previously published 30x60-minute geologic quadrangle maps

- Carson City (2001), 1:100,000 scale

Humboldt River Basin

New geologic maps of 7.5-minute quadrangles at 1:24,000 scale

- Argenta (1999)
- Bateman Spring (1999)
- Battle Mountain (1997)
- Emigrant Pass (1998)
- Mount Blitzen (1996)
- Russells (2002)
- Stony Point (1998)
- Toe Jam Mountain (1997)
- Tuscarora (1997)

Digital versions of previously published 7.5-minute geologic quadrangle maps

- Battle Mountain (2002)
- Mount Blitzen (2001)
- Stony Point (2002)
- Toe Jam Mountain (2002)
- Tuscarora (2001)

Digital versions of Carlin trend maps

- North Carlin trend (2003),1:24,000 scale
- Maggie Creek district (2003), 1:18,000 scale
- North trend (2003), 1:6,000 scale

Other Areas

New geologic maps of 7.5-minute quadrangles at 1:24,000 scale

- Bell Canyon, Churchill County (1995)
- Bell Mountain, Churchill County (1995)

Digital versions of previously published 7.5-minute geologic quadrangle maps

- Bettles Well (2001)
- Buckskin Mountain (2001)
- Delvada Spring (2001)
- Frazier Creek (2001)
- Job Peak (2001)
- Lamoille (2002)
- Lime Mountain (2002)
- Little Horse Canyon (2001)
- Mina (2001)
- Mount Moriah (2001)
- Old Mans Canyon (2001)
- Pirouette Mountain (2001)
- Reveille (2001)
- Robinson Summit (2001)
- Spring Mountain (2001)
- Wonder Mountain (2001)

Digital versions of other previously published 1:24,000-scale geologic maps

- Bullfrog Hills (2002)
- Eugene Mountains (2002)
- Fairview Range (2002)
- Grassy Mountain (2002)

The STATEMAP part of the National Cooperative Geologic Mapping Program has helped Nevadans by significantly increasing the geographic coverage of detailed maps produced by the Nevada Bureau of Mines and Geology. Geologic mapping in the Las Vegas and Reno urban areas is focused primarily on issues related to growth and land management, including earthquake and flood hazards, land subsidence due to ground-water withdrawal, collapsing and expanding soils, landslides, ground-water protection, air quality, and raw materials for construction. Mapping of the Humboldt River basin provides key information on the origin of its precious metal deposits, which make Nevada the leading gold and silver producer in the U.S., and on the environmental and economic impacts of mining and climatic change. Planners, scientists, engineers, managers, policy makers, teachers, students, and members of the general public who are interested in the world around them use geologic maps. Only about 20% of Nevada's 1,980 7.5-minute quadrangles are adequately mapped with the detail that is needed for most applications.

STATEMAP FUNDING

Federal Fiscal Year	State Dollars	Federal Dollars	Total Project Dollars
93	20,519	20,000	40,519
94	21,746	20,000	41,746
95	15,113	10,000	25,113
96	126,444	123,780	250,224
97	261,357	152,410	413,767
98	258,917	139,424	398,341
99	175,175	115,500	290,675
00	135,520	111,210	246,730
01	216,702	196,289	412,991
02	220,825	213,597	434,422
03	184,860	183,231	368,091
04	203,225	171,583	374,808
	$1,840,403	$1,457,024	$3,297,427

Nevada Bureau of Mines and Geology

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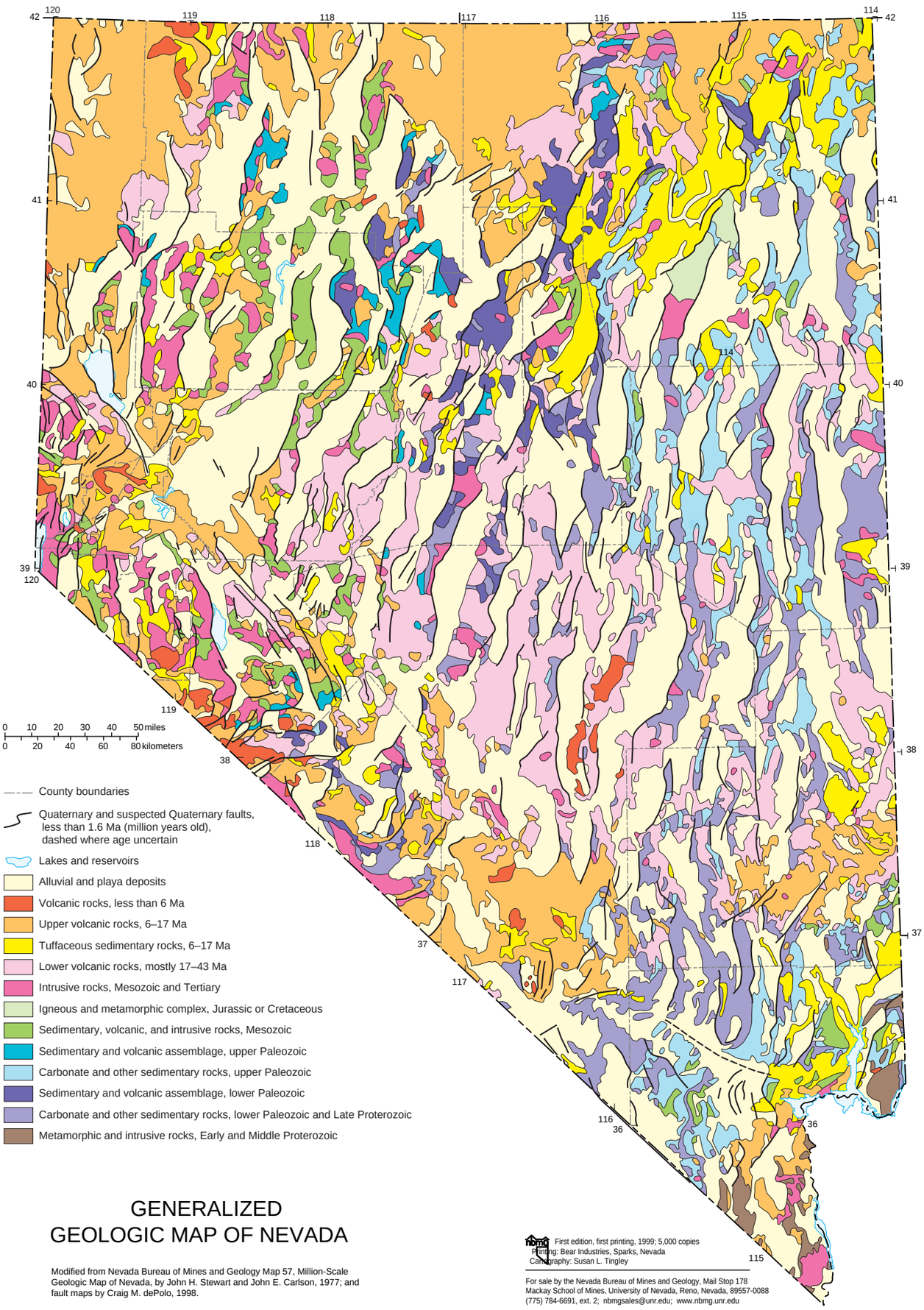

GENERALIZED GEOLOGIC MAP OF NEVADA

Modified from Nevada Bureau of Mines and Geology Map 57, Million-Scale Geologic Map of Nevada, by John H. Stewart and John E. Carlson, 1977; and fault maps by Craig M. dePolo, 1998.

First edition, first printing, 1999; 5,000 copies
Printing: Bear Industries, Sparks, Nevada
Cartography: Susan L. Tingley

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