Hydrology of Stock-Water Development in the Ely Grazing District Nevada

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1475-L

Prepared as part of the Soil and Moisture Conservation Program of the Department of the Interior

Hydrology of Stock-Water Development in the Ely Grazing District Nevada

By CHARLES T. SNYDER

HYDROLOGY OF THE PUBLIC DOMAIN

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1475-L

Prepared as part of the Soil and Moisture Conservation Program of the Department of the Interior

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1963

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington 25, D.C.

CONTENTS

ILLUSTRATIONS

TABLES

HYDROLOGY OF THE PUBLIC DOMAIN

HYDROLOGY OF STOCK-WATER DEVELOPMENT IN THE ELY GRAZING DISTRICT, NEVADA

By CHARLES T. SNYDER

ABSTRACT

The Ely Grazing District is an administrative unit established by the Bureau of Land Management. It covers about 9 million acres, or approximately 14,000 square miles, in White Pine, Nye, and Lincoln Counties, Nev.

The district has an arid to semiarid climate. Precipitation ranges from 7 inches in the south to 13 inches in the north. In the southern part of the district precipitation is about equally divided between winter and summer, but in the northern part most of the precipitation occurs in the winter. The evaporation rate is high throughout the district.

Physiographically the Ely Grazing District consists of isolated valleys surrounded by mountains. The valleys lack exterior drainage except for three in the south which are tributary to the Colorado River.

The geology of the area falls naturally into two general categories: (1) the geology of the mountains and (2) the geology of the valleys. The valleys are important for desert water supply as they contain the principal aquifers.

Water supplies are derived chiefly from runoff of precipitation that falls in the mountains. Much of the rain that falls is lost in the mountains by evaporation and transpiration; the remainder moves toward the valleys in surface streams or as ground water.

Surface streams can be used directly by stock or the water can be stored in reservoirs for future use. Reservoir losses which take place through seepage and evaporation are high. The losses by evaporation may be minimized most economically through use of deep reservoirs having a minimum surface area.

Most of the ground water used in the Ely Grazing District occurs in the valley fills. A few wells have been dug or drilled into the bedrock of the mountains but dry holes are not uncommon.

Water resources in 20 valleys in the district were investigated to determine the water supplies available for stock use and possible additional sources. It is concluded that most of these valleys will sustain additional development. Each valley, however, is a unique case; and before large-scale developments can be made, local test drilling and test pumping should be done.

INTRODUCTION

The public domain in the Western States provides forage for cattle and sheep which are the mainstay of the ranching industry. Large areas of this land are administered by the Bureau of Land Management, Department of the Interior, through local grazing districts. The Ely Grazing District in eastern Nevada is one such administrative unit. The Department has a responsibility to protect as well as to administer the land under its jurisdiction. The Soil and Moisture Conservation program of the Department contributes to the discharge of a part of this responsibility.

In order to protect the range from erosion it is necessary to regulate grazing and reduce trailing, because overgrazed range, or land badly dissected by stock trails, is subject to accelerated erosion by wind and water. Experience has shown that adequate distribution of water supplies results in a reduction of erosion and in optimum use of available forage.

Usually range water has been developed on a random basis, which has led to uneven distribution of the supplies over the entire range. Under the Soil and Moisture Conservation program an effort is being made to achieve a better distribution of the stock-water supplies and better use of the range.

This report, a contribution by the Geological Survey to the Soil and Moisture Conservation program, describes an investigation of the stock-water resources of the Ely Grazing District. It defines the available water sources and areas of water need, and it suggests measures for improvement of the supplies. A map, prepared during the fieldwork, shows the location of the existing supplies and the proposed developments. This map and report should be useful not only to the district manager for planning the Soil and Moisture Conservation activities in the district and in subdividing the district into individual allotments, but also to residents of the area whose livelihood depends in large part on the successful use of the public lands.

The Ely Grazing District is in east-central Nevada between lat 37°40′ and 40°06′ N. and long 114° to 116° W. It includes all of White Pine County as well as the northern parts of Nye and Lincoln Counties.

The district is approximately 170 miles from north to south and about 95 miles from east to west. It covers about 9,000,000 acres, of which more than 8,073,000 acres is administered by the Bureau of Land Management (written communication from D. E. Dimmick, Bureau of Land Management). The total area amounts to 14,000 square miles, or approximately one-seventh of the State of Nevada.

The district contains a number of intermontane desert basins that are elongated north to south. Most are nearly flat floored and some have a central playa. All are desert, with scanty rainfall, high evaporation rates, and a wide range of temperature between winter and summer. Winds are persistent and sand dunes are common.

Access to the area is generally along paved roads between Ely and neighboring towns and by State and county service roads and truck trails to the more remote parts of the district.

Thanks are due Mr. Jess Kirk, district manager of the Ely Grazing District, and his staff for their cooperation. Especial thanks are due the following allottees for their cooperation and assistance: Messrs. Halstead, Arambel, Goicoechea, Paris, Eldridge, and Uhalde. Many other individuals have also provided information and assistance.

The fieldwork was done by reconnaissance methods with valley outlines mapped by car-compass traverse from known points and elevations determined by altimeter. Base maps were furnished by the Bureau of Land Management.

A reconnaissance geologic map (pl. 23) of the Ely Grazing District was prepared during the investigation to show the occurrence of the principal aquifers and nonwater-bearing formations. During the examination an inventory was made of all existing stock-water facilities. These were plotted on the map with the geology. Available information about each well or water source was obtained. Where water supplies cannot be developed on the surface, subsurface exploration in favorable areas may provide useful ground-water supplies. No attempt was made during this investigation to include a quantative evaluation of the water available. Many problems relating to the water supply of the area were discussed with personnel of the Bureau of Land Management, and possible solutions were suggested. The descriptions of the water resources of the individual basins, which are presented later in this report, include examples of possible additional sources of water.

Wells, springs, reservoirs, and other features are described by a three-part number derived from the General Land Office township and range coordinate system. The first part identifies the township north or south of the Mount Diablo base line. The second part is the number of the range east of the Mount Diablo meridian. The third part gives the section number, to which may be added a letter to indicate the quarter section, if known. Quarter sections are indicated by capital letter A, B, C, or D, reading counterclockwise from the northeast quadrant. If more than one well is in the same quarter section, the letter is followed by a number. The only well in the SW¼ sec. 5, T. 4 N., R. 61 E., would be 4N/61–5C or the second well in the NW¼ sec. 6, T. 1 N., R. 68 E., would be 1N/68–6B2 (fig. 47).

The service-area concept is used to appraise the distribution of water sources in a given area. It has been defined by the Bureau of Land Management (1955, p. 4) as "the area that can be properly grazed by livestock watering at a certain water. In determining such

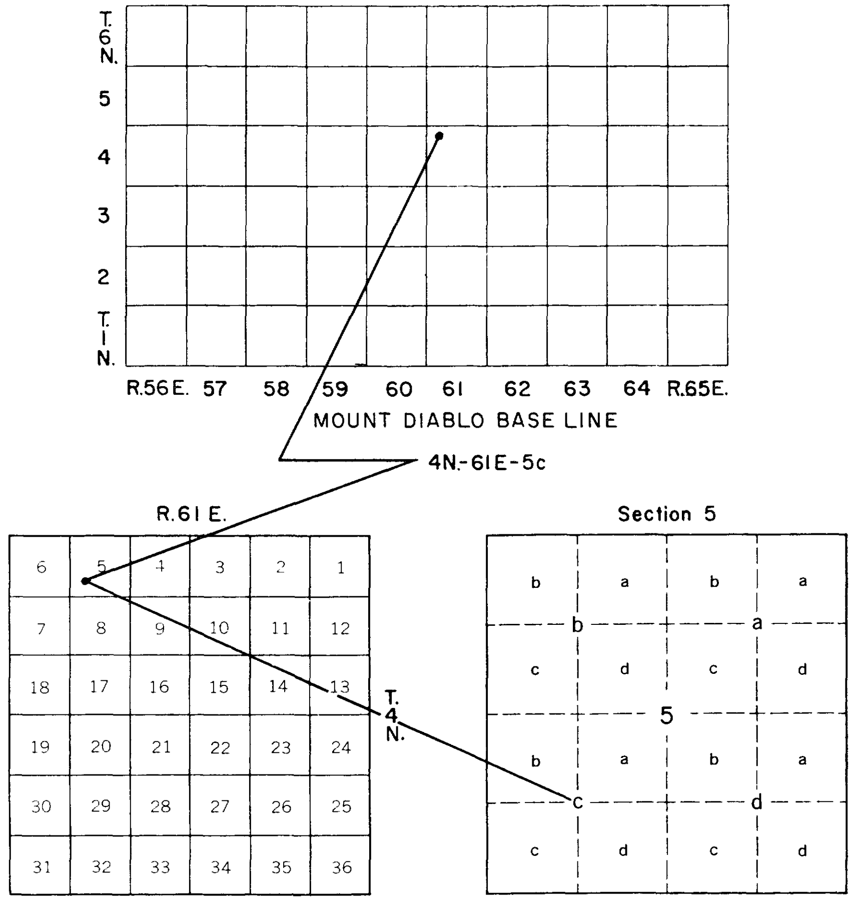

FIGURE 47.—Sketch showing numbering system used in this report.

area, natural and cultural barriers, recognized habits of livestock, proper livestock practices, and range management factors will be considered." It is based on the distance that an animal can graze around a water source without harm to itself or damage to the range. Where walking is easy, as on relatively level ground, an area within about 2½ miles of a water source is considered the service area. On this basis water sources about 5 miles apart would provide for optimum use of the range. The service area is reduced in size where the terrain is steep or rocky.

An area is considered to be well supplied if the water sources are generally with a 5-mile limit or if circles of 2½-mile radius drawn around the sources are tangential or overlapping. If the circles do not touch, leaving unserviced range between the circles, then additional water may be required.

CLIMATE

The Ely Grazing District has an arid to semiarid climate. In the southern part of the district the summers are very hot and dry but the winters are moderate. In the northern part the summer temperatures are not as high but the winters are more rigorous. Because the district is in the central part of the State it has the extremes of both the north and the south.

Average annual precipitation in the valleys ranges from a minimum of 7 inches in the south, at Alamo, to a maximum of 13 inches at Ruby Lake in the north. Most of the precipitation stations are near the valley floor and little direct information is available for the mountains, but the vegetation in the mountains indicates that the annual average is higher.

Table 1 gives the mean monthly and mean annual precipitation at 10 stations within the district. The location of these stations can be found from the coordinates given in table 1.

Average monthly precipitation data at six stations in the Ely Grazing District were plotted as histograms to show distribution of precipitation throughout the year. These graphs (fig. 48) indicate that in the north precipitation tends to be greatest in the late winter. The graph for Ely is typical. In contrast, Adaven in the south has winter and summer maximums and relatively dry periods during the spring and fall.

Distribution of annual precipitation over the district is shown in figure 49, which is part of an unpublished isohyetal map prepared by the Geological Survey. The higher mountains are shown as the areas receiving the greatest precipitation, whereas the valleys and lower mountains receive less precipitation. Much of the precipitation in the northern half occurs as snow, but snow is a less important source of water in the south.

VEGETATION

Vegetation in the Ely Grazing District has been described by F. A. Branson, botanist, U.S. Geological Survey (written communication, 1959).

The two most extensive types of vegetation in the Ely Grazing District are northern desert shrub and pinyon-juniper (Shantz and Zon, 1924). The northern desert shrub type prevails at lower altitudes, and the pinyon-juniper type occurs on ridges and low mountains. At higher altitudes—generally above 7,000 feet—there is a zone of ponderosa pine (*Pinus ponderosa*). The summit areas of the few mountains that exceed 11,000 feet in altitude are covered by alpine tundra vegetation.

The most widely distributed species of the northern desert shrub type is big sagebrush (*Artemisia tridentata*). Big sagebrush, which in some places is mixed with black sagebrush (*A. nova*), generally occurs on light-textured,

TABLE 1.—*Precipitation, in inches, at stations in the Ely Grazing District*

[Given as long-term monthly and annual means, based on U.S. Weather Bureau, 1957, climatological data for Nevada]

Station and county	Location	Altitude (feet)	Years of record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Adaven, Nye	T. 3 N., R. 57 E.	6,250	43	1.30	1.54	1.32	0.98	0.89	0.44	0.96	1.23	0.44	1.02	0.73	1.23	12.08
Alamo, Lincoln	T. 7 S., R. 61 E.	3,440	33	.67	.77	.80	.69	.52	.21	.74	.79	.29	.53	.31	.65	6.97
Caliente, Lincoln	T. 7 S., R. 61 E.	4,402	34	.89	1.00	.86	.61	.44	.32	.66	.75	.45	.68	.52	.80	7.98
Ely, White Pine	T. 16 N., R. 63 E.	6,257	18	.94	.90	1.29	1.20	1.18	.50	.55	.89	.68	.82	.69	.88	10.52
Geyser, Lincoln	T. 9 N., R. 65 E.	5,984														8.39
Lehman Caves, White Pine	T. 13 N., R. 69 E.	6,825	15	1.06	1.27	1.62	1.42	1.00	.86	.70	1.14	.62	1.32	1.27	1.05	13.33
McGill, White Pine	T. 18 N., R. 64 E.	6,340	44	.80	.77	.80	1.01	1.09	.78	.69	.86	.57	.88	.58	.64	9.47
Pioche, Lincoln	T. 1 N., R. 67 E.	6,110	18	1.44	1.39	1.44	1.03	.89	.38	.79	1.30	.98	.88	.66	1.60	12.78
Ruby Lake, Elko	T. 26 N., R. 57 E.	6,012	16	1.03	1.06	1.61	1.15	1.14	1.06	.53	.49	.72	1.20	1.40	1.58	12.97
Sunnyside, Nye	T. 7 N., R. 62 E.	5,325														9.17

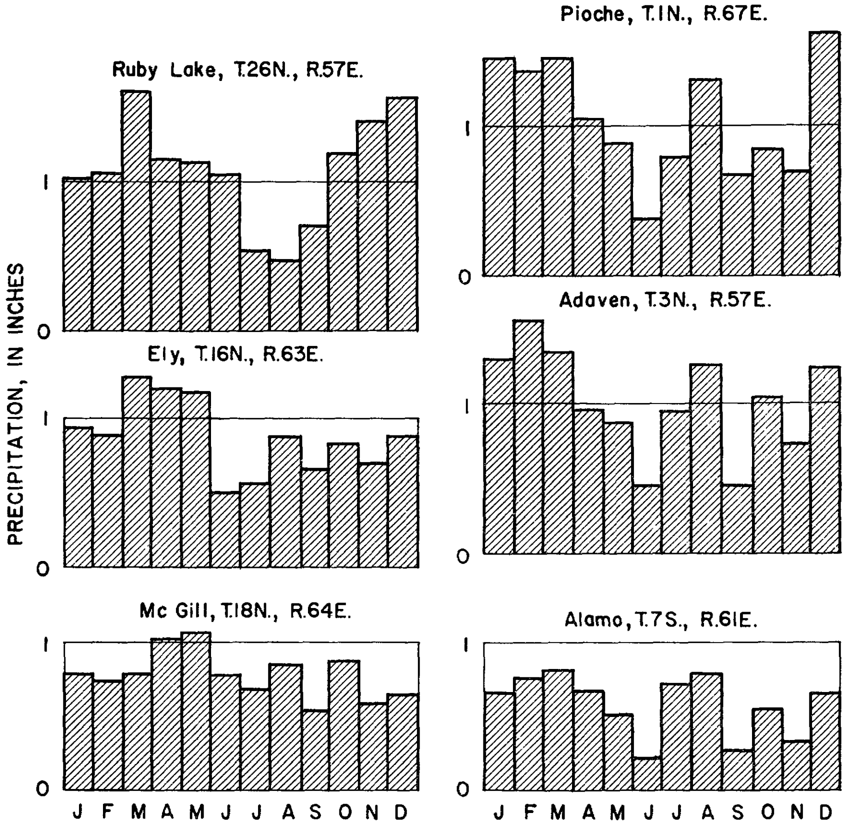

FIGURE 48.—Histograms showing distribution of average monthly precipitation for stations in the Ely Grazing District.

nonsaline soils. Associated with the sagebrush are several grasses of which the principal species are galleta (*Hilaria jamesii*), bluebunch wheatgrass (*Agropyron spicatum*), squirreltail (*Sitanion hystrix*), and Indian rice grass (*Oryzopsis hymenoides*). Cheatgrass brome (*Bromus tectorum*) and Russian thistle (*Salsola kali*) have replaced perennial herbs in some parts of the district. The sagebrush type is best used as spring-fall range.

Toward the lowest parts of the valleys the soils become finer in texture and contain increasing amounts of salts. Various salt-tolerant shrubs grow in the lower areas. The more common shrubs are shadscale (*Atriplex confertifolia*), winterfat (*Eurotia lanata*), kochia (*Kochia vestita*), and greasewood (*Sarcobatus vermiculatus*). These shrubs have higher nutritive value in winter than do herbs and are best used as winter range.

Utah juniper (*Juniperus utahensis*) and singleleaf pinyon (*Pinus monophylla*) are the common species in the pinyon-juniper type. Although forage species are not abundant in this type a wide variety of shrubs and herbs are present in it. The type occupies warm, dry slopes at intermediate altitudes and is considered good spring-fall range.

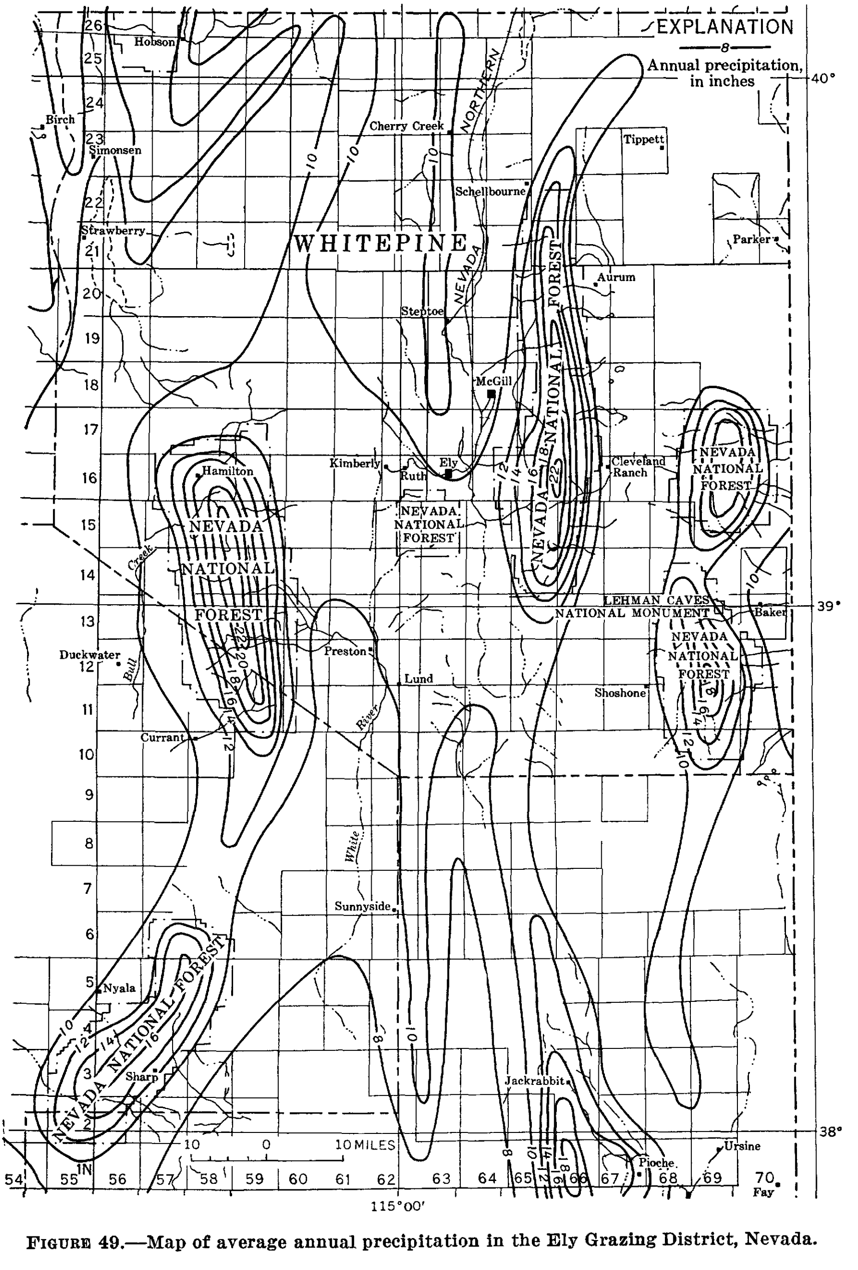

Figure 49.—Map of average annual precipitation in the Ely Grazing District, Nevada.

PHYSIOGRAPHY

GENERAL FEATURES

The Ely Grazing District is in the center of the Great Basin section of the Basin and Range physiographic province (Fenneman and others (1930)). Most of the district is typically "Great Basin," having alternating valleys and mountains.

Fenneman and others (1930) describe the Great Basin as an area of "isolated ranges separated by aggraded desert plains." Although this is true for areas in Arizona and western Utah, the mountains are the dominant features in the Ely Grazing District. Nowhere in the district is there a truly isolated mountain mass. Inselbergs, or solitary outliers, are numerous but none are of mountainous proportions. The mountains generally are joined, so it is the valleys that are the isolated features; to them Jaeger (1957, p. 142) has given the name "enclosed-basin deserts." These isolated valleys surrounded by mountains—rather than isolated mountains surrounded by desert—are a striking feature of this part of the Great Basin, and one that has a market effect on the hydrology.

MOUNTAINS

Mountains of the Ely Grazing District are massive interconnected bodies that trend northward across the mapped area. Their continuity can be illustrated by considering that, if the valleys were cut out of plate 23 the map would be held together by the mountains, but if the mountains were cut out leaving only the isolated valleys, the map would fall apart.

The mountains are continuous and interconnected, but they are not alike. Instead, each range has its own characteristics that set it apart. Individuality results from differences in rock type, structure, relief, vegetation, and general aspect. The appearance of the mountains changes with the rock type. The appearance of an uplifted block of sedimentary rock is quite different from that of a similar body of weathered lava or volcanic ash.

Relief is great and the mountain topography is rough. Many of the mountains have a sheer rise of several thousand feet above the valley floor. Wheeler Peak, with a summit altitude of about 13,000 feet, rises about 7,000 feet above Spring Valley.

Many of the mountains that are steep and without vegetation have been swept bare of debris, so that the underlying formations are exposed. Where the mountains are less steep their slopes are covered by residual soil or alluvium which in most places supports trees or brush.

Alluvial fans have been built up around the base of almost every mountain range of any size. These fans, spreading outward into the valleys from the canyons, form an important physiographic and hydrologic link between the mountains and the valleys.

VALLEYS

Valleys throughout the Ely Grazing District are alike in many ways. Most are downfaulted in relation to the mountains, all are filled with alluvial or lacustrine sedimentary deposits, and all but three have interior drainage. The valleys occupy elongate trenches whose north-south axis is several times longer than the east-west axis. Spring Valley, for example, is nearly 100 miles long, but throughout most of its length it is less than 10 miles wide. Camp Valley, the smallest valley in the district, is 18 miles long and about 7 miles wide. The smaller valleys characteristically are wider in proportion to their length than are the larger valleys.

Most valleys have a flat floor and contain a playa, sand dunes, or other features common to the desert environment. Many valleys were occupied by Pleistocene (ice age) lakes and show relict features such as shorelines, spits, bars, and terraces around the valley margins. These shore features are interesting but have little effect on the occurrence of water in the valley. There are, however, lacustrine (lake-formed) sedimentary deposits in the valley fill of some valleys that may have a marked effect on the occurrence and movement of ground water.

GEOLOGY

PREVIOUS INVESTIGATIONS

Many writers have contributed to the geologic literature of Nevada. Most of the material that has been published is listed in a bibliography by Gianella (1945). Bibliographies of ground-water reports of Nevada and adjacent parts of Utah were prepared by Waring and Meinzer (1947) and brought up to date by Vorhis (1957). Many recent papers on the geology of Nevada have been devoted to aspects of petroleum geology, hence have contained little or no information on the occurrence of ground water.

The earliest paper on ground water in the Ely Grazing District described a reconnaissance of the southern counties made by Carpenter (1915). Clark and Riddell (1920) studied the possibilities of irrigation wells in Steptoe Valley and supervised the drilling of several test wells in the area north of McGill. Since World War II, ground-water investigations have been carried out in parts of the Ely Grazing District by Phoenix (1948), Maxey and Eakin (1949, 1950), and Eakin and Maxey (1951). These recent investigations were made by the U.S. Geological Survey in cooperation with the Nevada State Engineer.

GENERAL FEATURES

The geology of the Ely Grazing District is characteristic of the Great Basin, wherein block faulting has produced a system of northward-trending mountains and valleys. The mountains are being eroded and the erosional products are deposited in the valleys.

GEOLOGY OF THE MOUNTAINS

The term "bedrock" as used herein includes all the generally impermeable igneous and sedimentary rocks found in the mountains. The distribution of these rocks is shown on the map, plate 23.

The sedimentary rocks—limestone, sandstone, siltstone, conglomerate, and shale—have the greatest areal extent and generally form the highest mountains. Most of these rocks range in age from Precambrian to Paleozoic; some, however, are younger.

Igneous rocks of intrusive and extrusive origin are widespread. Rhyolitic or basaltic lava flows are interbedded with accumulations of volcanic ash. Bodies of intrusive rocks occur locally.

The most distinctive geologic feature of the Basin and Range province is the faulting along which the valleys have been depressed in relation to the mountains. A mental picture of what has happened can be gained by visualizing the valleys and mountains as fault-bounded blocks of irregular size and shape. Some have been uplifted, others depressed, and all have been rotated to some extent and their strata more or less deformed. In the Ely Grazing District the valleys are isolated blocks framed by mountains. The mountains, however, are not single blocks, but include many blocks that have reacted differently to the forces imposed upon them.

GEOLOGY OF THE VALLEYS

Boulders, gravel, sand, silt, and clay have been transported from the mountains and deposited in the valleys by streams or in lakes.

The valley fill differs from valley to valley and from place to place in the individual valleys. In many valleys, deposition has been entirely the work of streams and the valley fill is all alluvium, much of it deposited as alluvial fans around the valley margins. Where lakes temporarily occupied the valleys the alluvium of the fans is interbedded with unconsolidated sediment deposited in the lakes. In either case, sediment has accumulated more or less continuously. Most of the fill has been retained in the valleys except for minor amounts removed by the wind, or by wind and stream action from White River, Lake, and Camp Valleys.

The alluvial fans are conspicuous features of the desert valleys. They are a transition between the mountains and the valleys where the mountain streams debouch, losing their velocity and their sediment-carrying capacity. Each fan usually has a mixture of coarse and fine-grained material deposited near its apex that becomes progressively finer grained valleyward. Figure 50 is an idealized cross

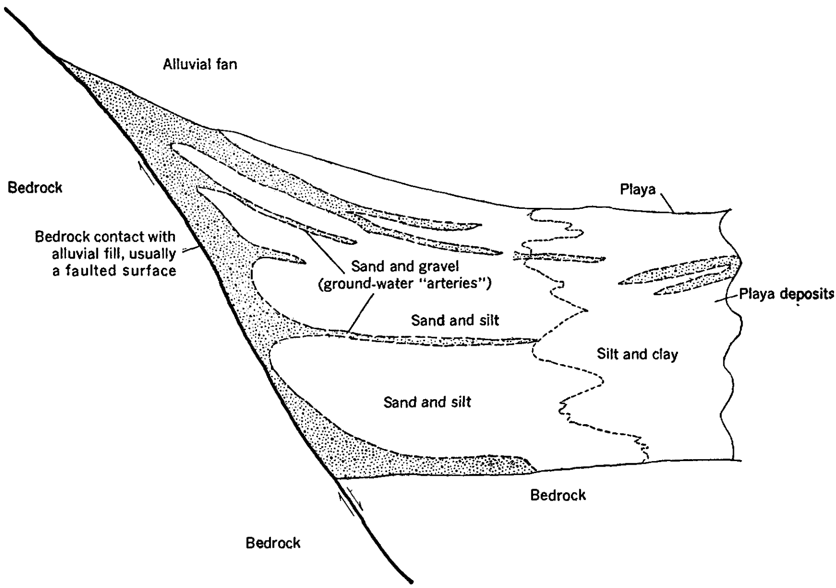

FIGURE 50.—Idealized cross section of the left half of an alluvium-filled valley, showing the tongues of coarse material extending into the valley.

section showing the general relation between the bedrock of the mountains, the alluvial fan, and the valley fill. In the central part of the valley, the playas are fine-grained lacustrine and alluvial sedimentary deposits in which tongues of coarser material interfinger. Outward from the valley center the valley fill becomes coarser and the tongues of sand and gravel are thicker. Usually the alluvium at the valley edge is gravel or larger sized particles, but in some valleys fine-grained material has been deposited in lenses near the base of the mountain.

Alluvial fans, as the valley terminals of the mountain streams, usually absorb most of the water that comes from the mountains. The water infiltrates rapidly during the short periods of runoff, with the result that much of the water flowing from the mountains goes into underground storage where it is largely protected from evaporation. The fans serve as temporary storage media from which the water moves downward into permeable parts of the valley fill. The capacity of the alluvial fans to absorb a large amount of water rapidly—thus preventing its loss by evaporation—is the key to a usable ground-water supply for the desert valleys.

Several valleys, notably Newark, Lake, and White River have accumulations of sediment exposed in the valleys that predate the Quaternary valley fill. It is recognized that the valley fill includes Tertiary formations of volcanic, lacustrine, and fluvial origins, but these have not been differentiated from the Quaternary sedimentary rocks in the field or on the map.

Most valleys are enclosed by rock that prevents or retards the escape of ground water. In some places, however, gaps between the mountains open into neighboring valleys. In these gaps the presence or absence of a ground-water barrier cannot be determined without subsurface exploration because the opening is hidden by alluvium or residual soil. If sufficient ground-water information is available, it is possible to determine whether ground water is moving from one valley to another. Passes that may or may not have hidden barriers are found between the following valleys:

Little Smoky and Sand Spring Valleys
Newark and Huntington Valleys
Garden and White River Valleys
Coal and White River Valleys
Spring and Antelope Valleys

Within a few valleys there are low divides that may separate one end of a valley from the rest. These divides are usually formed by alluvial fans built out from the mountains. Such internal divides are found in Butte, Lake, and Antelope Valleys. In Lake Valley the northern third of the valley is isolated, making it a topographically closed basin; the southern two-thirds of the valley is drained by Patterson Wash, a tributary of the Colorado River. In Butte and Antelope Valleys the southern ends are isolated.

WATER RESOURCES

SURFACE WATER

The Ely Grazing District has only a small amount of surface water, mostly in the mountains, but some is found in small valley streams, playa lakes, or reservoirs.

There are small flowing streams in Huntington Valley in the northwestern part of the district and in Camp Valley in the southeastern part. White River Valley and Lake Valley have stream channels but these do not carry water under existing climatic conditions.

Surface flow in most streams is confined to the mountains except during periods of flood flow when discharge extends beyond the mouths of the canyons and across the alluvial fans. In some asymmetrical closed valleys, where the low part of the valley is near one end, the drainage systems may extend from the canyons across the alluvial fans and down the length of the valley. The stream course in Steptoe Valley, which rises in the southern end of the valley and extends northward toward Goshute Lake, a distance of about 80 miles, is one of the longest of such axial streams.

All the perennial mountain streams are fed by permanent springs. Streams fed by melting snow flow only during the spring and early summer. During most of the year the spring-fed streams are confined to the canyons but during the period of spring snowmelt they are enlarged and flow out of the mountains and across the alluvial fans. As these streams cross the fans they become progressively smaller and finally disappear altogether as the water is lost into the fan. As evaporation and transpiration increase in the early summer and there is no longer runoff from melting snow, the streams terminate farther and farther up on the alluvial fan or in the mountains.

Spring-fed streams provide water for cattle that graze the canyon bottoms and lower canyon slopes. Water for grazing of the alluvial fans and lower mountain slopes is available for only short periods after the spring snowmelt. Thus much of the forage on the alluvial fans and lower mountain slopes remains unused.

RESERVOIRS AS A SOURCE OF STOCK WATER

Reservoirs have been used in the Ely Grazing District with varying degrees of success. Most of them are ponds of small capacity for storage of stock water, but a few are large enough to hold a supply sufficient for irrigation. Some are used for both stock and irrigation water.

Stock ponds are usually constructed by damming a stream course or less often by excavating an off-channel storage system. Channel construction usually requires enlargement of the channel for a storage basin and use of the earth in the dam. Off-channel storage requires that a pit be dug away from the channel and a ditch built to the channel. Earth from the pit is usually used as dike material to increase the depth of storage.

Ninety ponds examined by the writer in the Ely Grazing District are shown on the map (pl. 23) and data are summarized in table 2. Information about individual reservoirs is included in the descriptions of the water resources of individual valleys.

Water for storage in a reservoir may come from storm runoff, snowmelt, a nearby spring, or a combination of sources. Reservoirs that receive at least part of their water supplies from springs are the most dependable.

TABLE 2.—*Reservoirs in the Ely Grazing District, by valleys*

Valley	Reservoirs		
	Stock	Irrigation	Other
Railroad	11	2	
Antelope	11	1	
Long	1		
Spring	10	2	1
Sand Spring	2		
Steptoe	12	1	
Jakes	7	1	
Newark	3		
White River	5	3	
Butte	3		
Dry Lake	2		
Lake	5		
Coal	6		

Reservoirs that depend upon storm runoff or on water from melting snow may be successful if properly located and designed. Poorly situated reservoirs seldom fill, or may waste, through overflow or leakage, most of the water they do receive.

Because reservoir losses are measured in depth of water lost per unit of time, depth of storage is one of the important factors in reservoir design. The relations between reservoir depth and performance has been used by Langbein, Hains, and Culler (1951, p. 17) in a design formula that can be applied when a reservoir having adequate storage for carryover is required.

Additional reservoirs, if they are properly designed and located, can be used to good advantage in the Ely Grazing District. There are areas—where little or no ground water is available—in which water from the mountains or from part of the valley floor can be stored.

GROUND WATER

In this region of scanty precipitation and high evaporation, where streams are few and water stored on the surface is soon lost, ground water is the most important source of supply. A usable supply of ground water requires that there be areas of sufficient precipitation to supply the aquifer with water and that the aquifers be able to absorb, store, and transmit the water for eventual use where needed.

In the Ely Grazing District most of the precipitation occurs in the mountains. By its very nature, water tends to move out of the mountains, either as surface flow or in an aquifer as ground water. The occurrence of surface water in the Ely Grazing District has already been described (p. 395).

Ground water moves through openings in the bedrock or through the soil mantle over the rock. In either case, water from the mountains finds its way into the valley fill, which comprises the principal aquifers in the area.

In many places ground water finds its way to the surface through seasonal or permanent springs or artesian wells. In other areas it must be pumped from wells drilled below the water table.

Seasonal springs usually are superficial and have little or no natural storage. This limited storage is reflected in the sudden rises in discharge that occur with increases in runoff in the area and the sudden drops after cessation of runoff. Seasonal springs thus do not provide a dependable supply unless manmade facilities are provided to store water for later use. In this way many seasonal springs may be utilized as year-round sources of stock water.

Permanent springs are the surface outlets of elaborate and extensive natural storage systems that allow the springs to discharge throughout the year with only minor fluctuations. Many permanent springs in the district provide water that is needed by the stock. The usefulness of some permanent springs has been extended by pipelines that carry water to areas that would otherwise be without water.

Wells dug or drilled into the stream-valley alluvium of the mountains provide only minor amounts of stock water. The alluvium of such stream channels is often discontinuous and shallow so that it has little storage capacity. Wells dug into these discontinuous bodies of alluvium have water only during and for short periods after runoff. Continuous bodies of alluvium that extend from the mountains to the valleys may have a greater storage capacity and wells drilled into these bodies are more apt to be permanent. Because there are fewer places in the mountains where successful wells can be drilled, it is necessary to examine each area where water is required, rather than to make blanket recommendations such as can be done in the valleys.

Ground water in the valley fill is probably the most important natural resource of the district. In contrast to the mountains, where most of the area is underlain by impermeable bedrock, the valleys are almost all underlain by one or more permeable beds that may contain water.

The valley fill and the alluvial fans have been described as the terminals of the mountain streams. The alluvial fans provide storage for ground water and an area for infiltration of surface water. Once the ground water leaves the mountains it enters the complex environment of the valleys. From the alluvial fans the ground water moves into the valley fill and then to a point of discharge. To better understand the valleys, the valley fill, and the ground water, a classification based on the topography and the hydrology is described in the following section.

Valleys of the Great Basin, and of the Ely Grazing District in particular, can be classified on the basis of their degree of isolation and their capacity to hold water. A valley may be completely enclosed or it may be tributary to another valley. If completely isolated it is topographically closed; if tributary to another valley it is topographically open. It may also fully contain the water within its basin, or water may be conveyed to adjacent basins through the subsurface materials. A closed valley that loses water to another valley therefore would be hydrologically drained but topographically closed. The simplest situation is the valley that is hydrologically undrained and topographically closed. The sole source of water for such a valley is the precipitation that falls within the watershed. The alluvium underlying a closed, undrained valley is saturated and ground water is being discharged by evaporation from the floor of the valley. Some of the closed undrained valleys contain swamp areas in which phreatophytes (water-loving plants that obtain their water from ground water) are common.

When discharge by evapotranspiration keeps pace with inflow, the valley alluvium is moist, evaporites crust the surface, and water stands in pools only at night or in winter. If precipitation should exceed evaporation, lakes would form in the valleys as they did in Pleistocene time.

Each of the valleys in the Ely Grazing District has been classified according to its hydrologic and topographic characteristics. (See table 3.)

Some basins, although topographically closed, are hydrologically connected to adjoining valleys so that ground water is discharged to the lower valley. In such valleys the ground surface usually is dry, the water table is deep, and phreatophytes are uncommon. The playas are wet only during the spring snowmelt runoff or after rains. Antelope, Butte, Long, and Dry Lake Valleys are examples of drained valleys where the water table is at moderate depths. Coal Valley is drained beyond the depth of any well ever attempted. Wells have not been drilled in Jakes Valley but surface conditions suggest that it is drained.

Drained valleys tributary to closed basins are without playas and the water table is tens or hundreds of feet below the surface. Garden and Little Smoky Valleys are typical tributary valleys.

TABLE 3.—*Hydrologic and topographic classification of valleys in the Ely Grazing District*

Valley	Classification			
	Hydrologically		Topographically	
	Drained	Undrained	Open	Closed
Antelope	×			×
Spring		×		×
Steptoe		×		×
Butte	×			×
Long	×			×
Ruby		×		×
Huntington	×		×	
Newark		×		×
Little Smoky	×		×	
Sand Spring	×			×
Snake	×		×	
White River	×		×	
Jakes	×			×
Railroad		×		×
Lake	×		×	
Dry Lake	×			×
Cave	×			×
Coal	×			×
Garden	×		×	
Camp	×		×	

White River, Lake, and Camp Valleys are drained open valleys tributary to the Colorado River that have stream channels along the valley axis.

In closed valleys, wells drilled almost anywhere will yield water. In some basins, however, the water under the valley floor may contain high concentrations of salts remaining after evaporation of the water. Available information indicates, nevertheless, that to date no wells in the Ely Grazing District have been abandoned because the water was unfit for use by stock.

The position of the water table in the drained valleys, though not so well known, ranges from a few tens of feet to several hundred feet below the surface. Its position partly depends upon the thickness and the permeability of the valley fill. In those valleys in which wells have been drilled, it is usually possible to estimate the position of the water table, and sometimes to determine the direction of movement of the water. If enough information is available, accurate water-table maps can be prepared which show not only the depth to water but also the direction in which the water is moving. Such a map shows the areas of recharge and discharge for the aquifers. With such information well-site locations and estimates of the probable depth to water can be made with reasonable accuracy.

In some of the valleys, ground water is being discharged onto the valley floor by marginal springs that form swamps or small lakes. These provide water for stock and often support meadows that furnish feed for the cattle. These springs are usually small, but in Spring, Snake, White River, and Railroad Valleys some of the springs are large enough to provide a supply sufficient for irrigation.

Most of the wells dug or drilled in the valleys find water under water-table conditions. In a few places, however, artesian conditions prevail and water rises in the well, in some places high enough to flow.

WATER RESOURCES OF THE INDIVIDUAL VALLEYS

Ground-water conditions in the individual valleys of the Ely Grazing District range widely, therefore range-water conditions in the individual valleys are described separately. The descriptions include appraisal of the available stock water and the occurrence of water in each valley. Suggestions and examples of possible additional supplies are included. The locations of the valleys and the water-supply features in them are shown in plate 23.

ANTELOPE VALLEY

Antelope Valley, the northeasternmost basin in the Ely Grazing District, occupies a structural trough about 80 miles long that extends northward beyond the district boundary into Elko County. Only the southern part of the basin—about 30 miles long—is included in the district.

Antelope Valley is bordered on the west by the Antelope Range, on the southeast by the Kern Mountains, and on the northeast by the Goshute Mountains. A prominent alluvial divide in T. 24 N., R. 69 E., within the Goshute Indian Reservation, completes the closure of Antelope Valley on the east. On the north a ridge of alluvian lying between the Antelope Mountains and Goshute Mountains forms a divide separating the southern end of the valley from the part to the north. Southwest of Antelope Valley is a small tributary basin separated from Spring Valley by an alluvial divide. The floor of Antelope Valley in the Ely Grazing District has a minimum altitude of 5,625 feet and the surrounding mountains range from 8,500 to 9,600 feet in altitude.

Antelope Valley is a typical filled basin almost completely bordered by alluvial fans that merge valleyward into alluvium and lacustrine sediments underlying the valley floor. A dry playa occupies the lowest part of the valley. During part of the Pleistocene epoch, Antelope Valley was occupied by a small lake which at its maximum was about 75 feet deep and covered an area of about 40 square miles.

Surface drainage in Antelope Valley is toward the playa. A tributary stream from the small basin to the southwest enters through a narrow canyon in T. 22 N., R. 67 E. Drainage from most of the Goshute Indian Reservation is eastward into Utah, which is just east of the map area (pl. 23). The part of Antelope Valley that is within the district is topographically closed but hydrologically drained; that is, surface water does not flow out of this part of the basin but ground water does.

STOCK-WATER SUPPLIES

Wells, springs, and reservoirs provide water for stock grazing in Antelope Valley, the surrounding mountains, and on the Goshute Reservation. Despite the diversity of sources there are large areas in the valley where wells have not been attempted; one such area is in the central part of the valley. A ground-water investigation in the Elko County part of Antelope Valley was made by Eakin, Maxey, and Robinson (1949), but no similar study has been made in White Pine County.

SPRINGS

Springs in the mountains around Antelope Valley provide water for stock. A few of these springs are listed in table 4 and shown on the map (pl. 23).

The improvement of the springs, including repair work to reduce losses, should make more water available to the stock. The repair work would include removal of phreatophytes and construction of spring boxes and troughs to reduce evaporation and seepage losses. Troughs help to keep the stock away from the spring.

RESERVOIRS

Twelve reservoirs in Antelope Valley are listed in table 4. Ten are in the Ely Grazing District and two are on the Goshute Reservation. Eight of the ten reservoirs in the district are in the north end of the valley.

Two of the eight reservoirs in the north end of the valley contained water in November 1956. The irrigation reservoir (24N/70–18) has always been dry when examined, and from the appearance of the reservoir bottom it has never held water for any extended period.

WELLS

There are seven wells in Antelope Valley, including those on the Goshute Reservation. Five of these were drilled on the reservation, one was drilled in the south end of the valley, and one was dug in the mountains at the north end. Five of the wells are in Antelope Valley and two are east of the divide. (See pl. 23, and table 4.) The dug well was shallow. Water was found in the drilled wells at depths of 215 to 350 feet below the land surface.

It seems significant that water has been found wherever wells have been attempted in the valley. There is not enough information at present to indicate the direction of ground-water movement through the valley fill. The evidence indicates that stock water can be obtained from wells in the central and northern parts of the valley, but drilling probably should be avoided near the valley margin, where shallow bedrock may be found and the depth to water may be extreme.

SPRING VALLEY

Spring Valley, the first valley southwest of Antelope Valley, is one of the longest valleys in the district. It occupies a deep trench about 100 miles long between the mountains.

Spring Valley is bordered on the north by the Antelope and Kern Ranges, on the east by the Snake Range, on the south and west by the Fortification Range, and on the west by the Schell Creek Range. Low divides separate Spring Valley from Antelope Valley on the north, Snake Valley on the east, and Lake Valley on the south. The altitude of the lowest part of Spring Valley is 5,536 feet. The bordering mountains range in altitude from 9,000 to 13,000 feet.

Spring Valley is a topographically closed, hydrologically undrained basin in which the water table is close to the land surface. The valley is filled with alluvium interbedded with lacustrine sedimentary deposits that accumulated during the Pleistocene and Recent epochs. During a part of the Pleistocene epoch a lake occupied the valley and had, at its maximum, a depth of about 265 feet and an area of 335 square miles.

Drainage is toward the playa on the valley floor, but the waters of many of the spring-fed streams from the mountains are lost by evaporation or by seepage on the alluvial fans.

STOCK-WATER SUPPLIES

Wells, springs, reservoirs, and mountain streams furnish water for stock. In addition, spring-fed streams furnish irrigation water along both sides of the valley.

SPRINGS

Springs, mostly arising either along the outer margins of the alluvial fans or in the mountains, furnish small to medium amounts of water for ranch and stock use. The range of use of several springs has been increased by pipelines from the springs to areas where the water is needed. (See table 4.)

Mike Spring, 20½N/69–34B, one of the largest, provides water for stock and for mining operations. No estimate of the discharge was made.

RESERVOIRS

Stock reservoirs play only a minor part in the water economy. Ten stock reservoirs have been built in the valley in addition to two irrigation reservoirs that are open to stock. These are listed in table 4.

WELLS

Thirty-four wells have been drilled or dug. Most of these provide water for stock use but some supply irrigation or mining needs. Spring Valley has been explored for water about as thoroughly as any similar area in the district, and successful wells seem to have been obtained wherever attempted.

The distribution of wells and other water supplies is shown on the map (pl. 23). Although most of the valley is adequately watered, a number of additional stock wells can be obtained as required. Two well sites in the reentrant between the Kern Mountains and the Snake Range, and typical of the sites that can be chosen in Spring Valley, are as follows:

Typical well sites in Spring Valley

Location	*Altitude (feet)*	*Estimated depth to water (feet)*
Sec. 24, T. 20 N., R. 68 E	6,320	100 or less.
SE¼SW¼ sec. 32, T. 21 N., R. 68 E	6,300	Do.

Determination of the shape of the water table, on the basis of data from existing wells, was attempted, but only a general correlation between the ground surface and the water table was established. The water table slopes from the edges of the valley toward the playa, and in the northern part of the valley the water table is inclined more steeply than it is in the south.

The chemical quality of the water is satisfactory for stock. So far as is known there are no instances in which mineralization is high enough to make the water unfit for use.

STEPTOE VALLEY

Steptoe Valley, immediately west of Spring Valley and the Schell Creek Range, has the largest share of industry, population, and agriculture in the county. Despite this development it still has large areas of grazing land. This valley is large and more than 90 miles of its length is in the Ely Grazing District. It extends several miles northward into Elko County.

Steptoe Valley is bounded on the east by the Schell Creek and Duck Creek Ranges and on the west by the Egan and Cherry Creek Ranges. South of Steptoe Valley these ranges converge to form a barrier between Steptoe Valley and Cave Valley. To the north, beyond the county line, several small ranges separate Steptoe Valley from Goshute Valley. Steptoe Valley is asymmetrical, in that it is lower at the north end than in the center. The altitude ranges from 5,850 feet at Goshute Lake to 6,800 feet at the south end. The mountains on either side have altitudes that range from 9,000 to 10,000 feet.

Alluvium and lacustrine sediments have accumulated in the valley. Clark and Riddell (1920, p. 19–20) reported a large Pleistocene lake in the northern end of the valley and a smaller lake southeast of Ely.

Drainage in Steptoe Valley is northward toward Goshute Lake. Steptoe Valley is classfied as a closed, undrained basin.

STOCK-WATER SUPPLIES

Wells furnish most of the water used, but minor amounts are obtained from springs, reservoirs, and flowing streams. Steptoe Valley presents few problems of stock-water supply. Its hydrologic conditions and the occurrence of ground water were described by Clark and Riddell (1920). Additional information is given in the following section.

SPRINGS

"Steptoe Valley contains a considerable number of springs," according to Clark and Riddell (1920, p. 45). Many of these are usable for stock-water supply; however, others are thermal and not acceptable for stock use. Table 4 lists the larger or better known springs. A number of springs, visited by Clark and Riddell (1920, p. 45–50) during their work in Steptoe Valley, were revisited in 1958 and the temperatures were found to be within 2 or 3 degrees of those obtained in 1917 and 1918.

RESERVOIRS

At least 13 reservoirs (table 4) are in use for stock, irrigation, or industrial water supplies. Most of the reservoirs contained water when visited. The smaller stock reservoirs have been less successful, partly because of a high percentage of structural failures. In several cases failure resulted from flows in the stream channels that exceeded the capacity of the structures. Several off-channel diversion systems are no longer usable because diversion structures in the channels are not effective or storage capacities are too small.

Two reservoirs, Cummings Lake (15N/64–17) and an unnamed reservoir (18N/63–2), are used for irrigation supply but are not used by stock.

WELLS

Numerous wells are in use in Steptoe Valley and several additional wells could be put to use if desired. These are listed in table 4.

So far as is known the alluvium of Steptoe Valley is water bearing. Ground water in Steptoe Valley moves north toward Goshute Lake. Depth to water decreases northward from 175 feet until, in the area east of Cherry Creek, the water stands about 2 feet below the ground surface. From Cherry Creek northward to Goshute Lake, groundwater is discharged by evapotranspiration.

Drilling for stock water is practical in sec. 29, T. 12 N., R. 64 E., east of the Cave Valley road junction. Water can be expected about 225 feet below the surface.

BUTTE VALLEY

Butte Valley is a small closed basin in White Pine County lying north of Ely and west of Steptoe Valley. Like Antelope Valley, it is classified as a closed drained basin that has an alluvium-covered drainage divide at its north end. The valley is about 40 miles long and has an average width of 7 or 8 miles.

Butte Valley is bordered on the northeast by the Cherry Creek Mountains, on the southeast by the Egan Range, and on the southwest and west by the Butte Mountains. The Butte Mountains and the Egan Range join along the southern edge of Butte Valley. The divide along the northern part of the valley is low and inconspicuous. The lowest altitude measured in Butte Valley was slightly more than 6,200 feet, whereas the surrounding mountains have altitudes ranging from 8,700 to 10,500 feet.

Butte Valley is filled with alluvium that may be interbedded with lacustrine sediments. Direct field evidence of a Pleistocene lake is lacking, but air photographs suggest the presence of shorelines.

Subsurface conditions in the valley fill of Butte Valley are not well defined, but there are two distinct ground-water areas. A partial barrier of low hills that trend northwestward across the valley separates the two areas, and the occurrence of ground water differs on the two sides of the barrier. North of the barrier the area is subirrigated by ground water, whereas south of the barrier, in the main part of the valley, the water table is tens of feet below the surface.

Butte Valley is classified as hydrologically drained but topographically closed.

STOCK-WATER SUPPLIES

Wells and springs furnish most of the stock water used in Butte Valley; there is only minor dependence upon reservoirs. However, some water from the mountains is used for irrigation and, to a limited extent, for stock water.

SPRINGS

Springs in Butte Valley and the surrounding mountains provide minor amounts of water for stock and a fair supply of water for irrigation. Several springs are shown on the map (pl. 23) and are listed in table 4.

RESERVOIRS

Three stock-water reservoirs in Butte Valley, listed in table 4, are small and the depth of storage is insufficient to provide for carryover.

An irrigation reservoir in 26N/62–15, supplied from springs, is the largest pond in the area. However it is on private land and is not available for use by range cattle.

WELLS

Fourteen wells have been dug or drilled in Butte Valley and the surrounding mountains. (See table 4.) All have been successful except wells 21N/60–30 and 24N/61–20. Three of the successful wells are in the Cherry Creek Mountains to the east, one is in the Butte Mountains to the south, and the remaining eight are on the valley floor. All wells were dug or drilled into alluvium or valley fill, except 19N/60–3 and 21N/60–30, which were drilled into the bedrock. Well 21N/60–30 was drilled into limestone in the Butte Mountains and was unsuccessful. Water was found in well 19N/60–3 that was moving through interconnected fissures in the rhyolite.

A dry well, 24N/61–20, started on the floor of Butte Valley, was abandoned at a depth of 21 feet. This well probably would have been successful if continued an additional 15 or 20 feet.

Two large areas without wells or springs are shown on the map (pl. 23). The largest of these is in the south end of the valley and in the embayment between the mountains. A smaller area lies at the north end of the valley, west of the low hills. It is likely that additional stock-water supplies can be obtained from wells in these areas, as the valley fill has been found to be saturated wherever wells have been drilled.

LONG VALLEY

Long Valley is a narrow valley in the north-central part of the district used exclusively for grazing. It is uninhabited and uncultivated, and as far as is known has never been farmed. It has a length of about 42 miles, of which 18 miles is a northeastward-trending panhandle. Long Valley is classified topographically as a closed basin that is drained.

The Butte Mountains form the east and south margins of Long Valley, the Ruby Range and Maverick Springs Range the west and north margins. The lowest altitude measured in Long Valley was 6,060 feet, which is slightly higher than the floor of neighboring valleys. The surrounding mountains are generally below an altitude of 9,000 feet.

The valley fill in Long Valley is composed of alluvium and Pleistocene lacustrine sediments. Relict shore features indicate that the Pleistocene lake was about 30 miles long and had a maximum depth of about 250 feet.

A number of drainage courses empty into Long Valley. The biggest of these drains the panhandle and the bordering mountains.

STOCK-WATER SUPPLIES

Wells and springs furnish all the stock water used. At present the central part of Long Valley is well watered but the southern end and the panhandle lack adequate water supplies.

SPRINGS

Springs provide only a minor amount of water for use by stock. Table 4 lists four springs that are currently in use. Most of the springs in the area are in the mountains. An exception to this is Long Valley Slough (23N/58–25C), which lies on the floor of Long Valley near its north end. Long Valley Slough has an altitude of 6,075 feet, which is higher than the level of water in nearby wells.

RESERVOIRS

No reservoir construction has been attempted in Long Valley and it is unlikely that any will be undertaken as long as water can be obtained from wells and springs. The reservoir, listed in table 4, is in the mountains south of Long Valley.

WELLS

Table 4 lists 15 wells that have been drilled or dug in the valley. These are restricted to the center of the basin. No wells have been drilled in the extreme north or south ends. The valley fill seems to be saturated at a fairly shallow depth, the water-table elevations ranging from 5,975 feet in the south to 6,075 feet in the north. One dry well (20N/59–20) was dug to a depth of 150 feet and abandoned about 50 feet above the level of the water. A second dry well (22N/58–32C) is caved.

Two sites, one each in the NE¼SE¼ sec. 16, T. 25 N., R. 60 E., and SW¼ sec. 32, T. 24 N., R. 59 E., are typical of the possible water sources that can be selected in Long Valley.

RUBY VALLEY

Ruby Valley, in the mountains west of Long Valley, has only 15 miles of its length in White Pine County and in the district. Most of Ruby Valley is in Elko County.

Ruby Valley is bordered by the Maverick Springs Range on the southeast and the Ruby Mountains on the west. Ruby Lake, in the lowest part of the valley, has a surface altitude of 5,990 feet. The Ruby Mountains are steep, rising to an altitude of more than 10,000 feet. The Maverick Springs Range is less steep and ranges from 6,000 to 8,000 feet in altitude.

Ruby Valley is filled with aluvium and fine-grained lacustrine sedimentary deposits.

Surface drainage in the southern end of Ruby Valley is into Ruby Lake. This is a closed, undrained valley where evaporation and precipitation are in balance and a system of swampy ponds and small lakes is maintained on the valley floor. The wetted area covers about 35 square miles.

STOCK-WATER SUPPLIES

Stock water is provided by 1 well in the mountains southwest of Ruby Lake, 2 wells on the valley floor, and 7 springs. These are listed in table 4 and shown on the map (pl. 23).

The occurrence of ground water in Ruby Valley has been described by Eakin and Maxey (1951, p. 65–93). Their report is generally concerned with ground-water conditions in Elko County, as little was known about the southern end of the valley at that time. The three wells listed in table 4 have been drilled since 1951.

SPRINGS

Springs on the Harris Ranch in the northwestern corner of Ruby Valley provide water for irrigation and stock use on a large area of pasture land. These and other springs in the area are listed in table 4.

RESERVOIRS

No reservoirs are in use and so far as is known none are under consideration for development in Ruby Valley.

WELLS

Two wells have been drilled in the White Pine County part of Ruby Valley, in a broad reentrant east and south of the lake. Other wells that might be drilled between these two wells should find water under the same conditions as found in the existing wells. Drilling in the area south of well 25N/58–32 may not be successful because bedrock probably is at shallow depth.

HUNTINGTON VALLEY

Huntington Valley lies between Newark Valley and the Elko County line. It is bordered on the east by the Ruby Mountains, on the west by the Diamond Mountains, and on the south by a low divide that separates Huntington Valley from Newark Valley. The valley floor slopes toward the north and is drained in this direction by tributaries of Huntington Creek.

The divide between Newark and Huntington Valleys is covered with residual soil, so that little is known about the subsurface geology. Outcrops of pyroclastic rocks—included with the Quaternary alluvium on plate 23—in the northwestern part of T. 23 N., R. 56 E., indicate that at least part of the divide area is underlain by material that may form a hydrologic barrier between the two valleys.

STOCK-WATER SUPPLIES

Nine springs, one well, and Huntington Wash provide water for stock in the Huntington Valley area. No reservoirs have been built or used in the southern end of Huntington Valley.

SPRINGS

Springs in the valley and in the mountains provide water for stock. Headwaters Spring 25N/55–34D is the source of Huntington Creek, which flows north toward the Humboldt River. Springs in Huntington Valley, listed in table 4, are shown on the map (pl. 23).

WELLS

Only one well, 24N/56–20B, has been drilled in the northern end of Huntington Valley. This is a fairly shallow well drilled into alluvium. Additional well sites probably can be located in the valley fill of Huntington Valley under conditions similar to those found in the NW¼ sec. 11, T. 24 N., R. 56 E., and the SW¼ sec. 35, T. 24 N., R. 56 E.

NEWARK VALLEY

Newark Valley and its tributary Little Smoky Valley, parallel the western edge of the Ely Grazing District.

Newark Valley is bounded on the east by the Ruby and White Pine Mountains, on the south by the Pancake Range, and on the west by the Diamond Mountains. The crestline of the Diamond Mountains forms the western boundary of the Ely Grazing District. Newark Valley opens southward to the Little Smoky Valley, but is separated by an alluvium-covered divide from Huntington Valley to the north. The lowest measured altitude on the floor of Newark Valley was 5,835 feet above sea level. The surrounding mountains range from 7,000 to more than 10,000 feet in altitude.

Newark Valley is classified as a closed, undrained basin that discharges water by evapotranspiration. The amount of water so discharged must be large in proportion to the playa size as the contributing drainage basin, which includes Little Smoky Valley, is quite large in relation to the size of the discharge area.

During the Pleistocene epoch, Newark Valley was filled with water to a depth of 285 feet. Relict shorelines and other lake features are common around the valley margin.

Well-defined drainage systems come into Newark Valley from Little Smoky Valley and from the reentrant between the Pancake Range and the White Pine Mountains.

STOCK-WATER SUPPLIES

The water supply has not been studied previously. Wells, springs, and reservoirs furnish water for stock in Newark Valley and in the surrounding mountains. Wells have been drilled as needed and have been successful wherever attempted.

SPRINGS

Springs in Newark Valley and the adjoining mountains provide water for stock and for irrigation. A large amount of water comes from privately-owned springs along the west side of the valley. Most of these are not open to use by range cattle and are not included in this study. Springs open to stock are shown on the map, plate 23, and are listed in table 4. The largest is Warm Spring (22N/56–1A), which has a discharge of more than 6 cfs (cubic feet per second). This is one of the largest springs in the grazing district. Improvement of the springs to reduce waste should make more water available for stock.

RESERVOIRS

Reservoirs have not been used widely in Newark Valley because other sources of water were available. The few reservoirs that are in use in the mountains east of Newark Valley are listed in table 4. Most of these are small and do not provide any storage for carryover.

WELLS

Wells provide a stable supply of water for stock throughout most of the valley. These are described in table 4 and shown on the map (pl. 23). The only area where more wells are needed is in a small reentrant that lies southeast of the main valley between the Pancake Range and the White Pine Range.

The valley fill of Newark Valley is saturated below the level of the valley floor. The water table slopes downward from the valley margins to the valley bottom. Water moves into Newark Valley from Little Smoky Valley and from the surrounding mountains.

Four well sites, listed in the following table are examples of locations where drilling should provide water east of the Pancake Range. Water should be found near the level of the water in the low part of Newark Valley. Wells drilled near the playa, however, may be contaminated by evaporites from the valley fill. Drilling should be confined to the valley fill, as the underlying bedrock probably would not contain water.

Typical well sites in Newark Valley

Location	Altitude (feet)	Estimated depth to water (feet)
SE¼NE¼ sec. 2, T. 16 N., R. 56 E	6, 310	400–500.
SE¼NE¼ sec. 14, T. 17 N., R. 56 E	6, 300	350–450.
SE¼SE¼ sec. 26, T. 18 N., R. 56 E	6, 170	300–400.
NW¼SW¼NW¼ sec. 34, T. 18 N., R. 57 E	6, 480	Less than 600.

LITTLE SMOKY VALLEY

Little Smoky Valley, which is south of Newark Valley and partly outside the Ely Grazing District, is a tributary of Newark Valley. Locally, the northernmost part of Little Smoky Valley is called Fish Creek Valley or Fish Creek Flat. Southward it becomes Little Smoky Valley. The valley includes parts of White Pine, Nye, and Eureka Counties. Only the part in White Pine and Nye Counties is within the Ely Grazing District.

This valley is about 40 miles long in a north-south direction and ranges from 6 to 11 miles in width. It is broad and flat floored in the north but narrows and steepens southward.

Little Smoky Valley is bordered on the north by the Diamond Mountains, on the east and southeast by the Pancake Range, and on the west by the Fish Creek and Antelope Ranges. Northward it opens into Newark Valley and to the south it is separated from Sand Spring Valley by a low divide. The altitude ranges from 6,600 feet on the divide in the south to 5,900 feet at the valley outlet on the north.

The valley fill probably contains a large proportion of coarse fragments because the finer particles have been carried northward into Newark Valley. Locally, however, there are playas on the valley floor.

Surface drainage in the valley is northward along a system of dry stream channels that are discontinuous and end in the small playas. The valley is classed as topographically open and hydrologically drained.

STOCK-WATER SUPPLIES

Stock water is obtained from wells and springs in the valleys and the surrounding mountains. In spite of the fact that a number of successful wells have been drilled, there are areas where successful wells cannot be drilled.

SPRINGS

Springs occur in the Pancake Range east of Little Smoky Valley and Sand Spring Valley, but so far as is known no springs are used in Little Smoky Valley as a source of stock water.

RESERVOIRS

No reservoirs are in use and, so far as is known to the author, no construction is anticipated at this time.

WELLS

Sixteen successful and two unsuccessful wells were drilled for stock use or in a search for a possible irrigation supply. These are listed in table 4. Not all the wells listed in table 4 are shown on the map (pl. 23), as several, indicated in the table, are outside the Ely Grazing District.

All but three of the wells are less than 400 feet deep and in most the water is less than 250 feet below the surface. The valley fill is saturated at depth and will furnish adequate water for stock but may not yield enough water for irrigation. The dry well 15N/54–20D listed in table 4 was drilled into bedrock near the Pancake Range. Well 15N/53–31A had insufficient water for irrigation or stock, so was abandoned.

Additional supplies could be developed by drilling. Typical sites are those in the SE¼ sec. 31, T. 14 N., R. 53 E. (unsurveyed), and sec. 17, T. 12 N., R. 53 E. The first well would have to be drilled to a depth of 400 to 450 feet. If successful within the indicated limits, the second well might be drilled to a maximum depth of 500 feet. Additional wells may be practicable in T. 13–14–15 N., R. 52 E., but considerable care is needed in site selection.

SAND SPRING VALLEY

Sand Spring Valley is a closed, drained valley west of the Pancake Range in the northern part of Nye County. It is about 40 miles long and about half its length is in the Ely Grazing District. It shares the same structural trough between the Pancake Range and the Antelope Range as does Little Smoky Valley to the north but is separated from it by a low alluvium-covered divide. The altitude of the valley floor is slightly above 6,000 feet at the north end of the valley. The lowest part of the valley is in the south, outside the district.

There are no ranches or farms because there is no water for irrigation and little for stock or domestic supply.

Drainage in Sand Spring Valley is toward the playa at the south end.

STOCK-WATER SUPPLIES

Stock water is in short supply, as there are no wells either in the valley or in the mountains. The cattle have to depend upon the meager supply obtained from reservoirs or from springs.

SPRINGS

Two springs, listed in table 4, on the east side of the valley produce only a small amount of water.

RESERVOIRS

Two reservoirs in Sand Spring Valley are listed in table 4 and shown on the map (pl. 23). Additional ponds might be considered after more information has been obtained about reservoir performance in this very dry valley.

WELLS

A well in the north end of Sand Spring Valley was reportedly dry at a depth of 300 feet. This well was dug many years ago and the location has been forgotten, but it was supposedly dug in clay throughout. No other wells have been attempted, but drilling near the unsurveyed location shown in plate 23 might be considered. If water is found, other sites could be located as needed.

SNAKE VALLEY

The part of Snake Valley in the Ely Grazing District is a narrow strip along the Utah-Nevada State line. It includes the eastern slope of the Snake and the White Rock Mountains of the Wilson Creek Range and some of the floor of Snake Valley.

The Nevada part of Snake Valley consists of two embayments, one near Baker in White Pine County, and a second in Lincoln County between the Snake Range and the Wilson Creek Range. The valley is drained and opens to the Great Salt Lake Desert of Utah.

STOCK-WATER SUPPLIES

Wells and springs are used to furnish water for stock and for irrigation. Most of the valley is well watered except for an area between the State line and the White Rock Mountains. No previous studies have been made of the ground water in Snake Valley.

SPRINGS

Fourteen springs in Snake Valley and the adjoining mountains are listed in table 4. These range from small seeps that provide water for a few cows to Big Spring (10N/70–33), which has an estimated discharge of 9 or 10 cfs. Big Spring is used for irrigation.

WELLS

Eleven wells have been dug or drilled in the Nevada part of Snake Valley, and about 35 have been drilled in the Utah section. Wells in the Ely Grazing District are listed in table 4 and shown on the map (pl. 23). Table 4 includes two wells in the Snake Mountains and a third in Pleasant Valley, which is tributary to Snake Valley in T. 21 N., R. 69 and 70 E.

Wells in the valley fill range in depth from 70 feet to 240 feet and in depth to water from 26 feet to 175 feet.

Both embayments are well supplied with water. If additional water is required on the valley floor, well sites can be located on the basis of conditions found in nearby wells.

Two well sites, one in the NE¼ sec. 21, T. 19 N., R. 70 E., and the other near the SW. cor. sec. 24, T. 11 N., R. 70 E., indicate possible water sources. The depth to water cannot be determined without drilling, but it probably ranges from 250 to 350 feet below the surface. Additional wells might be drilled in Snake Valley, but sites should be selected to avoid bedrock along the mountain front.

WHITE RIVER VALLEY

White River Valley, one of the better known valleys in the district, heads in the mountains southwest of Ely and extends southward for almost 125 miles from White Pine County across Nye County and into Lincoln County.

White River Valley is bordered on the east by the Egan Range and the Pahroc Mountains; and on the west by the White Pine Mountains, the Grant Range, and the Seaman Range. In its northern and central parts it is 10 to 20 miles wide, but in the south it becomes a narrow alluvium-filled canyon that winds its way between the Seaman Range and the Pahroc Mountains.

The floor of White River Valley slopes from an altitude of 6,500 feet in the north to 5,100 feet at the head of the canyon. The canyon drops another 1,000 feet to the village of Hiko. Altitudes of 10,000 to 11,000 feet are common in the mountains at the north end of the valley. In the south the mountains are lower, ranging in altitude from 7,000 to 9,000 feet.

STOCK-WATER SUPPLIES

Ground-water conditions in White River Valley were first described by Carpenter (1915, p. 53–58). Wells, springs, and reservoirs furnish water for stock and irrigation in White River Valley and in the mountains north and west of Preston. The locations are shown on plate 23.

White River Valley has been described by Maxey and Eakin (1949) in a report devoted to the area north of T. 6 N. They state that, although White River Valley is drained, it has the characteristics of an undrained basin. In most drained basins the water table is at depth and evaporation is at a minimum. In the central part of White River Valley, however, there is a large area of shallow ground water where the water table is close to the surface and water is being lost by evapotranspiration. Maxey and Eakin (1949, p. 45) state that, in addition to the water being lost by evaporation, ground water is moving as underflow along the dry course of the White River.

SPRINGS

Springs furnish large amounts of water for irrigation and for stock use. Eleven springs are listed in table 4 and shown on the map (pl. 23). These range from small capacity stock-water sources to large springs (as much as 10 cfs) that are used as an irrigation supply.

Measures for improvement or development work at the springs to reduce seepage or evapotranspiration losses would increase the water supplies available for stock.

RESERVOIRS

Eight reservoirs in White River Valley are listed in table 4 and shown on the map (pl. 23). These include several large irrigation reservoirs that are used by stock.

WELLS

Table 4 lists 43 wells in White River Valley and the surrounding mountains. The water table in the valley fill, as defined by a number of wells, has a marked southward slope. The gradient of the water table in the north is approximately the same as that of the valley floor, about 8 feet per mile. In the canyon section the gradient steepens to 23 feet per mile for most of the distance but flattens markedly near Hiko. The arithmetical average gradient for the entire reach from Preston to Hiko is about 16 feet per mile.

The fill in White River Valley contains lenses of fine-grained lakebed material that do not absorb, transmit, or yield water readily. A well drilled near the Adams McGill reservoir, 6N/61-21, was reported as dry throughout. However, the aquifer may have been sealed by the drilling mud from the rotary drill. This well was abandoned and could not be relocated, and hence it is not shown on the map or in the table.

Examples of possible stock-water sources are given in the following table:

Typical stock-water sources in White River Valley

Location	Altitude (feet)	Estimated depth to water (feet)
NW¼ sec. 27, T. 14 N., R. 62 E	6, 195	600–700.
SW¼ sec. 17, T. 4 N., R. 62 E	5, 390	350–450.
Sec. 1, T. 2 N., R. 61 E	------	Water at 40–45.

The site in sec. 1, T. 2 N., R. 61 E., is an abandoned mine shaft that might be tested for usability. Water in the shaft could be pumped into a trough or pond. If the water in the shaft is not simply stored precipitation, a permanent supply would be available. Additional well sites can be selected in the valley and in the canyon on the basis of the occurrence of water in nearby wells. Bedrock near the mountains should be avoided.

JAKES VALLEY

Jakes Valley is a closed basin lying north of White River Valley between the Egan and White Pine Mountain Ranges. It is small, only about 22 miles long and 8 miles wide. The lowest altitude measured on the valley floor was 6,370 feet. The surrounding mountains stand 3,000 to 4,000 feet above the valley, except in the south where a low alluvium-covered divided separates Jakes Valley from White River Valley.

Jakes Valley is classed as a closed drained basin having no playa on the valley floor. Lacustrine sedimentary deposits are interbedded with the fill as a result of occupancy of Jakes Valley by a small Pleistocene lake which was about 65 feet deep. At its maximum the lake was about 75 feet below the level of the divide that separates Jakes Valley from White River Valley.

STOCK-WATER SUPPLIES

Springs and reservoirs provide most of the water used. One well has been drilled in the valley and two in the adjoining mountains. These are listed in table 4 and shown on the map (pl. 23).

SPRINGS

There are seven springs, listed in table 4, in the mountains west and north of Jakes Valley.

RESERVOIRS

Reservoirs in Jakes Valley have been the best source of stock water. Eight ponds were being used at the time of the investigation (1957). These ponds generally depend upon local runoff but one, 17N/59–10, is filled from a nearby creek and another, the Townsend reservoir, 18N/60–15, has been dug to intercept the water table. Additional reservoir construction may be necessary, especially if well drilling in the valley is unsuccessful.

WELLS

A well in the alluvial fill of Jakes Valley was dug after the successful supply was developed in the Townsend Reservoir. Two other wells, listed in table 4, were drilled in the mountains at the ends of the valley.

Well 19N/60–21 in the mountains to the north of Jakes Valley reportedly was in rock throughout. The mountains surrounding the well consist of rhyolitic rocks of Tertiary age that appear to be hundreds of feet thick. Water in these rocks usually occurs in fracture openings.

Little information is available about the well 14N/60–4 to the south of Jakes Valley, except that alluvial material is exposed at the surface. The water may be moving along the base of the alluvium above the bedrock.

A test well in Jakes Valley may find ground water in the valley fill. If successful, then other wells could be drilled.

No information is available to indicate the direction of movement of the ground water, but according to Maxey and Eakin (1949, p. 40) ground water enters White River Valley from Jakes Valley.

RAILROAD VALLEY

Railroad Valley in White Pine and Nye Counties is adjacent to and east of the Newark-Little Smoky-Sand Spring Valleys. In its entirety Railroad Valley is nearly 100 miles long and 10 miles wide. Only the northern quarter, which is in the Ely Grazing District, was included in this investigation.

The valley occupies a structural trough between the Pancake Range on the west and north and the White Pine Mountains on the east. It has two tributaries, one to the north and the other to the west.

Railroad Valley contains alluvium and lacustrine sedimentary deposits. A Pleistocene lake, according to Carpenter (1915, p. 75), had a maximum depth of 75 feet. This filled the lower part of the valley but never reached either of the tributary basins.

Railroad Valley is a closed, undrained valley but the part in the Ely Grazing District is drained southward beyond the district boundary.

STOCK-WATER SUPPLIES

Wells, springs, streams, and reservoirs are used for stock-water supply in Railroad Valley and its tributaries. In spite of the diversity of the supply there are unwatered areas in the valley and in the surrounding mountains.

The valley was first examined by Carpenter (1915) and later by Maxey and Eakin (1950, p. 127–171); the author studied the valley in 1954 and subsequently. Extensive geological and geophysical investigations have also been made by petroleum geologists in a search for oil.

SPRINGS

There are 14 springs in Railroad Valley and its tributaries. These are listed in table 4 and shown on the map (pl. 23).

Several of the springs, including Little Warm (12N/56–5), Big Warm (13N/56–32), Green (15N/57–33C), Bull Creek (14N/56–14D), and Currant Creek (11N/59–21), are large springs that furnish water for irrigation and stock.

Water from Green Springs is used for irrigation during the growing season but at other times is allowed to flow across the valley to reservoirs. The reservoirs and ditch provide ample water for cattle.

RESERVOIRS

Thirteen reservoirs are listed in table 4 and shown on the map (pl. 23). Several of these reservoirs, filled by springs, furnish a permanent supply. This type of development is the exception, as most of the ponds that are filled by runoff cannot be depended upon for year-round use. The effectiveness of the reservoirs may be improved by deepening.

WELLS

There have been 15 wells drilled in Railroad Valley and its tributaries. Ten are used for stock or domestic supply and five were dry.

Water in Railroad Valley is moving southward from the mountains toward the playa, which is beyond the map area. The depth to water is greatest near the valley edges and least toward the center. The range in depth to water is from 280 feet in the north to 10 feet in the south.

Ground water occurs in the tributary valley west of Railroad Valley under conditions similar to those found in the main valley. Here again the water is nearest the surface at the south—where it discharges into Railroad Valley—and the depth to the water table increases toward the north. North of well 13N/56–19 no successful wells have been drilled.

Five dry wells are located in the tributary valley west of Railroad Valley. Two of these, 14N/56–19B and 12N/55–25B, appear to have been used but were dry in 1957. In the remaining three, drilling was stopped above the level of the water in the valley. Well 12N/55–25C, which supplies stock water, was drilled between two dry holes, 11N/55–2D and 12N/56–19B.

Additional drilling, as required, would seem practicable. Wells can probably be drilled throughout most of Railroad Valley. Well sites in the southwestern part of T. 14 N., R. 57 E., and the northeastern corner of T. 13 N., R. 57 E., should be selected with care, as a bedrock pediment is buried beneath a shallow cover of alluvium. A shallow well probably could be drilled along the dry wash about 3 miles downstream from Mud Spring in the SE¼ sec. 33, T. 14 N., R. 57 E.

LAKE VALLEY

Lake Valley lies almost entirely in northeastern Lincoln County, only 6 miles of its length lying in White Pine County. It is about 60 miles long in the north-south direction and has a width of 8 to 10 miles.

Lake Valley is bounded on the east by the Wilson Creek and Fortification Ranges, on the northwest by the Schell Creek Range, and on the west and southwest by the Ely, Bristol, and Highland Ranges. It has an altitude of 5,900 feet in the north and 5,500 feet east of Pioche. The mountains have altitudes between 8,000 and 9,000 feet, though 1 or 2 peaks are more than 9,000 feet above sea level.

Lake Valley is topographically closed in the north and open in the south. The north end is filled with alluvium and has alluvial fans around the margin. In the southern end, Patterson Wash has eroded the alluvial fans and cut stream terraces.

Drainage is southeastward through a narrow canyon to Meadow Valley Wash and the Colorado River.

STOCK-WATER SUPPLIES

The valley fill has been thoroughly explored for water by the wells, listed in table 4. In addition to the wells, springs and reservoirs are used for stock-water supplies.

Ground-water conditions were described by Phoenix (1948) in a report on the Meadow Valley Wash drainage system. However, that report was limited to the southern half of the valley, and the wells drilled in the northern half were not examined by Phoenix.

SPRINGS

Two springs, listed in table 4, provide a small amount of stock water. These springs were the only ones visited during the examination of the valley.

RESERVOIRS

Reservoirs have been used sparingly because of the success of drilled wells. Five stock-water reservoirs are listed in table 4. All these except 7N/67–20 are located along the tributaries of Patterson Wash in the drained part of the valley. In the late summer of 1958 only two reservoirs contained water that could be used by stock. Performance of the reservoir 7N/67–20, in the northern part of the valley, is not known.

WELLS

Thirty-six wells have been dug or drilled in the valley. The valley fill appears to be saturated at some depth below the surface, as no dry or unsuccessful wells were found. The water table has a uniform slope southward. The low divide in the central part of the valley seems to have no appreciable effect on the movement of ground water. There is always a question, wherever such divides occur, as to their effect. In this case none is evident. Additional wells can be selected as required on the basis of the information available from the nearby wells now in use.

DRY LAKE VALLEY

Dry Lake Valley is classed as a closed drained valley that is located between Lake Valley and the southern end of White River Valley. The valley is partly within the Ely Grazing District and partly in the Searchlight Grazing District. It occupies the northern end of a structural trough which it shares with Delamar Valley. Delamar Valley is entirely outside the Ely Grazing District.

Dry Lake Valley is bordered on the east by the Highland, Bristol, and Ely Ranges and on the west by the Pahroc Mountains. The lowest altitude measured was about 5,000 feet, which is several hundred feet above the level of valleys to the east and west.

Dry Lake Valley is a typical filled valley having a playa near the southern end.

STOCK-WATER SUPPLIES

Wells, springs, and reservoirs provide minor amounts of water in the north end of the valley and around the valley margin. The only previous ground-water examination was made by Carpenter, who called this valley Bristol Valley (Carpenter, 1915, p. 65–67).

SPRINGS

Five springs, listed in table 4, provide a limited amount of water for stock.

RESERVOIRS

Only two reservoirs are in use in the northern part of Dry Lake Valley, table 4. However, reservoirs do provide a good supply of water for stock south of the Ely Grazing District boundary in Dry Lake and Delamar Valleys.

WELLS

Seven wells, listed in table 4, have been dug or drilled within the Ely Grazing District part of Dry Lake Valley; in addition, several deep dry wells were reportedly drilled in Delamar Valley. Well 7N/65–17C is on the divide between Dry Lake and Lake Valleys. Three wells in Dry Lake Valley were dry; of these 2 were shallow, and 1 was 350 feet deep.

Dry Lake and Delamar Valleys, like Coal Valley to the west, are drained valleys in which the water table, if one exists, is several hundred feet below the floor of the valley. Shallow wells around the valley margin—that intercept water moving into the valley—are successful unless bedrock occurs in the well above the water table.

Exploratory drilling in the area north of well 7N/65–17C should not be undertaken until more can be learned about conditions in well 7N/65–17C.

CAVE VALLEY

Cave Valley, in the north-central part of Lincoln County and the southern part of White Pine County, is about 30 miles long in a north-south direction and about 6 miles wide. It is classed as a closed drained basin bordered on the east by the Ely Range and on the west by the Egan Range. The lowest altitude measured on the valley floor was 5,985 feet above sea level. There is a small playa near the southern end of the valley. A small lake occupied the southern end of the valley during part of the Pleistocene epoch.

STOCK-WATER SUPPLIES

Seven springs and four wells provide water for stock use. Despite the number of water sources and the small size of the valley, there is a large area in the south where water is needed. No previous well-site examinations or ground-water studies have been made. Reservoirs are not used for stock-water supply.

SPRINGS

Seven springs, listed in table 4 and shown on the map (pl. 23), provide water for stock in the valley and the adjoining mountains. The spring at 9N/64–15B is large enough to furnish some water for stock and irrigation.

WELLS

Four wells that supply stock water are listed in table 4. These include 1 well in the mountains to the south and 3 wells on the valley floor. The valley fill is partly saturated and a water table occurs at a depth of nearly 300 feet, but the direction of movement of the ground water is not known. Typical well sites are listed in the following table.

Typical well sites in Cave Valley

Location	Altitude (feet)	Estimated depth to water (feet)
SW¼ sec. 4, T. 8 N., R. 64 E	6, 195	450–500.
Sec. 20, T. 7 N., R. 64 E	6, 010	300–400.
W½ sec. 24, T. 6 N., R. 63 E	5, 985	250–350.
Sec. 10, T. 6 N., R. 63 E	6, 005	250–350.

Additional well sites can be selected as needed under conditions similar to those found in existing wells nearby.

COAL VALLEY

Coal Valley is a high dry basin very much like Dry Lake Valley except that it is in the mountains west of the lower White River.

Coal Valley is classed as a topographically closed, hydrologically drained basin about 30 miles long and 10 miles wide, between the Seaman Range on the east and the Golden Gate Range on the west. A low alluvial divide separates Coal Valley from White River Valley on the north. A pass through the Golden Gate Range on the west opens into Garden Valley, a tributary of Coal Valley. The ground-surface elevation is about 4,590 feet above sea level, or about 700 feet above the level of the lower White River, just to the east.

STOCK-WATER SUPPLIES

Water is in short supply throughout Coal Valley. There have been several examinations to locate possible drilling sites in the past, and a number of wells have been drilled but all were unsuccessful. Carpenter (1915, p. 69) describes the valley as "one of the driest basins in southeastern Nevada."

SPRINGS

Several springs have been reported as occurring in the mountains, but only one, 1N/61–30D, table 4, was found during the examination. Water losses from this spring now exceed the amount of water furnished to the stock.

RESERVOIRS

Six reservoirs in the area, listed in table 4, were visited during the examination. These have been used successfully for a number of years in an area where no other water sources are available. Other reservoirs can be constructed as needed, provided the ponds are deep enough to allow for evaporation losses.

WELLS

The Eisenbak well, 3N/61–5B, dug in a canyon northeast of the valley, is the only successful well within the limits of Coal Valley. Reports are commonplace about abandoned dry wells in Coal Valley. Carpenter (1915, p. 69) recommended that deep drilling be undertaken and drilling reportedly has been done, but no holes were found.

Additional wells, similar to the Eisenbak well, might be developed along the dry stream channel about 1 mile west of Oreana Spring. A road from Coal Valley follows this wash to the spring. A similar site may be selected along a tributary channel about 1 or 1½ miles to the south. A road that leads southward from the Oreana Spring road follows this tributary. These wells should be centered in the channel and dug to the base of the alluvial fill. These are not shown on the map (pl. 23), but can be located on the ground from Oreana Spring.

GARDEN VALLEY

Carpenter (1915, p. 69) has aptly described this valley. He said:

> Garden Valley is bordered on the west by the Quinn Canyon, Grant, and Worthington ranges [the first and last are beyond the limits of plate 23], and on the east by Golden Gate Range. It drains into Coal Valley through a gap in the Golden Gate Range and is separated from the White River Valley on the north by only an alluvial divide (Pl. I). The valley is properly an alluvial slope, which has been formed by debris washed from the mountains. On account of the greater altitude of the mountains on the west side of the valley, most of the debris has been derived from them, with the result that the valley slopes eastward to the Golden Gate Range, partly burying it in unconsolidated material. The drainage is thus all to the eastward. Cottonwood and Cherry Creeks which head in the Quinn Canyon Range (Pl. 1), have carved shallow channels, which cross the slope, unite near the east side, and discharge through the gap in the Golden Gate Range.

STOCK-WATER SUPPLIES

Wells and springs provide water for stock in Garden Valley. The wells are at the ends of the valley, however, and the springs are in the surrounding mountains, so the present distribution of the water supplies is spotty.

The only previous ground-water examination was made by Carpenter (1915, p. 69). At that time no wells had been drilled and he believed that the chances for wells were remote.

SPRINGS

Two springs in the mountains have been developed and pipelines built to tanks on the valley floor. These are listed in table 4 and shown on the map (pl. 23).

RESERVOIRS

No reservoirs are in use at this time. Reservoir construction should not be necessary unless additional wells cannot be developed.

WELLS

Seven wells are listed in table 4, including 4 to the north, 1 in the south, and a dry well along the west side. The seventh, 4N/59-17, was reported but was not found during the examination.

Ground water occurs in the valley fill at shallow depth in the north and at a reported depth of 570 feet in the south. The range in altitude of the water table is from 5,000 feet in the south to 5,350 feet in the north.

Additional wells should be possible in the valley. These will vary in depth depending upon their location. In the northern and central parts of the valley, stock wells should not be a problem as the water table is fairly near the surface. However, in the southern end of the valley, drilling depths will be greater as the water table is several hundred feet below the surface.

CAMP VALLEY

Camp Valley is classed as a closed drained basin near the headwaters of Meadow Valley Wash, in eastern Lincoln County. This valley (called Spring Valley by Phoenix, 1948) is a minor tributary of Meadow Valley Wash and the smallest of the drained valleys. It is bordered by the Wilson Creek Mountains on the west and the White Rock Mountains on the east. A canyon through the Wilson Creek Range drains Camp Valley.

Camp Valley is an erosional valley cut into the bedrock of the surrounding mountains. The resulting basin has been filled with alluvial and lacustrine sediments.

STOCK-WATER SUPPLIES

Wells, springs, and Camp Valley Wash provide water for the stock. Ground-water conditions were investigated and described by Phoenix (1948) in his study of Meadow Valley Wash and its tributaries. So far as is known, no reservoirs are used for stock-water supply.

SPRINGS

Three springs, used for stock-water supply, were noted during this examination. (See table 4.) These springs are along the course of Camp Valley Wash and are related to the movement of water in the valley fill. No spring developments or improvements appear necessary at this time.

WELLS

Seven wells, listed in table 4, have been dug or drilled into the valley fill. Wells along the wash are shallow and the water is near the stream level; however, wells located at a distance from the wash are deeper but the water is still near the level of Camp Valley Wash. Additional wells needed in the future can be located on the basis of conditions in nearby existing wells.

CONCLUSIONS

From the foregoing it appears that the mountains are poorly watered at present and that the chances for obtaining new or additional water sources are remote. Possible well sites in the mountains are restricted to surficial aquifers that are usually found along the mountain streams. New water developments in the valleys, on the other hand, can be expected in almost every valley in the district except where subsurface conditions are such that the potentially water-bearing deposits are drained. Whenever possible, surface supplies of water should be considered for exploitation before any attempt is made to obtain water by drilling wells.

RECORDS OF SPRINGS, RESERVOIRS, AND WELLS

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*

Depth: m, measured; r, reported.
Type of well: Dr., drilled well; Du., dug well.
Use of water: D, domestic; I, irrigation; In, industrial; N, unused; S, stock.
All altitudes above mean sea level.
BLM, Bureau of Land Management.

Location	Owner, tenant or name	Altitude of surface		Use of Water	Remarks
		Land (feet)	Water (feet)		
Antelope Valley					
Springs:					
23N/67-14A					
24N/70-3B					
26N/67-24B					
Reservoirs:					
22N/67-27					Dry, Nov. 15, 1956. Rodent burrows in dike.
23N/67-13					
24N/68-8					Water, Nov. 12, 1956.
24N/68-27					
24N/69-25					Dry, Nov. 13, 1956. Small.
24N/70-18				I	Dry, Nov. 13, 1956.
25N/67-24					
25N/68-16					
25N/68-33					
26N/68-22					Water, Nov. 12, 1956.
26N/68-28					Dry, Nov. 12, 1956.
26N/68-33					
Wells:					
22N/67-36D	BLM	5,700	5,410	S	Dr., r 350 ft deep.
23N/69-11		5,975			Dr.
23N/69-18		5,770	5,555	S	Dr.
24N/69-16		5,850			Dr.
24N/69-19D		5,750	5,530		Dr., 6 in. diam.
24N/69-23		5,785	5,520	N	Dr.
25N/69-30		6,500			Du., now in disrepair.
Spring Valley					
Springs:					
8N/67-3A	Pipe Spring				Yield 1 to 2 gpm.
9N/67-15B					Piped to shallow pond.
9N/67-26					Do.
9N/67-27A					
12N/66-36D	North Spring			S	Depression spring.
12N/67-18	do			S	Do.
14N/68-29C					
17N/68-28A					
18N/68-27C					
19N/69-6C		6,835		S	
20N/66-17B	Muncie Creek Spring			S	Yield, ½ cfs (estimated).
20½N/69-34B	Mike Spring			In, S	
21N/65-23D					
22N/65-15A				S	
22N/65-34A	Siegel School Spring			S	Yield, ¼ cfs (estimated).
Reservoirs:					
9N/68-30					
10N/67-36					
11N/66-3					
11N/66-21					
14N/68-31					Water from spring in mountains.
15N/66-24				I, S	
16N/67-18				I, S	
20N/66-11					Dry and small.
20N/68-22					Steel storage tank filled by truck.
23N/65-11					
23N/66-18B					
23N/66-18C					
24N/66-32					Small and dry.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface: Land (feet)	Altitude of surface: Water (feet)	Use of Water	Remarks
Spring Valley—Continued					
Wells:					
7N/68-3A		6,560		N	Dr. Drilled for domestic use in camp.
7N/68-3D		6,640	6,615	D, S	Dr.
8N/68-14A	BLM	6,180	5,760	S	Dr., 4,495 ft deep.
10N/67-16	do	5,840	5,795	S	Du., r 54 ft deep, 38 in. diam.
11N/66-1A		5,790		S	Dr. Flowing. Yield, 2 gpm (estimated).
11N/66-23A		5,775	5,755	S	Dr.
11N/66-35D		5,780	5,775	S	Du.
11N/67-13	BLM	5,850		S	Du., r 15 ft deep, 38 in. diam.
11N/68-31	do	5,865	5,790	S	Du., r 80 ft deep, 38 in. diam.
13N/67-7D		5,775		S	Dr.
13N/67-17A	BLM	5,800	5,750	S	Dr., r 120 ft deep.
13N/67-17D		5,790	5,788		Du.
13N/67-22A		5,850	5,780	S	Dr.
13N/67-31D		5,790	5,770	N	Du.
13N/67-33D	BLM	5,770	5,765	S	Du., r 30 ft deep, 38 in. diam.
13N/67-35D		5,805			Dr. Flowing. Temp 74°. Yield, 5± gpm (estimated).
14N/66-13D	BLM	5,780	5,755	S	Dr., r 45 ft deep.
14N/67-15C		5,680	5,670	D, I	Dr., r 600 to 800 ft deep.
16N/67-26	BLM	5,555	5,545	S	Du., r 16 ft deep, 38 in. diam.
17N/67-9	do	5,500		S	Du., r 30 ft deep, 38 in. diam.
17N/67-20A					Du.
17N/67-28	BLM	5,495	5,495	S	Du., r 30 ft deep, 38 in. diam.
17N/68-7C	do	5,555	5,530	S	Du., m 30.8 ft deep, 38 in. diam.
18N/66-2A		5,685	5,645	D, S	Du., r 60 ft deep.
18N/67-1C		5,570		S	Dr., r 45 ft deep.
19N/66-11B		5,680	5,640	I	Dr., r 400 to 500 ft deep.
19N/67-13A		5,600		S	Dr.
20N/67-3		5,780	5,595	S	Dr., r 280 ft deep.
20N/67-26A		5,710	5,590	S	Dr.
21N/66-4B1		6,170		S	Du., r 30 ft deep.
21N/66-4B2		6,170		S	Dr.
23N/65-10D		6,685	6,620	S	Dr., r 80 ft deep.
23N/65-14C		6,860	6,695	S	Dr., r 180 ft deep.
23N/66-7D		6,485	6,465	S	Dr., r 31 ft deep.
Steptoe Valley					
Springs:					
11N/63-3D					
14N/63-26A				S	
17N/63-9C					
18N/64-3D				I	
19N/63-33D					
21N/63-23D					Thermal spring.
21N/64-19C					
22N/63-14D				S	
22N/63-16A				S, I	Temp., 66°F.
22N/63-23C					
22N/64-25C					
22N/64-36B					
23N/63-8					Thermal spring.
24N/65-31A				S, I	Temp., 83°F. Yield, 1 cfs.
25N/64-30A				S, I	
25N/65-11A	Becky Spring			D, S	
25N/65-12B	do			D, S	
26N/64-20					
26N/64-21					
26N/65-33	Collar and Elbow Spring.			S	
Reservoirs:					
11N/64-4					Breached.
12N/64-29					Nearly destroyed.
13N/64-10					Should be deepened.
13N/64-29					
14N/63-25					Fed by spring.
14N/64-30					Do.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface		Use of Water	Remarks
		Land (feet)	Water (feet)		
Steptoe Valley—Continued					
Reservoirs—Con.					
15N/64-17	Cummings Lake			I	
18N/63-2				I	Irrigation.
18N/64-3					Spring fed.
19N/64-26					
23N/64-6					
23N/64-18					
24N/63-4					Dry. Much too small.
Wells:					
12N/64-5D	BLM	6,825	6,760	S	Dr., r 140 ft deep.
13N/64-9C	do	6,685	6,515	S	Dr., r 216 ft deep.
13N/64-15C	do	6,690	6,515	S	Dr., r 202 ft deep, 6 in. diam.
14N/64-36B	do	6,800			Dr., r 320 ft deep.
15N/64-33D		6,510	6,495	S	Dr.
16N/64-6D	BLM	6,260		S	Dr., r 303 ft deep, 8 in. diam.
17N/61-12	do	7,135		S	Dr.
17N/62-7C	do	7,000		S	Dr.
17N/62-30A		6,960	6,900	S	Du.
17N/64-6A		6,100	6,085		Du., r 16 ft deep.
18N/62-25D		6,700	6,560	S	Dr., r 175 ft deep.
18N/63-1D		6,075			Du. Dry, now caved.
18N/63-8	BLM	6,130	6,110	S	Du., m 26.6 ft deep, 38 in. diam.
18N/63-25D		6,260			Dr.
19N/63-12	BLM	6,005	5,985	S	Dr., 10 in. diam.
19N/63-24A		6,065		N	Du., r 51 ft deep. Now caved.
20N/63-13A	BLM	5,965		S	Du., r 26 ft deep, 38 in. diam.
20N/64-7B		5,985		S	Du., r 25 ft deep.
20N/64-8B		5,960	5,955	D, S	Du.
20N/64-32C1		6,035	6,020	N	Dr., r 122 ft deep, 10 in. diam.
20N/64-32C2		6,045	6,030	N	Dr., m 23 ft deep.
20N/64-32C3		6,045	6,035	N	Dr., m 90 ft deep.
21N/63-23A		6,060	6,040	D	Du., m 30 ft deep.
22N/64-3C	Nevada State Highway Dept.	6,140	5,920		Dr., m 242.5 ft deep.
23N/64-18A		5,895	5,890	S	Du.
24N/63-11D		5,835	5,820		Du., m 16 ft deep.
24N/63-33A		5,930		D	r 30 ft deep.
24N/64-15		5,920	5,885	S	Dr.
24N/64-31	BLM	5,880	5,875	S	Du.
24N/65-8D				S	Dr., r 21 ft deep, r 18 ft to water. 6 in. diam. Not visited.
25N/65-30A		5,910	5,860	N	Dr.
25N/65-31B	BLM	5,915	5,870	S	Dr., r 55 ft deep, 8 in. diam.
26N/65-25C		5,985	5,850	N	Dr.
Butte Valley					
Springs:					
19N/60-5A					
21N/62-32D					
22N/60-20C	Butte Spring			S	
25N/60-36A					
25N/62-5C					
26N/62-15				I, S	
26N/62-33D				S	Yield, ½ cfs.
Reservoirs:					
24N/61-12					Dry, June 26, 1958.
25N/62-17					Dry, June 27, 1958. Shallow.
25N/62-33					Dry, much too small.
26N/62-15					Irrigation reservoir.
Wells:					
19N/60-3	Uhalde Bros	7,200		S	Dr.
20N/61-6	do	6,295	6,140		Dr.
21N/60-30					Dr., Dry.
21N/61-7A	Uhalde Bros	6,170	6,100	S	Dr.
22N/60-35D	B. Paris	6,215	6,150	S	Dr.
22N/61-15	do	7,400	7,370	N	Du., r 36 ft deep.
22N/61-18A	do	6,190	6,150	S	Dr., r 185 ft deep.
22N/61-33	do	6,690	6,680	S	Du., m 12.3 ft deep.
23N/60-22B	Robinson	6,255	6,200	S	Dr.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface		Use of Water	Remarks
		Land (feet)	Water (feet)		
Butte Valley—Continued					
Wells—Continued					
23N/61-7	B. Paris	6,185		S	Du., r 40 ft deep.
23N/61-13	do	7,615	7,605	N	Du., r 10 ft deep.
24N/61-20		6,200		N	Du., m 21 ft deep. Dry
24N/61-23	B. Paris	6,225	6,175	S	Dr., r 125 ft deep.
25N/62-17B	do	6,285	6,280	S	Du.
Long Valley					
Springs:					
18N/58-23				S	Contact spring. Yield, 0.2 gpm.
23N/58-25C	Long Valley Slough	6,075		S	
24N/58-24C	Tognini Spring			S	Yield, 6 gpm.
25N/60-12				S	Yield, 1 or 2 gpm.
Reservoir:					
18N/58-11					Small storage space.
Wells:					
20N/58-8	J. Goicoechea	6,065	5,975	S	Dr., r 170 ft deep, 6 in. diam.
20N/58-14A		6,100	5,985	S	Dr., r 150 ft deep.
20N/59-20		6,185		N	Du., r 149 ft deep, dry.
21N/58-7B		6,270	6,260	S	Du., r 13 ft deep.
21N/58-10D		6,070		S	Dr.
21N/58-32B		6,065	5,990	S	Du.
21N/58-35B		6,050	5,980	N	Dr., m 79 ft deep.
21N/59-18D		6,060	5,975	S	Dr.
21N/59-30D		6,155		S	Dr.
22N/58-21D		6,070		S	Dr.
22N/58-26B		6,070	6,030	S	Dr., m 93 ft deep.
22N/58-32C		6,200		N	Du., dry. Well caved, not usable.
22N/59-10D		6,095	6,070	S	Dr., m 123 ft deep.
22N/59-27B		6,055	5,990	S	Dr., m 71 ft deep.
23N/57-24A		6,530	6,295	S	Dr.
Ruby Valley					
Springs:					
24N/58-2A	Blue Jay Spring			S	Yield, 6 gpm.
24N/58-16D					
24N/58-29C					
24N/58-29D				S	Yield, ½ gpm.
24N/58-32A					
25N/57-11B	Harris Ranch	6,000		S, I	Large area of discharge, numerous openings.
25N/59-28B	Mountain Spring			S	Yield, 1 to 2 gpm.
Wells:					
24N/57-27C	J. Goicoechea	7,400	7,330	S	Dr., m 83 ft deep, 6 in. diam.
25N/58-2	Dan Clark	6,080		S	Dr.
25N/58-32D	BLM	6,125	5,995	S	Dr., r 200 ft. deep.
Huntington Valley					
Springs:					
24N/57-16A	Mill Spring			S	Yield, 15-20 gpm.
24N/57-22C					
24N/57-23A					
24N/57-27B	Bourne Tunnel			S	Yield, 5 gpm.
25N/55-14D					
25N/55-34D	Headwaters, Spring	6,055			Temp, 62° F. Discharge, 5 cfs.
25N/56-5C				S	Yield, 2-3 gpm.
25N/57-29C		6,800		S	Small.
25N/57-32	Overland Pass			S	Yield, 1 gpm.
Well:					
24N/56-20B	BLM	6,020	5,955	S	Dr., r 100 ft deep, 8 in. diam.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface: Land (feet)	Altitude of surface: Water (feet)	Use of Water	Remarks
Newark Valley					
Springs:					
16N/57-15	Monte Cristo Mine Spring.			S	Usually fails in midsummer.
16N/58-17B					
17N/57-35C					
18N/55-7C	Barrel Spring			S	Small yield.
18N/56-21B				S	
18N/57-11D		6,560		S	
18N/58-17C					
19N/55-31A	Muchacho or Stone Cabin Spring.			S	Yield, 2 gpm.
19N/55-31D	Indian Spring			S	Do.
19N/57-34A				S	Needs repair badly.
20N/56-23C	Sulphur Spring			S	Much water wasted. Yield, 1.5 gpm.
20N/57-6A					
21N/56-5B				S, I	Large yield.
21N/56-10B				S, I	Yield, ½ cfs.
21N/56-15D					
22N/56-1A	Warm Springs	5,920		S, I	Yield, 6.38 cfs, reported by State Engineer.
23N/55-22C					
Reservoirs:					
18N/58-17					
18N/58-21					
18N/58-28					
Wells:					
16N/57-14A	Hamilton Land Co.	8,120	8,070		Du., m 69.2 ft deep.
17N/55-4B		5,960	5,905	S	Dr.
17N/55-27D		6,330	6,295		Du., m 39.8 ft deep.
17N/57-24C	Smith Bros. Sheep Co.	6,880		S	Du.
18N/55-23B	Lagari	5,920	5,870	S	Du., m 58.0 ft deep.
18N/55-31C		5,940	5,905	S	Du., m 43.2 ft deep.
18N/56-2B		6,030		S	Du.
18N/56-21D		6,480	6,455		Du., m 41 ft deep.
18N/56-33A		6,550	6,540	S	Du., m 20.3 ft deep.
18N/57-15B		6,480	6,470		Du., m 14 ft deep. Siphon used to produce water.
19N/56-30D		5,895	5,860	S	Du., m 37 ft deep.
19N/57-5D		6,045	6,015		Du., m 29 ft deep.
19N/57-19B		5,995	5,885	S	Du., m 130.5 ft deep.
20N/55-34D				S	Du.
21N/55-27C				S	Du.
22N/55-2	J. Goicoechea	5,840	5,830	D, S	Dr.
22N/55-15	do	5,825	5,815	S	Du., m 22.3 ft deep.
22N/55-34C		5,795	5,785	S	Du., m 9.5 ft deep.
Little Smoky Valley					
Wells:					
11N/53-6	B. Arambell	6,625		S	Dr., r 900 ft deep.
15N/52-13B [1]	Bartholomae	6,405	6,050		Dr., r 376 ft deep.
15N/52-35C	B. Arambell	6,435	6,035	S	Dr., r 500 ft deep.
15N/53-23A		6,125		S	Dr., r 350 ft deep.
15N/53-25D		6,200	6,045	S	Dr., m 200 ft deep, 6 in. diam.
15N/53-28B		6,180		S	Dr., r 350 ft deep.
15N/53-31A		6,225	5,990		Dr., m 256 ft deep, 13 in. diam. Well abandoned, insufficient water.
15N/53-32B		6,210	5,985		Dr., r 240 ft deep, 6 in. diam.
15N/54-2		6,380	6,370	S	Du., m 14.9 ft deep. Piped to trough, acts as spring.
15N/54-2		6,395	6,380		Dr., m 44.7 ft deep.
15N/54-6 [1]		6,060	5,900	S	Du., m 164 ft deep.
15N/54-20D	Bureau of Indian Affairs.	6,600			Dr., m 164 ft deep. Dry.
16N/53-10D [1]	Bartholomae	6,050	6,035	D, S	Dr., r 539 ft deep, 12 in. diam. Drilled for irrigation supply.
16N/53-36D [1]					Dr.
16N/54-15B		6,015	5,930	S	Du., 48 in. diam.
16N/54-17 [1]		5,965	5,895	S	Dr., r 126 ft deep.
17N/54-22A		5,980	5,930	S	Du., m 48.5 ft deep.
17N/54-29C [1]		5,987		S	Du., 40 in. diam.

See footnotes at end of table.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface		Use of Water	Remarks
		Land (feet)	Water (feet)		
Sand Spring Valley					
Springs:					
11N/54-24					Unnamed spring. Less than 1 gpm.
11N/55-6B	Sand Spring				Less than 1 gpm.
Reservoirs:					
10N/54-30					
12N/54-2					Built in 1958; never filled.
Snake Valley					
Springs:					
5N/70-5D					
5N/70-11D					
9N/69-18				S	
9N/70-2				S	
10N/70-21C				S, I	
10N/70-22B				S, I	
10N/70-33	Big Spring			S, I	Temp, 62°F. Discharge 9 or 10 cfs.
10N/70-34D				S, I	
12N/70-15C					
13N/69-14D					
13N/70-19A	Kious Spring			D	Yield, 2 or 3 gpm.
16N/70-15A					
16N/70-36B					
20N/70-22	Lower Sulphur			S	Needs to be cleaned up.
Wells:					
8N/69-16B	Deardon Bros	5,720	5,645	S	Du., m 81.5 ft deep.
8N/69-36A	BLM	5,795	5,695	S	Dr., r 225 ft deep, 6 in. diam.
8N/70-5A	do	5,720	5,625	S	Dr., r 164 ft deep, 6 in. diam.
8N/70-16B	Orson Taite	5,725			Dr., r 153 ft deep.
9N/70-13C	BLM			S	Dr., r 160 ft deep.
9N/70-34D	do	5,720	5,620		Dr., r 217 ft deep.
9N/71-6B	do	5,800	5,625	S	Dr., r 240 ft deep, 6 in. diam.
13N/70-35A	do	5,325	5,225	S	Dr., r 158 ft deep, 6 in. diam.
13N/70-36	do	5,260	5,205	S	Du., r 70 ft deep, 38 in. diam.
13N/71-19B	do	5,160	5,135		r 82 ft deep. 26 in. diam.
14N/70-27B	do	5,265	5,170		r 140 ft deep.
19N/69-16	do	7,145		S	Du., r 18 ft deep.
20N/69-22A	do	6,735		S	Du., r 15 ft deep.
21N/70-7B	do	6,475	6,385		r 125 ft deep.
White River Valley					
Springs:					
1S/62-4	White Rock Spring				
6N/59-17C					
6N/60-25B	Moon River Spring			S, I	Temp, 92°F. Yield, 2 cfs (estimated).
6N/61-7D	Egan Spring			S	Yield, 5 gpm (estimated).
6N/61-18B	Hot Creek Spring			I, S	Yield, 15.3 cfs (m).
9N/61-13				S	
9N/61-32D	Mormon Spring			S	(2).
10N/62-31B				S	
11N/62-4A	Lund Spring			I, S	Yield, 5 to 10 cfs (r).
12N/61-2A	Preston Big Spring			I	Yield, 6 to 9 cfs (m).
13N/60-33A	Williams Hot Spring			S	Temp, 128°F.
Reservoirs:					
3S/61-18					
2N/62-24					
5N/61-2					
6N/61-19					
6N/61-21	Adams McGill Reservoir.			I	
13N/60-27				I	
13N/61-1					Water, Sept. 29, 1958.
13N/61-36				I	

See footnotes at end of table.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface: Land (feet)	Altitude of surface: Water (feet)	Use of Water	Remarks
White River Valley—Continued					
Wells:					
4S/60-2A	Hiko Land and Cattle	3,945		I	Dr.
4S/60-2D	do			I	Dr.
3S/60-24A	A. Stewart	4,015		I	Dr., Depth to water more than 150 ft.
3S/61-7D	H. Stewart	4,050	3,870	I	Dr., m 235.0 ft deep.
2S/61-23	Stewart Bros	4,240			Dr., m 314.0 ft deep. Water reported at 385 ft.
3N/62-8C	H. Esplin	5,035	4,820	S	Dr., r 210 ft deep, 8 in. diam.
3N/62-27C	BLM	4,960	4,710		Dr., r 357 ft deep.
4N/61-27		5,080			Dr., r 175 ft deep. Depth to water less than 150 ft.
4N/61-36C		5,035			Dr.
4N/63-32	BLM			S	Du., r 10 ft deep.
5N/60-13		5,105	5,100	S	Du.
6N/60-30C		5,380			Dr., m 33.6 ft deep. Dry.
6N/62-29C	Hendrix Bros	5,310	5,265	S	Du., m 52.2 ft deep, 24 in. diam.
7N/60-31A	BLM	5,585	5,185		Dr., r 460 ft deep.
8N/60-27D	Don Eldridge	5,335	5,220	S	Dr., r 142 ft deep.
9N/59-36		6,050	6,015	S	Du., m 39.9 ft deep.
9N/61-6D	Lloyd Sorenson	5,330	5,300	S	Du., m 41.5 ft deep.
10N/60-13C	Carter Bros	5,335	5,280	S	Dr.
10N/60-24	BLM			S	Dr., r 80 ft deep, 6 in. diam.
10N/60-36A	do	5,330	5,290	S	Dr.
10N/61-11	BLM			S	Du., r 18 ft deep, 72 in. diam.
10N/61-26B	Carter Bros			S	Dr., m 9.4 ft to water.
10N/61-31C	E. Gubler	5,330	5,295	S	Du., r 40 ft deep.
10N/61-34A	Don Eldridge			S	Dr.
11N/61-16D	Carter Bros	5,460	5,430	S	Dr., r 82 ft deep.
11N/61-32B	do	5,415	5,375	S	Du., r 48 ft deep.
11N/61-35A		5,410	5,395	S	Dr.
11N/62-17C		5,510	5,500	S	Du.
11N/62-19C				S	Dr., 6 in. diam.
12N/60-22C	BLM	6,240	6,100	S	Dr., r 200 ft deep.
12N/60-27D	do	6,230	6,110	S	Dr., r 330 ft deep.
12N/61-3B	W. Duval	5,820	5,805	D, S	Dr., r 75 ft deep.
12N/61-34A	BLM	5,540	5,480		Dr.
12N/62-17D	Peacock Bros	5,595	5,535	S	Dr.
13N/60-8D		6,490	6,435	S	Dr., r 65 ft deep.
13N/60-26A	Gardner Ranch	6,160		D	Dr., r 40 ft deep.
13N/61-9C	Wm. Wieser	6,025	5,925	D	Dr., r 203 ft deep.
13N/61-29D	B. Fernandez	5,900	5,880	D	Du., r 30 ft deep.
14N/61-21D	BLM	6,045	5,765	S	Dr., r 365 ft deep, 6 in. diam.
14N/61-34B	Wells Cargo	5,945	5,555	N	Dr., r 500 ft deep.
14N/62-31B	BLM	5,965			Dr., r 185 ft deep. Dry.
15N/61-24A	do				Dr., r 375 ft deep. Dry.
15N/62-31B	Wells Cargo	6,355			Dr., r 470 ft deep. Dry.
Jakes Valley					
Springs:					
17N/58-11D				S	Poor quality, H_2S odor, may not be usable by stock.
17N/58-13A				S	
17N/58-15C	Ledge Spring			S	Dry, Oct. 4, 1957.
17N/58-20A				S	Yield 10 gpm (m).
17N/59-16				S	Yield ½ gpm (est.).
18N/58-28B					
18N/60-6B					
Reservoirs:					
15N/60-4					Water, Nov. 7, 1957.
16N/59-14					
16N/60-30					
17N/58-24				I, S	
17N/59-10					Water, Nov. 6, 1957.
17N/59-15A					
17N/60-30					
18N/60-15					Intersects water table.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface: Land (feet)	Altitude of surface: Water (feet)	Use of Water	Remarks
Jakes Valley—Continued					
Wells:					
14N/60-4		6,750	6,635	S	Dr.
18N/60-15		6,590	6,575	S	Du. Water about 15 ft deep.
19N/60-21	BLM	6,915	6,710	S	Dr., r 230 ft deep.
Railroad Valley					
Springs:					
11N/59-21				I	
12N/56-5B					
12N/56-14C					
13N/55-5B					
13N/55-19				S	Yield, 1 gpm (estimated).
13N/55-20				S	Yield, 0.5 gpm (estimated).
13N/55-29				S	Yield, 0.5 gpm (estimated).
13N/56-32C	Big Warm Spring			I	Yield, 14 cfs (m).
14N/56-14D		5,840		I	Yield, 5 cfs (estimated).
14N/56-25B	Bull Creek Ranch	5,800		S, I	Temp, 53° F.
14N/57-23B	Mud Spring			S	Yield, 1 gpm (estimated).
15N/55-4	Pit Spring	6,530			
15N/55-29		6,365		S	
15N/57-33C	E. Halstead			I	m temp: 61° F. Yield: 2 cfs (m).
Reservoirs:					
10N/57-31					Small, spring fed.
13N/56-1					
13N/56-12					
14N/56-25				I	At Bull Creek Ranch.
14N/57-8					Very small. Dry, Sept. 16, 1956. Water, June 18, 1957.
15N/55-1					
15N/55-12					Dry, Aug. 18, 1956.
15N/55-13C					
15N/55-13D					Water, Aug. 18, 1956. Dry, June 17, 1957.
15N/56-7					Water, Aug. 18, 1956.
15N/56-25					Water, Aug. 17, 1956.
15N/56-35					
15N/57-33				I, S	
Wells:					
9N/59-5B		5,765	5,725	S	Du., m 44.0 ft deep.
10N/58-12C	BLM			S	Dr., r 96 ft deep, 6 in. diam.
11N/55-2D	E. Halstead	5,965		N	Dr., r 300 ft deep. Dry.
11N/55-21D	do	6,550	6,540	N	Du., m 16.6 ft deep.
11N/57-16C	BLM	5,070	4,885	S	Dr., r 354 ft deep, 6 in. diam.
12N/55-25C	do	5,675	5,470	S	Dr., r 289 ft deep, 6 in. diam.
12N/56-19B	do	5,490		N	Du., m 20.7 ft deep, 38 in. diam. Dry.
12N/56-21D	E. Halstead	5,350	5,330	D, S	Dr., r 107 ft deep.
12N/57-17D	do	5,490	5,210	S	Dr., r 350 ft deep, 6 in. diam.
13N/56-19		5,595	5,515	D	Du., r 85 ft deep.
14N/55-12	BLM	5,960			Dr., m 400.0 ft deep. Dry.
14N/56-19B		5,820		N	Dr., 8 in. diam.
15N/55-21	Bureau Indian Affairs	6,335		N	Dr., m 271.4 ft deep. Dry.
15N/55-36B		6,055		N	Dr., dry.
15N/57-17D	BLM	6,085	5,885	S	Dr., r 200 ft deep, 6 in. diam.
Lake Valley					
Springs:					
5N/66-5A					
5N/67-15D					
Reservoirs:					
1N/67-1					Water, Sept. 5, 1958.
3N/66-1					Dry, Aug. 21, 1958.
3N/66-36					Water, Aug. 21, 1958.
5N/66-35					Dry, Aug. 14, 1958.
7N/67-20					Dry, Aug. 12, 1958. Shallow.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface: Land (feet)	Altitude of surface: Water (feet)	Use of Water	Remarks
Lake Valley—Continued					
Wells:					
1N/67-12B		5,495	5,405		Dr., m 262 ft deep.
1N/67-14B	Ely Valley Mines	5,765	5,390		Dr., r 500 ft deep.
1N/67-14D	Pioche City	5,860	5,370		Dr., r 570 ft deep. Yield: 27 gpm (r).
2N/66-25	BLM	5,925	5,575	S	Dr., r 400 ft deep, 6 in. diam.
2N/67-16C		5,580	5,560		Dr., r 21 ft deep.
2N/67-22D		5,550	5,525	N	Dr., r 40 ft deep, 8 in. diam.
2N/68-27A		5,870	5,855	S	Dr. Underflow in alluvium.
3N/66-2D		5,745	5,655	S	Dr., r 140 ft deep.
3N/66-8A	BLM	5,890	5,680	S	Dr., r 303 ft deep.
3N/66-15B	Jack Rabbit Mine	5,775	5,675	N	Dr., r 140 ft deep.
3N/66-23C		5,710	5,645	N	Du., m 82.5 ft deep.
3N/66-26D	BLM	5,675	5,635	S	Dr., r 148 ft deep.
3N/67-4B	BLM	5,965	5,625	S	Dr., r 382 ft deep.
3N/67-23C	BLM	5,935	5,570	S	Dr., r 398.5 ft deep, 6 in. diam.
4N/66-2B		5,890	5,695		Dr., r 300 ft deep.
4N/66-2D		5,850	5,840	N	Dr., m 136.5 ft deep, 6 in. diam.
4N/66-14D	BLM	5,850	5,675	S	Dr.
4N/66-26C	BLM	5,775	5,655	S	Dr., r 122 ft deep, 6 in. diam.
5N/66-14A	BLM	5,995	5,850		Dr., r 225 ft deep, 6 in. diam.
6N/65-1	BLM	5,940		S	Du., 48 in. diam.
6N/66-35D		6,015	5,875	S	Dr., r 162 ft deep.
6N/67-18C	BLM	6,090	5,880	S	Dr., r 292 ft deep.
7N/65-23A		5,955	5,930	S	Dr., m 39.9 ft deep, 6 in. diam.
7N/66-6C	I. J. McCullough				Dr.
7N/66-36C	BLM	5,985	5,875	S	Dr., r 138 ft deep, 6 in. diam.
7N/67-16	BLM	6,160	5,875	S	Dr., r 300 ft deep, 6 in. diam.
8N/65-33D	F. Twisselmann	6,210		S	Dr., r 340 ft deep.
8N/66-6A	BLM	5,920	5,895	S	Dr., r 69 ft deep, 6 in. diam.
8N/66-27B		5,935		S	Dr.
9N/65-13B		5,960		S	Dr.
9N/66-3B		5,945	5,910	S	Dr.
9N/66-27C		5,970		S	Dr.
10N/65-13A	I. J. McCullough	6,140	5,920	S	Dr., m 234.0 ft deep, 6 in. diam.
10N/66-4C	BLM	6,040	5,865		Dr., r 225 ft deep.
10N/66-17C	I. J. McCullough	6,020			Dr., 6 in. diam.
10N/66-31B		5,970	5,935	S	Dr.
Dry Lake Valley					
Springs:					
1S/63-33D	Rattlesnake Spring			S	Yield 5 gpm (estimated).
2N/63-13C					
2N/66-30	Simpson Spring			S	Yield, 1 gpm (estimated).
5N/64-18	Mud Spring			S	
5N/65-33A					
Reservoirs:					
1N/64-1					Water, July 27, 1958.
2N/65-19					Dry, Aug. 7, 1958.
Wells:					
1N/65-2A				N	Du., r 12 ft deep, r 10 ft to water, 48 in. diam.
2N/65-6B					Dr., r 376 ft deep. Dry.
3N/64-20B	BLM	5,030	4,790	S	Dr., r 380 ft deep, 6 in. diam.
3N/65-20A					Dr., r 222 ft deep. Dry.
3N/65-21C	BLM	5,380	5,335	S	Du., r 51 ft deep.
5N/64-14		5,540			Dr., m 239.5 ft deep. Dry.
7N/65-17C	Fred Twisselmann	6,310	6,100	S	Dr., r 220 ft deep, 6 in. diam. Will not stand continuous pumping.

TABLE 4.—*Records of springs, reservoirs, and wells in the Ely Grazing District, Nevada*—Continued

Location	Owner, tenant or name	Altitude of surface		Use of Water	Remarks
		Land (feet)	Water (feet)		
Cave Valley					
Springs:					
5N/63-16D				S	Yield, 15 gpd (estimated).
5N/63-21D				S	
6N/63-31D				S	
7N64-33C				S	
9N/64-15B				S, I	
10N/63-4A				S	
10N/63-32A				S	
Wells:					
5N/63-21A				S	Du., r 10 ft deep, m 1.0 ft to water. Should be repaired.
7N/63-15	BLM	6,030	5,700	S	Dr., r 385 ft deep, 6 in. diam.
8N/64-30C	M. Urrutia	6,085	5,755	S	Dr.
10N/64-19C	do	6,590	6,570	S	Du., r 20 ft deep.
Coal Valley					
Spring:					
1N/61-30D	Oreana Spring			S	Needs repairs badly.
Reservoirs:					
1S/59-13B					
1S/60-16B	Tooley Reservoir				
1N/59-12	Coal Valley Reservoir No. 2.				
1N/60-32	East Coal Valley Reservoir.				
2N/60-3					Water, October 1958.
2N/60-8	Line Reservoir				
Well:					
3N/61-5B				N	Du., m 6.0 ft deep, m 4.0 ft to water, 48 in. diam.
Garden Valley					
Springs:					
2N/57-7					Pipeline to tank at 2N/57-21.
3N/57-28					Pipeline to tank at 2N/57-2.
Wells:					
1S/57-2B	Uhalde Bros	5,565	4,995	S	Dr., r 620 ft deep.
3N/58-18				N	Du., m 27.5 ft deep. Dry.
4N/58-25A		5,365	5,350	N	Dr., 10 in. diam.
4N/59-6		5,300	5,290	S	Du., m 11.3 ft deep.
4N/59-17					Reported but not located.
4N/59-31C		5,255	5,230	S	Du., m 31.1 ft deep, 30 in. diam.
5N/59-32C	B. Paris	5,370	5,360	S	Du.
Camp Valley					
Springs:					
2N/70-5B		5,895		S	
5N/69-8C					
5N/69-20A					
Wells:					
3N/70-5A	BLM	6,085	6,015	S	Dr., r 245 ft deep.
3N/70-7A1	E. Lytle	5,975	5,965	S	Du., r 30 ft deep.
3N/70-7A2				S	Du.
3N/70-8C	BLM	5,980	5,960	S	Dr., m 80.0 ft deep, 8 in. diam.
3N/70-17		5,960		S	Dr.
4N/69-14A		6,225	6,050	S	Dr., r 206 ft deep.
4N/70-30C	A. Delamue	6,105	6,035	N	Dr., m 103.8 ft deep, 6.5 in. diam.

[1] Wells outside Ely Grazing District. Data furnished for information only. Not shown on the map, plate 23.

[2] Maxey and Eakin, 1949 or Stearns, Stearns, and Waring, 1937.

REFERENCES

Carpenter, Everett, 1915, Ground water in southeastern Nevada: U.S. Geol. Survey Water-Supply Paper 365, 86 p.

Clark, W. O., and Riddell, C. W., 1920, Exploratory drilling for water and use of ground water for irrigation in Steptoe Valley, Nevada: U.S. Geol. Survey Water-Supply Paper 467, 70 p.

Eakin, T. E., Maxey, G. B., and Robinson, T. W., 1949, Ground water in Goshute-Antelope Valley, Elko County, Nevada: Nevada State Engineer, Water Resources Bull. 12, p. 17–34.

Eakin, T. E., and Maxey, G. B., 1951, Ground water in Ruby Valley, Elko and White Pine Counties, Nevada: Nevada State Engineer, Water Resources. Bull. 12, p. 67–93.

Fenneman, N.M., and others, 1930, Physical divisions of the United States: U.S. Geol. Survey, scale 1:7,000,000.

Gianella, V. P., 1945, Bibliography of geologic literature of Nevada; Nevada Univ. Bull., v. 34, no. 6, 205 p.

Jaeger, E. C., 1957, The North American deserts: Stanford, Calif., Stanford Univ. Press, 308 p.

Kohler, M. A., Nordenson, T. J., Baker, D. R., 1959, Evaporation maps for the United States: U.S. Weather Bur. Tech. Paper 37, 13 p.

Langbein, W. B., Hains, C. H., and Culler, R. C., 1951, Hydrology of stock-water reservoirs in Arizona; U.S. Geol. Survey Circ. 110, p. 17–18.

Maxey, G. B., and Eakin, T. E., 1949, Ground water in White River Valley, White Pine, Nye, and Lincoln Counties, Nevada: Nevada State Engineer, Water Resources Bull. 8, 59 p.

——— 1950, Ground water in Railroad, Hot Creek, Reveille, Kawich, and Penoyer Valleys, Nye, Lincoln, and White Pine Counties, Nevada: Nevada State Engineer, Water Resources Bull. 12, p. 127–171.

Phoenix, D. A., 1948, Geology and ground water in the Meadow Valley Wash drainage area, Nevada, above the vicinity of Caliente: Nevada State Engineer, Water Resources Bull. 7, 117 p.

Shantz, H. L. and Zon, R., 1924, The physical basis of agriculture, natural vegetation, *in* Atlas of American agriculture: U.S. Dept. of Agriculture, p. 1–29.

Stearns, N.D., Stearns, H. T., and Waring, G. A., 1937, Thermal springs in the United States: U.S. Geol. Survey Water-Supply Paper 679–B, p. 59–206.

U.S. Bureau of Land Management, 1955, The Federal Range Code for grazing districts: Federal Register, Washington, p. 4.

Vorhis, R. C., 1957, Bibliography of publications relating to ground water prepared by the Geological Survey and cooperating agencies, 1946–55; U.S. Geol. Survey Water-Supply Paper 1492, 203 p.

Waring, G. A., and Meinzer, O. E., 1947, Bibliography and index of publications relating to ground water, prepared by the Geological Survey and cooperating agencies: U.S. Geol. Survey Water-Supply Paper 992, 412 p.

INDEX

○