ENVIRONMENTAL REPORT

COVERING SELECTED HYDROGRAPHIC BASINS IN

CLARK, LINCOLN, NYE AND WHITE PINE COUNTIES, NEVADA

1994

Las Vegas Valley Water District

COOPERATIVE WATER PROJECT
Water for Nevada's Future
Report No. 14

ENVIRONMENTAL REPORT

COVERING SELECTED HYDROGRAPHIC BASINS IN

CLARK, LINCOLN, NYE AND WHITE PINE COUNTIES, NEVADA

1994

By

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Las Vegas Valley Water District

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1.0
INTRODUCTION

1.1 BACKGROUND

Population influxes to southern Nevada from other parts of the country are increasing the population of Clark County considerably. Growth rates during the 1980s ranged between 3 and 12 percent per year. The 1980 census population was 450,000. By 1993, the population of Clark County was about 919,400 (Clark County Department of Comprehensive Planning (CCDCP) 1993). Approximately 95 percent of this growth occurred in Las Vegas Valley. Future projections estimate the County population will be 1.8 million by the year 2035 (CCDCP 1994).

The Las Vegas area currently uses a mixture of 85 percent Colorado River water and 15 percent local ground water. The local ground-water system is fully appropriated, and Nevada's share of Colorado River water will be fully utilized shortly after the turn of the century.

In an early engineering water supply study by the Las Vegas Valley Land and Water Company, the forerunner of the Las Vegas Valley Water District (District), it was determined that the Las Vegas Valley ultimately would develop beyond the available water supply from the Colorado River and local ground-water system. Water planning studies by the State Division of Water Planning and the State Engineer's Office (Nevada Department of Conservation and Natural Resources 1982) evaluated optional water supplies and recommended that water resources be developed in other ground-water basins in eastern and southern Nevada and imported into the Las Vegas area.

The need for additional water resources was established further by a series of studies conducted jointly by the major water purveyors and all levels of government agencies in southern Nevada. Initially, the University of Nevada-Las Vegas (UNLV) Center for Business and Economic Research was asked to develop socioeconomic projections to the year 2030, using the econometric model that determines the effects of projected changes in the national economy on the southern Nevada economy. The Center projected an average annual population growth rate of 2 percent for southern Nevada from 1990 to 2030. This growth rate would result in a population of 1.8 million, with employment of 1 million by the year 2030, if sufficient water resources were available. These projections were reviewed and accepted by all water purveyors and agencies involved.

Next, projections of housing units and employment in a wide range of industries were used to determine corresponding water demands, using a customized version of the U.S. Army Corps of Engineers' water use forecasting system. The water demands were then used in a network optimization model to study various future demand and supply scenarios, and to determine for each scenario the year in which Nevada's consumptive use allocation from the Colorado River would be fully utilized. The analysis concluded:

1. If moderate water conservation is practiced and there are no shortages on the Colorado River, Nevada's consumptive use allocation would be fully used by about 2006.

2. If a severe level of conservation is imposed and the sharing by Nevada of possible future Colorado River shortages was taken into account (as seemed reasonable to assume for a scenario involving severe conservation), Nevada's consumptive use allocation would still be fully used by 2006; however, without shortages, the available water would last about six additional years.

Clearly much depends on the flows of the Colorado River and the critical time of full use of Nevada's allocation could come earlier than 2006, but probably not much later. At that time, without an additional water supply, the community will be extremely vulnerable to drought, and additional conservation measures will not be adequately effective. Thus the major water purveyors and all levels of government in southern Nevada agreed that a new source of supply would need to be available by at least 2007.

1.2 WATER SUPPLY OPTIONS

The District is continually reviewing and utilizing all water resource options available to prepare for future water needs. The first project was to "bank" water through artificial recharge which has been described by Katzer and Brothers (1989) and Brothers and Katzer (1990). In addition, water conservation efforts were started in 1989 (Las Vegas Valley Water District 1992; Morris et al. 1994 in preparation). These efforts are becoming more effective with time, and are expected to extend the available water to about year 2006 and perhaps beyond.

The options of water reuse and desalinization also are being investigated at the present time. Reuse involves using treated wastewater effluent for uses that do not require potable water quality (e.g., crop or golf course irrigation). However, because the Las Vegas Valley is close

to the Colorado River, water can be returned to the river via the advanced wastewater treatment plant and return-flow credit is given for this water. These credits extend the amount of potable water available for use in the area, however, the District is currently (1994) involved with the City of Las Vegas to determine the feasibility of building a wastewater reclamation plant on the west side of Las Vegas Valley to provide reuse for golf courses during the summer months. Desalinization also is being considered with the thought that someday this process may not be so energy intensive and desalted ocean water could be delivered to southern California in exchange for Colorado River water.

The most promising option currently (1994) is the possibility that an additional long-term water supply can be obtained from other Colorado River Basin states. Utah, Arizona, and California have all indicated a willingness to discuss marketing Colorado River water with Nevada.

In October of 1989, the District applied for surface- and ground-water rights on the Virgin River as another water supply option. The District subsequently asked the State Engineer to withhold action on the ground-water applications. In 1993 the District transferred the surface-water application to the Southern Nevada Water Authority (SNWA), an entity that represents the major water purveyors in southern Nevada and is responsible for obtaining new water supplies. The SNWA subsequently filed an additional surface-water application on the Virgin River. The State Engineer held a water-rights hearing on the applications in January 1994.

On November 10, 1994, the State Engineer issued Ruling 4151 approving the applications for a maximum diversion volume of up to 190,000 acre-feet per year, which is based on an average annual diversion of 90,000 acre-feet. The SNWA has indicated that its preference in developing the Virgin River water is to build nothing in the river and simply take credit for the river water entering Lake Mead, then withdraw that water from Lake Mead. Negotiations are under way to explore this possibility.

Another option being studied is the supply of unappropriated ground water in eastern and southern Nevada. This potential ground-water development is termed the Cooperative Water Project (CWP), and is described in the following section.

1.3 COOPERATIVE WATER PROJECT

In October 1989, the District filed on the available ground water in about 26 hydrographic basins in eastern and central Nevada, with 130 applications (excluding Virgin River

applications) for diversion of ground water. After a preliminary evaluation of these ground-water basins, the District withdrew applications from several because of environmental concerns, existing overappropriation, and low benefit/cost ratios. The amount of ground water in the remaining applications totals about 180,000 acre feet. This is the amount of water that is available within the perennial yield concept and is over and above that amount currently being put to beneficial use. Thus the CWP would involve development of unallocated ground water from certain hydrologic basins in Nevada, as shown on Figure 1-1. The total area encompassed by the project is about 20,000 square miles and includes parts of Clark, Lincoln, Nye, and White Pine counties.

Five separate flow systems occur in the CWP area. One, the Virgin River Basin, is not connected to other flow systems to the west and north. Surface water of the Virgin River dominates the water resources of this basin, and the terminus for this system is Lake Mead on the Colorado River. This flow system was characterized in a 1992 report entitled, "Environmental Report of the Virgin River Water Resource Development Project, Clark County, Nevada." The four flow systems encompassed by the CWP area of investigation include:

- Northeastern Basins flow system (tributary to the Great Salt Lake Desert flow system).
- Railroad Valley flow system (terminus of a multi-valley ground-water flow system).
- Death Valley flow system.
- White River flow system.

The systems and associated basins are as follows: The Northeastern Basins flow system includes Spring, Snake, and Hamlin Valleys; the Railroad Valley flow system includes Railroad North and South Valleys; the Death Valley flow system includes Tikaboo, and Three Lakes North and South; and, the White River flow system includes Pahroc, Cave, Dry Lake, Delamar, Garden, Coal, and Coyote Springs Valleys, and indirectly associated with this system through inferred ground-water flow are Hidden, Garnet, and California Wash Valleys (Figure 1-1).

Subsequent to the District's filing of applications for ground-water rights in the CWP area, the District conducted hydrologic studies on the basins of interest. Results of these studies have been published in a series of reports, referenced in Chapter 4 of this document (Las Vegas Valley Water District, Cooperative Water Project series 1992; 1993; 1994).

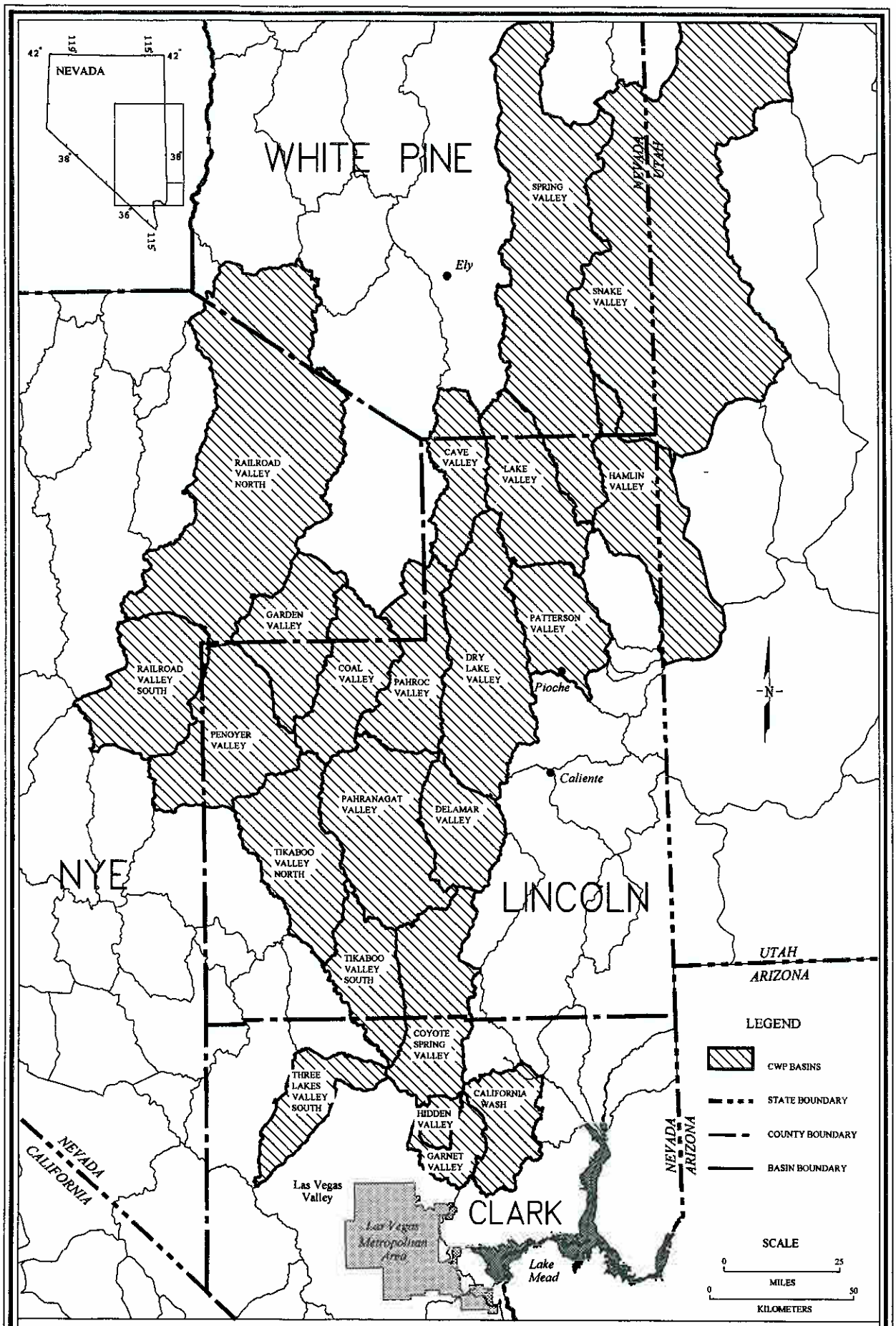


Figure 1–1. Cooperative Water Project Area

2.0
OBJECTIVES OF THIS REPORT

The State Engineer required an environmental report be prepared for the CWP area, in accordance with Nevada Revised Statute (NRS) 533.368. This report was originally intended to include baseline environmental data for the CWP area as well as assessments of potential impacts that could result from project development. However, other water resource supply options, as described in Chapter 1, may prove more productive in the immediate future. Thus, the intensity of effort to complete the studies of the ground-water basins in the CWP area has been, by necessity, reduced accordingly. This report presents only a summary of baseline environmental data for the CWP area.

The design of the actual project for the CWP (wells, transmission facilities, pumping stations, etc.) is dependent upon not only completing all of the studies, but also the degree of success in implementing other water supply options. An addendum to this report will be prepared when the project design is completed. Such an addendum would include the description of a proposed project and potential impacts, and would, along with this baseline report, complete the environmental reporting requirements of NRS 533.368.

The baseline data in the CWP area for hydrology, biological resources, cultural resources, and land use are described in Chapter 3 of this report. References and literature cited are provided in Chapter 4.

3.0
ENVIRONMENTAL SETTING

The CWP area includes 18 hydrological basins in Clark, Lincoln, Nye, and White Pine counties in Nevada. Other basins described in this report, Hamlin, Penoyer, and Pahranagat Valleys, have no water right applications pending but were included because transmission facilities could cross them. The CWP area is shown on Figure 1-1.

3.1 HYDROLOGY

Most of Nevada is located in the Great Basin Physiographic Region as defined by Fenneman (1931) which is also designated as part of the alluvial basin ground-water region of the United States (Heath 1984). The single greatest source of water is from melting snow on the mountain blocks, with winter and summer rain providing lesser amounts. No surface flow leaves this region because most water reaching it from precipitation is returned to the atmosphere through evaporation and transpiration; a small percentage enters the ground-water system.

The CWP area is located mostly in central and eastern Nevada and a portion, Snake and Hamlin Valleys, is located in Utah. This entire area is within the Carbonate-Rock Province of the Great Basin, and these hydrographic basins tend to be north to northeast trending mountain ranges separated by deep (several thousand feet) unconsolidated alluvial filled valleys, generally 10 to 20 miles wide and 30 to 80 miles long (Prudic, et al. 1993). Underneath these alluvial valleys are thick sequences of marine deposits of limestone and dolomites. These carbonate rocks are believed to regionally transmit significant quantities of ground water through fractures and solution cavities. In some valleys there are volcanic rocks between the alluvium and the carbonate rocks, and in most cases the volcanic rocks do not transmit water readily.

3.1.1 Precipitation and Ground-Water Recharge

Most of the CWP area is located in Nevada which is the driest state in the United States, with large parts being classified as semiarid and arid. Because of the scarcity of precipitation and low volumes of surface-water runoff, ground water, which is primarily contributed by snow on the surrounding mountain ranges, is the major source of water in the alluvial basin region. Therefore, valleys receiving the most snowfall (those with the higher surrounding mountain ranges) receive the greatest ground-water recharge.

The ground-water system is recharged primarily in three ways, as shown in Figure 3-1.

The first is by gradual snowmelt slowly entering the bedrock fractures. Some small percentage of this water feeds the higher localized springs or seeps, which discharge and enter the unconsolidated alluvial material by infiltration. The remaining larger percentage stays in the bedrock fractures, moving downward in fracture pathways.

The second recharge pathway is a more rapid snowmelt, common to higher mountains in the spring and early summer, which provides runoff feeding perennial and ephemeral drainages. Some of this runoff (probably the majority) enters the alluvial system at the drainage bedrock-alluvial contacts, some (probably lesser amounts) enters the bedrock system, and some is diverted for agricultural uses providing some secondary recharge to the alluvial system. The remaining runoff (if there is any) flows toward the center or lowest part of the valley floor, which is characterized by fine grained sediments or playas, where this water ponds and slowly evaporates; some very small percentage will enter the ground-water system unless the underlying sediments are at saturation.

The third recharge pathway is by rainstorms or extremely fast snowmelt, resulting in high rapid runoff events which probably provide minor recharge to the alluvial and bedrock ground-water systems. The majority of the water, carrying fine-grained sediments, reaches the center of the valley or the playa. As in the second case, the majority of the water evaporates, leaving fine-grained sediments and some salts behind on the playa.

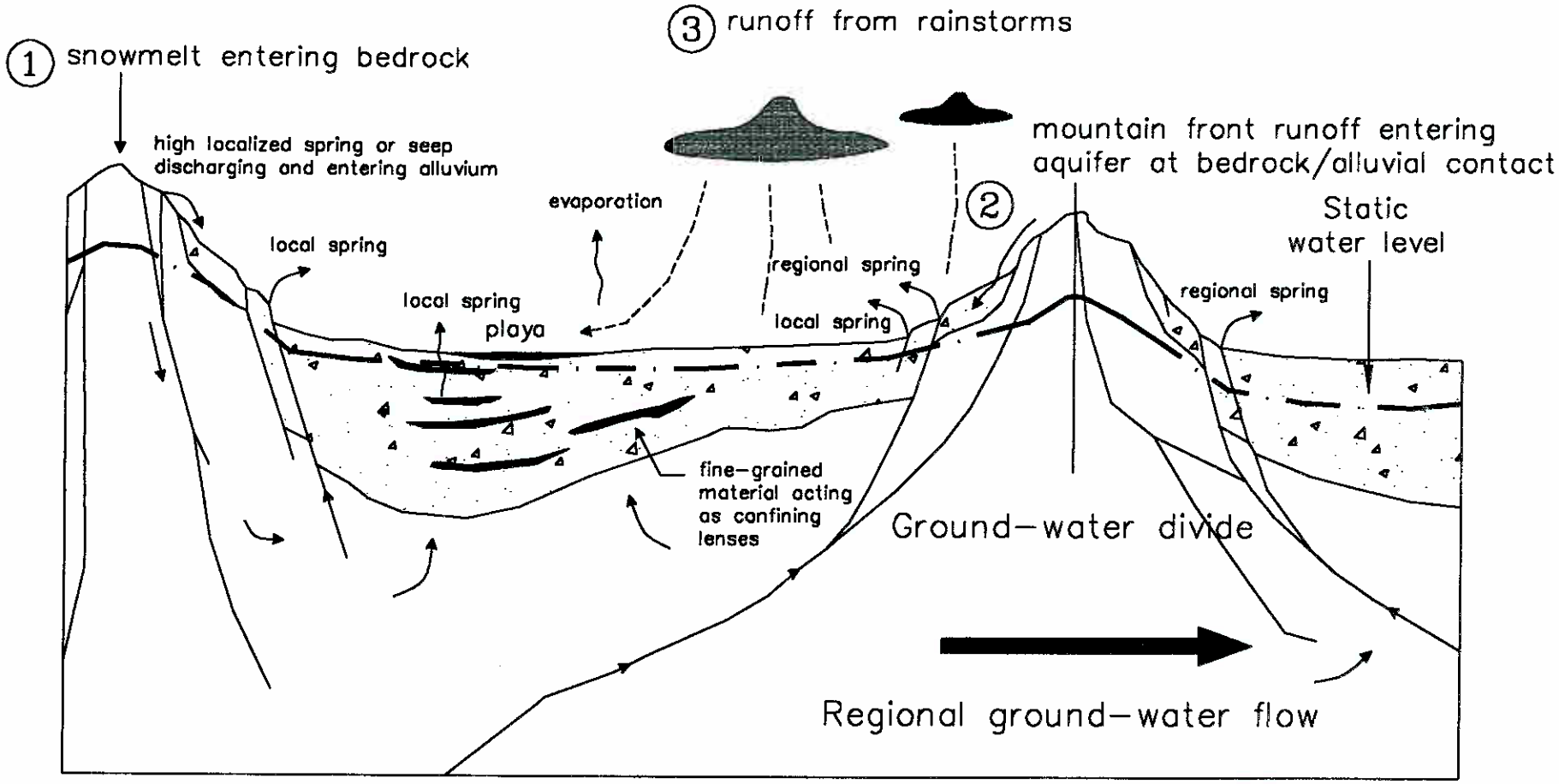


Figure 3-1. – Recharge and flow paths for a typical alluvial valley

A method for estimating recharge to the ground-water system for the alluvial basins was developed by G.B. Maxey and T.E. Eakin between 1947 and 1951 (Eakin 1951). This method estimates the average annual volume of precipitation entering a valley based on precipitation volumes for various elevation zones. For each elevation zone, a certain percentage of precipitation is estimated to enter the ground-water system. The percentage entering the ground-water system is greater with higher elevation simply because of greater precipitation. This method has been applied to over 200 basins in Nevada and other western states in the alluvial basin ground-water region. The Maxey-Eakin method for estimating ground-water recharge has been evaluated for Nevada valleys and found to be a fairly reliable estimator (Avon and Durbin 1992), and is the basis of estimates in this report.

3.1.2 Ground-Water and Surface-Water Movement and Interaction

As previously discussed, precipitation, primarily from snowmelt, enters the ground-water system directly and through infiltration of surface water runoff. Both the consolidated rocks and unconsolidated, alluvial sediments receive recharge and transmit water.

Consolidated Rock Aquifers

Water enters the consolidated rocks primarily through the first recharge pathway discussed (snowmelt slowly entering the bedrock fractures). Water moving in the consolidated rocks is transmitted more readily through fractures and solution cavities, since the primary porosity (spaces in the rock matrix) of bedrock is minor. This water can move downward through these fracture pathways, sometimes to great depth, before another pathway is found through which the pressurized water can move back up toward the surface. This upward gradient causes water to move into overlying alluvium or to land surface in springs. This water can be interregionally transported, finding an upward pathway in another down-gradient alluvial basin.

Greater depth of movement results in higher water temperatures, which are characteristic of regional springs. A rule of thumb for calculating the depth of water movement of a regional spring is to subtract the average valley ambient air temperature from the spring-water temperature and then apply the estimate of 1°F for every 100 feet of downward movement (Driscoll 1986). Water moving through consolidated rocks can also flow to localized springs

or seeps; the water, which then surfaces, may infiltrate into the alluvium, the rest is used up by evapotranspiration. The water temperature of localized springs is usually about equal to the average ambient air temperature.

Discharges from some springs are of sufficient magnitude to sustain perennial streams. Both regional and local spring flows provide water for wetland areas. Vegetation (wetlands) surrounding these springs is dependent on the high ground-water table resulting from the spring-water infiltration. In some valleys, this spring flow is used for agricultural crops or diverted to sustain meadow grass for livestock grazing. Wetland areas are areas of evapotranspiration or water discharge from a valley.

Unconsolidated Aquifers

As discussed, the first ground-water recharge pathway results in water entering consolidated rock flowpaths, which, in turn, results in some water entering the alluvial sediments through spring and seep discharges. Ground water also moves from the bedrock directly into the alluvial ground-water system. The second recharge pathway probably results in significant recharge to the alluvium from more rapid snowmelt runoff entering ephemeral drainages and infiltrating at the bedrock-alluvial contact. In the higher elevation valleys (i.e., Spring and Snake Valleys), runoff from snowmelt is of sufficient quantity and duration to create numerous perennial streams.

Some water from these drainages can flow to the center of the valley or the playa area. Water from the third recharge pathway, extremely rapid snowmelt or rainstorms, also can reach the playa areas; however, it is believed that very little of this water reaches the alluvial aquifer because most of it evaporates.

Water in the alluvial aquifer moves toward the center of the valley. In some valleys fine-grained sediments located toward the center of the valley can act as confining layers. If there is sufficient pressure or head, water in wells penetrating these confining layers can rise above land surface. In addition, faults in the confining layers can allow water to rise to the surface and form springs, which discharge to the alluvium.

3.1.3 Ground-Water Discharge

In the Basin and Range hydrographic basins, the only way water is lost from the ground-water system is through evapotranspiration (ET), including bare soil evaporation (E) as shown in Figure 3-2, which occurs when the water table is within 20 to 30 feet of land surface. As discussed in Section 3.2, vegetation within the CWP area is classified in 10 broad vegetation zones for purposes of this report. These broad vegetation zones are classified by the dominant plant species or by general descriptive terms such as "playa," "montane zone," etc. The vegetation zones include:

- Montane Zone
- Pinyon-Juniper Zone
- Sagebrush Zone
- Blackbrush Scrub Zone
- Creosote Bush Scrub Zone
- Winterfat Zone
- Saltbush Zone
- Greasewood Zone
- Irrigated Agriculture and Wetland Zone
- Playa

Two of the vegetation zones contain plant species termed phreatophytes that are dependent on ground water: the Greasewood Zone and the Irrigated Agriculture and Wetland Zone. Plant species in the other vegetation zones are dependent on soil moisture. Wetland types of vegetation are supported by regional and local springs as well as the alluvial aquifer where it occurs within 10 to 20 feet of land surface. Phreatophytes, such as greasewood, will extend their roots to the alluvial water table up to 57 feet below land surface (Mozingo, 1987).

Figure 3-3 also shows various types of vegetation that live off of soil moisture. Very little, if any, of this moisture, which is provided by rainstorms, enters the alluvial aquifer.

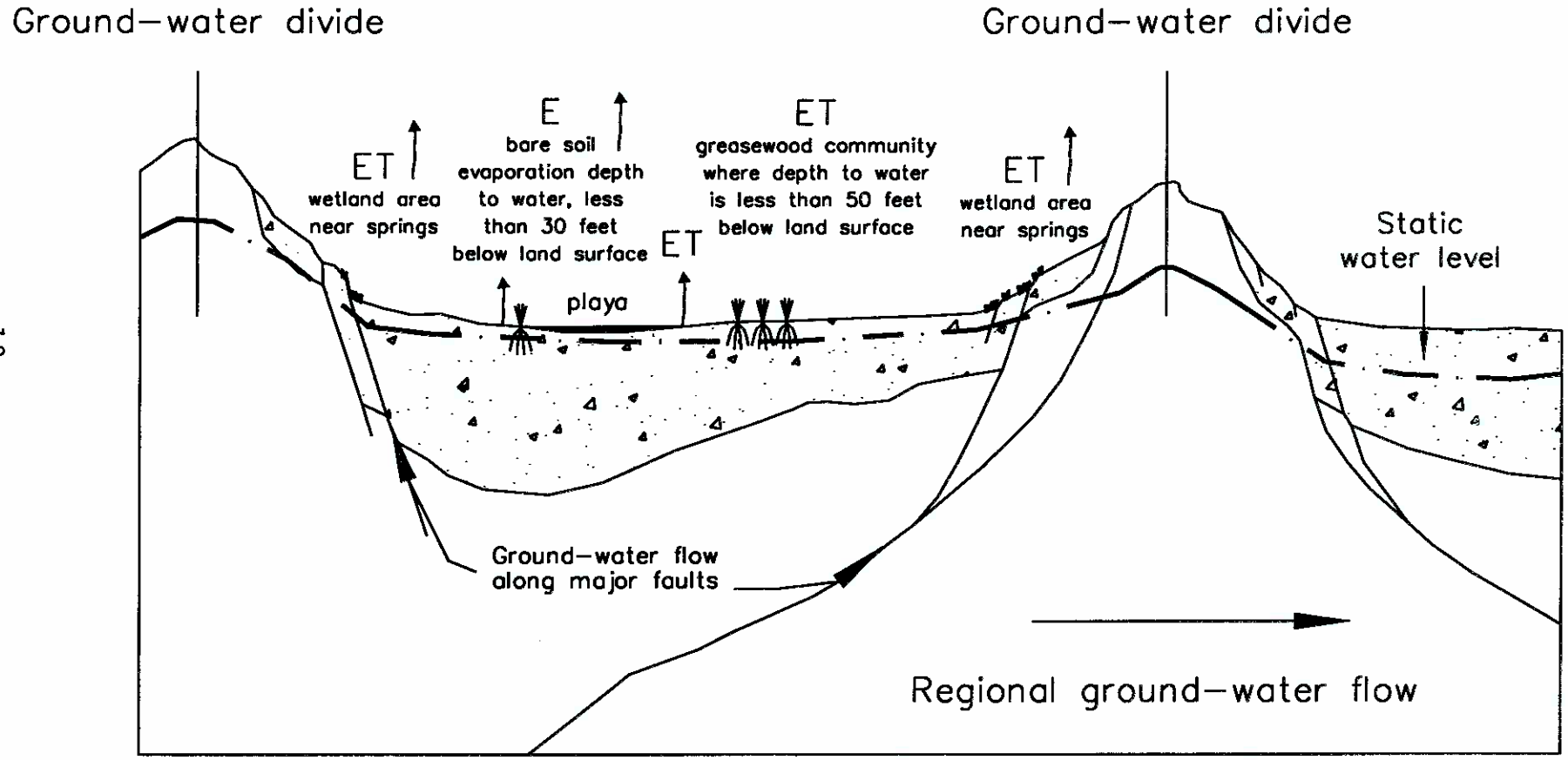


Figure 3–2. – Water discharge for a typical alluvial valley

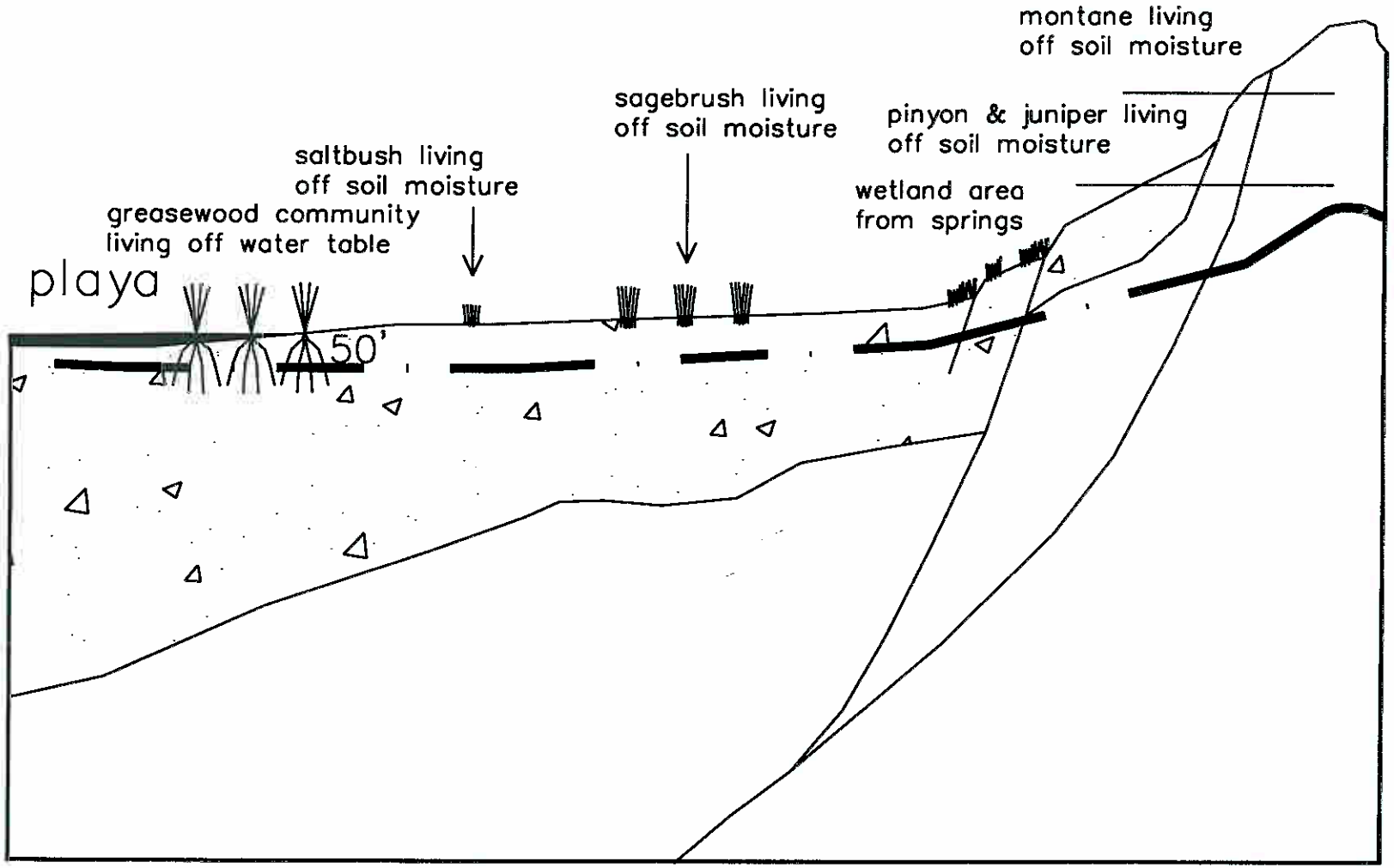


Figure 3–3. – Typical vegetation types and corresponding source of water.

Ground-Water Development

Ground-water development for importation out of the basin is also considered a budget discharge. The District has filed for water rights to develop both the alluvial and consolidated rock aquifers. The following discusses development of these aquifers and potential general impacts on the environment due to such development.

Unconsolidated Aquifers

In most cases, wells completed in the alluvial aquifers will yield higher water production rates since the unconsolidated materials usually have higher transmissivities than bedrock aquifers and thus will be the preferred type of well. Anytime water is withdrawn from a well the water table declines, or for confined systems, the pressure is reduced as shown in Figure 3-4.

This decline in the potentiometric head while a well is pumping is called a cone of depression, which spreads with time and is dependent on the hydraulic capability of aquifer materials to transmit water to the well as the well continues to produce ground water. In unconfined aquifers, water withdrawals result in declines in the water table since the water is removed from the alluvial matrix. In confined aquifers water withdrawals result in a reduction in the pressure (potentiometric head) on the confining layer but no decline in the water table occurs. If the confined aquifer is feeding a spring or water table aquifer above it, through a pathway such as a fracture, this decline in pressure may cause a decline in the aquifer above the confining layer.

Consolidated Aquifers

Bedrock aquifers receive water directly by snow melting on the surrounding outcroppings and percolating downward into the saturated rock aquifer. As mentioned previously, the bedrock aquifers can provide water for the overlying alluvial system. However, these rock aquifers also provide deep connections between hydrographic basins allowing for interbasin or regional flow.

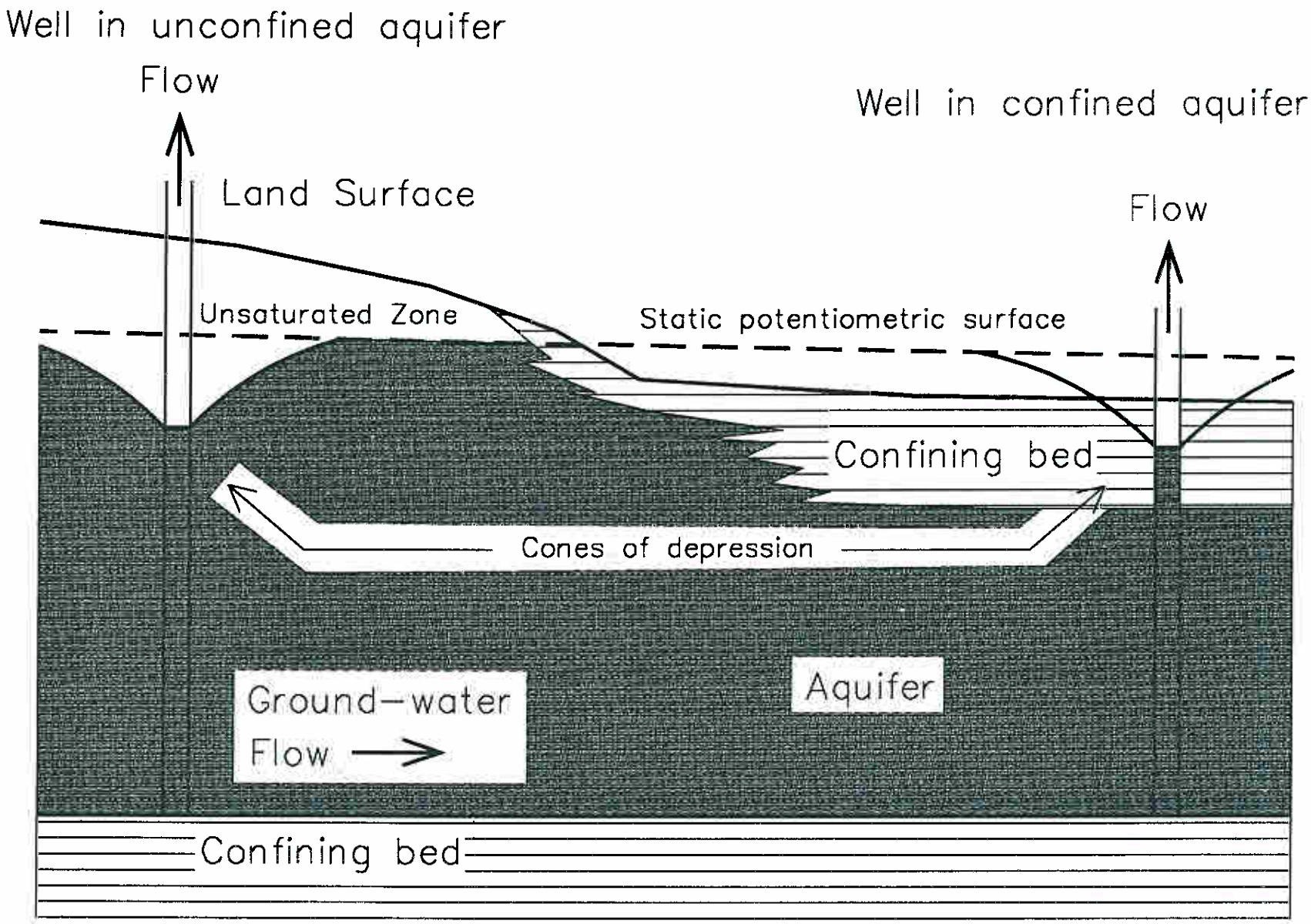


Figure 3–4. – Wells in confined and unconfined parts of an aquifer.

Bedrock aquifers are usually less transmissive than unconsolidated aquifers since the porosity is much less. Fractures, or solution cavities, are considered secondary porosity features and result in higher transmissivities in areas where they are encountered. Therefore, when siting bedrock wells, every attempt will be made to drill in areas where fractures could be encountered.

It is much more difficult to define impacts from withdrawing water from a bedrock well, since it is difficult to define the interconnection of fractures. However, in most all cases regarding the development of the bedrock aquifer, only the upper part of the saturated rock aquifer will be tapped because of economic limitations on the depths of water supply wells. As shown in Figure 3-5, this decline in pressure at the well could cause some decline in flow from the bedrock aquifer to the alluvial aquifer, resulting in a localized water table decline in the overlying aquifer.

3.1.4 Flow Systems

Northeastern Basins Flow System

Total recharge to Spring and Snake including Hamlin is about 177,000 acre-feet per year, with Spring receiving about 75,000 of Snake and Hamlin receiving about 102,000 acre-feet per year (about 65,000 per year of which is generated in Nevada). Estimated discharge (spring and related evapotranspiration) from these valleys is about 150,000 acre-feet per year, about 70,000 from Spring and 80,000 from Snake. Ground-water movement is shown in Figure 3-6, and is from north to south in Spring Valley, with an estimated 4,000 acre-feet per year flowing from southern Spring into Hamlin then into Snake, where the general flow direction is from the southwest to the northeast. Harrill et al. (1988) estimate that the underflow from Snake Valley to the Great Desert system may be as much as 33,000 acre-feet per year. This also includes water entering Snake Valley from the southeast from Pine and Wah Wah Valleys (not shown in Figure 3-6) in the consolidated rock system.

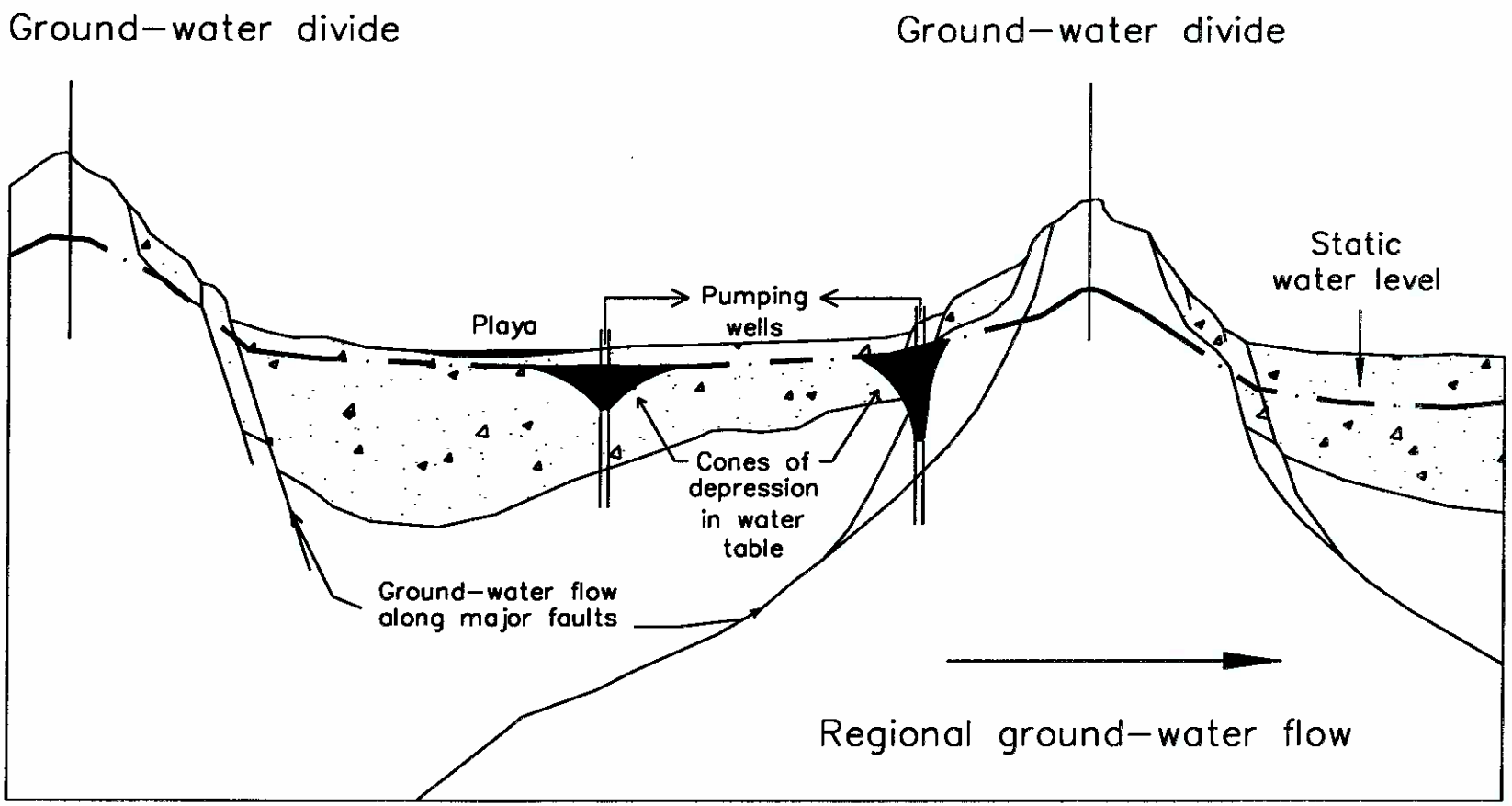
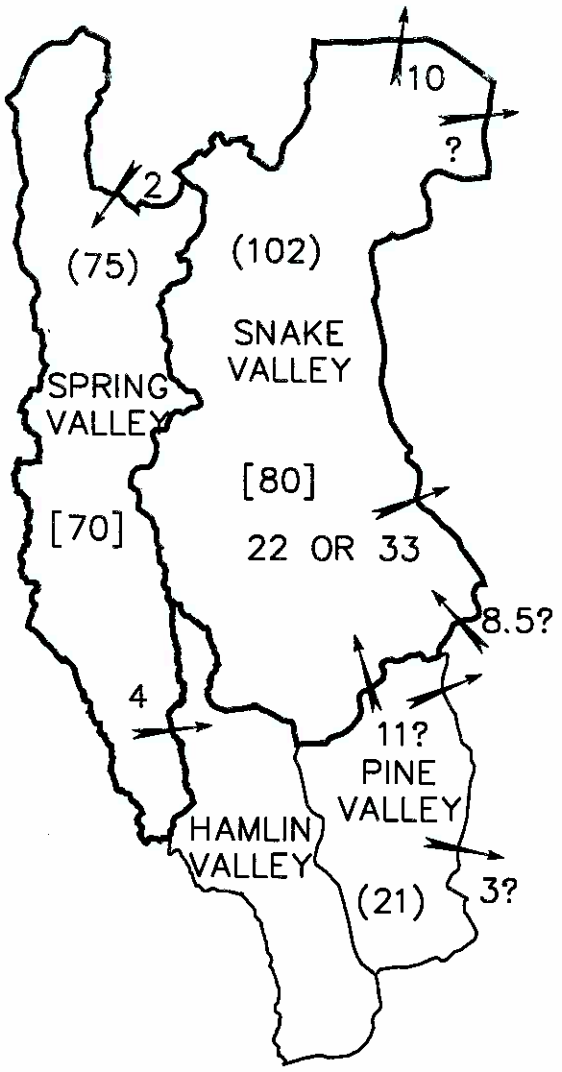
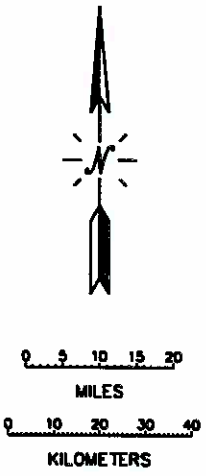


Figure 3–5. – Drawdown comparisons, alluvial and rock aquifers





All numbers 1000 acre-feet/year

(75) Natural recharge to basin

← Flow across boundary

[70] Discharge ET and Springs

Based on Harrill et.al., (1988)

Figure 3-6. – Northeastern basins flow system.

Railroad Valley Flow System

Railroad Valley is the terminus of the Railroad Valley flow system, which is thought to include five hydrographic basins encompassing an area of 4,820 square miles (Harrill et al. 1988). The extent of the sources of this flow system are not precisely defined. The total ground-water recharge to the system is estimated at about 71,000 acre-feet per year. The evapotranspiration in Railroad Valley is estimated to be about 80,000 acre-feet per year with another 10,000 acre-feet per year discharged by evapotranspiration in Little Fish Lake Valley. Ground-water movement is from the recharge area toward the terminus of the system, the Railroad Valley springs, and playa. Figure 3-7 shows the hydrographic basins comprising the Railroad Valley flow system and the general budget and direction of ground-water movement.

Death Valley Flow System

The Death Valley flow system encompasses about 15,600 square miles and 29 hydrographic basins or subareas (Harrill et al. 1988). The system is characterized by major interbasin flow and large regional springs with the terminus of the system being the Death Valley playa, which is about 200 feet below sea level. There are several intermediate discharge points, the most prominent being Ash Meadows in Amargosa Valley. Total ground-water recharge is about 90,000 acre-feet per year with discharge estimated to be about 95,000 acre-feet annually. Discharge estimates vary depending on the estimation of evapotranspiration and interbasin flow. For example, Harrill et al.(1988) estimate flow to Death Valley to be between 3,000 and 19,000 acre-feet per year. Figure 3-8 shows the basins comprising this flow system and the major flow paths and discharge points. There are two major flow paths in the Death Valley flow system. One path flows west from Tikaboo, Three Lakes North and South, and Indian Springs, intersecting with flow moving south from the Test Site area (Jackass Flats, Frenchman Flat, etc.), entering the Amargosa Desert, then flowing to Death Valley. The other major path is recharge from the northwest side of the Spring Mountains in Pahrump Valley flowing toward the southern part of Death Valley.

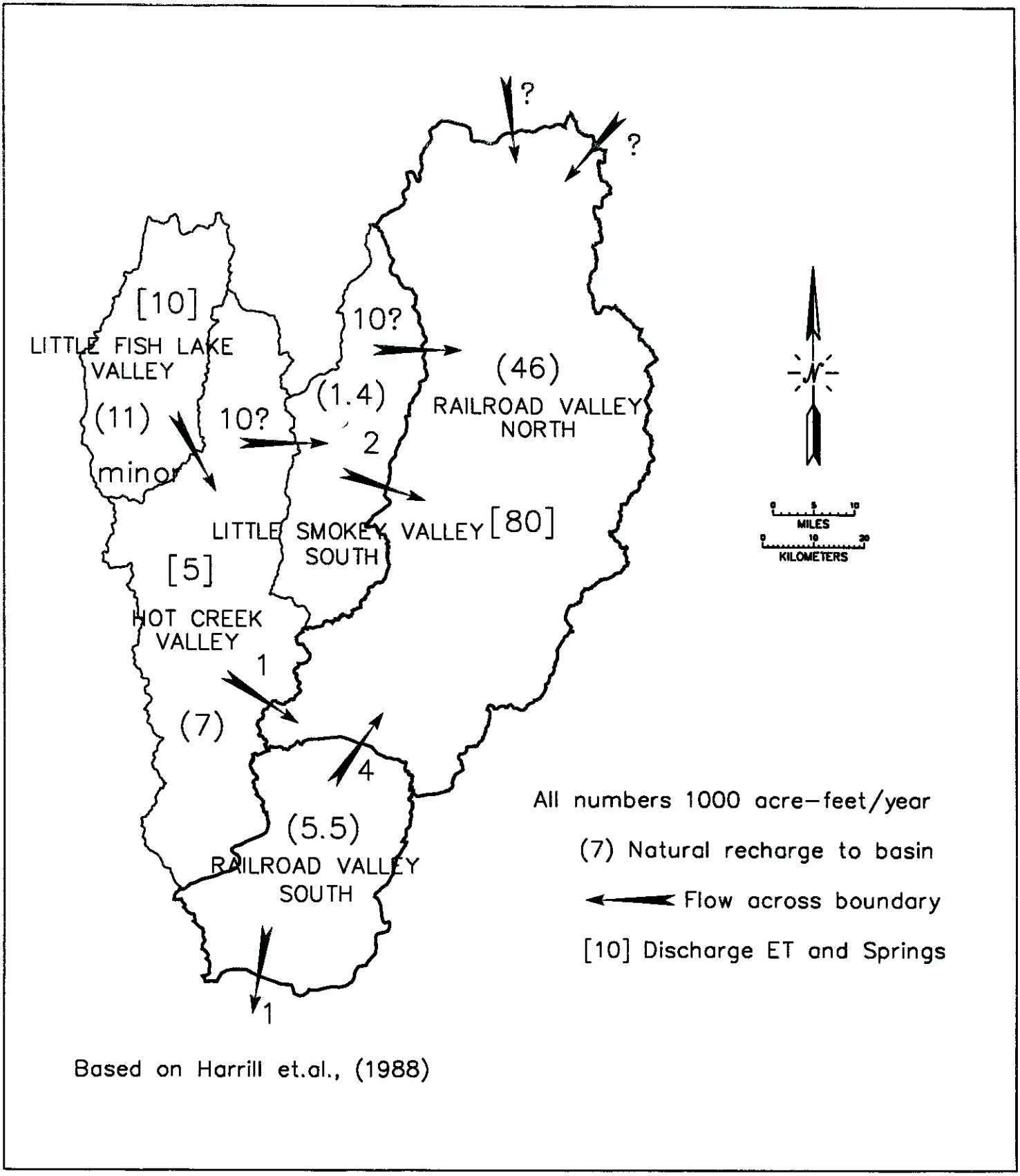


Figure 3-7. – Railroad Valley flow system.

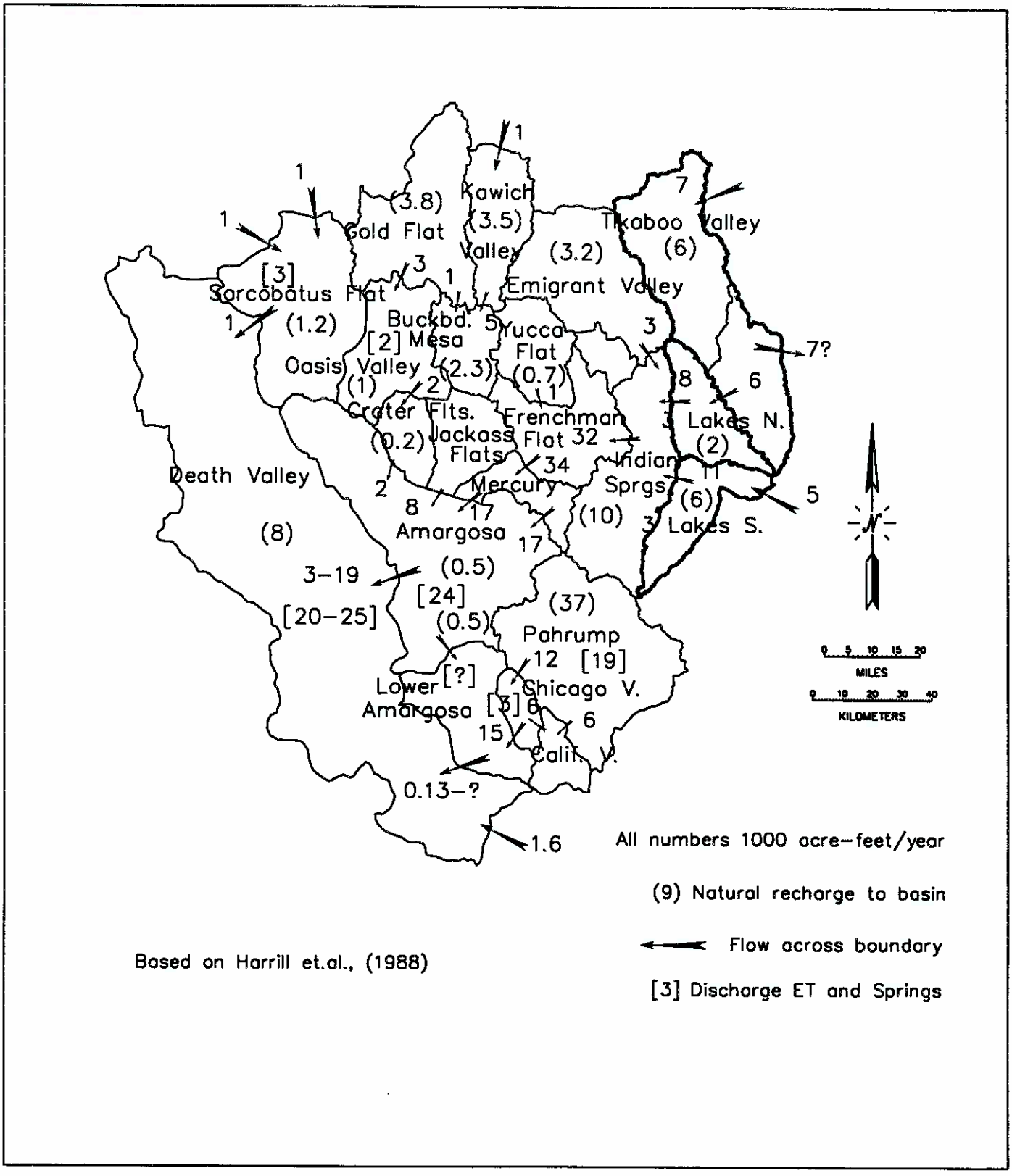


Figure 3–8. – Death Valley flow system.

White River Flow System

The Colorado Flow System encompasses about 16,300 square miles and 34 hydrographic basins or subareas (Harrill et al. 1988). The Colorado system includes the White River flow system with 13 hydrographic basins, and also for the purposes of this discussion includes Patterson, Garnet, Hidden Valley, and California Wash. The District has filed applications for a total of 36,000 acre-feet per year of permanent unappropriated ground-water rights: 33,500 from the White River System, and 2,500 from California Wash. The total recharge to the White River system is about 104,000 acre-feet per year, with the primary recharge areas being in Long, Jakes, and White River Valleys. Total discharge from the White River flow system is about 100,000 acre-feet per year, with the major discharge points being springs in White River, Pahranagat, and Muddy River Valleys. Figure 3-9 summarizes the White River flow system budget, including Hidden and Garnet Valleys and California Wash, and shows the major direction of ground-water flow.

3.1.5 Springs

The following is a general discussion of each valley with respect to springs. As stated above, spring areas are important components of Basin and Range hydrologic systems. Many are used for irrigation and most all are sources of wildlife habitat. The following general discussion includes both regional and localized springs, which is an important distinction when evaluating potential impacts from ground-water withdrawals. Detailed information on specific valley springs can be found in the individual hydrologic basin reports and will be included in the geochemical section of the report regarding the District's regional ground-water model.

Spring Valley

The magnitude of the spring flow ranges from seeps to Bastian Spring which is reported to flow 1,700 gpm. This spring is located in the mountain block in the Bastian Creek drainage on the west side of the valley. Other reported maximum spring flow in the valley is no more than 300 to 400 gpm, and most is less than 100 gpm. Total spring flow has never been determined but is probably on the order of several thousand acre-feet per year.

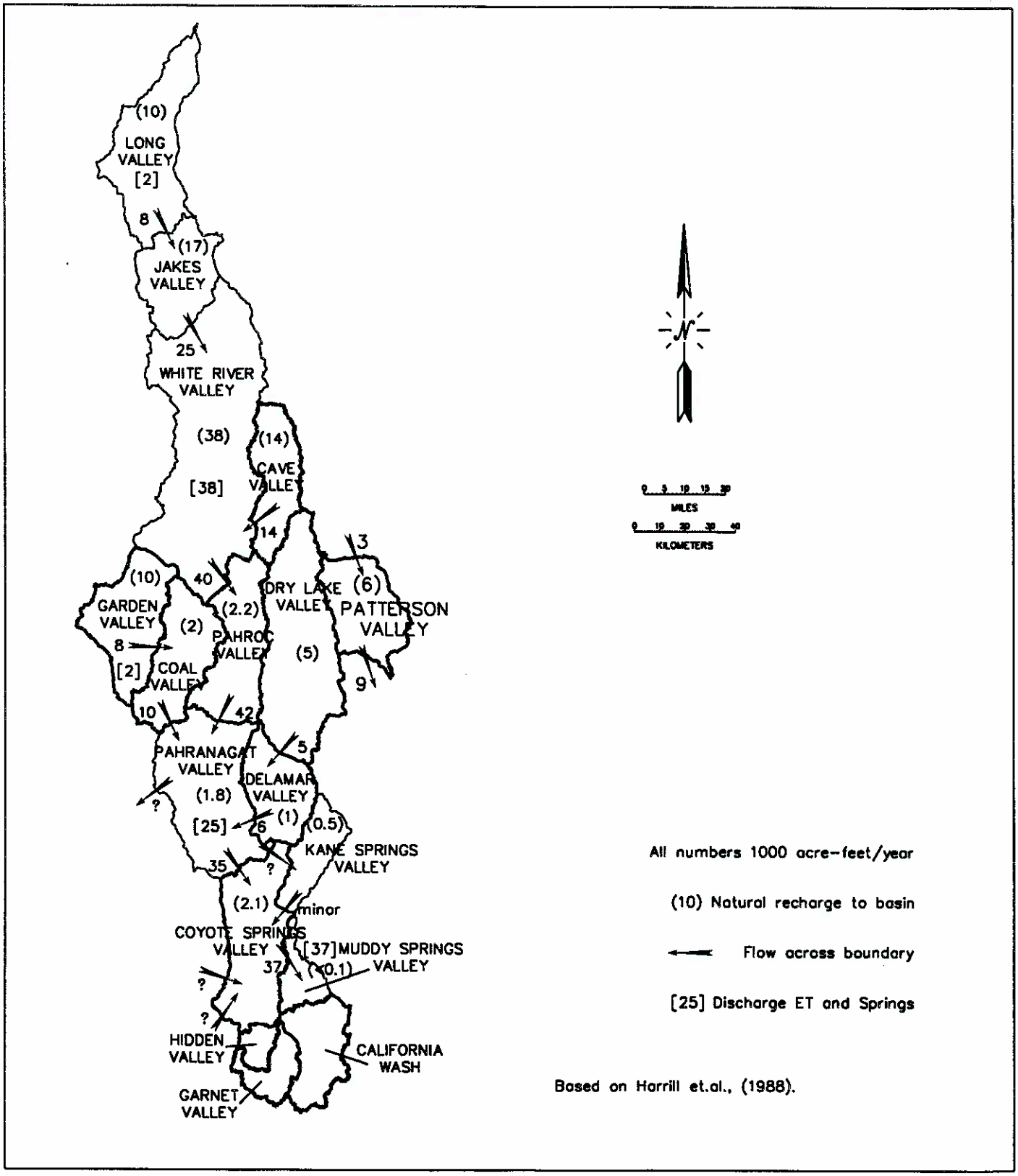


Figure 3–9. – White River flow system.

Springs are found throughout Spring Valley, on alluvial fans on both sides of the valley, in the middle of the valley, and in the surrounding mountain blocks. There are two main spring areas in the northern part of the valley on the western alluvial fans which drain the Schell Creek Range and in the southern part on the eastern alluvial fans which drain the southern Snake Range. These springs on the edges of the valley are on obvious fault scarps and are local gravitational springs. These springs are all cold water ranging from about 8 to 14°C, indicating recent ground-water recharge. Ground water exits the mountain block over probably a large depth interval, the top of which is likely close to land surface. As this water moves toward the valley, it is intersected by the fault zone and brought to the surface. As there appears to be more recharge than spring flow, it is apparent that the fault zone brings up a small percentage of the ground water to the surface. There are local gravitational springs located near the center of the valley that probably result from the intersection of land surface with the water table.

One area in Spring Valley, called the Cedars, exhibits a thermal component. In this area several flowing wells provide about 21°C water to ponds.

Snake Valley

Three large springs dominate springflow in the valley. First is Warm Springs located in the northern end of the valley that flows about 8 cfs. The water temperature at the orifice is 26.5°C, which indicates the water is thermal in origin and may be part of a regional multi-valley ground-water flow system. Judging by the relatively warm temperature, the source waters are probably from the Snake Range to the west, circulate to a depth of two to three thousand feet, and are brought to the surface along a fault plane.

Another major spring in the valley is Big Springs, located in the southern end of the valley with a flow of about 8 cfs. Big Springs is local in origin although there may be a thermal component because the water temperature is 18°C. This slightly elevated temperature indicates that, although the spring is part of the basin's local hydrologic system, it also has some component coming from depth. The mechanism that brings the water to the surface appears to be a northeast trending fault structure.

The third large spring in the valley is Twin Springs, located in the northern part of the valley near the eastern edge. Twin Springs flows about 4 cfs, has a slightly elevated water temperature of 19.5°C, and is slightly warmer than Big Springs, indicating a deeper or more regional component. Basins to the east could be the source area for this water, but perhaps the intrusive body of volcanics in the Confusion Range provides the needed heat flux to elevate the temperature above the average ambient air temperature.

Other springs in the valley proper are all gravitational. Some may be under artesian pressure, and some may be brought to the surface by faults. These springs, while significant to the basin, are minor in comparison to the flows of Warm, Big, and Twin Springs.

Patterson Valley

Patterson Valley is part of the Colorado Flow System and ultimately part of the White River subsystem. Patterson receives regional flow from Lake Valley; then, Patterson's recharge and the regional flow from Lake Valley enter Panaca Valley, which is part of the Meadow Valley flow system, a tributary to the White River flow system. A few minor local springs and seeps are located high in the mountain block.

Dry Lake Valley

Numerous small cold water or localized springs or seeps are located in the surrounding mountain blocks with a large concentration in the northern part of Dry Lake Valley.

Delamar Valley

A few small cold water or localized springs or seeps are located in the mountain blocks surrounding Delamar Valley.

Coyote Springs Valley

A few minor springs and seeps are located high in the western mountain block, the upper flanks of the Sheep Range. One spring, Coyote Spring, is in the valley. All these springs

are local springs dependent on local snowmelt, and the combined discharge is less than 5 gpm.

Hidden Valley

Very few minor springs or seeps are located in the mountain blocks surrounding Hidden Valley. These localized discharges depend totally on precipitation in the mountain block.

Garnet Valley

Very few minor springs or seeps are located in the mountain blocks surrounding Garnet Valley. These localized discharges depend totally on precipitation in the mountain block.

Railroad Valley North

A number of springs are located in Railroad Valley North, both local and regional with varying degrees of thermal water. The magnitude of the spring flow ranges from mere seeps to about 15 cfs. The distribution of springs is generally such that local gravitational springs are located on the east side of the valley and nongravitational, or thermal, springs are located on the west side of the valley.

The area north of State Route No. 6, which includes the Duckwater Springs, the largest in the valley, is north of the CWP area and is not discussed in this report.

West Side. As stated above, the majority of the thermal springs are located on the west side of the valley and the probable source of heat for these thermal springs is from the volcanics in the Pancake Range that bound the valley on the west side. The springs located on the west side of the valley are described below.

Lockes Springs. These springs, also known as Big Springs, are located on the very northwestern edge of the playa that occupies the central part of the valley. Big Springs is clearly a thermal springs because the temperature at several orifices ranges between 34 to 38°C. The source of water for this spring, and perhaps for all of the thermal springs on the west side of the valley, appears to be from Hot Creek and Little Smokey Valleys to the west.

The primary evidence for this is the ground-water chemistry which indicates a flow path through volcanic tuff and carbonate rocks, both of which have been mapped in the Pancake Range (Kleinhampl and Ziony 1985). These springs are home to a species of Pleistocene fish called the Railroad Valley springfish, and the area is part of the Railroad Valley USFWS Management Area.

Warm Springs/Chimney Hot Spring Area. This spring area is located about 6 miles south of Lockes Springs. Warm Spring is somewhat of a misnomer because the water temperature of the highest orifice is hot, about 70°C. The spring has built a large mound several feet above land surface of calcium carbonate through precipitation, hence the alternate name. The flow from the three orifices is about 50 acre-feet per year. The spring was established as a refuge for Railroad Valley springfish in 1978 (Minckley, 1991) as described in Section 3.5.3.

Storm, Coyote Hole, Abel Springs. These three small springs are located south of Warm Spring. Spring morphology is similar to Warm and Lockes Springs to the north. There are also reports of warm water toward the central part of the valley (Van Denburgh and Rush 1974), thus thermal waters are moving away from the fault zones and mixing with the local ground-water system.

Oil exploration wells in this vicinity (Garside et al. 1988) encountered volcanic rocks at slightly less than 1,000 feet below land surface. The transmissivity of the volcanics is not known; however, if the volcanics on the west side of the valley are less permeable than those on the east, they may restrict the vertical movement of water.

East Side. The east side of Railroad Valley North contains numerous springs. From a reconnaissance level, the springs on this side of the valley are classified as regional, and the water temperatures for the few that have been measured are in the 10 to 15°C range and are not thermal in origin.

Recharge is generated on the mountain block, and as it moves toward the valley, it is intercepted by a fault zone and moves to the surface. This is most apparent on the west side of the Grant Range (east side of the valley) for about a 20-mile stretch of range front. Some of these springs are located in close proximity to the mouth of reasonably large drainage

areas, which may be in part structural features. Much of the water that reaches these springs probably originates in the drainage area. Numerous springs also are located within the mountain block. These high springs, as well as those at the mountain front, are sensitive to below normal precipitation.

Railroad Valley South

There are no major springs in Railroad Valley South. A few localized springs or seeps are located in the mountain block.

Tikaboo Valleys North and South

There are no major springs or wetlands in Tikaboo Valleys North and South. A few localized springs or seeps are located in the mountain block.

Pahranagat Valley

The District is no longer pursuing water rights in Pahranagat Valley. However, a description of Pahranagat Valley is included because this valley is a major discharge point in the regional White River flow system.

There are three major regional springs in Pahranagat Valley. These are Hiko, Crystal, and Ash Springs, and corresponding temperatures and flow measurements are: Hiko Springs 26.5°C, about 3,000 gpm; Crystal Springs 27.0°C, about 5,200 gpm; and Ash Springs 35.8°C, about 8,000 gpm; all measured in December of 1991.

Cave Valley

Only small, highly localized springs and seeps are located in the mountain block in Cave Valley. Cave Valley Spring flows from a large cave in carbonate rock located near the north-central part of the valley. The flow is less than 10 gpm, and the temperature of the water is 11.5°C, indicating a localized source.

Pahroc Valley

Only minor, localized springs and seeps occur in this valley, mostly in the mountain block. Eakin (1963) estimates the total spring discharge to be a few tens or hundreds of acre-feet per year.

Coal Valley

There are very few springs in Coal Valley, and these consist of a few minor springs and seeps mainly in the southern mountain block. Discharge from these springs is variable, ranging from a few tens of gpm in the spring to seeps in the summer and fall. This is indicative of cold water springs that depend on snowmelt.

Garden Valley

Garden Valley has numerous high localized minor springs and seeps, mainly in the western mountain block.

Three Lakes South Valley

A number of small localized springs or seeps are located in the Spring and Sheep Mountain Ranges, high in the mountain block.

California Wash

A few minor springs or seeps are located in the mountain blocks surrounding California Wash. These are localized discharges depending totally on precipitation in the mountain block.

White River Valley

The District is no longer pursuing water rights in White River Valley. However, the major White River Valley springs are discussed because this valley is a major discharge point in the regional White River Valley flow system.

A number of regional and localized springs are located in White River Valley. A number of these springs have been measured, and water quality samples have been collected by the U.S. Geological Survey (USGS), and consultants as part of the MX Missile Program, and recently by the Desert Research Institute (DRI) in conjunction with the District.

The three largest regional springs in White River Valley are Hot Creek, Preston Big Spring, and Lund. Hot Creek's flow ranges from 9 to 16 cfs with a temperature around 27 °C, Preston Big Spring's flow ranges from 8 to 9 cfs with a temperature around 21 °C, and Lund's flows range from 5.5 to 12 cfs at a temperature about 18 °C. Total estimated spring flow and associated evapotranspiration in White River Valley is estimated at about 38,000 acre-feet per year.

Muddy Springs Valley

The District is not pursuing water rights in Muddy Springs Valley, however, it is mentioned here because the Muddy Springs is a major discharge point in the regional White River flow system.

The Muddy Springs consist of a number of spring orifices which, on an annual average, discharge a combined volume of about 37,000 acre-feet. The temperature at the orifice of the Big Muddy Spring is about 32°C.

3.2 VEGETATION

3.2.1 Method of Satellite Analysis

The spatial distribution of known vegetation types within the project area was determined through the computer-assisted classification of June 1990 LANDSAT Thematic Mapper (TM) data. The TM satellite is a multispectral scanning system that records electromagnetic energy reflected and/or emitted from the surface of the earth. The TM sensor records energy in seven distinct regions ("bands") of the electromagnetic spectrum, including portions of the visible, reflective-infrared, middle-infrared, and thermal-infrared (ERDAS 1992). The overall spatial coverage of a typical TM image is approximately 185 x 185 kilometers. The spatial resolution (pixel size) of the TM sensor in any given spectral band for a geocorrected scene is 25 x 25 meters, with the exception of the thermal-infrared band, which has a spatial resolution of 120 x 120 meters.

Detailed satellite classifications by vegetation in arid regions, such as southern Nevada, have been found to be somewhat limited due to the complexity, varying density, and heterogeneity of rangeland vegetation (McGraw and Tueller 1983; Tueller et al. 1991; Belward et al. 1989). Additionally, spectral identification of plant communities in such areas is hampered by the overall dominance of soil reflectance from an aerial (satellite) vantage point. This dominance is principally considered to be a function of the low and sparse canopy cover common to vegetation habitats in arid regions (Wilson and Tueller 1987). Evaluation of vegetation classes may not always be entirely accurate due to the spectral similarities between some vegetation and soil types. These deviations could be eliminated with extensive field surveys; however, at the present time such surveys are beyond the scope of this report.

Wetland areas associated with springs, riparian areas, and irrigated areas are easily defined by the TM LANDSAT imagery. The ERDAS image-processing software was used to classify the TM data. To best delineate springs, wetlands, and agricultural areas, the "sequential clustering" method of image processing was used. This method examines pixels one at a time. The spectral distances between each analyzed pixel and the means of previously defined clusters are calculated. Each pixel either contributes to an existing cluster, or begins a new cluster, based on the spectral distances. Clusters are merged if too many are formed. For valleys with no wetland or agricultural areas, both sequential clustering and statistical

clustering methods were run, then the biologist determined what method best represented the valley's vegetation based on existing literature and field reconnaissance.

Vegetation habitats within the project area were initially determined through an extensive review of known literature sources and vegetation maps. The review was supplemented with helicopter and ground-based field reconnaissance. Based upon this review and reconnaissance, an overall vegetation classification representative of the area was established. Ten vegetation zones were represented in the project area:

- Creosote Bush Scrub Zone
- Blackbrush Scrub Zone
- Saltbush Zone
- Greasewood Zone
- Winterfat Zone
- Sagebrush Zone
- Pinyon-Juniper Zone
- Montane Zone
- Irrigated Agriculture and Wetland Zone
- Playa

Field reconnaissance indicated that the areas of greasewood were underestimated in Spring and Snake Valleys with the use of the vegetation classification. Based on USGS mapping, areas of greasewood were digitized onto the images to more accurately represent actual greasewood acreage in these valleys.

3.2.2 Major Vegetation Zones

The CWP area is located within portions of the Mojave Desert and the Great Basin region. The diverse topography and climate of these two physiographic areas support a number of distinct plant communities. Vegetation is generally arranged into floristic divisions, or vegetation types that are associated with specific topography, soils, and/or other environmental conditions. Vegetation classification for this report was developed through the modification and combination of several generally accepted vegetation subdivision systems, including those by Billings (1951), Cronquist et al. (1972), Brown (1982), and Holland (1986).

Mojave Desert vegetation in southern Nevada consists of creosote bush scrub and blackbrush scrub zones, and the latter may dominate in either Mojave or Great Basin desert scrub biomes. The Great Basin region lies within the Great Basin Floristic Province, as outlined by Cronquist et al. (1972) and others, and consists of a number of vegetation associations which delineate environmental conditions such as changes in elevation, soil salinity, ambient temperature, and water availability.

Ten major vegetation zones were identified that could be mapped using satellite imagery and computer technology. Each zone contained recognizable community features and was grouped according to the predominant plant species present. Distinct boundaries of vegetation zones and subtle changes of species composition within the zones could not be accurately mapped with a high degree of confidence. Mapping smaller variations of vegetation composition would require extensive field surveys beyond the scope of this report.

Creosote Bush Scrub Zone

Creosote bush scrub is the most abundant vegetation type of the lower elevations of the Mojave Desert, and is co-dominated by creosote bush (*Larrea tridentata*) and bursage (*Ambrosia dumosa*). This vegetation type is generally found on alluvial fans and flats below 4,000 feet; however, creosote bush may be found up to 5,200 feet in some areas of southern Nevada (Beatley 1974). This two-species dominance of the lower elevations changes at higher elevations where bursage often predominates and creosote bush becomes sparse or disappears completely.

Characteristic shrub species in this association include Nevada ephedra (*Ephedra nevadensis*), ratany (*Krameria parvifolia*), brittle-bush (*Encelia farinosa*), indigo bush (*Psorothamnus fremontii*), Anderson desert thorn (*Lycium andersonii*), and several salt bush species (*Atriplex* sp.). Major washes and arroyos often support extensive stands of catclaw (*Acacia greggii*), cheesebush (*Hymenoclea salsola*), and desert willow (*Chilopsis linearis*). A diverse assemblage of cacti are found throughout this zone; most commonly, cholla (*Opuntia acanthocarpa*), beavertail cactus (*Opuntia basilaris*), hedgehog cactus (*Echinocereus engelmanii*), cottontop cactus (*Echinocactus polycephalus*), and barrel cactus (*Ferocactus acanthodes*).

Mojave yucca (*Yucca schidigera*) and Joshua tree (*Yucca brevifolia*) may occur at higher elevations on bajadas and steeper slopes. Joshua tree intergrades at its lower elevation limits with creosote bush scrub, and with blackbrush scrub above 4,500 feet. Joshua trees often form distinct communities with an understory of shrubs such as Anderson desert thorn, Nevada ephedra, and hopsage (*Grayia spinosa*).

Blackbrush Scrub Zone

The blackbrush scrub is common and widespread at higher elevations (4,500-5,000 feet) on non-saline soils of the Mojave Desert and southern Great Basin. In southern Nevada this zone is situated at elevations between that of creosote bush scrub and pinyon-juniper. Some authorities have noted that blackbrush comprises a broad belt between the Great Basin and Mojave Deserts (Mozingo, 1987).

Blackbrush scrub may be entirely dominated by blackbrush (*Coleogyne ramosissima*) forming an extensive low and monotypic vegetation type, or more often in a mixture of species with distinct subgroups such as hopsage, Nevada ephedra, and budsage (*Artemisia spinescens*). Other common species associated with blackbrush scrub include Joshua tree, bladder sage (*Salazaria mexicana*), turpentine-broom (*Thamnosma montana*), big sagebrush (*Artemisia tridentata*), shadscale (*Atriplex confertifolia*), common snakeweed (*Gutierrezia sarothrae*), and blue yucca (*Yucca baccata*).

Saltbush Zone

The saltbush zone, referred to as the shadscale zone by many authors, is a widespread and abundant shrub community common throughout central Nevada (Billings 1951; Cronquist et al. 1972). The saltbush zone occurs on dry, somewhat saline valley soils, but also on bajadas and foothills. Saltbush vegetation is characterized by an assemblage of widely spaced, small-leaved shrubs. This zone is dominated by shadscale which often occurs in either pure stands or in association with a number of species listed below. Four-wing saltbush (*Atriplex canescens*) is another dominant species, although it rarely appears to completely dominate any vegetation type. Other associated species include budsage, hopsage, common snakeweed, winterfat (*Ceratoides lanata*), sticky leaf rabbitbrush (*Chrysothamnus viscidiflorus*), and greasewood (*Sarcobatus vermiculatus*).

Greasewood Zone

The greasewood zone is the most extensive salt-tolerant community in the Great Basin region. The greasewood zone, commonly described as a subzone of the saltbush community, was separated in this report due to its relationship to the water table. The greasewood community is adapted to high water tables and usually occurs on the valley floors in saline clay soils. Greasewood is the principal phreatophyte in this zone, and is considered a reliable indicator of ground water (Cronquist et al. 1972; Kartesz 1987). Taproots of greasewood may penetrate as far as 57 feet below the surface (Mozingo 1987). The greasewood zone is often limited in species composition, with greasewood growing in pure stands, or in association with budsage, shadscale, red sage (*Kochia americana*), and other members of the saltbush community. A subspecies of big sagebrush (*Artemisia tridentata* ssp. *tridentata*) was observed in a dune area in the southern portion of the Spring Valley greasewood zone. Vast areas of greasewood occur in Railroad Valley, Spring Valley, and Snake Valley, and smaller areas in Cave and Penoyer Valleys.

Greasewood, considered a single species by some botanists (Kartesz 1987), was formerly subdivided into greasewood and the smaller Bailey's greasewood (*Sarcobatus baileyi*). Generally the smaller form occurs in the saltbush zone, whereas *Sarcobatus vermiculatus* predominates in areas closer to the water table.

Where salt concentrations become too high for greasewood, a number of halophytic species, such as desert saltgrass (*Distichlis spicata*) and iodine bush (*Allenrolfea occidentalis*) often form the inner fringes of vegetation around playas or near springs. Alkaline meadows of desert saltgrass, alkali sacatan (*Sponobolus ainoides*) and other species are common in the greasewood zone in Spring Valley and Railroad Valley.

Winterfat Zone

The winterfat zone occurs on saline or alkaline soils on dry plains and mountainsides or foothills and is generally considered a subzone of the shadscale community (Cronquist et al. 1972). Winterfat often exists as pure stands over large areas in Nevada, forming a distinct vegetation community with its whitish-gray herbage, but is more commonly found as a mixed

community in dry valleys and on mountainsides. Herbivores consider this a very palatable plant, and it provides excellent forage during the winter.

Winterfat grows in a wide elevational range in association with creosote, sagebrush, blackbrush, and even above 9,000 feet. The winterfat zones of the Dry Lake, Delamar, Spring, Garden, and Pahroc Valleys consist mostly of a mixed community of winterfat with budsage, common snakeweed, shadscale, and sagebrush species.

Sagebrush Zone

The sagebrush zone replaces the saltbush, greasewood, and winterfat zones at higher elevations. The sagebrush zone occurs above 5,000 feet and extends to nearly 10,000 feet in isolated areas. In the northern part of Nevada, this zone occupies broad valleys and lower foothills, in southern regions the sagebrush zone occupies narrow latitudinal belts (Cronquist et al. 1972). This zone receives, in general, greater annual precipitation than the lower zones. Salt-free soils provide compatible substrate for sagebrush which is intolerant of high soil salinity (Wallace et al. 1973).

Typical sagebrush community ranges from fairly dense to open vegetation. It is dominated by big sagebrush. Other important shrubs of this community include little sagebrush (*Artemisia arbuscula*), black sagebrush (*Artemisia nova*), rubber rabbitbrush (*Chrysothamnus nauseosus*), sticky leaf rabbitbrush, bitterbrush (*Purshia tridentata*), little-leaf horsebrush (*Tetradymia glabrata*), snowberry (*Symphoricarpos* sp.), and hopsage.

Pinyon-Juniper Zone

The pinyon-juniper zone is widespread within the project area in mountainous terrain and on plateaus between 5,000 and 8,000 feet, with the lower limits determined by the scarce amount of moisture. Single-leaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) are restricted to slopes that receive more than 12 inches of rainfall annually. The pinyon-juniper zone changes composition both elevationally and geographically. Juniper is generally found in pure stands at lower elevations and often extends into the sagebrush zone where it cannot be clearly categorized. Pinyon enters the association at somewhat higher

elevations, often forming a uniformly mixed community. At higher altitudes, pinyon replaces juniper entirely (Cronquist et al. 1972; Tueller et al. 1979).

Pinyon-juniper is a woodland community with trees rarely exceeding 30 feet in height. The moderate to dense understory of small- to medium-sized shrubs consists predominantly of sagebrush. Other less common species include sticky leaf rabbitbrush, rubber rabbitbrush, mountain maple (*Acer glabrum*), serviceberry (*Amelanchier utahensis*), mountain mahogany (*Cercocarpus ledifolius*), cliffrose (*Cowania mexicana*), common snakeweed, Gambel oak (*Quercus gambellii*), and squaw currant (*Ribes cereum*).

The Ely Shoshone Tribe requested that the economic and cultural values of the pinyon-juniper zone be addressed. Cultural values are discussed in Section 3.6 and some aspects of economic benefits are addressed below.

Pinyon pines produce edible nuts. Traditionally, these nuts provided a staple food of American Indians. Pine nuts have outstanding dietary value. The singleleaf pinyon nut is high in carbohydrates, and although low in protein, these nuts contain all of the 20 amino acids (Lanner 1981). Maturation process of nuts occurs over approximately 26 months, from the time of bud formation to cone growth, and seed maturation. Approximately every 3 to 7 years pine trees produce a bumper crop of seeds, with lean years between. The cyclic nature of pine nut production is not well understood, but may be affected by climate or plant nutrition (Lanner 1981).

In the western United States, pinyon trees are commercially important as nut-bearing pines. Each year 1 to 2 million pounds of nuts are harvested by commercial operators; in some years the harvest exceeds 8 million pounds (Evans 1988). The nut harvest tends to be localized and sporadic. Harvesting of singleleaf pinyon nuts in southern and central Nevada appears to be confined to a few commercial contracts. In 1992, one permit was issued by the Nevada Department of Forestry (NDF) for 6,000 pounds of nuts (Jones 1992). BLM, Las Vegas District, issued four permits for less than 6,000 pounds total (Pierce 1992). The amount of pine nuts gathered commercially in the BLM Ely District is generally higher. In 1992, three permits were issued for approximately 45,000 pounds, but commercial permits generally vary from zero to 100,000 pounds depending on the nut crop (Rey 1992). It is difficult to estimate the actual harvest, since there is no permit requirement for Native Americans who gather nuts

for their own needs. In addition, permits are not required for any individual harvesting less than 25 pounds of pine nuts.

The abundance and quality of pinyon and juniper wood is not sufficient to support or economically justify large-scale timber operations. However, some wood is used for fence posts and firewood. Approximately 8,000 permits are annually issued (5,000 permits by BLM and 3,000 permits by the NDF) for the harvesting of pinyon and juniper for use as Christmas trees.

Montane Zone

For the purpose of this project, the montane zone was defined as those vegetation communities above the pinyon-juniper zone, which may include mountain brush, mixed conifers, and alpine tundra vegetation. The montane zone includes those communities located on the higher mountain ranges of the project area. These areas receive more precipitation than the lowlands, and support the development of forests and other vegetation communities. For the purpose of this project, the various assemblages are treated as a single zone. The composition and arrangement of these vegetation zones is briefly discussed below.

At elevations slightly higher than the pinyon-juniper zone, the vegetation is characterized as mountain brush. Dominant species include mountain mahogany, snowberry, bitterbrush, Mohave antelope brush (*Purshia glandulosa*), cliffrose, serviceberry, and Gambel oak.

Floristic composition of the mixed conifer forest varies with latitude and longitude within the project area. Lower elevations of mountain ranges in the eastern Great Basin show characteristic Great Basin vegetation, with a modified Rocky Mountain zonation (Billings 1990) found at higher elevations . Conifers in the Snake Range, Shell Creek Range and Egan Range include Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), limber pine (*Pinus flexilis*), and bristlecone pine (*Pinus longaeva*). In the Snake Range, mixed conifer forests occur from 7,500 to 11,300 feet on sites ranging from dry, rocky, southwest facing slopes to sheltered or exposed ridges and north-facing shaded slopes (Great Basin National Park 1991).

Conifer forests have a limited distribution in southern Nevada. Ponderosa pine (*Pinus ponderosa*), limber pine, and bristlecone pine are present in the Spring Mountains (Clokey 1951).

Alpine tundra is restricted to higher mountain ranges with elevations above 11,000 feet, such as the Snake Range and Schell Creek Range. In Nevada, alpine zones are considered those areas above the highest areas dominated by shrubby sagebrush species (Bell and Johnson 1980). The alpine tundra consists of low perennial herbs, grasses, and sedges. Characteristic alpine species include mountain sorrel (*Oxyria digyna*), tufted hairgrass (*Deschampsia cespitosa*), alpine timothy (*Phleum alpinium*), and various species of sedges (*Carex* spp.).

Irrigated Agriculture and Wetland Zones

Agricultural lands that have recently been irrigated are readily classified using LANDSAT TM data as described in Section 3.2.1. However, an attempt to account for lands that had, at anytime, been irrigated was made; therefore, Table 3-1 is conservative (estimating more) regarding agricultural and wetland land. In Nevada, agricultural lands are often located near springs and associated wetlands where water is diverted to raise grasses and other crops used to sustain livestock.

Wetland areas are periodically, seasonally, or permanently submerged by surface or ground-water and support a number of hydrophytic plant species and life forms that differ from the adjacent biota. Such conditions potentially occur in places where the water table is high, springs and their outflow areas, the margins of streams and rivers, and in floodplains.

Wetlands vegetation, especially in areas of desert springs and marshes, consists of several subgroups of plant communities. Aquatic or submergent species occur where there is seasonal or permanent water, such as small- to medium-sized ponds. Vegetation was not sampled during field efforts, but submergents may include pondweed (*Potamogeton* sp.) and horned pondweed (*Zannichellia palustris*). Emergent vegetation of pond margins and slow moving streams within the project area include bulrush (*Scirpus* sp.), cattail (*Typha* sp.), spikerush (*Eleocharis palustris*), rushes (*Juncus* sp.), and sedges. Wet salt meadow vegetation occurs in areas of high ground-water levels or where fresh water reaches the soil surface from

underground reservoirs. This plant community is dominated by desert saltgrass, which often forms dense mats near springs. Other common species in this community include pickleweed (*Salicornia* sp.), Torrey seablite (*Suaeda moquinii*), alkali sacaton, and sedges. Non-hydrophytic species such as greasewood and rubber rabbitbrush are predominant in areas where the water table is close to the surface.

Riparian vegetation is found along banks of perennial and some intermittent streams throughout the project area. Riparian vegetation is dominated by medium-sized trees which include cottonwood (*Populus fremontii*), several species of willow (*Salix* sp.), birch (*Betula papyrifera*), and aspen (*Populus tremuloides*). Understory vegetation may include wild rose (*Rosa woodsii*), chokecherry (*Prunus virginiana*), grasses, and sedges. Frequently, disturbance of riparian areas by livestock is evident, with grazed and trampled vegetation and pollution of stream areas (BLM 1982; Taylor et al. 1989).

Wetlands, riparian, and irrigated agricultural zones are found scattered throughout the project area, most commonly in lower elevations of the valleys. Extensive areas are found in Spring Valley, Snake Valley, Railroad Valley, and Pahranagat Valley. Wetland and irrigated agricultural zones are also found in Penoyer Valley, Cave Valley, Lake Valley, Patterson Valley, and California Wash.

Playa

Playas are generally classified as areas on valley floors lacking vegetation. However, playas that periodically fill and then dry often support communities of annual species that flourish for short periods following draw down. Older playas may not be totally barren, but may support low forms of greasewood, as observed in Southern Railroad Valley, or components of the saltbush community.

3.2.3 Sensitive Vegetation Communities

Sensitive vegetation communities generally do not include endangered or threatened vegetation types, nor are they common or widespread enough to be included in the general vegetation description. These sensitive communities include: unique features such as an unusual range extension where a species occurs as a disjunct population or is found beyond

its known limits; areas where a relict population of species has remained unaltered over long periods of time; and unique ecotypes which contain species that normally occur in different habitats. Wetlands are also considered sensitive communities. In this report, discussion is limited to sensitive vegetation of lower elevations.

A unique ecotype of juniper (*Juniperus scopulorum*) known as "swamp cedar" (Billings 1954) occurs in Spring Valley. This species forms a woodland in the moist, saline valley floor, as much as 600 feet below the lower limit of the more xerophytic Utah juniper. This population is thought to be a unique living vestige of the early Holocene woodland (Wells 1983) and exists because of special microclimatic conditions.

A population of pygmy sage (*Artemisia pygmaea*), a rare woody herb, is located in the Shoshone Pygmy Sage Natural Area (Bostick and Niles 1975) within Spring Valley. This species occurs on about one acre in an opening of the dense sagebrush community.

3.2.4 Vegetation Zones within Specific Valleys

Table 3-1 provides the number of acres of each vegetation zone present in each hydrologic basin as mapped from the satellite imagery for purposes of this report.

Spring Valley

Vegetation zones within Spring Valley are shown on Figure 3-10 and major vegetation communities within the valley, in order of decreasing acreage, include sagebrush (385,400 acres), pinyon-juniper (203,200 acres), saltbush (180,100 acres), and greasewood (159,300 acres) (Table 3-1). Over 94 percent of the valley is occupied by these four vegetation zones. Areas mapped as saltbush in Spring Valley are mainly shadscale and areas mapped as greasewood are variable in density and composition, containing a large amount of saltgrass and other grasses in some areas, and big sagebrush and rabbitbrush. A large playa, Yelland Lake, exists in the northern part of the valley. Approximately 13,700 acres of agriculture (irrigated and fallow) and wetland areas are also located in the valley.

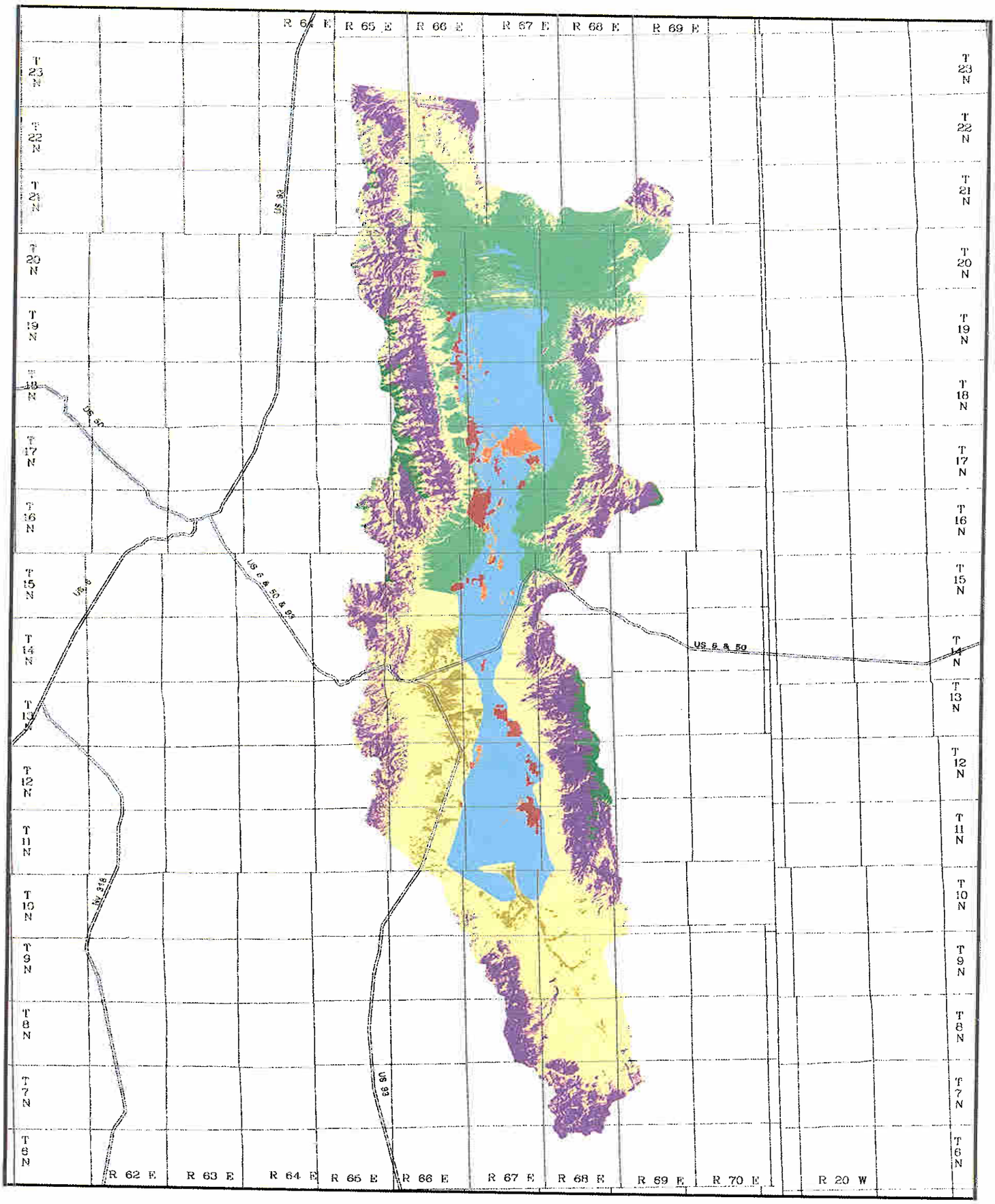


Figure 3-10. – Vegetation classification in Spring Valley

WB184

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon juniper
- Montane
- Roads

N

0 9

One inch 9 miles.

TABLE 3-1
ACREAGE OF VEGETATION ZONES IN BASINS WITHIN THE CWP AREA

Valley/Vegetation Zone	Acreage	Percent
Spring Valley*		
Playa	9,500	1.0
Agriculture and Wetlands	13,700	1.4
Winterfat	17,900	1.8
Greasewood	159,300	16.2
Saltbush	180,100	18.3
Sagebrush	385,400	39.1
Pinyon-Juniper	203,200	20.6
Montane	16,200	1.6
TOTAL	985,300*	100.0
Snake Valley*		
Open Water	2,000	0.1
Playa	20,900	1.4
Agriculture and Wetlands	25,500	1.7
Greasewood	177,200	11.5
Saltbush	681,100	44.1
Sagebrush	399,400	25.9
Pinyon-Juniper	210,100	13.6
Montane	26,800	1.7
TOTAL	1,543,000*	100.0
Hamlin Valley		
Winterfat	32,100	6.4
Sagebrush	300,200	60.0
Pinyon-Juniper	167,800	33.6
TOTAL	500,100	100.0
Lake Valley		
Agriculture and Wetlands	3,700	1.0
Sagebrush	186,700	52.6
Pinyon-Juniper	160,600	45.2
Montane	4,300	1.2
TOTAL	355,300	100.0
Patterson Valley		
Agriculture and Wetlands	100	0.1
Sagebrush	167,600	62.5
Pinyon-Juniper	88,300	33.0
Montane	11,900	4.4
TOTAL	267,900	100.0
Dry Lake Valley		
Playa	16,400	2.8
Winterfat	182,700	31.8
Sagebrush	287,900	50.1
Pinyon-Juniper	88,200	15.3
TOTAL	575,200	100.0

TABLE 3-1
(Continued)

Valley/Vegetation Zone	Acreage	Percent
Delamar Valley		
Playa	5,300	2.3
Winterfat	33,900	14.6
Blackbrush	184,800	79.7
Pinyon-Juniper	8,000	3.4
TOTAL	232,000	100.0
Coyote Springs Valley		
Blackbrush	144,200	36.8
Creosote Bush Scrub	224,900	57.3
Pinyon-Juniper	23,200	5.9
TOTAL	392,300	100.0
Hidden Valley		
Winterfat	2,000	3.8
Blackbrush	7,800	14.8
Creosote Bush Scrub	42,900	81.4
TOTAL	52,700	100.0
Garnet Valley		
Playa	3,300	3.2
Creosote Bush Scrub	99,100	96.8
TOTAL	102,400	100.0
Railroad Valley North		
Open Water	50	<0.1
Playa	38,800	2.8
Agriculture and Wetlands	14,100	1.0
Greasewood	187,000	13.6
Saltbush	807,050	58.8
Pinyon-Juniper	320,000	23.4
Montane	5,000	0.4
TOTAL	1,372,000	100.0
Railroad Valley South		
Playa	5,500	1.4
Saltbush	235,700	62.3
Sagebrush	88,500	23.3
Pinyon-Juniper	49,400	13.0
TOTAL	379,100	100.0
Penoyer Valley		
Playa	3,300	0.7
Agriculture and Wetlands	700	0.2
Greasewood	6,600	1.5
Saltbush	302,400	67.5
Sagebrush	90,100	20.1
Pinyon-Juniper	44,700	10.0
TOTAL	447,800	100.0

TABLE 3-1
(Continued)

Valley/Vegetation Zone	Acreage	Percent
Tikaboo Valley		
Playa	26,800	4.2
Blackbrush	249,000	39.4
Creosote Bush Scrub	126,500	19.9
Saltbush	204,300	32.2
Pinyon-Juniper	27,700	4.3
TOTAL	634,300	100.0
Pahranagat Valley		
Open Water	900	0.1
Agriculture and Wetlands	5,500	1.1
Blackbrush	231,300	46.5
Creosote Bush Scrub	86,100	17.3
Saltbush	126,500	25.4
Pinyon-Juniper	47,700	9.6
TOTAL	498,000	100.0
Cave Valley		
Winterfat	2,000	1.0
Agriculture and Wetlands	1,100	0.5
Greasewood	7,300	3.1
Sagebrush	117,400	51.0
Pinyon-Juniper	97,400	42.2
Montane	5,100	2.2
TOTAL	230,300	100.0
Pahroc Valley		
Winterfat	4,300	1.3
Sagebrush	273,700	84.0
Pinyon-Juniper	48,000	14.7
TOTAL	326,000	100.0
Coal Valley		
Saltbush	81,000	27.8
Sagebrush	164,300	56.6
Pinyon-Juniper	45,200	15.6
TOTAL	290,500	100.0
Garden Valley		
Winterfat	15,400	4.8
Sagebrush	197,500	62.0
Pinyon-Juniper	95,600	30.0
Montane	10,100	3.2
TOTAL	318,600	100.0

TABLE 3-1
(Continued)

Valley/Vegetation Zone	Acreage	Percent
Three Lakes South Valley		
Blackbrush	33,000	16.4
Creosote Bush Scrub	131,800	65.7
Saltbush	18,700	9.3
Pinyon-Juniper	17,200	8.6
TOTAL	200,700	100.0
California Wash Valley		
Open Water	55	0.1
Agriculture and Wetlands	1,100	0.5
Creosote Bush Scrub	204,800	99.4
TOTAL	205,955	100.0

* Northernmost extent of basin not included in total acreage (see Figures 3-10 and 3-11).

Snake Valley

Saltbush, sagebrush, pinyon-juniper, and greasewood are the most abundant vegetation communities in Snake Valley (Figure 3-11) and include 681,100, 399,400, 210,100, and 177,200 acres, respectively. Together these four vegetation communities comprise over 95 percent of the valley's vegetation. As shown on Table 3-1, 25,500 acres of agriculture and wetland areas are also located in Snake Valley.

Hamlin Valley

Major vegetation zones within Hamlin Valley include sagebrush (300,200 acres), pinyon-juniper (167,800 acres), and winterfat (32,100 acres) (Figure 3-12). All of the valley is represented by these three vegetation communities (Table 3-1). No areas of sensitive vegetation were identified in Hamlin Valley.

Lake Valley

As shown on Figure 3-13, major vegetation zones in Lake Valley are limited to sagebrush and pinyon-juniper and together they occupy almost 98 percent of the valley (Table 3-1). Small areas of montane (4,300 acres) and agriculture and wetlands (3,700 acres) are also located in Lake Valley.

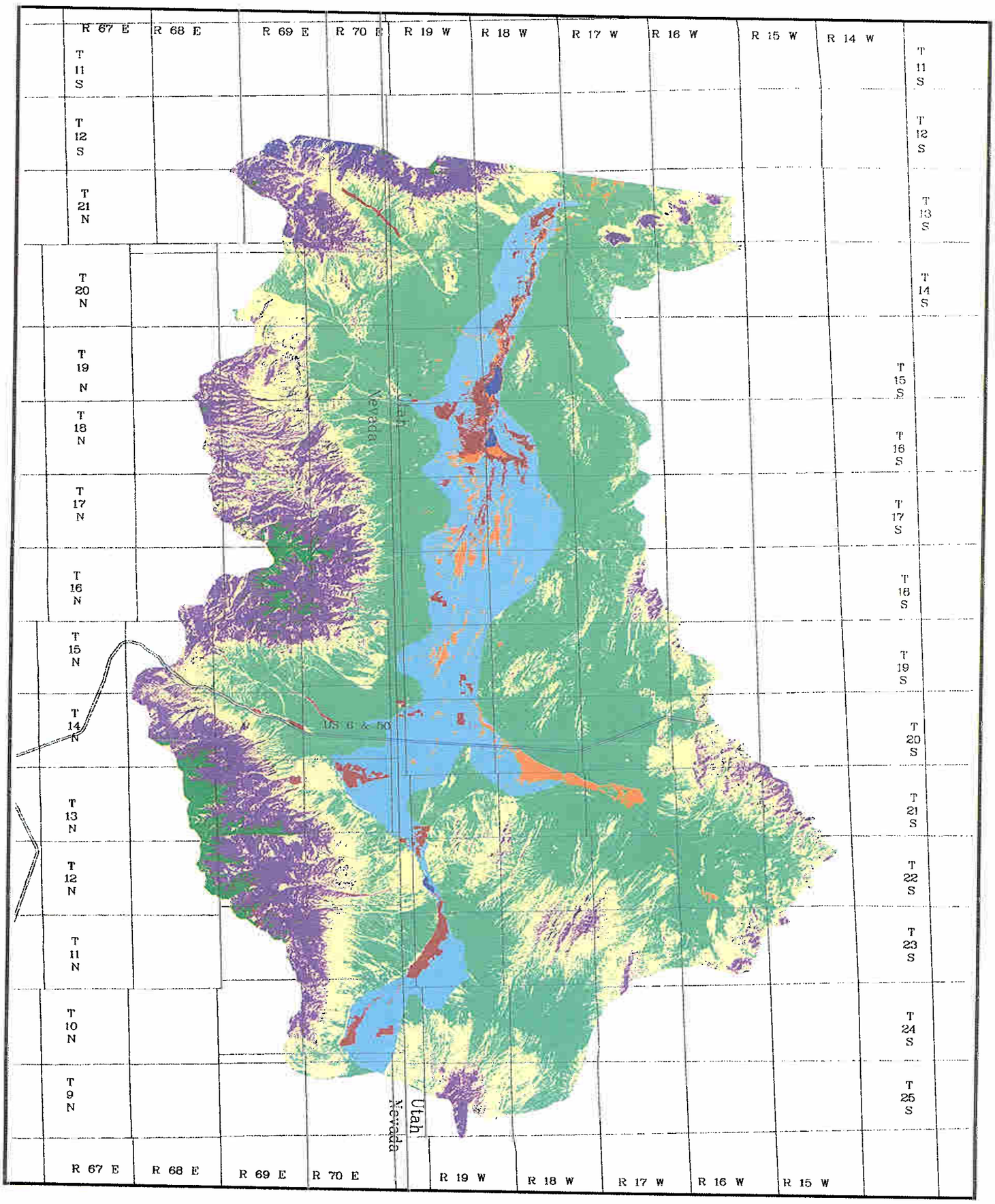


Figure 3-11. – Vegetation classification in Snake Valley

WB195

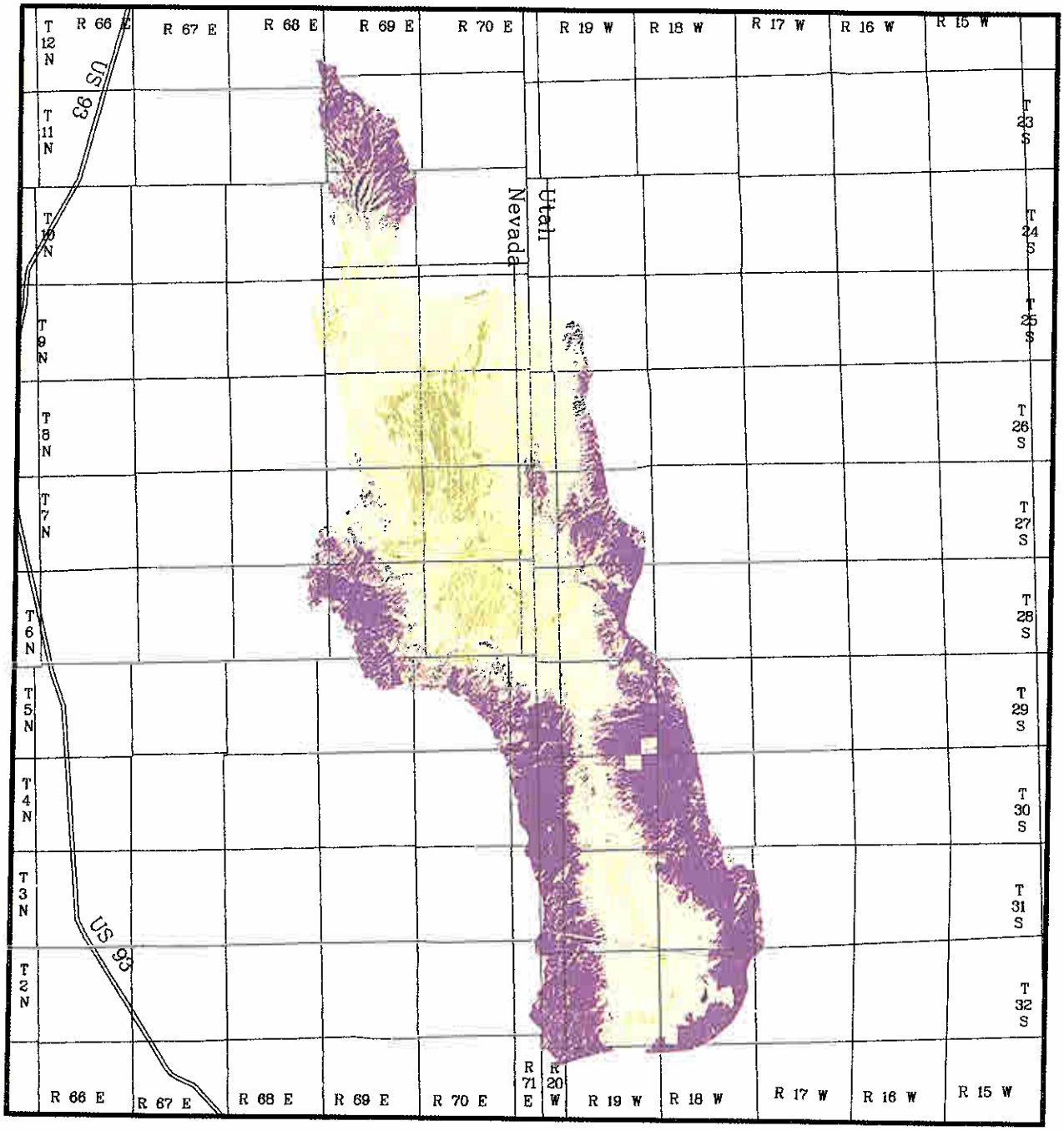


Figure 3-12. - Vegetation classification in Hamlin Valley

WB196

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

-N-

0 11

One inch = 11 miles.

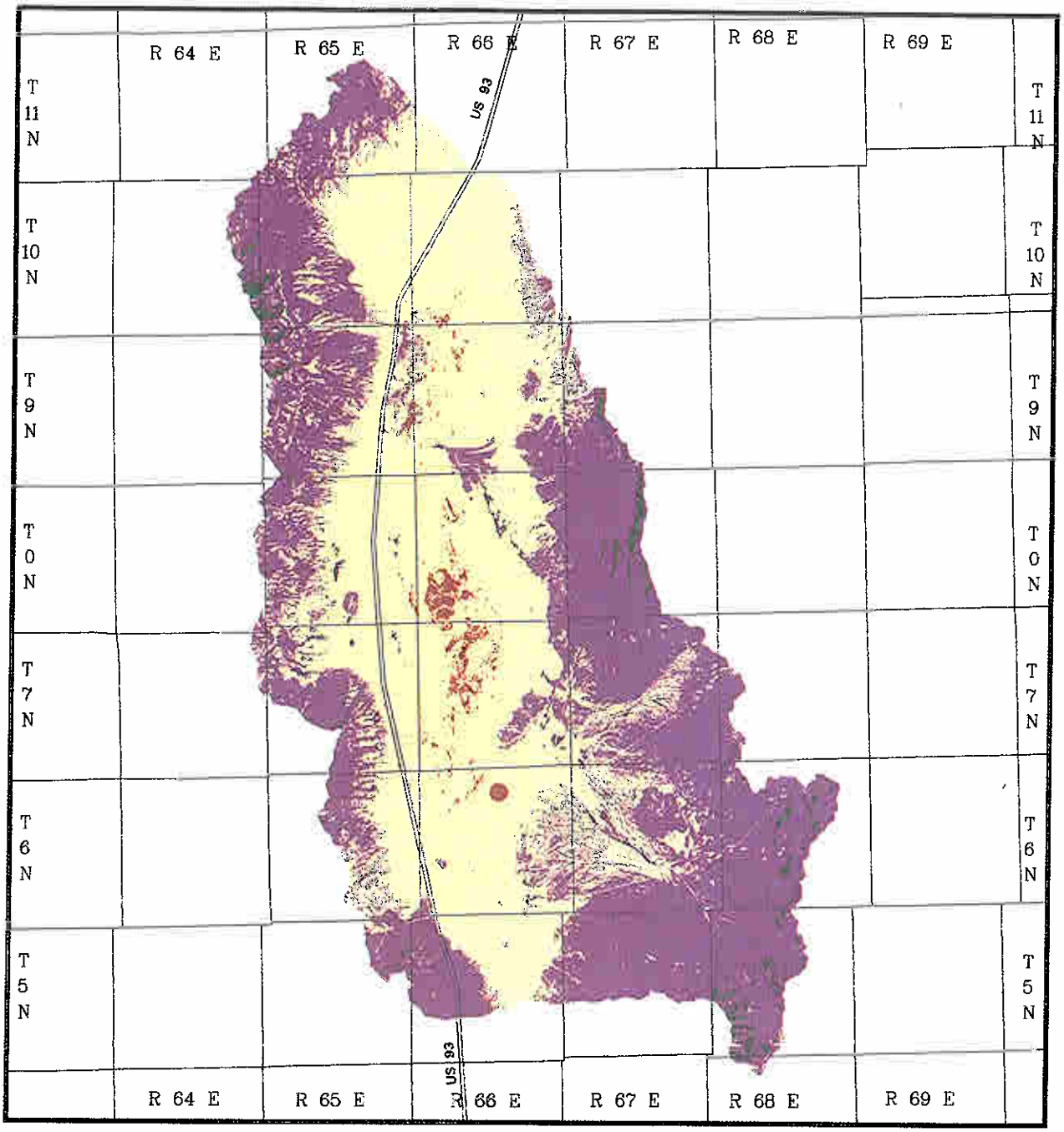


Figure 3-13. – Vegetation classification in Lake Valley

WB183

Patterson Valley

Similar to Lake Valley, major vegetation zones in Patterson Valley are sagebrush and pinyon-juniper (Figure 3-14) and together represent over 95 percent of the valley's vegetation. Patterson Valley contains approximately 100 acres of agriculture and wetlands (Table 3-1) and no other sensitive vegetation has been identified in the valley.

Dry Lake Valley

Sagebrush, winterfat, and pinyon-juniper are the major vegetation zones within Dry Lake Valley (Figure 3-15) and together occupy over 97 percent of the valley (Table 3-1). A large playa exists in the southern part of the valley, hence the name "Dry Lake". No areas of sensitive vegetation were identified in the valley.

Delamar Valley

Blackbrush and winterfat are the two most abundant vegetation communities in Delamar Valley (Figure 3-16) comprising over 94 percent of the vegetation within the valley. Areas mapped in the blackbrush zone in Delamar Valley include a wide variety of shrubs including blackbrush, ephedra, sagebrush, rabbitbrush, and spiny hopsage with local dominance variable. A large playa exists in the southern part of the valley. No agriculture or wetland areas were identified in the valley (Table 3-1). Joshua trees (sensitive vegetation) are present in Delamar Valley.

Coyote Springs Valley

As shown on Figure 3-17, major vegetation communities in Coyote Springs Valley include creosote bush scrub and blackbrush. Together these two communities represent 94 percent of the valley's vegetation (Table 3-1). No agriculture, wetland, or sensitive vegetation features were identified in Coyote Springs Valley.

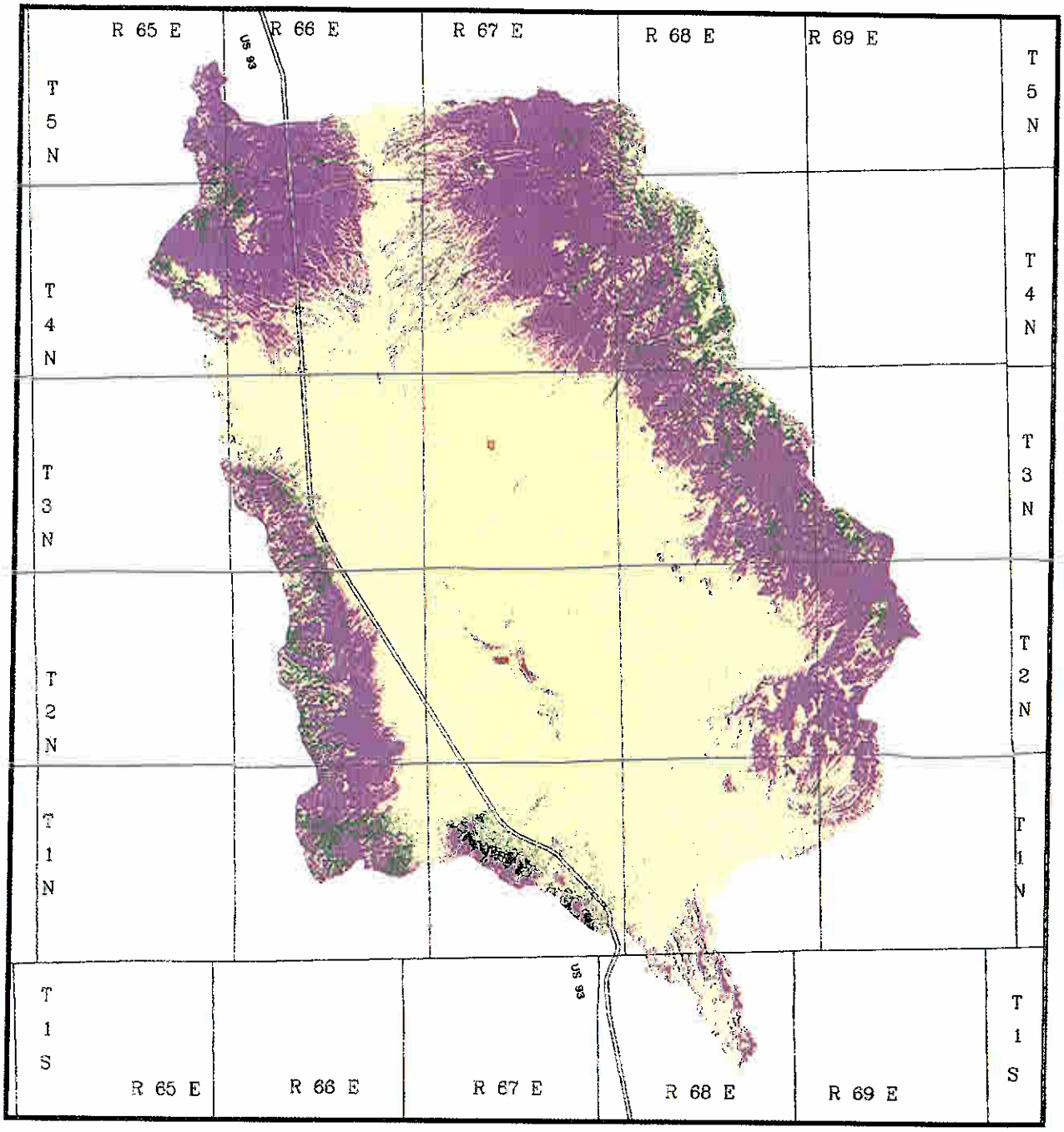


Figure 3-14. - Vegetation classification in Patterson Valley

WB202

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 5

One inch = 5 miles.

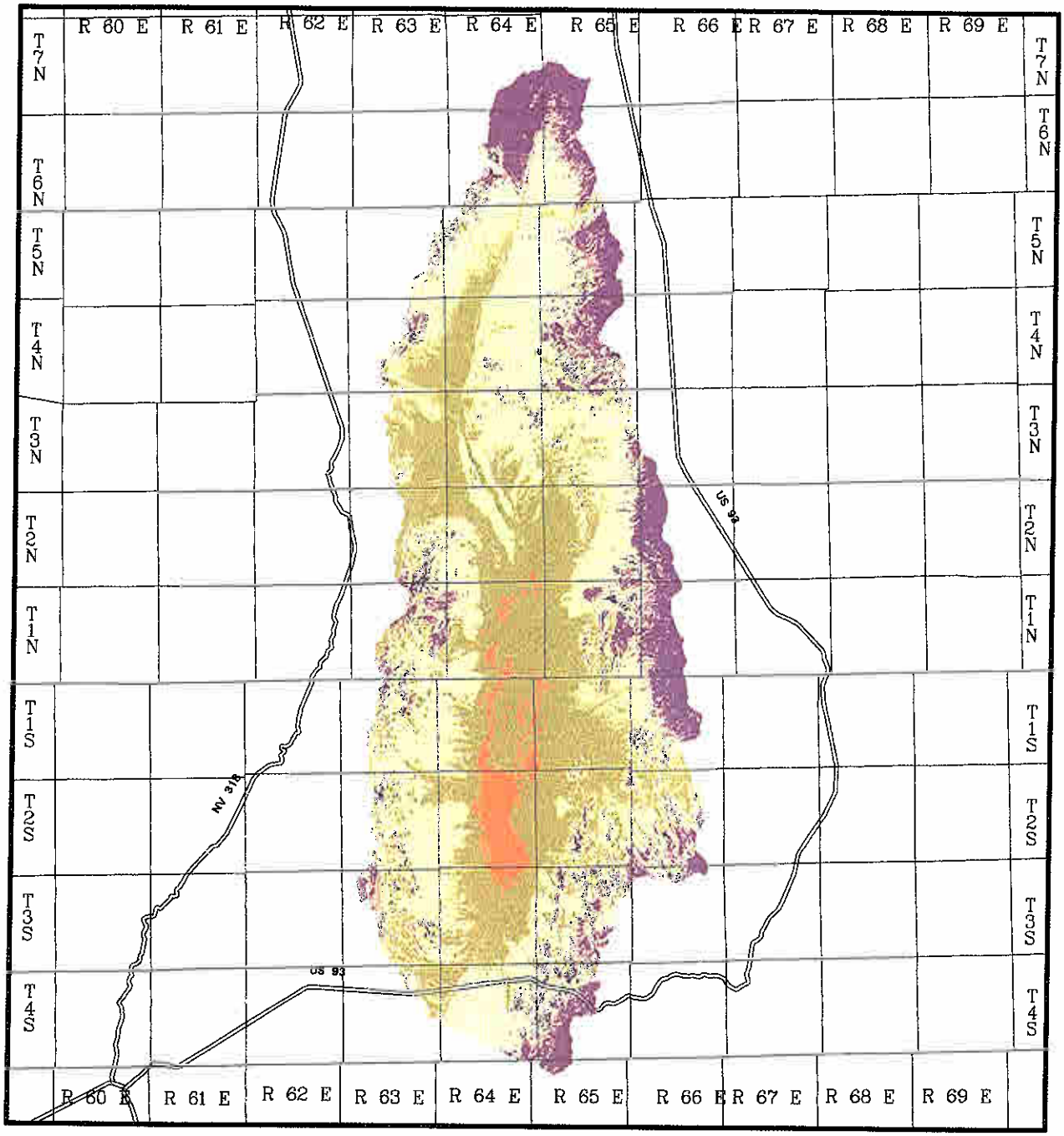


Figure 3-15. – Vegetation classification in Dry Lake Valley

WB181

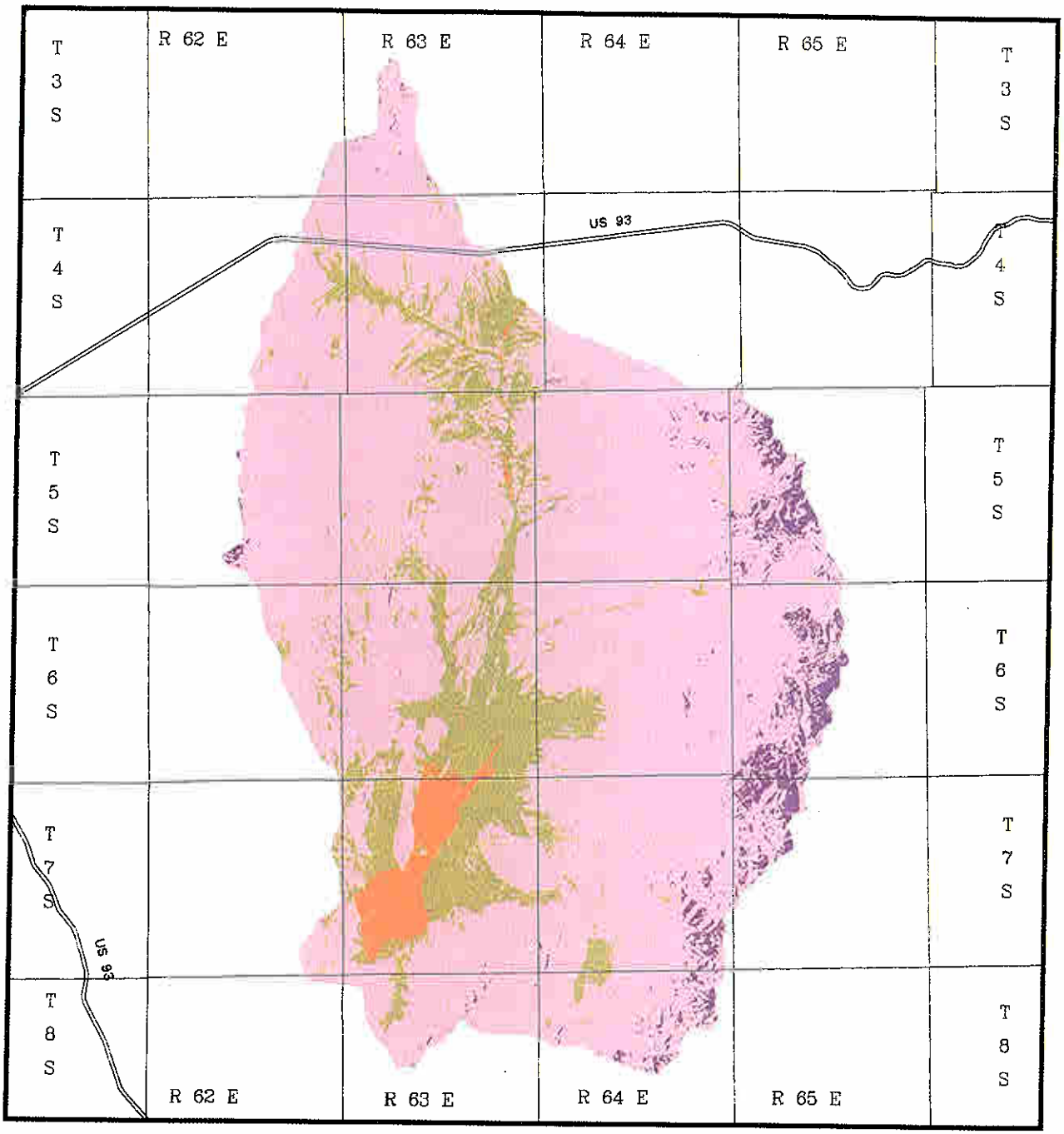


Figure 3-16. - Vegetation classification in Delamar Valley

WB182

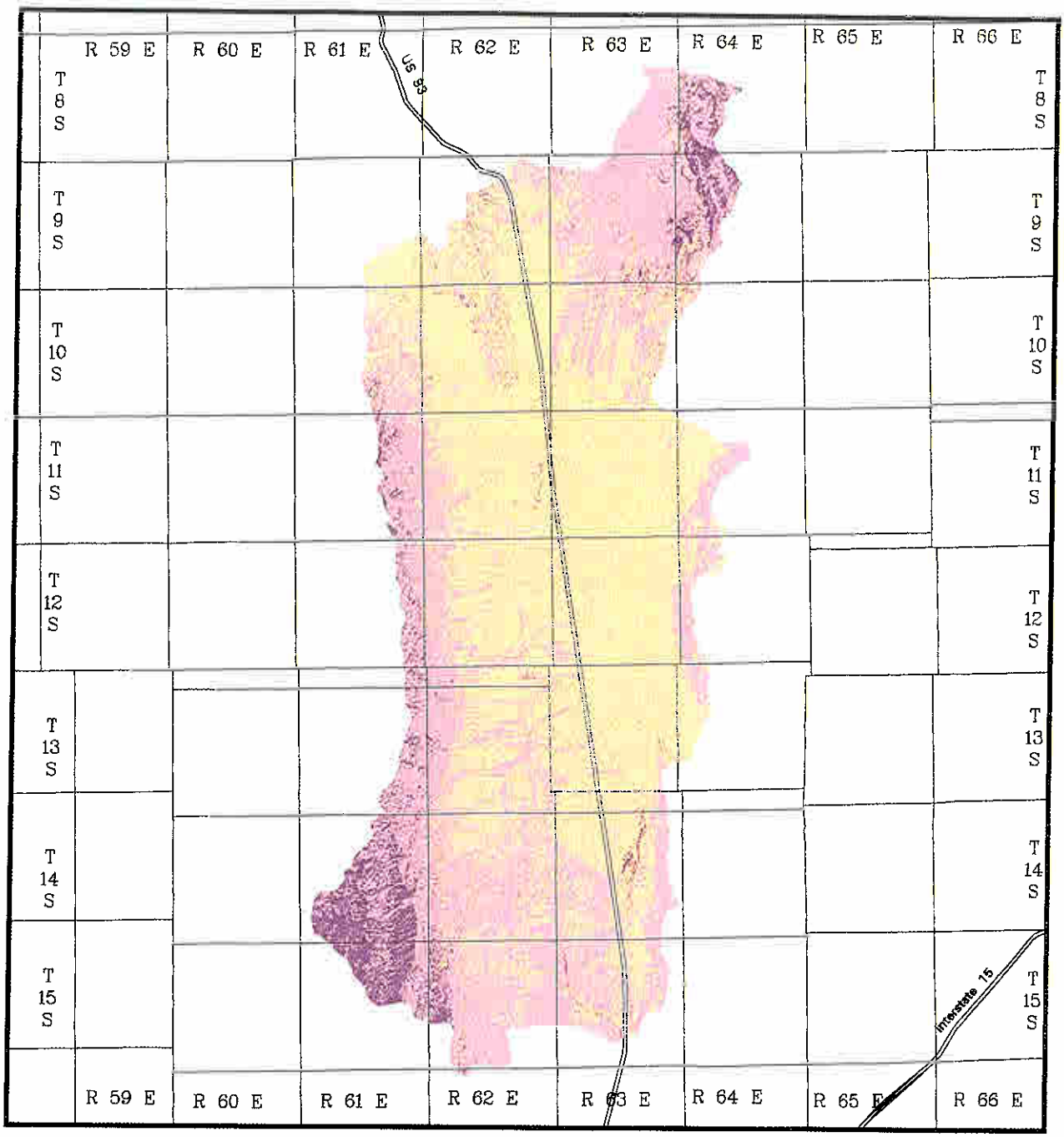
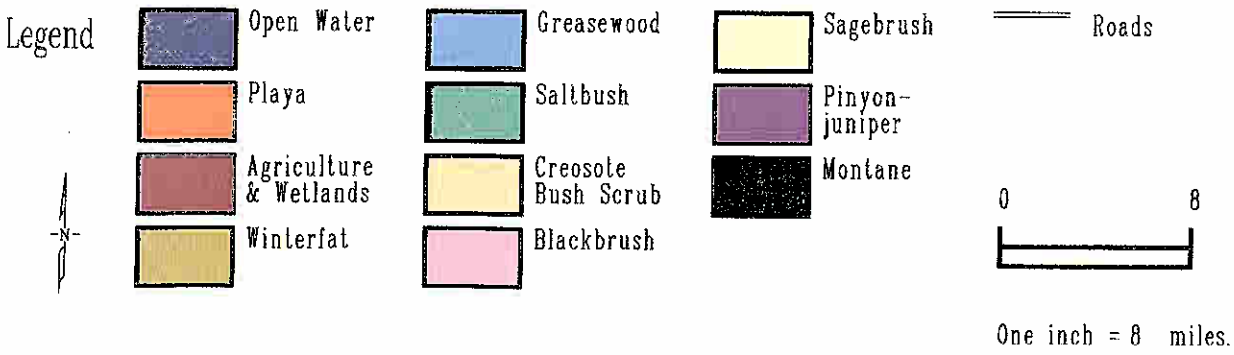


Figure 3-17. - Vegetation classification in Coyote Springs Valley

WB210



Hidden Valley

Over 96 percent of the vegetation in Hidden Valley is composed of creosote bush scrub and blackbrush vegetation zones (Table 3-1; Figure 3-18). A limited amount of winterfat (2,000 acres) is also located in the valley. No agriculture, wetland, or sensitive vegetation features were identified in Hidden Valley.

Garnet Valley

As shown on Figure 3-19, almost all of the vegetation in Garnet Valley is creosote bush scrub (almost 97 percent). A large playa exists between the two major highways. No agriculture, wetland, or sensitive vegetation features were identified in Garnet Valley.

Railroad Valley North

Vegetation zones are much more diverse in Railroad Valley North then in most of the other valleys in the project area (Figure 3-20). Major vegetation communities include saltbush, pinyon-juniper, and greasewood. These three vegetation communities represent more than 83 percent of the valley's vegetation (Table 3-1). Areas mapped as saltbush are primarily shadscale and areas mapped as greasewood are variable in density and composition, containing a large amount of saltgrass and other grasses in some areas. A large playa exists mid-valley. Agriculture and wetland areas occupy 14,100 acres (one percent) in the valley, and are largely associated with a number of springs and irrigated meadows on the east side of the valley.

Railroad Valley South

As shown on Figure 3-21, saltbush, sagebrush, and pinyon-juniper are the major vegetation zones in the valley and together represent over 98 percent of the valley's vegetation (Table 3-1). Areas mapped as saltbush are primarily shadscale. No agriculture or wetland areas were identified in Railroad Valley South.

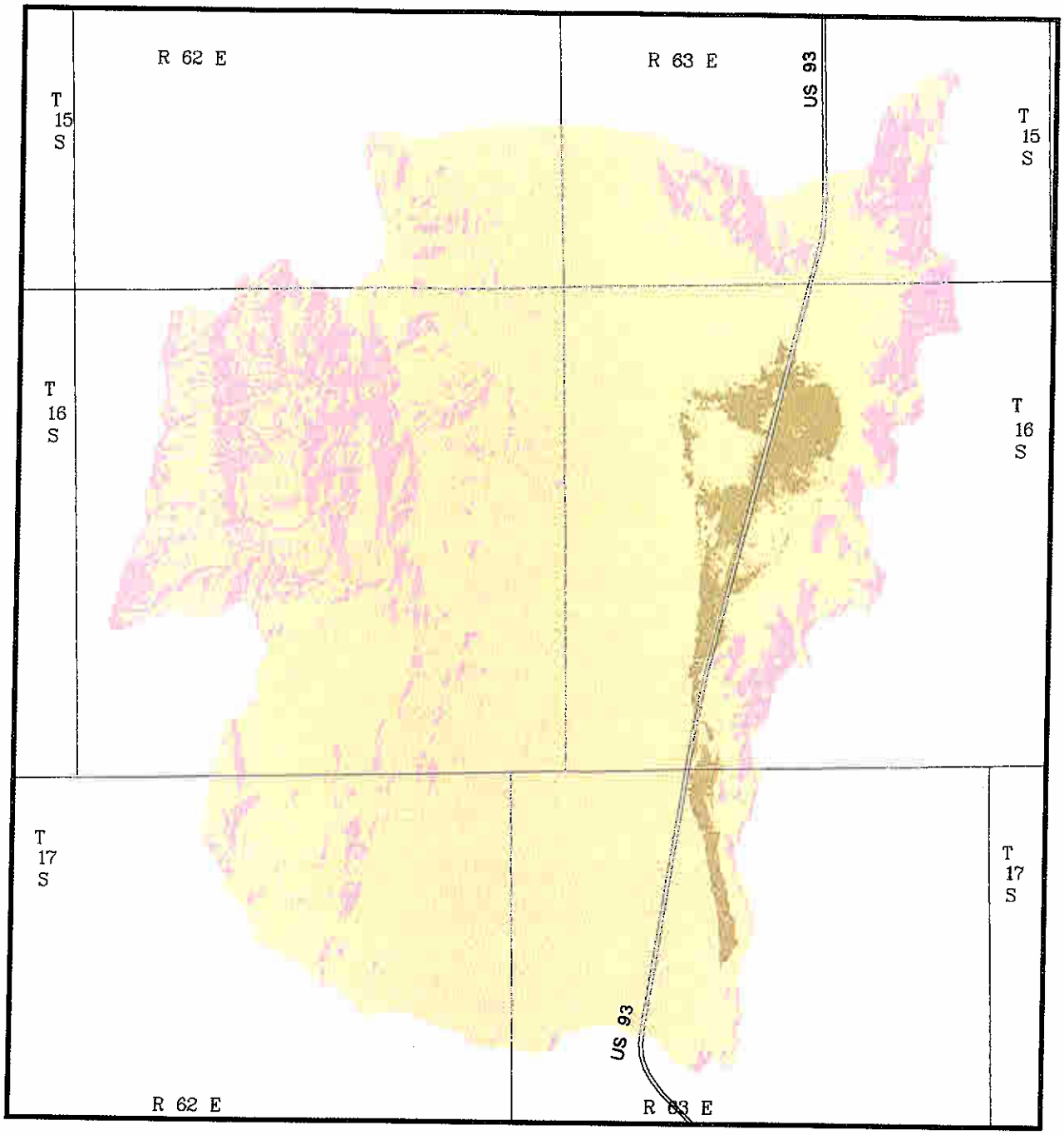


Figure 3-18. - Vegetation classification in Hidden Valley

WB217

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 3

One inch = 3 miles.

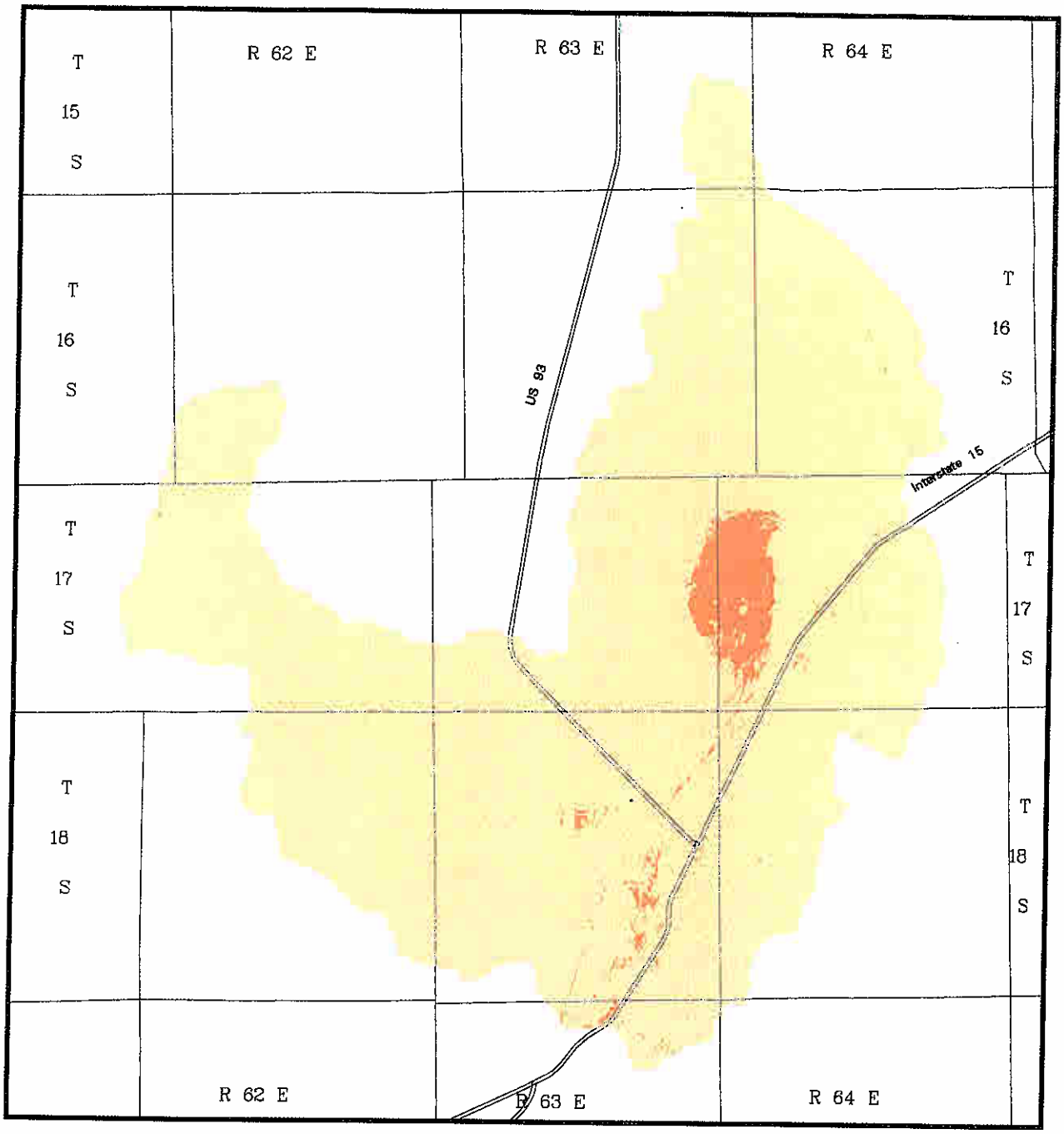


Figure 3-19. - Vegetation classification in Garnet Valley

WB216

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 4

One inch = 4 miles.

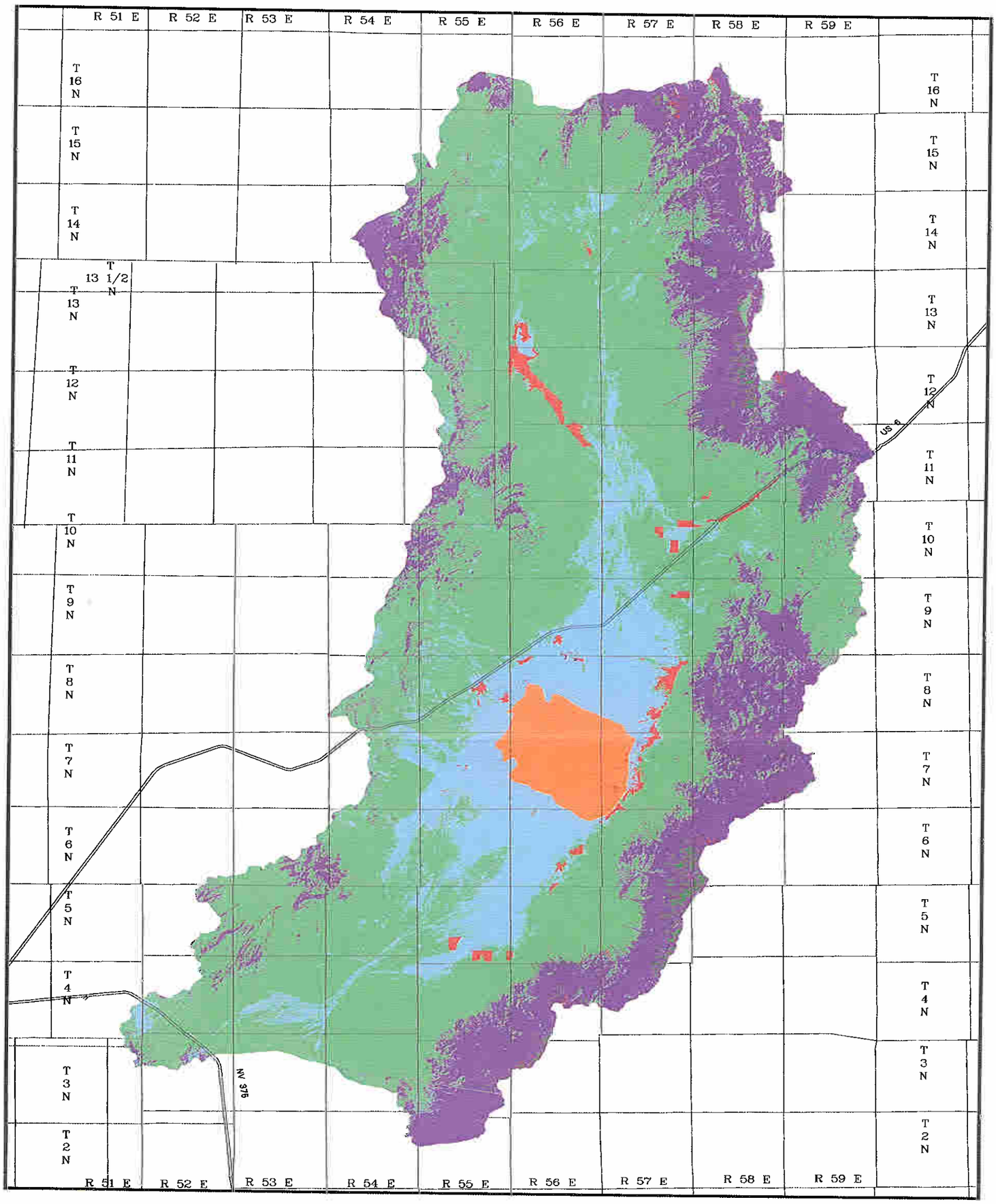


Figure 3-20. – Vegetation classification in Railroad Valley North

WB173B

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

0 8

One inch = 8 miles.

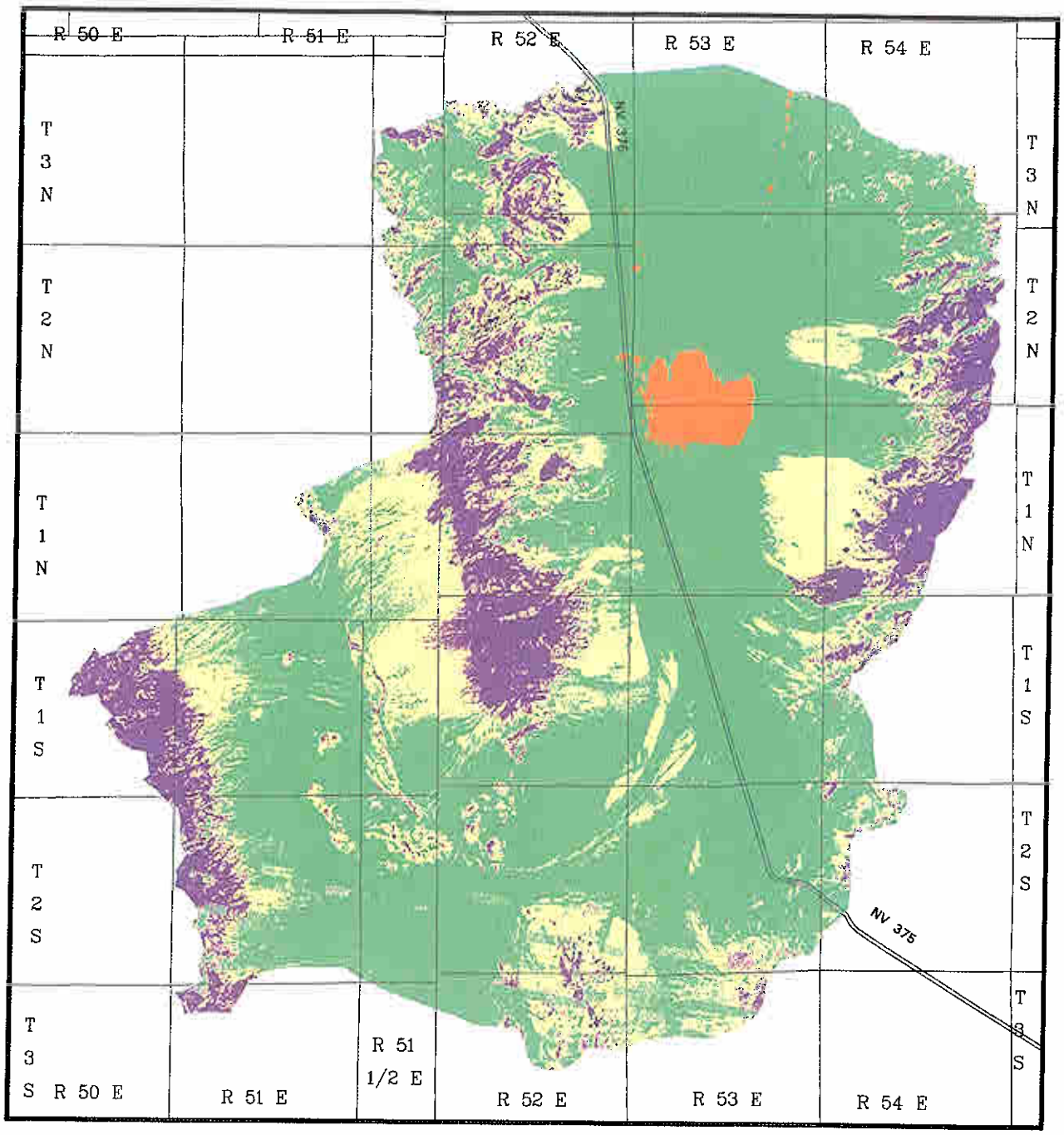


Figure 3-21. – Vegetation classification in Railroad Valley South

WB173A

Penoyer Valley

Major vegetation zones within Penoyer Valley include saltbush, sagebrush, and pinyon-juniper (Figure 3-22). Together these three vegetation communities occupy approximately 98 percent of the valley's area (Table 3-1). The valley also contains smaller areas of greasewood and playa. Agriculture and wetland areas occupy 700 acres (0.2 percent) within the valley.

Tikaboo Valley

Blackbrush, saltbush, and creosote bush scrub are the primary vegetation communities in Tikaboo Valley (Figure 3-23). Together these three vegetation zones represent over 91 percent of the valley's vegetation (Table 3-1). Portions of the area near Coyote Summit mapped as blackbrush are occupied by sagebrush. This valley clearly illustrates the vegetation demarkation between the Great Basin Desert to the north and the Mojave Desert to the south (Trimble, 1989). No agriculture or wetland areas were identified in the valley. Joshua trees are scattered in saltbush and blackbrush communities in northern Tikaboo Valley.

Pahranagat Valley

As shown on Figure 3-24, vegetation in Pahranagat Valley consists primarily of blackbrush, saltbush, and creosote bush scrub. Together these three vegetation zones represent about 89 percent of the valley's vegetation (Table 3-1). The valley also contains 5,500 acres of agriculture and wetland areas associated with springs and irrigated meadows. Joshua trees (sensitive vegetation) are also located in Pahranagat Valley.

Cave Valley

Primary vegetation communities in Cave Valley include sagebrush and pinyon-juniper (Figure 3-25). Together these two vegetation zones represent more than 93 percent of the vegetation in the valley (Table 3-1). The playa area in the southern part of the valley is covered with about 7,300 acres of greasewood. The sagebrush community includes islands of winterfat. There are approximately 1,100 acres of agriculture and wetland areas.

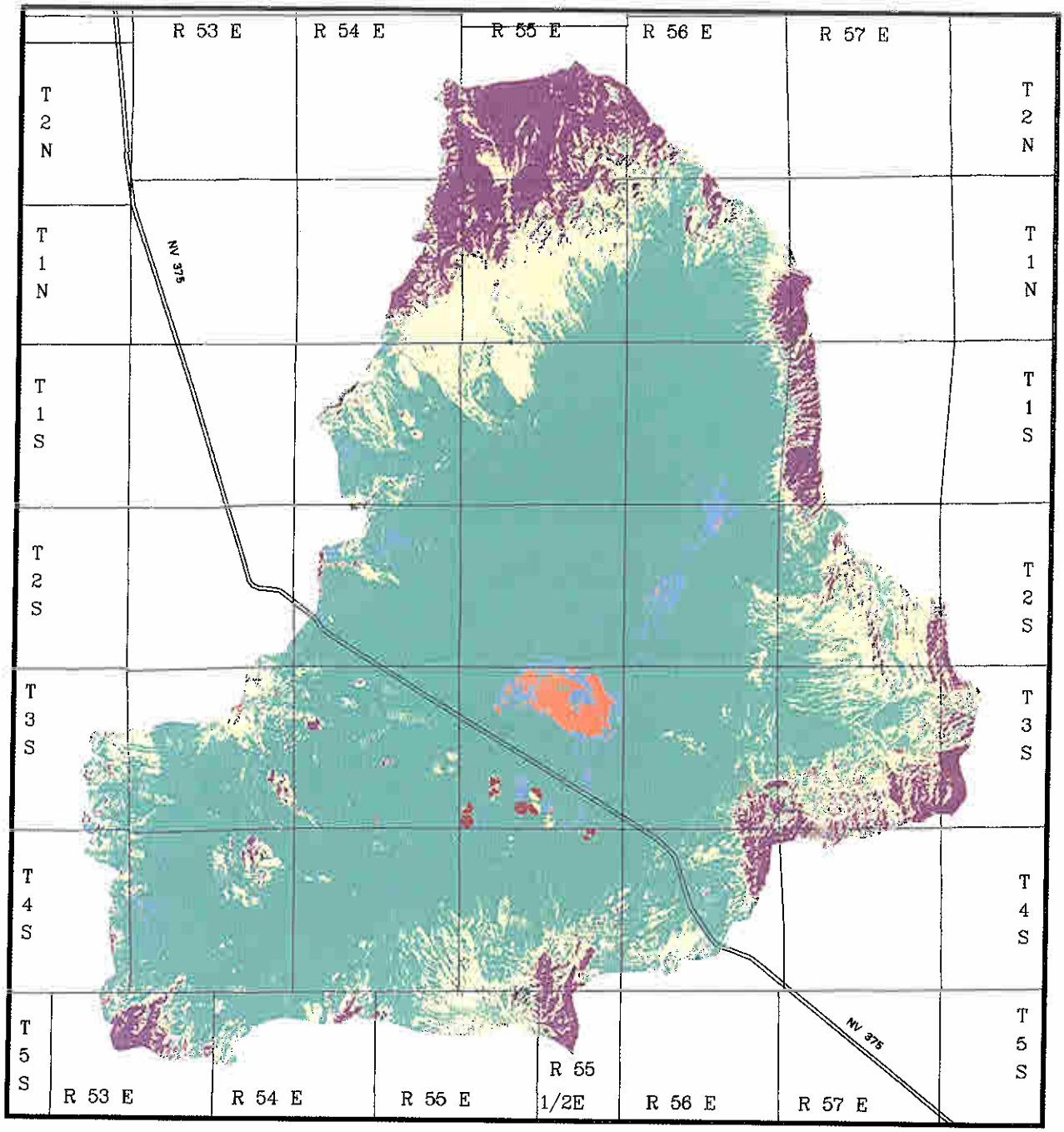


Figure 3-22. - Vegetation classification in Penoyer Valley WB170

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 6

One inch = 6 miles.

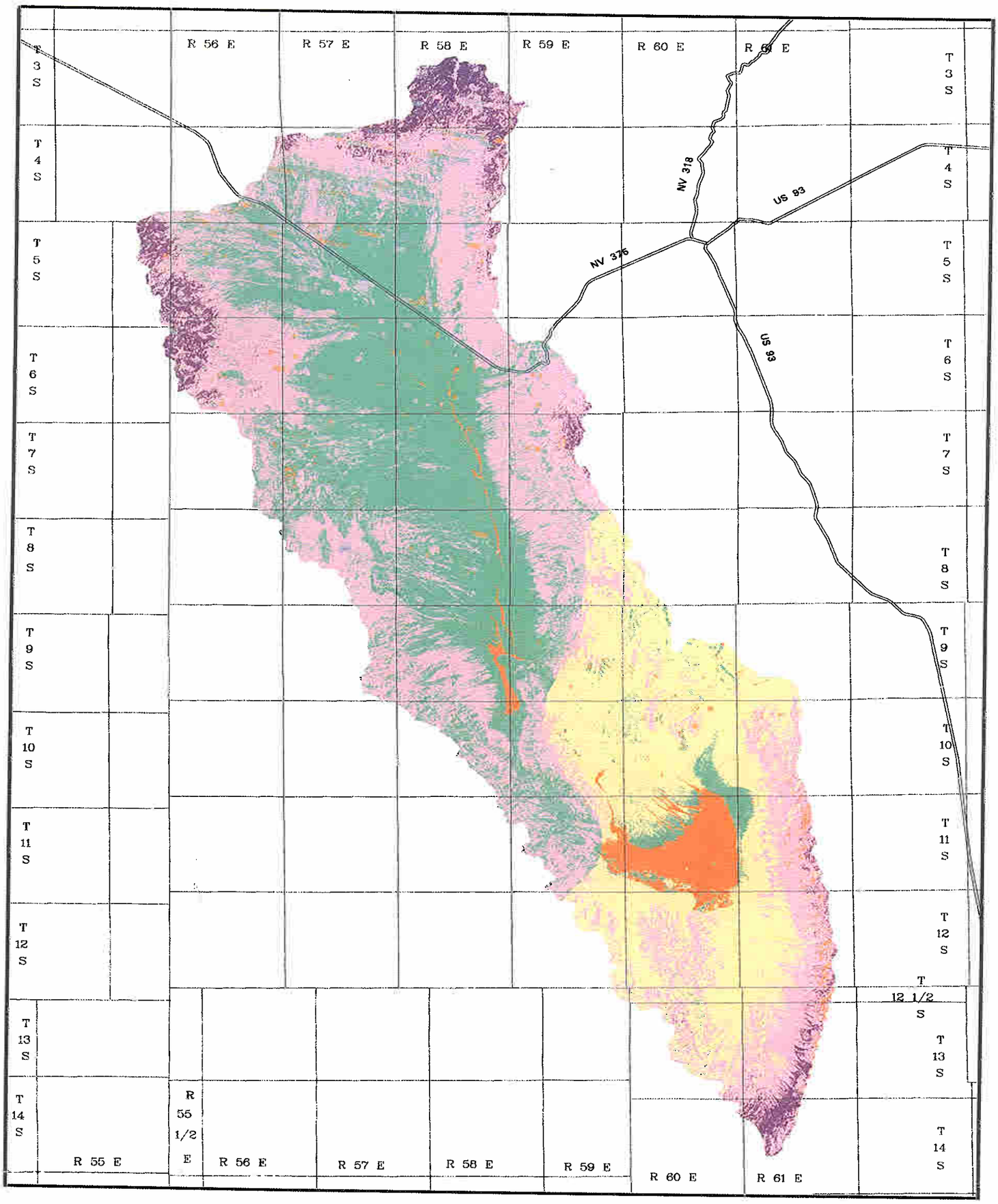


Figure 3-23. – Vegetation classification in Tikaboo Valley

WB169

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

0 6

One inch = 6 miles.

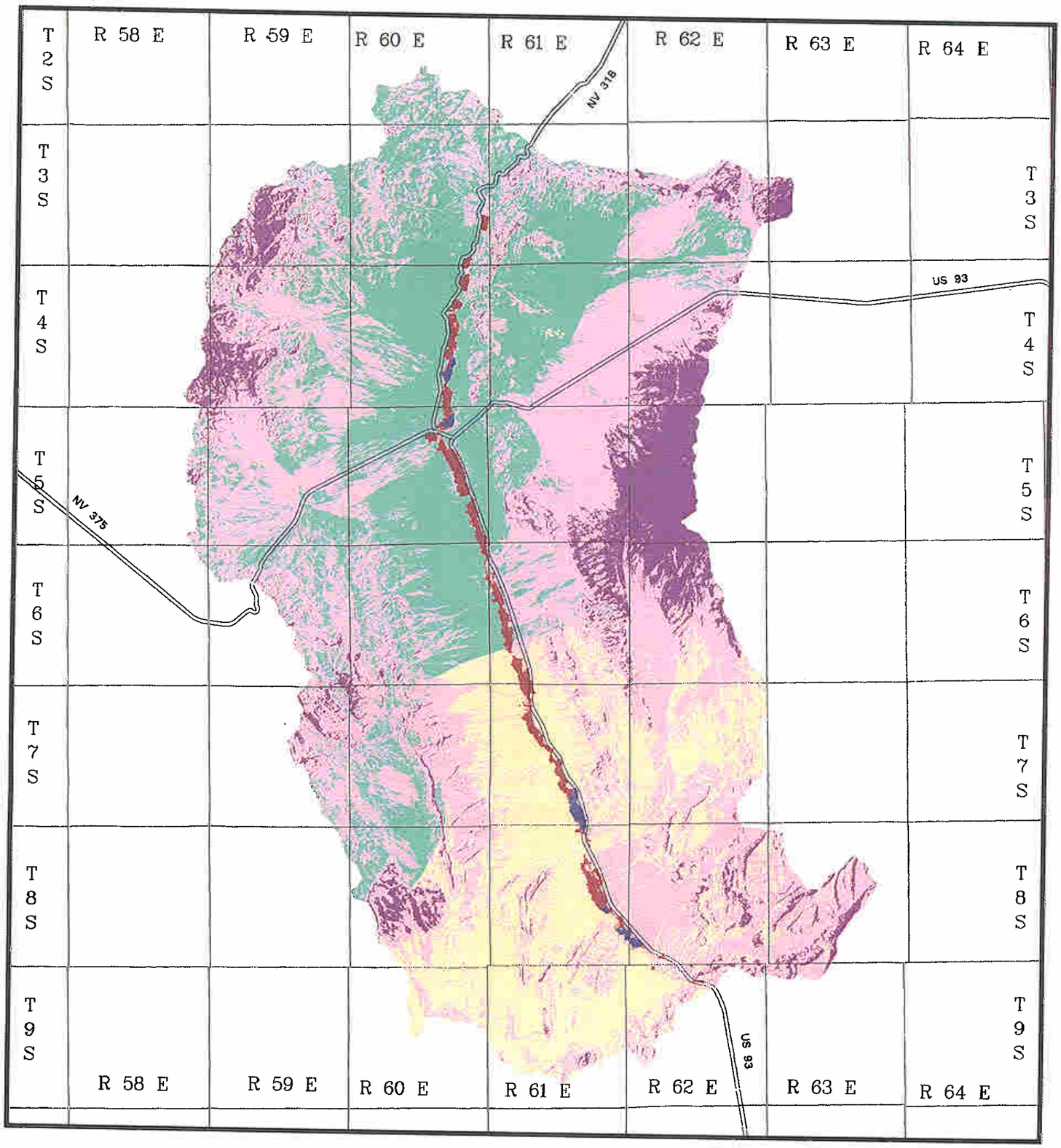


Figure 3-24. - Vegetation classification in Pahranagat Valley

WB209

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 7

One inch = 7 miles.

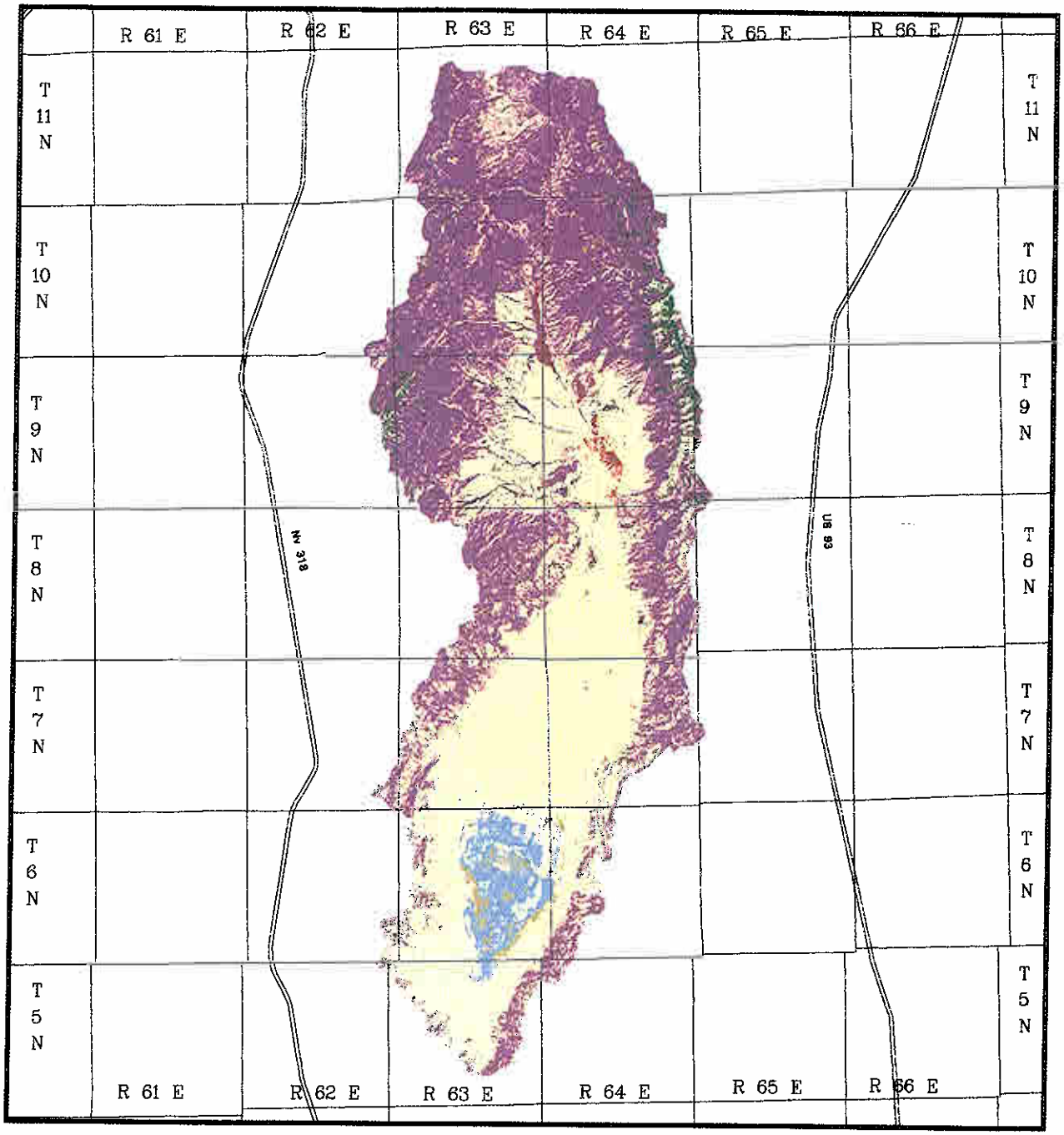
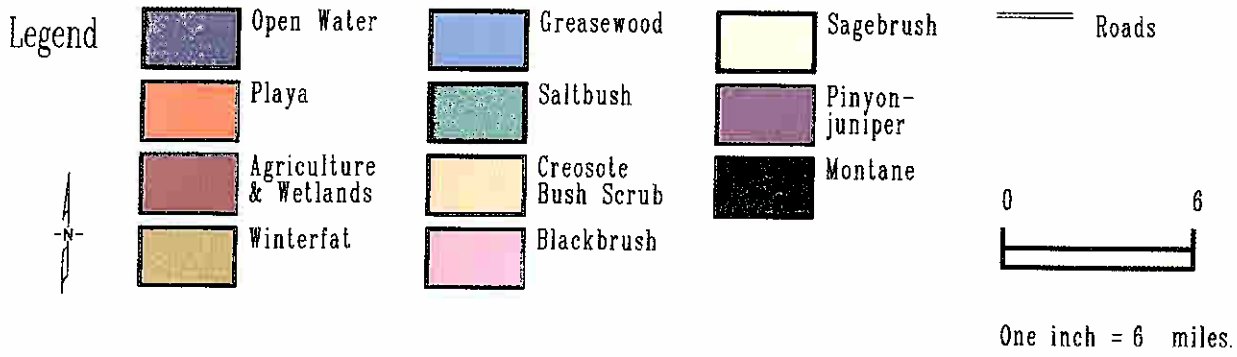


Figure 3-25. - Vegetation classification in Cave Valley

WB180



Pahroc Valley

As shown on Figure 3-26, vegetation in Pahroc Valley is comprised primarily of sagebrush and pinyon-juniper. These two vegetation zones comprise almost 97 percent of the vegetation (Table 3-1). Some scattered areas of winterfat are located within the sagebrush community along the White River. No agriculture, wetland, or sensitive vegetation features were identified in Pahroc Valley.

Coal Valley

Vegetation zones within Coal Valley are limited to sagebrush, saltbush, and pinyon-juniper (Figure 3-27). No agriculture, wetland, or sensitive vegetation features were identified in Coal Valley.

Garden Valley

Primary vegetation zones within Garden Valley include sagebrush and pinyon-juniper (Figure 3-28). These two vegetation zones represent 92 percent of the valley's vegetation. In addition, the valley contains areas of winterfat (15,400 acres) and a limited amount of montane. No agriculture, wetland, or sensitive vegetation features were identified in Garden Valley.

Three Lakes Valley South

Creosote bush scrub, blackbrush, and saltbush are the three most abundant vegetation zones within Three Lakes Valley South (Figure 3-29). These three vegetation zones comprise over 91 percent of the vegetation in the valley (Table 3-1). Pinyon-juniper is the only other vegetation community identified in the valley. No agriculture, wetland, or sensitive vegetation features were identified in Three Lakes Valley South.

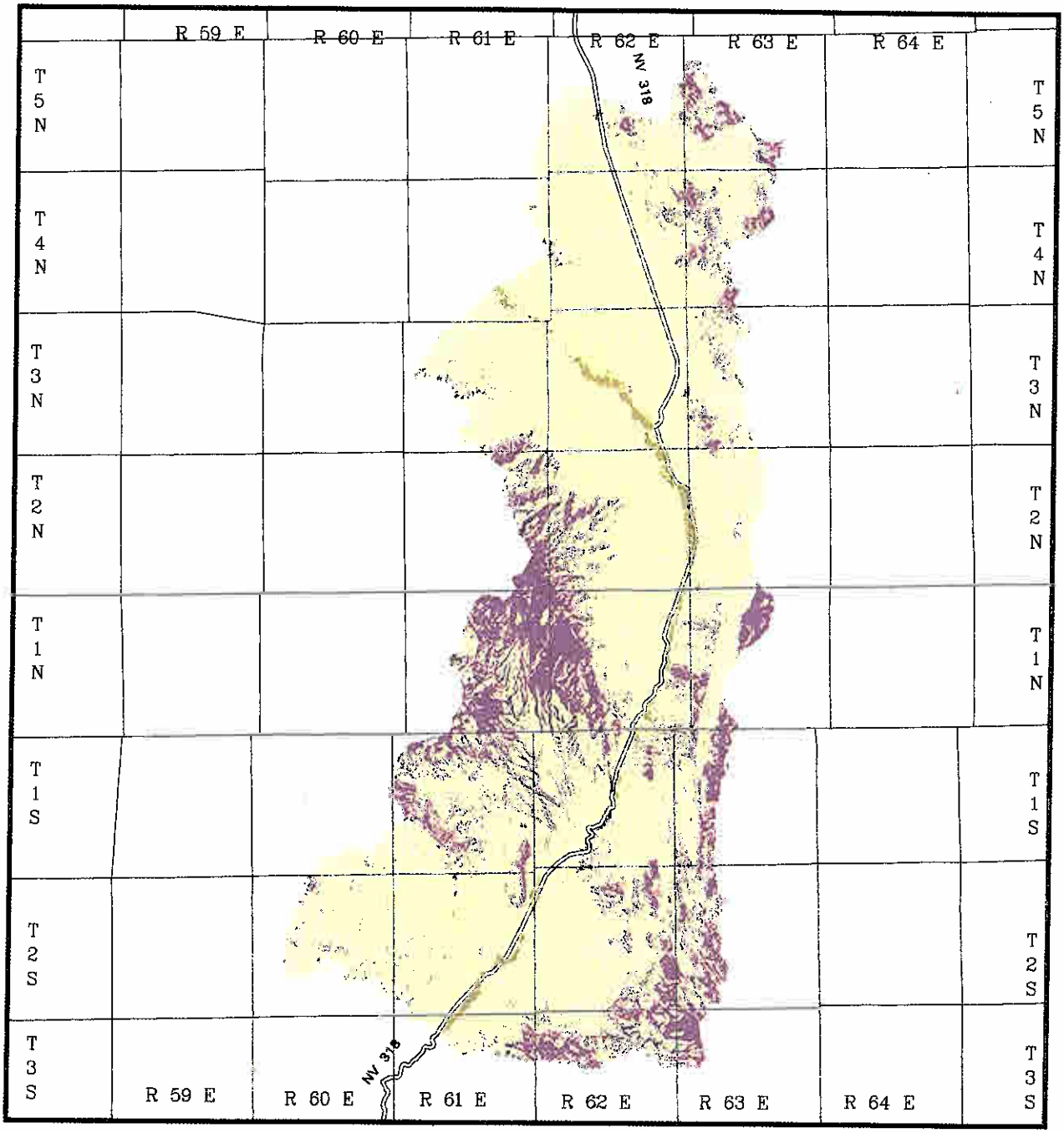


Figure 3-26. - Vegetation classification in Pahroc Valley

WB208

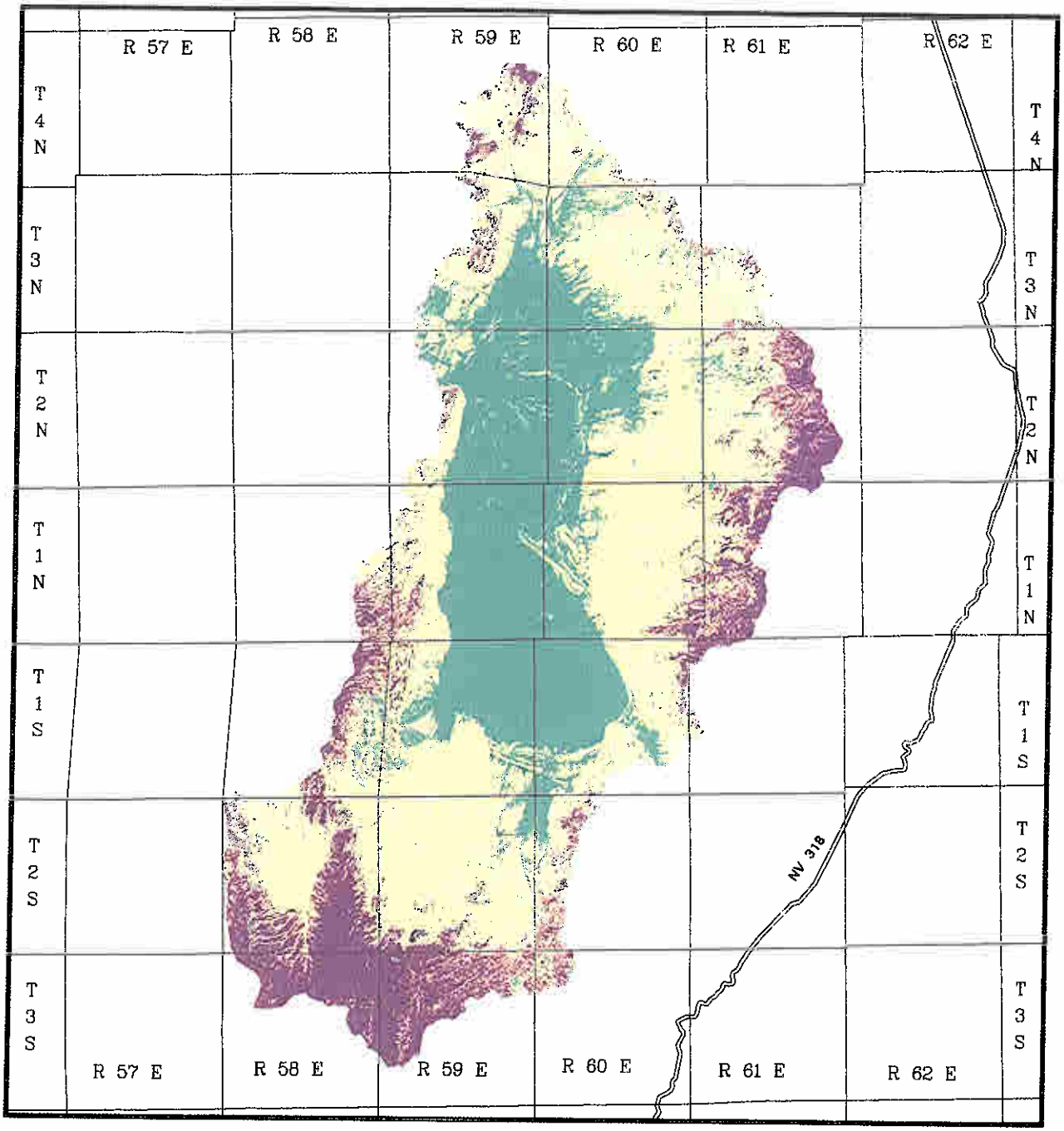


Figure 3-27. - Vegetation classification in Coal Valley

WB171

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 7

One inch = 7 miles.

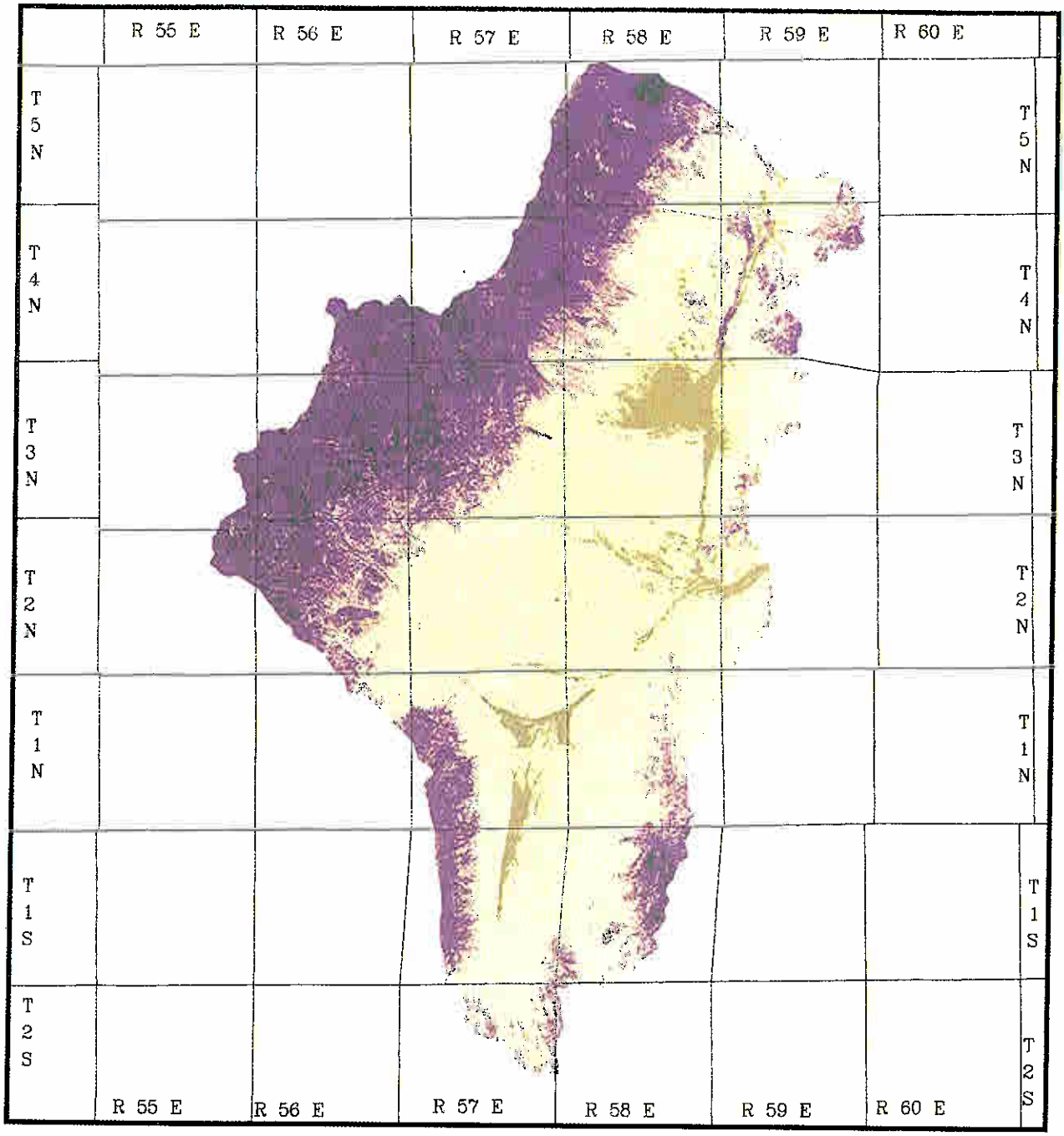


Figure 3-28. - Vegetation classification in Garden Valley

WB172

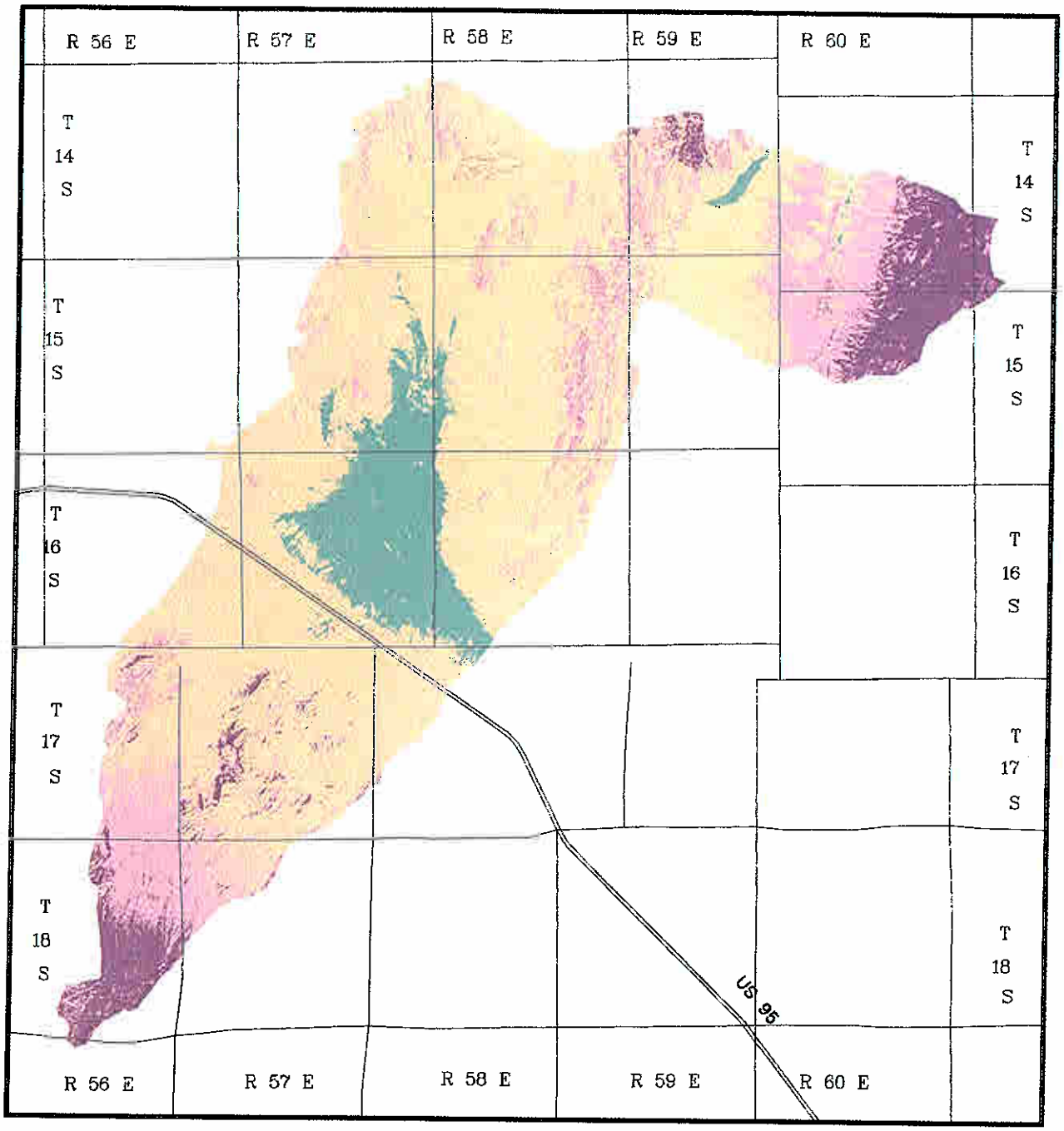


Figure 3-29. - Vegetation classification in Three Lakes Valley South

WB211

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 7

One inch = 7 miles.

California Wash Valley

Over 99 percent of the vegetation within California Wash Valley is creosote bush scrub (Table 3-1; Figure 3-30). Open water (55 acres) and agriculture and wetlands (1,100 acres) are the other vegetation zones in the valley and represents less than one percent of the valley's area. No sensitive vegetation features were identified in California Wash Valley.

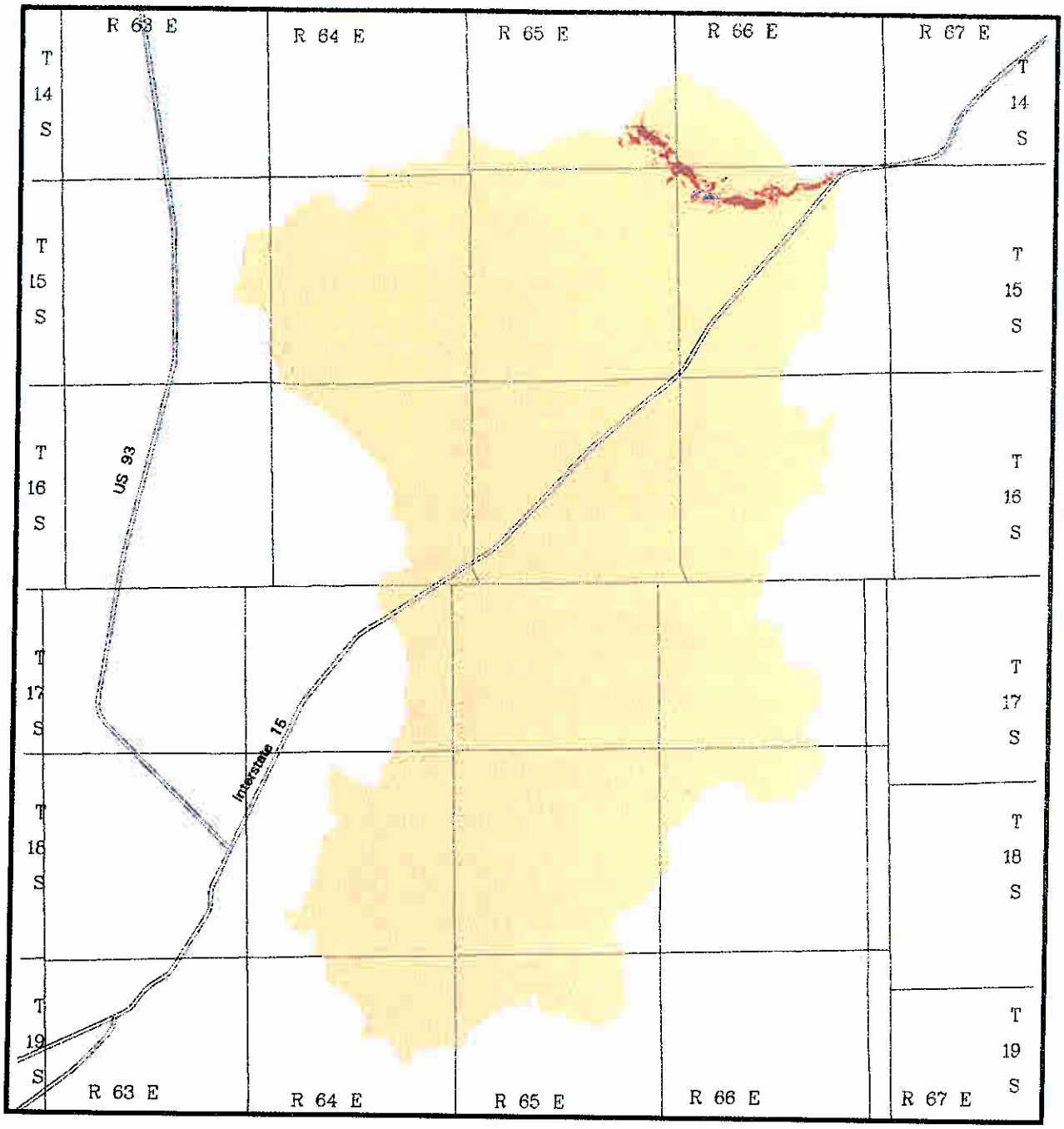


Figure 3-30. - Vegetation classification in California Wash Valley

WB218

Legend

- Open Water
- Playa
- Agriculture & Wetlands
- Winterfat
- Greasewood
- Saltbush
- Creosote Bush Scrub
- Blackbrush
- Sagebrush
- Pinyon-juniper
- Montane
- Roads

N

0 6

One inch = 6 miles.

3.3 WILDLIFE

The CWP area supports a wide variety of wildlife species. The project area is located within the basin and range region of the western United States, which is sparsely populated and rich in wilderness and semi-wilderness qualities.

3.3.1 Big Game

The CWP area provides habitat for numerous important big game species, such as mule deer, pronghorn antelope, and bighorn sheep. Management of these species falls under the jurisdiction of the Nevada Division of Wildlife (NDOW). The majority of the range on which these species occur is managed by BLM. BLM must balance the needs of big game and other wildlife species with the needs of domestic livestock and wild horses and burros, which also use BLM lands.

Due to the relatively arid climate in the CWP area, forage and surface water are limited. Availability of forage and water, as well as competition among livestock, wild horses, and big game for limited forage and water, has a strong influence on big game population numbers and densities. All of the big game species found within the project area are dependent upon accessible supplies of water. Populations within the various mountain ranges and valleys, therefore, tend to cluster around these water sources, particularly during the hot, dry summer months.

Development of water resources for livestock and other human uses has reduced the availability of water supplies and suitable riparian forage in big game summer ranges in portions of the CWP area (BLM 1979). Diversions of surface water supplies can greatly reduce the ability of big game populations to survive. NDOW and BLM have, in some cases, provided artificial sources of water (e.g., guzzlers) to enhance populations in areas where available surface water is scarce.

Hunting is an important recreational activity for the residents of Nevada and other states. Thousands of individuals hunt game in the CWP area each year. Mule deer and pronghorn antelope are hunted in the project area in large numbers, while elk, bighorn sheep, and mountain lions are hunted to a lesser extent. Economic activity stimulated by big game

hunting, such as the sale of gasoline, supplies, restaurant meals, etc., greatly benefits rural communities. Important big game species found within the CWP area are described below.

Mule Deer (*Odocoileus hemionus*)

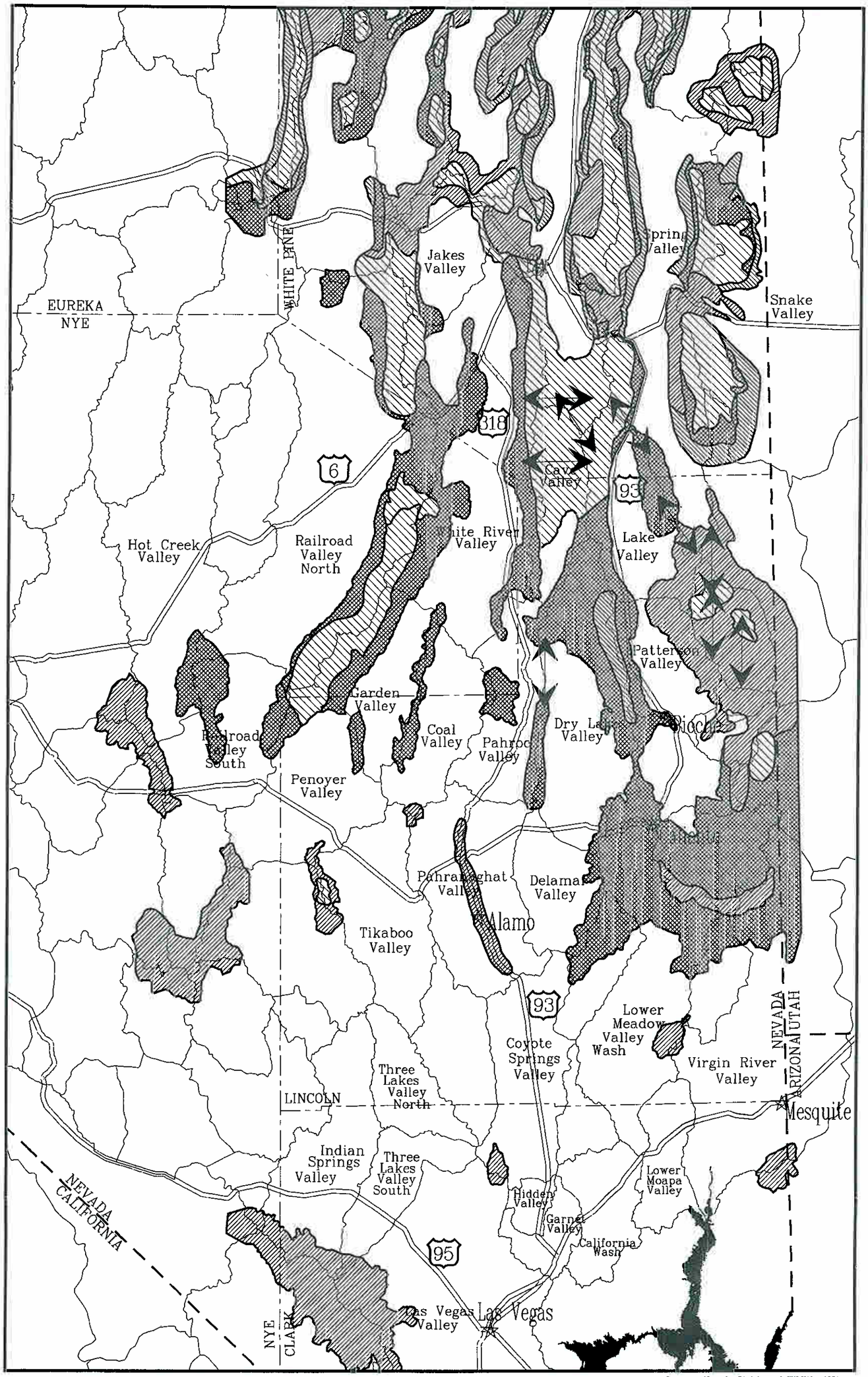
Within the CWP area, mule deer are the most abundant big game species. Winter range consists primarily of lower elevation pinyon-juniper woodlands, mountain mahogany woodlands, and sagebrush because these communities provide a desirable combination of browse, thermal cover and escape cover.

Within the CWP area, key mule deer winter range is found at the southern end of the Snake Range; the southwestern corner of Spring Valley; in the Limestone Hills and Fortification Range; in the extreme southern portion of the Patterson Valley east and southwest of Pioche; from the eastern Muleshoe Valley to the West Mountains to the Ely Spring Mountains along the northeast side of the Dry Lake Valley (particularly near Bristol Well and Meloy Springs); and in the Chief and Burnt Springs Ranges (Figure 3-31).

To the south and west, additional important winter range is found in Railroad Valley North in the Reveille Range near Hyde Spring; in the southern Pancake Range south of Lunar Lake; where Railroad Valley North abuts the Grant Range between Ox Spring Wash and Troy Canyon; on the eastern side of the Grant Range; in the Golden Gate Range; in the Worthington Mountains; and in the North Pahroc Range.

As winter ends, mule deer move to spring range to utilize grasses and forbs that emerge during the spring greenup. Population densities on these spring ranges can exceed 250 animals per square mile. Important mule deer spring range is found in the foothills and lower slopes of the Schell Creek and Snake Ranges in Spring and Snake Valleys. Mule deer fawning typically occurs from May through June and does will remain close to succulent vegetation and water (typically within 1 - 1.5 miles of riparian areas) during this important period.

For summer range, mule deer tend to utilize high elevation stream riparian, aspen, white fir, mountain mahogany, and mountain shrub communities (BLM 1982, 1983). Important browse species for the mule deer include antelope bitterbrush, cliffrose, mountain mahogany, snowberry, sagebrush, and serviceberry. In many other western states, availability of winter range is considered to be one of the most critical limiting factors for mule deer populations.



Source : Nevada Division of Wildlife, 1991
Bureau of Land Management, 1991

Figure 3-31. - Mule deer range in project area

Spring
Summer
Winter
Year Round
Antelope Kidding Grounds
Sage Grouse Lek
Highway
Water Basin Boundary
State Boundary
County Boundary
Major City
Migration Corridor
N

However, in the CWP area, summer range is considered to be the most critical because of its scarcity and heavy use by livestock. As a result, all suitable summer range is critical to mule deer populations within the CWP area. Critical summer range within the CWP area is found in the Egan Range north from Shingle Pass, in the Schell Creek Range between Connor's Pass and Patterson Pass, and in the Highland Range.

Year-round mule deer ranges are found in the South Schell Creek, Fairview, Bristol, Highland, and Wilson Creek Ranges. To the south and west, year-round range is found in the Timpahute Range, Groom Range, Kawich Range, Clover Range, Delamar Mountains, and Spring Mountains.

During seasonal migrations, mule deer may either migrate elevationally, moving up or down slope on a given mountain range, or laterally, actually moving from one mountain range or area to another, depending on the region within the CWP area. In general, mule deer prefer to remain as high as possible on mountain slopes where suitable forage is available.

Important migration corridors used by mule deer are as follows:

1. From the Southern Schell Creek Range, near Burnt Peak, to the North Pahroc Range.
2. From the Southern Schell Creek Range to the Fortification Range via Lake Valley Summit.
3. From the Southern Schell Creek Range to the Egan Range/Egan Range to Southern Schell Creek Range via Cave Valley.
4. From Mount Wilson and Table Mountain north to the Limestone Hills.
5. From the Wilson Creek Range south to the Patterson Valley and Red Buttes area.

Mule deer populations within the CWP area have declined significantly due to prolonged drought. As an example, NDOW has estimated that mule deer populations declined roughly 50 percent from 1988 to 1991 in portions of Lincoln County (Beckstrand 1992).

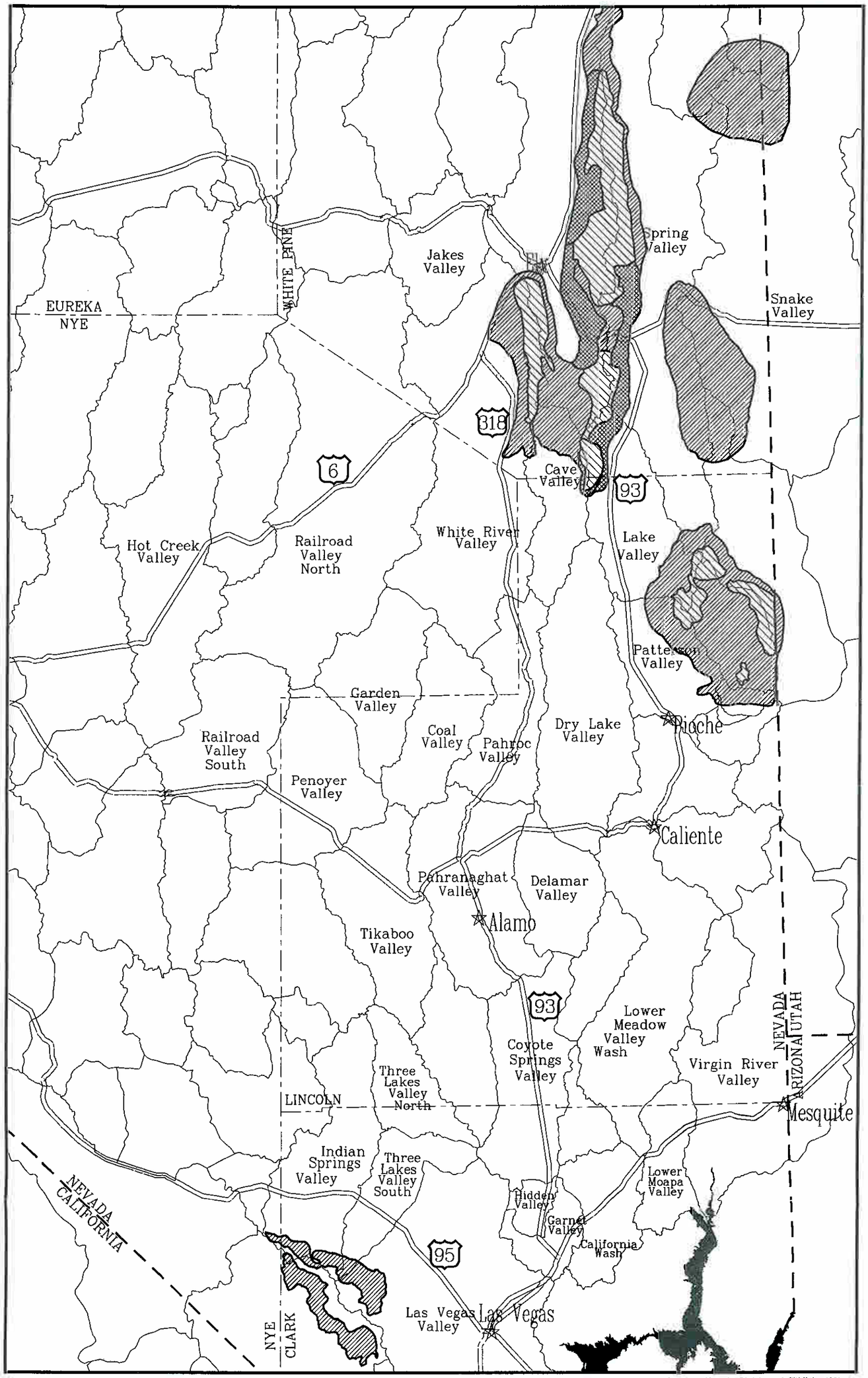
Elk (*Cervus elaphus*)

Elk populations in the CWP area are relatively small compared to mule deer populations. The largest elk herds are found in the Schell Creek and Egan Ranges and in northern Cave Valley (Figure 3-32). Approximately 1,300 to 1,500 animals are found in this complex. Approximately 10 percent of that population remains in the northern Cave Valley on a year-round basis. Additionally, a small herd of approximately 30 animals has been identified in the Snake Range, along with another in the Wilson Creek Range numbering approximately 150 animals. A few individuals have been observed in the Grant Range as well (Gilbertson 1992). To the south, approximately 330 adult individuals are found in the Spring Mountains, west of Las Vegas (Lee 1992).

NDOW has been actively promoting expansion of this species throughout the range mentioned above. Approximately 50 animals were recently introduced to the Mt. Grafton area in the Schell Creek Range. Another introduction in the southern Egan Range is planned. In general, NDOW intends to expand both elk populations and ranges in the future.

Elk are generally found in mountain ranges, moving to different elevation zones and communities as seasons change. Some populations migrate from one range to another, while others remain in isolated areas. A major migration corridor lies at the northern end of the Cave Valley, where elk will cross from the Egan Range to the Schell Creek Range, or vice-versa, depending on conditions at any given time.

Elk calving usually occurs between May and late June, near areas with adequate succulent vegetation and water. As is the case with other big game species, availability of water is critical during calving because milk production requires considerable liquid intake. Important elk calving areas are found wherever water is available in elk summer range. In general, elk calving occurs within about two miles of water. Northern Cave Valley, near its junction with the southern Steptoe Valley, is considered a sensitive calving area as a number of springs and water-producing windmills are present (Gilbertson 1992).



Source : Nevada Division of Wildlife, 1991
Bureau of Land Management, 1991

Figure 3-32. - Elk range in project area

Spring
Summer
Winter
Year Round
Antelope Kidding Grounds
Sage Grouse Lek
Highway
Water Basin Boundary
State Boundary
County Boundary
Major City
Migration Corridor
N

Within the CWP area, critical elk winter range is found on the lower slopes of the Schell Creek Range adjacent to the Spring Valley and the lower slopes of the South Egan Range. The section of Spring Valley extending south from Major's Place to Lake Valley Summit is considered particularly important. The northern end of Cave Valley is also considered critical winter range.

Summer range includes the highest portions of the Schell Creek and Egan Ranges. Year-round ranges are found in northern Cave Valley, the Snake Range, the Wilson Creek Range, and the Spring Mountains. In general, elk are grazing animals that will utilize various grasses and forbs.

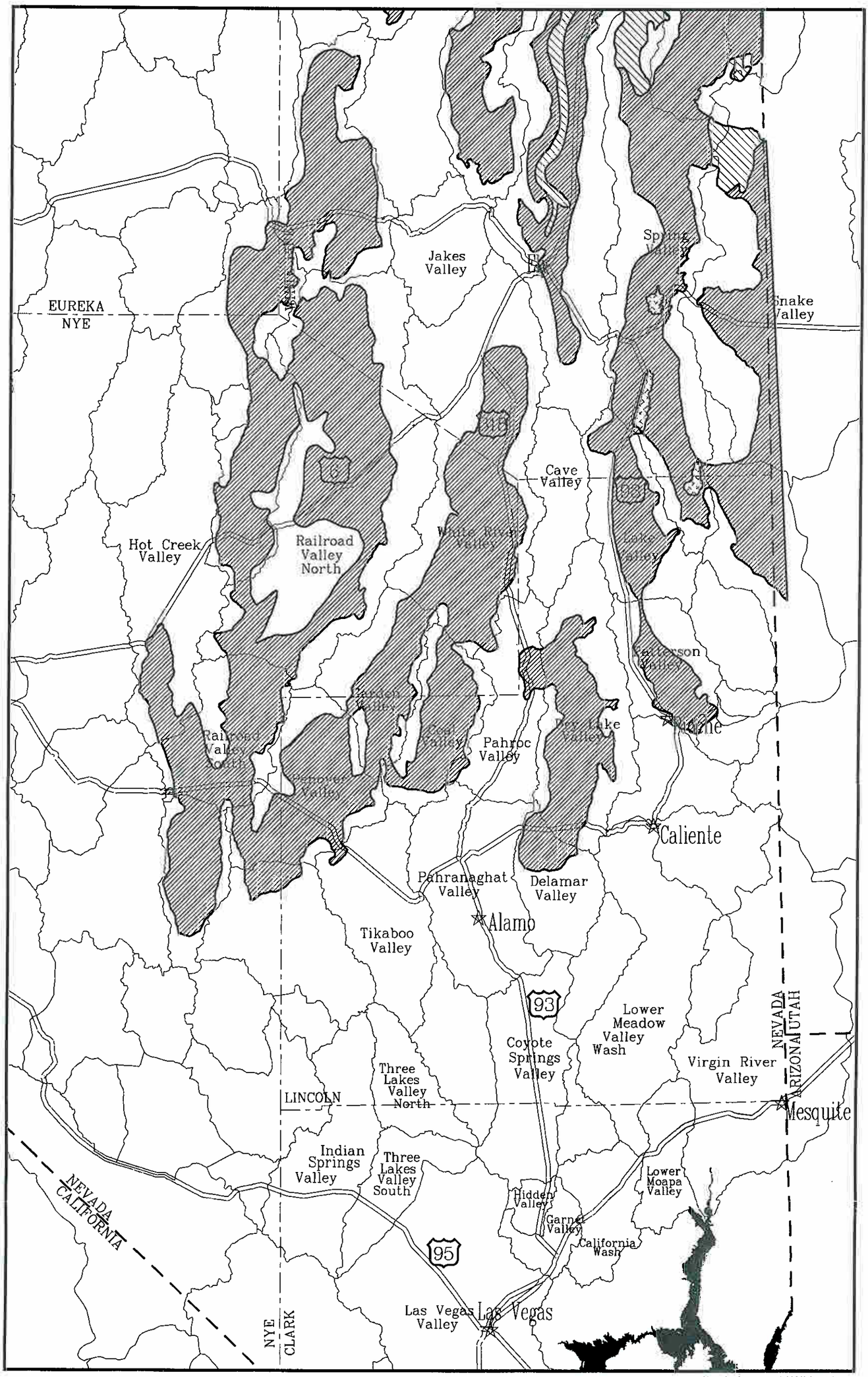
Pronghorn Antelope (*Antilocapra americana*)

This species is present in relative abundance in the CWP area and is generally found in valleys throughout the northern half of the project area. Within the CWP area, pronghorn antelope are found in the Snake, Spring, Lake, Patterson, Dry Lake, Delamar, Railroad Valley North, Railroad Valley South, Penoyer, Coal, and Garden Valleys on a year-round basis (Figure 3-33).

During winter, antelope tend to move to areas with minimal snow coverage. These areas generally feature southern exposures and maximum sunlight. During summer, antelope often congregate near juniper stands for shade cover.

Kidding occurs generally from late April to early June within two miles of water in areas that provide a mixture of grasses, forbs and brushy cover, used by kids to escape predators. Important kidding grounds are located on the eastern slope of the northern Schell Creek Range, in the Spring Valley northwest of Osceola, east of Highway 93 near Baking Powder Flat, and near the south end of the Snake Range, just south of the Lincoln County line (Figure 3-33).

NDOW is re-introducing pronghorn antelope to many valleys where they were historically found. Approximately 100 antelope were introduced to the Garden Valley in December of 1989. Another 66 animals were introduced to the Coal Valley in December of 1991 (Podbourney 1992). Two watering facilities were added to each of these valleys by NDOW to promote the success of these herds. Additional animals were introduced to Dry Lake



Source : Nevada Division of Wildlife, 1991
Bureau of Land Management, 1991

Figure 3-33. - Pronghorn antelope range in project area

Spring
Summer
Winter
Year Round
Antelope Kidding Grounds
Sage Grouse Lek
Highway
Water Basin Boundary
State Boundary
County Boundary
Major City
Migration Corridor
N

Valley. Despite six years of drought, pronghorn antelope populations have generally remained stable in the project area.

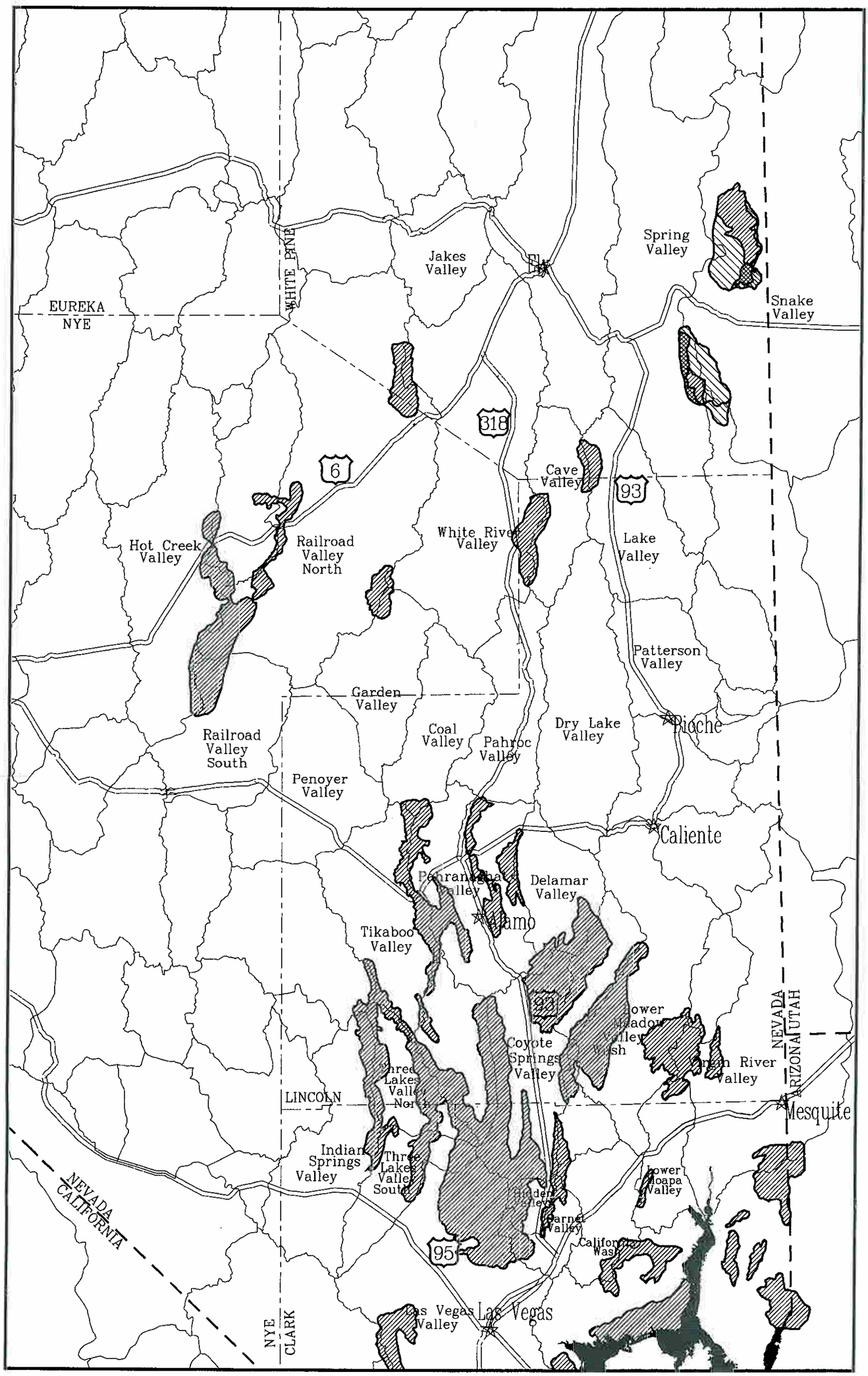
Bighorn Sheep (*Ovis canadensis*)

Two species of bighorn sheep are present in the CWP area, the Rocky Mountain bighorn (*Ovis canadensis canadensis*), and the desert bighorn (*Ovis canadensis nelsoni*). Both species are considered sensitive by NDOW, which is currently attempting to re-establish populations into historic ranges. Domestic sheep grazing in much of the bighorn's historic range brought diseases that significantly reduced populations of both species of bighorn sheep. The availability of permanent water supplies is the most critical factor affecting bighorn sheep survival. All permanent water supplies within bighorn sheep habitat area are considered critical. In addition, all habitat within two miles of permanent water supplies is considered crucial habitat. For forage, bighorn sheep prefer grasses, but will browse on shrubs if snows are deep or when grasses and forbs are not available.

Rocky Mountain bighorn sheep are found in the North and South Snake Ranges near Mounts Wheeler and Moriah, and in the Schell Creek Range, near Mount Grafton (Figure 3-34). All three of these populations are small, numbering no more than 30 individuals each. Over the northern half of the project area, the total number of Rocky Mountain bighorn sheep is estimated to be 150 (Gilbertson 1992).

Critical winter range for Rocky Mountain bighorn sheep is found in the Spring Valley, between the base of Mt. Wheeler and Mt. Minerva along the lower fringe of the pinyon-juniper community (Figure 3-34). Winter range is usually found at lower elevations or on south-facing slopes where sun exposure is greatest. Sometimes, groups of bighorn sheep will drop down to foothill areas during winter and early spring.

Desert bighorn sheep are more widely distributed in the CWP area. Desert bighorn populations, unlike other big game species, are greater in the southern half of the project area. Within the CWP area, desert bighorn sheep are found in the White Pine Range (20 individuals or fewer) on and around Currant Mountain (Gilbertson 1992), the central Grant Range (85 individuals), the southern Pancake Range, the North and South Pahroc Ranges, the East Pahranagat Range, the Delamar Mountains (50 individuals), the Pintwater Range (180



Source : Nevada Division of Wildlife, 1991
Bureau of Land Management, 1991

Figure 3-34. Bighorn sheep range in project area

Spring
Summer
Winter
Year Round
Antelope Kidding Grounds
Sage Grouse Lek
Highway
Water Basin Boundary
State Boundary
County Boundary
Major City
Migration Corridor
N

to 200 individuals), the Desert Range (80 individuals), the Sheep Range (220 individuals), the Las Vegas Range (100 individuals), the Arrow Canyon Range (100 individuals), and in the Spring Mountains (Padilla 1991, 1992).

During seasonal movements, desert bighorn sheep will move downslope, sometimes into valleys, and even cross between mountain ranges, depending on the severity of the winter and the availability of forage. Migration corridors between mountain ranges are considered sensitive. One important migration corridor is found at the northern end of the Pintwater Range, where it intersects the Desert Range. Another is found between the Arrow Canyon and Las Vegas Ranges (Delaney 1992).

NDOW has introduced desert bighorn sheep into several ranges in the CWP area. In addition, both BLM and NDOW have developed watering facilities to enhance desert bighorn populations. In general, most of the desert bighorn populations have declined since 1986 due to prolonged drought. For example, in the Sheep Range, populations declined from approximately 1,000 individuals in 1986 to 250 in 1992 (Delaney 1992).

For both species of bighorn sheep, lambing occurs in spring from late February through April. Ewes typically move to steep, rocky terrain to give birth, avoiding places that are easily accessed by mountain lions and other predators. In general, sensitive habitat areas of the desert bighorn sheep include lower elevation wintering areas such as the southwestern Tikaboo Valley, all summer water supplies, and lambing areas.

Mountain Lion (*Felis concolor*)

This species is generally found throughout the CWP area in mountainous terrain or forested areas where prey species are available. Large mammals, such as deer, are the preferred prey of the mountain lion. Smaller mammals, such as raccoons, coyotes, and mice may also be utilized. The mountain lion typically dens in caves, rocky crevices, rock piles, thickets, and other sheltered places. In general, mountain lion populations are stable throughout the state. Hunting is permitted in some portions of the CWP area.

3.3.2 Upland Game

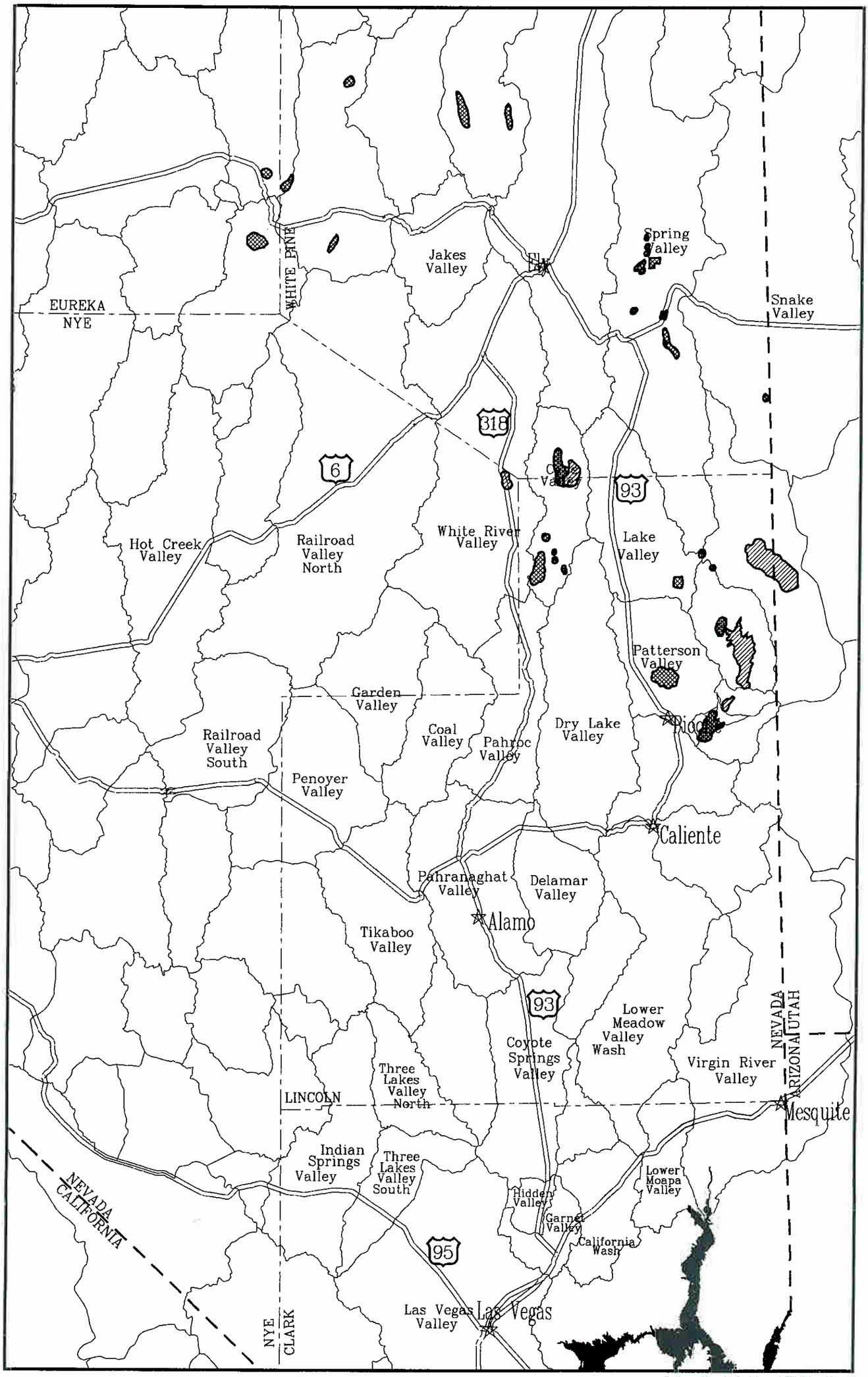
Sage Grouse *(Centrocercus urophasianus)*

The sage grouse is a widespread and important upland game species that occurs in the CWP area. It is typically associated with both tall and short species of sagebrush. It generally does not occur in pinyon-juniper woodlands, conifer forests, or on drier, saline slopes featuring shadscale communities (Ryser 1985). Sagebrush is critical to this species because it serves as the preferred food source and shelter. During late spring and early summer, herbaceous plants, leaves of legumes, grasses, and insects are also consumed.

During the months of spring, especially from March 15 to April 25, males assemble on ancestral leks and attempt to attract a mate by strutting/displaying. Each male uses his own portion or territory within the lek. Leks are typically found in openings or clearings in sagebrush, or where sagebrush is low and scattered (Ryser 1985). Leks are used exclusively for strutting and mating. After mating, nest/scrape preparation, egg laying, and incubation are carried out by the females. From a resource management standpoint, BLM considers strutting grounds and habitat within two miles of those grounds to be sensitive. In addition, as edible forbs dry up during the summer months, sage grouse typically move to meadow riparian areas. Consequently, these meadow areas are also considered crucial to sage grouse survival (BLM 1982).

Within the CWP area, the sage grouse may be present in large numbers in Spring and Snake Valleys (BLM 1982). Smaller populations have been identified in the northern end of Railroad Valley North, in Cave Valley, in Wilson Creek Range, in the southern Egan Range, and in Grassy Mountain area (Figure 3-35).

Several important strutting grounds have been identified in Spring Valley within the CWP area. These leks are found near Highway 50 below Osceola, on the west side of the valley at the base of the Schell Creek Range near Cleve and Cooper Creeks, and at the base of the Schell Creek Range between Taft and Freehill Creeks. Brooding areas in Spring Valley are mostly on the west side, near the base of the Schell Creek Range, particularly where water is available. In Cave Valley, leks are found near Sidehill Pass, near the base of the South Egan Range, and on the valley floor (Perkins 1992; Podbourney 1992).



Source : Nevada Division of Wildlife, 1991
Bureau of Land Management, 1991

Figure 3-35. Sage grouse range in project area

Spring
Summer
Winter
Year Round
Antelope Kidding Grounds
Sage Grouse Lek
Highway
Water Basin Boundary
State Boundary
County Boundary
Major City
Migration Corridor
N

Sage grouse critical wintering area is found in Spring Valley, along the base of the Snake Range below Mt. Wheeler, roughly three miles south of Highway 50 and on the valley floor along Cleve and Indian Creeks. In Cave Valley, a critical wintering area is located near the base of the South Egan Range near Horse Spring. In Patterson Valley, a critical wintering area is located along Patterson Wash northeast of Pioche.

Blue Grouse (*Dendragapus obscurus*)

The blue grouse is another important upland game species found in the CWP area. Its preferred summer habitat consists of canyon-bottom riparian vegetation, and its winter habitat consists of fir and multineedled pine forests on higher mountain ranges (Gullion and Christensen, as cited in Ryser 1985). Unlike many other species, the blue grouse migrates to higher elevations in winter. As winter ends, the blue grouse moves downslope to less densely forested areas to begin breeding. Male blue grouse establish hooting territories on tree branches or on the ground and attempt to attract a mate through hooting and displaying. After mating, nesting/scrape preparation, egg-laying and incubation are carried out by the females.

Within the CWP area, the blue grouse may be present in the White Pine Range (BLM 1983); the Schell Creek Range; the Snake Range; and in the Mt. Grafton, Mt. Wilson, and Grassy Mountain areas (BLM 1982).

Chukar Partridge (*Alectoris chukar*)

The chukar partridge is a species that was introduced in Nevada from Asia. Populations of this species thrive in sagebrush and grassland communities throughout the CWP area. Chukars prefer rocky slopes for cover and shade. Cheatgrass is a preferred food source. They are typically found near perennial water sources (natural and man-made) in mountain ranges and foothills (Ryser 1985).

Hungarian Partridge (*Perdix perdix*)

The Hungarian partridge is a species that has been introduced in Nevada. Within the CWP area, this species may be found in the Railroad Valley (BLM 1983).

Gambel's Quail (*Lophortyx gambelii*)

The Gambel's quail is an abundant upland game bird found throughout southern Nevada. Areas within 0.25 mile of springs and water developments used by the quail are considered important habitat. Succulent plants located near water sources are also crucial to the quail.

Within the CWP area, Gambel's quail may be present in the Highland Range, Delamar Valley, North Pahroc Range, northern Tikaboo Valley, Worthington Mountains, Penoyer Valley, Pahranagat Valley, Coyote Springs Valley, Hidden Valley, Garnet Valley, Three Lakes Valley South, and Las Vegas Valley where adequate water sources and forage are available.

3.3.3 Waterfowl and Other Waterbirds

Within the CWP area, waterfowl use areas are relatively scarce and are found in isolated locations. Important wetland areas are found in Railroad, Snake, and Spring Valleys, in the vicinity of various ponds, springs, and lakes. Other important wetland communities are found in Meadow Valley Wash near the southern end of Patterson Valley, and along the White River in the Pahranagat Valley.

These wetland habitats are critical to numerous species of waterfowl and shore birds, which use these areas for nesting, breeding, resting, and feeding. Given the arid climate of Nevada, wetland areas are relatively scarce. Waterfowl migrating through Nevada must travel considerable distances between rest stops. Given the relative scarcity of wetland areas in Nevada and their considerable value to waterfowl and other species, resource management agencies, such as NDOW and BLM, consider wetlands to be sensitive. As a result, various state and federal wildlife management areas/wildlife refuges have been designated to provide protected habitat for wetland species. Within the CWP area, portions of Railroad, Spring, and Pahranagat Valleys have been designated as wildlife management areas by NDOW and BLM. These wildlife management areas include the Key Pittman and Railroad Valley Wildlife Management Areas. In addition, the United States Fish and Wildlife Service (USFWS) manages the Pahranagat National Wildlife Refuge.

3.3.4 Raptors

Raptor Management. Management of raptors in Nevada at the state level is the responsibility of NDOW. NDOW considers all of Nevada's raptor species to be sensitive, whether listed as endangered, threatened, or sensitive by other government agencies. The department's goals are generally to preserve, protect, and enhance populations and properly manage habitat areas and prey species (Herron 1992).

At the federal level, management of raptors and their habitats falls under the jurisdiction of BLM, U.S. Forest Service (USFS), and USFWS. BLM, which has jurisdiction over the vast majority of the CWP area, considers raptors to be sensitive. Consequently, important nesting and foraging areas are often managed to restrict or discourage uses that may adversely affect them (BLM 1991).

Discussion of species distribution and nesting sites within the CWP area has been limited to identification of general regions (e.g., Spring Valley). Specific nesting sites have not been identified because NDOW has requested that specific location data remain confidential (Turner 1992).

Migration. Many species of raptors migrate considerable distances, spending only a portion of the year in Nevada. Migration is usually driven by seasonal changes in climate and prey availability. Some species typically migrate within the same local area, moving to lower elevations during the winter months. Other species migrate hundreds or even thousands of miles to warmer southern climates in fall and north again in the spring. Timing of migration and duration of stay in Nevada is variable among raptor species.

Major migration routes have been identified in the State of Nevada. Within the CWP area, the major north-south migration route passes along ridges adjacent to the Spring, Patterson, and Virgin River Valleys. Another important north-south migration route passes along ridges adjacent to Railroad (North and South), Penoyer, Tikaboo, Three Lakes, and Las Vegas Valleys (NDOW 1985).

Raptors In the CWP Area. Of the 25 raptor species that occur within Nevada, 23 species are found in the CWP area. Four of the raptors that occur in the CWP area are listed as

threatened, endangered, or candidate species by the USFWS: bald eagle, peregrine falcon, ferruginous hawk, and northern goshawk. These species are discussed in Section 3.5.2. Other species that may be present in the project area are described below. Table 3-2 summarizes habitat and distribution data for raptors in the CWP area.

The **Golden Eagle** (*Aquila chrysaetos*) is Nevada's largest year-round resident raptor. Resident golden eagles typically nest in cliffs overlooking river valleys, sagebrush flats, pinyon-juniper forests, desert saltbush shrub, and other habitats capable of supporting a significant prey base. Approximately 430 nesting territories have been identified in Nevada, supporting an estimated 1,200 nesting pairs (NDOW 1985).

Wintering golden eagles also use suitable roosting habitat in Nevada. Wintering individuals typically use broad valleys, interspersed with agricultural lands or sagebrush and desert shrub communities supporting high jackrabbit populations. The golden eagle is a powerful and effective predator, capable of taking numerous species of mammals and birds. Typical prey species include small mammals, such as black-tailed jackrabbits, cottontail rabbits, and ground squirrels.

Threats to the golden eagle include electrocution by contact with power transmission lines, and human activities including mining, logging, illegal hunting, and other activities that degrade or destroy suitable habitat and food supplies. The golden eagle is apparently very sensitive to human disturbance. Golden eagles will abandon their nests during courtship, incubation, etc. with little disturbance (NDOW 1985).

Within the CWP area, confirmed sightings of the golden eagle have been documented throughout the Virgin River Valley from Utah to Lake Mead, the Muddy River Valley from Moapa to Lake Mead, the California Wash basin south of I-15, the entire Spring Valley, the entire Snake Valley, all of Railroad Valleys North and South, Garden, Coal, Penoyer, and Dry Lake Valleys, and a small portion of northern Pahroc Valley along the White River (BLM 1991b, NDOW 1985).

Prairie Falcon (*Falco mexicanus*)

The prairie falcon is Nevada's largest species of falcon. Much like the peregrine falcon, the prairie falcon nests in cliffs, preferring the largest cliff available near areas with suitable quantities of prey. The prairie falcon does not actually build a nest; eggs are typically laid in a scrape or depression in the dirt found on a cliff ledge or in a cave. Sometimes abandoned stick nests are used.

The prairie falcon is a year-round resident of Nevada and can be found in a wide variety of habitat types. Prairie falcons forage over a wide area, ranging as far as 15 miles from the nesting aerie. Small mammals, particularly rodents, are the preferred prey, but they will take birds and reptiles if necessary. Areas with the highest falcon densities usually feature cliffs near the mouths of narrow canyons, overlooking riparian vegetation or agricultural fields. During winter months, prairie falcons may move to valley areas and agricultural lands where the prey base is most abundant. Based upon historic data for the species, the Nevada population of prairie falcons appears to be relatively healthy and stable (NDOW 1985).

Within the CWP area, the prairie falcon may be present year-round in eastern Spring Valley, Snake Valley, northern Cave Valley, Railroad Valley South, Pahranagat Valley, Coal Valley, Coyote Springs Valley, and the Muddy River Valley.

Merlin (*Falco columbaris*)

The merlin occurs in Nevada only as a winter visitor or migrant. Merlins are generally observed during the winter months near wetlands, riparian habitat, and agricultural areas. Although the preferred prey species are primarily small birds, small mammals, reptiles, amphibians, and insects are also utilized. This species is relatively uncommon in Nevada and little information has been gathered regarding its distribution and population (NDOW 1985).

American Kestrel (*Falco sparverius*)

The American kestrel is present in Nevada as a year-round resident and as a winter visitor. The highest kestrel densities are found near agricultural areas and riparian communities, where prey is abundant. In general, northern Nevada supports larger populations of kestrels than

does the southern half of the state. When fall approaches, many kestrels will migrate south to warmer climates in southern Nevada and elsewhere.

American kestrels prefer to nest in tree cavities excavated by large woodpeckers. Older aspens and cottonwoods are typical tree species utilized for nesting. Kestrels also occupy cliffs as well as old buildings. Preferred prey of the American kestrel includes insects and rodents. In addition, the kestrel will prey upon reptiles, small birds, and bats (NDOW 1985).

Within the CWP area, confirmed sightings of the American kestrel have been documented throughout the Spring Valley; in the Garden, Penoyer, and Railroad Valley South along watersheds in Quinn Canyon and Grant Ranges; in Muddy River Valley near Moapa; in majority of the Las Vegas Valley watershed; and Three Lakes Valley South near Highway 95 (BLM 1991b, NDOW 1985).

Red-Tailed Hawk (*Buteo jamaicensis*)

The red-tailed hawk is an abundant species found in Nevada throughout the year. The red-tailed hawk is very adaptable and is found in a wide variety of habitats throughout Nevada. Nesting can occur on cliff ledges, in trees, on power poles, etc. Generally, the raptor's nesting location is driven more by prey availability than optimum site type. The red-tailed hawk will prey upon a wide variety of small mammals, preferring rabbits, mice, and ground squirrels. Other rodents, birds, and reptiles are also utilized (NDOW 1985).

Within the CWP area, confirmed sightings of the red-tailed hawk have been documented in the Snake and Schell Creek Ranges north of Highway 50 (BLM 1991b, NDOW 1985). During winter months red-tailed hawks may migrate to the valley floors in Spring and Snake Valleys. In addition, red-tailed hawks have been observed in Dry Lake Valley, and in the Moapa area along the Muddy River and Meadow Valley Wash.

Rough-Legged Hawk (*Buteo lagopus*)

The rough-legged hawk is only present in Nevada from October to April as a fall and winter visitant. During the winter months, the rough-legged hawk is often found in agricultural areas where rodents are abundant. The rough-legged hawk preys upon rodents almost exclusively:

field mice, squirrels, and rabbits are typically utilized. Sometimes carrion is utilized if rodents are scarce or unavailable (NDOW 1985).

Within the CWP area, confirmed sightings of rough-legged hawks have been documented in Spring, Patterson, Pahroc, and Railroad North Valleys. They have also been sighted in the Moapa area (BLM 1991b, NDOW 1985).

Sharp-Shinned Hawk (*Accipiter striatus*)

The sharp-shinned hawk is an elusive, year-round resident of Nevada. This species prefers densely wooded or brushy habitat areas that support abundant populations of small passerine birds. Nests are typically found in mountain mahogany, pine, fir, or aspen trees at elevations ranging from 6,500 to 9,000 feet. Sharp-shinned hawks are also found where deciduous and coniferous trees merge in riparian areas. During the winter months, sharp-shinned hawks migrate to lower elevation areas, particularly near feed lots and other agricultural areas where prey species congregate. Typical prey species include starlings, sparrows, and blackbirds. Sharp-shinned hawks will also prey on small mammals, reptiles, and insects if small birds are not abundant or available. Due to the difficulty in observing these birds in the field, NDOW has not estimated their population in Nevada (NDOW 1985).

Within the CWP area, confirmed sightings of sharp-shinned hawks have been documented in the Snake Range south from Highway 50 to Minerva (BLM 1991b, NDOW 1985). The elevation at which they are found varies depending on the time of year. In addition, this raptor may also be present in the Schell Creek Range north of Highway 50. This species may also be present in the Mt. Charleston area and may migrate to the foothills above the Las Vegas Valley during winter months.

Cooper's Hawk (*Accipiter cooperii*)

The Cooper's hawk prefers a variety of habitat types in Nevada. Deciduous trees provide favorable locations for nest building. Most Cooper's hawk nests are found in aspen and cottonwood trees. The elevational range of observed nest sites is considerable. Nests have been observed in cottonwood stands at 4,500 feet, extending up to conifers near 10,000 feet (NDOW 1985). During the winter months, Cooper's hawks are typically observed near river

bottoms, and in foothills, valleys, and agricultural areas, particularly where large populations of small birds are found (NDOW 1985). Small birds and small mammals are the preferred prey of the Cooper's hawk. NDOW has estimated that roughly 700 nesting pairs of Cooper's hawk are found in Nevada. The majority of the state's individuals are found in the northern half of the state (NDOW 1985).

Within the CWP area, confirmed sightings of the Cooper's hawk have been documented throughout the Snake Range, Schell Creek Range north of Highway 50, Fortification Range, Quinn Canyon Range, and Grant Range (BLM 1991b). During the winter months, Cooper's hawks may migrate downslope to foothills and adjacent valleys/basins (Spring, Snake, Railroad North and South, Penoyer, and Garden). In addition, confirmed sightings have been documented in the Moapa area along the Muddy River and Meadow Valley Wash (NDOW 1985).

Northern Harrier (*Circus cyaneus hudsonius*)

The northern harrier is a year-round resident of Nevada. Northern harriers are highly dependent upon wet meadow, fresh and salt water marsh, and slough habitats. Northern harriers typically nest on or near the ground. Although they are year-round residents of Nevada, some individuals in northern Nevada may migrate to lower elevation areas or to southern Nevada to avoid ice and snow. These individuals will typically return to their breeding areas in March or April. Northern harriers will prey upon a variety of animals found in wetland areas, including small birds, rodents, reptiles, amphibians, and insects. Rodents, particularly mice, make up the bulk of the northern harrier's diet (NDOW 1985).

Within the CWP area, confirmed sightings of the northern harrier have been documented in Spring Valley and Railroad Valley North (BLM 1991b). Additional sightings were documented in the Moapa area (NDOW 1985).

Osprey (*Pandion haliaetus carolinensis*)

The osprey is a large fish-eating raptor. In Nevada, the only known nesting activity occurs at Lake Tahoe. The vast majority of osprey sightings has been during migration periods. In general, ospreys nest in dead snags or in trees near water. Ospreys have also been observed

in other states, nesting on cliffs and man-made structures such as chimneys, power poles, windmills, etc. Like many other birds, ospreys migrate south to winter ranges during September and October and migrate northward to breeding areas during March and April. In Nevada, migrating ospreys can be observed along rivers and at major lakes and reservoirs. The historic use of pesticides, such as DDT, drastically reduced the population of ospreys. Populations have begun to increase in other states, however, and it is anticipated that additional breeding pairs may establish themselves in suitable nesting areas in Nevada in the future (Herron 1992).

Within the CWP area, confirmed sightings of ospreys have been documented in Clark and Lincoln Counties (NDOW 1985). In Clark County, ospreys have been observed along the Virgin River between Arizona and Lake Mead and in the Moapa area. In Lincoln County, ospreys are known to occur in Pahranagat Valley. No nesting activity has been documented in either county.

Owls

The CWP area also provides suitable habitat for nine species of owls, which are considered sensitive by NDOW and BLM. Those species include the common barn-owl (*Tyto alba*), western screech-owl (*Otus kennicottii*), flammulated owl (*Otus flammeolus*), great-horned owl (*Bubo viginianus*), burrowing owl (*Athene cunicularia*), northern pygmy-owl (*Glaucidium gnoma*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), and the northern saw-whet owl (*Aegolius acadicus*).

With the exception of the burrowing owl, owls tend to inhabit areas that provide shelter and cover, such as forests or tall thickets in marshes. Forests near riparian corridors and/or agricultural areas are preferred for hunting as they usually support adequate populations of prey species. Burrowing owls are generally found in open flatlands. Information regarding the habitat requirements and distributions of the various owl species is found in Table 3-2.

TABLE 3-2

RAPTORS POTENTIALLY PRESENT IN THE CWP AREA

Common Name	Scientific Name	General Habitat	Distribution
Bald Eagle	*Haliaeetus leucocephalus*	Trees near open water areas	MPV, SPV, SNV, PGV, NPR, RRV
Peregrine Falcon	*Falco peregrinus*	Cliffs near riparian or ag areas	SNR, PRV, CSB, MPV
Ferruginous Hawk	*Buteo regalis*	Pinyon-Juniper, desert shrub communities	SPV, SNV, PTV, GDV, PGV, RRV
Northern Goshawk	*Accipiter gentilis*	Riparian woodlands, forested areas	SPV, SNV, SCR, SNR, LVV
Golden Eagle	*Aquila chrysaetos*	Cliffs near riparian or ag areas	SPV, SNV, RRVN&S, PRV, VRV, MPV, CWB, GDV, COV, DLV, PNV
Prairie Falcon	*Falco mexicanus*	Cliffs near riparian or ag areas	SPV, SNV, CAV, COV, RRVS, CSB, MPV, LVV
Merlin	*Falco columbaris ssp.*	Wetlands, riparian, ag areas	VRV, MPV
American Kestrel	*Falco sparverius*	Riparian, ag areas	SPV, QCR, GRR, MPV, VRV, LVV, 3LV
Red-Tailed Hawk	*Buteo jamaicensis*	Wide variety of areas	SNR, SCR, SNV, SPV, MPV, VRV, DLV
Rough-Legged Hawk	*Buteo lagopus*	Winters near ag areas	SPV, PTV, PRV, RRVN, MPV, VRV
Sharp-Shinned Hawk	*Accipiter striatus*	Mtn forests, ag in winter	SNR, SCR, SPV, SNV
Cooper's Hawk	*Accipiter cooperii*	Mtn forests, river valleys, ag	SNR, SCR, QCR, GRR, FTR, and adjacent valleys
Northern Harrier	*Circus cyaneus hudsonius*	Wet meadows, marshes	SPV, RRVN, MPV, VRV
Osprey	*Pandion haliaetus*	Trees near open water, rivers	VRV, MPV
Common Barn-Owl	*Tyto alba*	Ag., riparian	3LV, MV, SPV, CWB, LVV
Western Screech-Owl	*Otus kennicottii*	Pine forests, desert canyons	SNR, TPR, PNV, 3LV, SHR, LVV, MRV, VRV
Flammulated Owl	*Otus flammeolus*	Pine forests w/ dense understory	QCR, BRR, HLR, SHR
Great Horned Owl	*Bubo viginianus*	Ag, riparian, mtns, valleys	Entire Study Area
Burrowing Owl	*Athene cunicularia*	Open flatlands	SPV, PTV, DLV, LVV
Northern Pygmy-Owl	*Glaucidium gnoma*	High elev. forests, ag in winter	FTR, SPV, SNR, WCR
Long-eared Owl	*Asio otus*	High elev. forests, mtn riparian	WPR, SSCR, FTR, SNR
Short-eared Owl	*Asio flammeus*	Meadows, wetlands, ag	Anywhere Suitable Habitat is Found

Source: Woodward-Clyde Consultants

Key to Distribution Codes

Valleys

3LV - Three Lake Valley
PTV - Patterson Valley
CSB - Coyote Springs Basin
SPV - Spring Valley
GDV - Garden Valley
MPV - Moapa Valley
PRV - Pahroc Valley
COV - Coal Valley
SNV - Snake Valley
DLV - Dry Lake Valley
VRV - Virgin River Valley
PNV - Penoyer Valley
CAV - Cave Valley
RRV - Railroad Valley
CWB - California Wash Basin
TBV - Tikaboo Valley
LVV - Las Vegas Valley
PGV - Pahranagat Valley
RRVN- Railroad Valley North
RRVS- Railroad Valley South

Mountain Ranges

BRR - Bristol Range
FTR - Fortification Range
GRR - Grant Range
HLR - Highland Range
NPR - Northern Pahroc Range
QCR - Quinn Canyon Range
SCR - Schell Creek Range
SNR - Snake Range
WCR - Wilson Creek Range
WPR - White Pine Range
SSCR- South Schell Creek Range

3.3.5 Wild Horses and Burros

Legal protection and management of wild horses and burros began in 1971 with the passage of the Wild and Free-Roaming Horse and Burro Act. Management responsibility for wild horses and burros now falls under the jurisdiction of BLM and USFS. In general, wild horses and burros are protected from harmful activities such as hunting/shooting and harassment.

There are four BLM Districts within the CWP area, each of which has populations of wild horses and/or burros under their management. From a planning and management standpoint, BLM has designated Herd Management Areas (HMAs) for horse and burro populations. Population counts are generally categorized by HMA. Wild horse and burro distribution and population sizes within the CWP area are described below.

Wild Horses

Wild horses are grazing animals, utilizing grasses such as Indian ricegrass, bottlebrush, squirreltail, bluegrass, galleta, and needle grass. If grasses are scarce, horses may browse on plants such as teabush, rabbitbrush, saltbush, bitterbrush, willows, and cottonwoods. Horses typically graze away from water sources as a means of avoiding predators, such as mountain lions, which typically hunt near water sources. Given their mobility and speed, wild horses can roam as far as 15 miles from water sources to graze and/or foal.

During winter months, wild horses move to warmer areas, such as south-facing slopes, or other areas exposed to sunlight. Summer is the critical season for the majority of Nevada's wild horses. Extreme heat and scarce water during summer months can jeopardize the survival of horse herds. Competition for water among wildlife, livestock and wild horses is intense in many portions of the CWP area. Heavy use of riparian areas and springs by all of these animals has severely degraded water quality and has severely impacted important riparian communities. In some portions of the CWP area, water is so scarce that wild horses will use ponds and troughs developed by ranchers at the same time as livestock. It is not uncommon to see wild horses following herds of cattle from one water trough to another over the course of the summer (Kleinheitz 1991).

Some herds of wild horses remain on ridge tops as much as possible, whereas others will remain in the valleys. During winter and spring, when water is more abundant, horses may spread out and utilize vast portions of a given valley or range. As summer approaches and water becomes more scarce, horses tend to remain closer to available surface water sources. For wild horses, foaling occurs from April through June in areas with good forage. Wild horses rarely foal near water sources.

Within the Stateline Resource Area portion of the CWP area, numerous wild horse herds are present throughout the Spring Mountains to the west of Las Vegas. Based upon recent census and animal removal data, approximately 348 wild horses are estimated to be present in herds in the Spring Mountains and adjacent foothills (Stager 1992). In the Caliente Resource Area to the north, wild horses are found along the east side of Delamar Valley and in the Delamar Mountains (approximately 120) and in the eastern Dry Lake Valley along the Highland and Chief Ranges (from 50 to 70) (Shepherd 1992).

There are no managed wild horse herds within the Tonopah or Egan Resource Area portions of the CWP area.

Within the Schell Resource Area portion of the CWP area, wild horses are found in the Lake, Patterson, and southern Spring Valleys (Wilson Creek HMA); in Dry Lake Valley and Muleshoe Valley (Dry Lake HMA); and in Pahroc Valley and Coal Valley (Seaman HMA). Populations within the Schell Resource Area portion of the CWP area are approximately 291 in the Wilson Creek HMA, 276 in the Dry Lake HMA, and 244 in the Seaman HMA (Kahle 1992).

Wild Burros

Wild burros are relatively uncommon in the CWP area. Known burro herds are found only in the Stateline Resource Area in the Spring Mountains. The Spring Mountain HMA is located south of CWP area. Burros are not expected to be in the project area, other than occasional wandering near the HMA boundary.

Wild burros are generally durable animals that can withstand high temperatures and scarcity of forage. This durability is evident in the wide variety of plant species utilized by burros.

The preferred food source of wild burros in the CWP vicinity consists of white bursage. Other species utilized include galleta grass, Mormon tea, winterfat, and other shrubs.

3.3.6 Other Wildlife

Numerous species of reptiles, birds, and small- to medium-sized mammals inhabit the various community types found in the project area. These community types include pinyon-juniper, mountain and desert shrub (including creosote bush, blackbrush, and sagebrush communities), and wetland/riparian areas. The following section is a generalized discussion of the common types of wildlife that may be found in each of these vegetation community types. It should be noted that not all of the wildlife described for a given community type will necessarily be found in all portions of the relatively large CWP area. Wildlife species such as big game, upland game, and raptors have been described in previous sections.

Pinyon-Juniper Community

The pinyon-juniper community generally occurs at elevations from 5,000 to 7,000 feet throughout the CWP area. Reptiles and amphibians are not well represented in this community; however, common lizards include the western fence lizard (*Sceloperous occidentalis*) and sagebrush lizard (*Sceloperous graciosus*) (Bradley and Deacon 1967). The side-blotched lizard (*Uta stansburiana*), and the western whiptail lizard (*Cnemidophorus tigris)* may also be found in this community (BLM 1989). Snakes, while not abundant, include the gopher snake (*Pituophis* sp.), and the western rattlesnake (*Crotalus viridis)*. Amphibians that may be found in certain pinyon-juniper areas include Great Basin spadefoot toad (*Scaphiopus intermontanus*) and the western toad (*Bufo boreas*) (BLM 1989).

A number of species of birds inhabit the pinyon-juniper community including several permanent residents. Some of the more important species include the pinyon jay (*Gymnorhius cyanocephalus*), rock wren (*Salpinctes obsoletus*), mountain bluebird (*Sialia currucoides)*, and common bushtit (*Psaltriparus minimus*)(Bradley and Deacon 1967). Summer residents of the pinyon-juniper community may include turkey vultures (*Cathartes aura*), common nighthawk (*Chordeiles minor*), rufous-sided towhee (*Pipilo erthyrophtalmus*), white-throated swift (*Aeronautes saxatalis*), scrub jay (*Aphelocoma coerulescens*), and chipping sparrow (*Spizella passerina*) (Bradley and Deacon 1967).

Numerous mammals occur in the pinyon-juniper community. Common rodents characteristic of this community include the desert woodrat (*Neotoma lepida*), pinyon mouse (*Peromyscus truii*), deer mouse (*P. maniculatus*), and Great Basin pocket mouse (*Perognathus parvus)* (Bradley and Deacon 1967; BLM 1989; Brown 1982). Certain bats, such as the big brown bat (*Eptesicus fuscus*) occur in this community. The coyote (*Canis latrans*), bobcat (*Lynx rufus*), and striped skunk (*Mephitis mephitis*) are common carnivores that inhabit the pinyon-juniper community. Badgers (*Taxidea taxus*) and mountain lions (*Felis concolor*) may also be found in this community.

Great Basin Mountain Shrub Community

This community is described in the Montane Zone in Section 3.2.2. It is generally comprised of higher elevation shrub species including mountain mahogany, snowberry, bitterbrush, cliffrose, and Gambel oak. The mountain shrub community may include reptiles such as the sagebrush lizard and the western fence lizard. Birds common to this community include the rufous-sided towhee, chipping sparrow, common flicker (*Colaptes auratus*), bushtit, green-tailed towhee (*Pipilo chlorurus)*, golden eagle, and Townsend's solitaire (BLM 1982, 1983). The list of mammals that inhabit this community includes Nutall's cottontail, deer mouse, coyote, bobcat, and mountain lion. Snow-free hillsides in this community provide winter feeding areas for mule deer and numerous bird species (Brown 1982).

Many of the species found in the Great Basin mountain shrub community are also common to the desert shrub community discussed below.

Great Basin Desert Shrub Community

This community includes several of the major vegetation zones described in Section 3.2.2 including saltbush, greasewood, winterfat, and sagebrush. Reptiles in this community commonly include the sagebrush lizard, collared lizard (*Crotophytus collaris*), northern desert horned lizard (*Phyrynosoma platyrhinos*), western fence lizard, and the western whiptail lizard. Snakes in this community may include the Great Basin gopher snake, western patch-nosed snake (*Salvadora hexalepis*), and the striped whipsnake (*Masticophis taeniatus).*

Bird species characteristic of sagebrush communities include the sage thrasher (*Oreoscoptes montanus)*, sage sparrow (*Amphispiza billi)*, and the sage grouse and chukar partridge, discussed in previous sections. Other common birds include the black-throated sparrow (*Amphispiza bilineata*), house finch (*Carpodacus mexicanus*), cliff swallow (*Petrchelidon pyrrhonota*), brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), and common flicker.

Rodents in this community may include Ord's kangaroo rat (*Dipodomys ordii*), the Great Basin pocket mouse, harvest mouse (*Reithrodontomys megalotus*), and the mountain vole (*Mictrotus montanus*) (Brown 1982; BLM 1989). Common bats include the little brown myotis (*Myotis lucifugus*), the big brown bat, and the Mexican free-tailed bat (*Tadarida brasiliensis*). The desert cottontail and the black-tailed jackrabbit are two common rabbits found within this community type. Other mammals include coyote, bobcat, and kit fox (Brown 1982).

Mojave and Southern Desert Shrub

Two widespread habitat types occur within the desert shrub: the creosote bush community and the blackbrush community described in Section 3.2.2. There is a great deal of overlap in wildlife species types within these vegetative communities.

Reptiles are well represented in both communities although more diversity occurs within the creosote bush community. Reptiles in these areas can generally be divided into groups: the diurnal lizards and the more nocturnal snakes. Here, common lizards include the zebra-tailed lizard, side-blotched lizard, western whiptailed lizard, leopard lizard (*Gambelia wislizenii*) and the collared lizard. Snakes are very common and include the red coachwhip (*Masticophis flagellum*), Great Basin gopher snake, speckled rattlesnake (*Crotalus mitchelli)*, sidewinder (*C. cerastes*), and the western rattlesnake (*C. viridis)* (Bradley and Deacon 1967; Brown 1982).

The more important resident bird species in the creosote bush community include Gambel's quail, horned lark (*Eremophila alpestris*), cactus wren (*Campylorhynchus brunneicapillus*), rock wren, and the black-throated sparrow. Important permanent residents of the blackbrush community include the ladder-backed woodpecker, raven, cactus wren, and rock wren. While

resident populations are low for both community types, large populations of birds move through these areas during spring and fall migrations (Bradley and Deacon 1967).

Numerous types of mammals are common to both community types. Common rodents include the cactus mouse (*Peromyscus eremicus*), deer mouse, Merriam's kangaroo rat (*Dipodomys merriamii*), and the little pocket mouse (*Perognathus longimenbris*). Woodrats are widespread but not numerous. Common bats include the California myotis (*Myotis californicus*) and the pallid bat (*Antrozous pallidus*). Both the desert jackrabbit and desert cottontail are common.

Carnivores include the coyote, bobcat, kit fox, and badger (BLM 1982, 1983). Large herbivores are rarely seen in the creosote bush community, although bighorn sheep use the higher elevations of the blackbrush community.

Wetland/Riparian

Wetlands are represented by springs and marshes and various riparian habitats throughout the project area as described in Section 3.2.2. This type of habitat is particularly important to wildlife species in the arid climate of Nevada. Wetland and riparian areas are generally characterized by a combination of high species density, high species diversity, and high productivity. They supply important habitat and water sources for a number of wildlife species that are associated closely with wetlands. Interactions also occur between the wetland areas and the surrounding habitats through exchanges of nutrients, energy, and species. Many of the wildlife species found in the wetland areas are common to the surrounding upland habitat and are attracted to the springs, marshes, and riparian areas for water, generally more abundant food sources, and in some cases, the additional cover the vegetation provides. Numerous non-resident bird species also use these areas during spring and fall migrations. These include various types of shorebirds and waterfowl such as the American bittern (*Botaurus lentiginosus*), killdeer (*Charadrius vociferus*), and long-billed curlew (*Numenius americanus*) (Brown 1982; BLM 1983, 1989).

Small mammals found near springs and marshes are generally characteristic of the surrounding communities. Bats, such as the California myotis, use these areas at dusk and after dark for feeding and watering. In southern areas, the deer mouse, which is uncommon

in the creosote bush community, is abundant in many of the desert marshes. Harvest mice are also abundant.

The desert riparian community occurs along washes from the creosote bush community to approximately the middle elevations of the blackbrush community (Bradley and Deacon 1967). As with the marsh areas most of the vertebrate fauna found in the desert riparian is characteristic of the surrounding community. Some species of reptiles, such as the zebra-tailed and leopard lizard, may be more common along these washes. The sidewinder is also common here.

Birds found in these areas are also those of the lower shrub communities although they may be found in greater abundances in the wetland/riparian areas, utilizing the more abundant cover and prey species.

Mammals of the desert riparian include those from surrounding areas. The deer mouse, canyon mouse, and desert woodrats are common to this community. Carnivores such as the coyote, bobcat, and foxes may obtain much of their food from these areas as they range freely throughout the community.

3.4 FISH

This section describes game fish populations that occur in the CWP area. Threatened, endangered, or sensitive fish species are described in Section 3.5.3. Surface water bodies are quite limited in the project area, therefore limiting the game fish populations. Three general types of surface water bodies found in the CWP area include:

- Pools and ponds associated with springs
- Small ponds or reservoirs
- Small perennial streams

Game fish have gained access to some of the springs that contained sensitive species and almost without exception the sensitive species have been adversely affected.

The small ponds or reservoirs that have been constructed to capture surface runoff on occasion provide suitable habitat for introduced species, including different species of trout as well as several warm water species including bass and catfish. Limited catfish farming is occurring on the Duckwater Indian Reservation and stocking of catfish has occurred in small water bodies in the general vicinity.

Numerous small perennial streams originate on the mountain ranges within the CWP area, but these streams are intermittent by the time they reach the valley floor. However, these streams support viable populations of trout in the reaches that have perennial flow.

Based on information obtained from NDOW, it appears that ponds and/or reservoirs within the CWP area that contain game fish are limited to Nye and White Pine counties. Ponds or reservoirs known to contain game fish and the species present are listed below (NDOW 1987).

Reservoir/Pond	Game Fish Species
Nye County	
Upper Pahranagat Lake	Largemouth bass (*Micropterus salmoides*)

Reservoir/Pond	Game Fish Species
White Pine County	
Baker Lake	Rainbow trout (*Oncorhynchus mykiss*)
Baker Pond	Rainbow trout
Cave Lake	Rainbow trout; Brown trout (*Salmo trutta*)
Johnson Lake	Brook trout (*Salvelinus fontinalis*)
Silver Creek Reservoir	Rainbow trout; brown trout

Streams that are known to contain game fish populations are located in three of the four counties within the CWP area. Most of these streams originate in the Snake Range with those on the west side of the range flowing toward Spring Valley and those on the east side of the range flowing toward Snake Valley. The streams within each county and the game fish species they contain are listed in Table 3-3.

As shown, game fish populations in the CWP area are quite limited and those that do occur are limited in size. Almost all of the game fish populations are located on the mountain ranges and do not occur in the valleys where precipitation is less and temperatures and evaporation are higher.

TABLE 3-3
STREAMS WITHIN CWP AREA
THAT CONTAIN GAME FISH POPULATIONS

County/Stream	Game Fish Species
Clark County	
Cold Creek	Rainbow trout
Nye County	
Cherry Creek	Rainbow trout
Cottonwood Creek	Brook trout
Deep Creek	Rainbow trout
Hooper Canyon Creek	Brook trout; rainbow trout
Pine Creek	Brook trout
Troy Canyon Creek	Brook trout
White Pine County	
Baker Creek	Brook trout; cutthroat trout (*Oncorhynchus clarki*); rainbow trout
Baker Creek, S.F.	Rainbow trout
Bassett Creek	Cutthroat trout; rainbow trout
Bastian Creek	Rainbow trout
Big Wash and South Fork	Brook trout; cutthroat trout; rainbow trout
Cleve Creek	Brown trout; rainbow trout
Cleve Creek, N.F.	Rainbow trout
Cleve Creek, S.F.	Rainbow trout
Deep Canyon Creek	Cutthroat trout
Eightmile Creek	Rainbow trout
Hendrys Creek	Cutthroat trout
Kalamazoo Creek	Brown trout; brook trout; rainbow trout
Lake Creek	Brown trout
Lehman Creek	Brown trout; cutthroat trout; rainbow trout
Lexington Creek	Rainbow trout
Meadow Creek	Brook trout; cutthroat trout
Muncy Creek	Brook trout; cutthroat trout; rainbow trout
Negro Creek, Big	Brown trout; brook trout; cutthroat trout; rainbow trout
Negro Creek, Little	Rainbow trout
Odgers Creek	Cutthroat trout; rainbow trout
Piermont Creek	Brown trout; brook trout; cutthroat trout;rainbow trout
Pine Creek	Cutthroat trout
Ridge Creek	Cutthroat trout
Seigel Creek	Rainbow trout
Shingle Creek	Brown trout; rainbow trout
Silver Creek	Brown trout; cutthroat trout; rainbow trout
Silver Creek, S.F.	Rainbow trout
Smith Creek	Rainbow trout
Snake Creek	Brown trout; brook trout; rainbow trout
Snake Creek, N. F.	Brook trout; cutthroat trout; rainbow trout
Snake Creek, S. F.	Rainbow trout
Spring Creek	Rainbow trout
Strawberry Creek	Brook trout; cutthroat trout; rainbow trout
Taft Creek	Rainbow trout
Vipont Creek	Brook trout
Willard Creek	Cutthroat trout
Williams Creek	Rainbow trout

Source: NDOW 1987

3.5 THREATENED, ENDANGERED AND CANDIDATE SPECIES

The USFWS and NDOW provided reports and maps concerning endangered, threatened, candidate, and state protected species of southern and eastern Nevada. The Nevada Natural Heritage Program (NNHP) also supplied a compilation of federal and state listings for these species.

According to the Endangered Species Act of 1973, the term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range. A "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The determination of whether any species is endangered or threatened is based on any of the following factors: 1) the present or threatened destruction, modification, or curtailment of its habitat or range, 2) overutilization for commercial, recreational, scientific, or educational purposes, 3) disease or predation, 4) the inadequacy of existing regulatory mechanisms, or 5) other natural or manmade factors affecting its continued existence. Endangered and threatened species that are federally listed are protected under the Endangered Species Act.

A "candidate species" is a species that is currently being studied by the USFWS for biological vulnerability and threats. A candidate species could possibly be federally listed as threatened or endangered in the near future. Category 1 candidate species are species for which existing information supports listing. Category 2 candidate species are species for which existing information is not sufficient to determine whether the species are truly rare or just poorly known. Category 3 candidate species are species no longer considered a candidate for federal listing because they are more abundant or widespread than originally believed. For a more detailed explanation of definitions, procedures, and enforcements, the reader is referred to the Endangered Species Act of 1973.

The State of Nevada has statutes governing the protection of imperiled species that parallel the Federal Endangered Species Act. These State laws include NRS 501.331, NRS 501.337, NRS 501.375, NRS 501.386, and NRS 527. The designation of endangered and threatened species by the state is essentially equivalent to federal listings. A "State protected species" is similar to the federal candidate species designation although some differences in the current listings do exist.

3.5.1 Sensitive Plant Species

Sensitive plant species discussed in this section include those that are federally listed as threatened or endangered, species that are candidates for federal protection, state listed species, state protected species, and those species considered sensitive by the USFS and the Northern Nevada Native Plant Society (NNNPS). Table 3-4 shows sensitive plant species potentially present in the CWP area. Currently, there are no known federally endangered plants in the project area. The following provides a summary of the categories of species in Table 3-4:

- One federally listed threatened species (USFWS 1991), Ute Lady's tresses, has the potential to occur in the project area.
- Three State of Nevada critically endangered species (Morefield and Knight 1991) occur in the project area.
- Thirty-four federal Category 2 candidate species (USFWS 1990; Morefield and Knight 1991) potentially occur in the CWP area. No Category 1 species are located in the project area.
- Other plant species recommended as endangered, threatened, or watch list by the NNNPS (Morefield and Knight 1991) are shown in Table 3-4. Nearly all of the species in Table 3-4 are considered sensitive by NNNPS. Of those three species not listed as sensitive, two are not known to occur in Nevada.
- Species considered as sensitive by the USFS Intermountain Region (Spahr et al. 1991) are also identified as appropriate.

Species included in Table 3-4 are either known to occur within the project area, or have a reasonable expectation of occurrence based on habitat requirements and known range. The latter were included because the distribution of many sensitive species is not well documented.

TABLE 3-4

SENSITIVE PLANT SPECIES POTENTIALLY PRESENT WITHIN THE CWP AREA[1]

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Astragalus amphioxys var. *musimonum* *(Astragalus musimonum)* (Sheep Mt. milk-vetch)	C2/-/W/-	Pea family, perennial. Plant is low, tufted, short-stemmed. Densely silvery pubescent. Leaves 4-7 cm long with 11-17 small leaflets. Short calyx lobes, pods 1.5 to 2 cm with central ridge. Pink-purple flowers, April-June.	Dry hillside, limestone bajadas and gentle slopes, and along dirt roads with sagebrush, blackbrush, yucca, and pinyon-juniper. El. 4,400 - 6,300 ft.	Within the project area, occurs in the Sheep Range and Las Vegas Range, within the basins of Coyote Springs, Tikaboo, and Hidden Valleys; also occurs in AZ. Low potential for occurrence at project facilities, based on habitat and known distribution.
Antennaria soliceps (Charleston Mtn. Pussytoes)	C2/-/T/-	Sunflower family, perennial. Forms mats to 45 cm wide. Basal leaves are spatulate - obovate, 6-9 mm long. Large solitary flower heads on each flowering stalk. Outermost bracts have conspicuous blackish-brown spot. White pappus. Flowers June-August.	High elevation ridges and meadows, open screen slopes and cliffs with bristlecone pine, Ribes. El. 8,600 - 11,500 ft.	Known only from a few localities in the Spring Mountains, and also one at the southern end of Three Lakes Valley South, in the project area. No potential for occurrence.
Arctomecon californica (California bear poppy, golden bear poppy)	C2/CE/T/-	Poppy family, perennial. Flower stalks 20-40 cm. Oblanceolate leaves 2-3 cm long, covered with 1 cm long white hairs. Yellow flowers, April-May.	Gravelly, barren, desert flats, hummocks and slopes on heavy, gypsum soils with Larrea, Ambrosia, and Enceliopsis El. 1,300 - 2,700 ft.	Restricted to Clark County, Nevada, from the Las Vegas Valley east to the Overton Arm of Lake Mead and in NW Arizona. The potential for occurrence is moderate in the Las Vegas Valley. The potential for occurrence is low to none in other basins.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Arctomecon merrriamii (White bear poppy/ Merriam bear poppy)	C2/-/W/-	Poppy family, perennial. Clump of cuneate-oblanceolate leaves with long spreading hairs. Single flower per flowering stem. White flowers, April-May.	Shallow, gravelly soil, limestone outcrops, canyon washes with creosote bush, bursage blackbrush, saltbush. El. 2,000 - 4,800 ft.	Restricted to western Clark, southeast Nye, and extreme southwest Lincoln Counties. Occurs in the study area in Three Lakes Valley South, and northwest Las Vegas Valley mainly on the east side of Desert Range and the west side of Sheep Range. There is a moderate potential for occurrence.
Arenaria stenomeres (Meadow valley sandwort)	3C/-/W/S	Pink family, perennial. Densely clumped, glabrous, 1-2 dm tall. Narrow, linear leaves, 2-2.5 cm long. Linear petals and acute sepals. White flowers, May-June.	Desert, barren limestone cliffs and steep rocky slopes with Lepidium, Sphaeralcea. El. 3,000 - 3,800 ft.	Restricted to the Arrow Canyon and Las Vegas and Meadow Valley Mountains in Clark and Lincoln Counties. There is a low potential for occurrence along the pipeline routes, based on the species being restricted to steep terrain.
Asclepias eastwoodiana (Eastwood's milkweed)	C2/-/W/-	Milkweed family, perennial. Flexuous stems 1-2 dm long, basal leaves ovate to circular, 1-3 cm long. Stem leaves 2.5-4.5 cm long. Purple flowers, May-June.	Low alkaline clay hills or shallow gravelly drainages with saltbush and greasewood El. 4,500 - 7,400 ft.	Widely scattered in Lander, Lincoln, Nye, and Esmeralda Counties. Moderate potential for occurrence in suitable habitat in Railroad and Dry Lake Valleys, where it has been recorded and a low to moderate population in Penoyer, Coal, and Garden Valleys.
Astragalus ackermanii (Ackerman's milkvetch)	3C/-/W/-	Pea family, perennial. Tufted herb with woody base. Leaves with 4-7 remote pairs of leaflets. Flowers reddish-purple. Seed pod is on a stipe. Flowers April-May.	Canyons and washes, and ledges and crevices of steep limestone cliffs. El. 5,200 - 6,200 ft.	Restricted to the northern and southern Sheep and central Pintwater Ranges in the Desert National Wildlife Range, all within the project area. Nearest known location is in northern Las Vegas Valley; and potential for occurrence is low based on habitat.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Astragalus calycosus var. *monophyllidius* (One leaflet torrey milkvetch)	3C/-/W/-	Pea family, perennial. Densely caespitose with 2-6 cm long leaves. Single leaflet (rarely 3). White to purple flowers, May-June.	Open gravelly limestone hillsides with pinyon juniper and sagebrush. El. 5,200 - 7,000 ft.	Widely distributed in Eureka, Nye, Lincoln and Clark Counties, NV, and also in Sevier County Utah. Recorded only in Railroad Valley and Coyote Springs Valley within the project area. Potential for occurrence is moderate, based on habitat requirements and overall range.
Astragalus eurylobus (= A. tephrodes var. eurylobus) (Needle Mountain Milkvetch, Peck Station milkvetch)	C2/-/W/-	Pea family, perennial. Loosely tufted herb with short stems and short internodes, 17-27 leaflets on longer leaves, pink-purple petals with pale eye-spot on banner. Flowers April-June.	Washes and low alkaline, sandy or clay hills in shadscale desert. El. 4,600 - 5,000 ft.	Known from two areas in eastern Nevada, north of Duckwater, northeast Nye County and in eastern Lincoln County in the Needle Mountains. Also present near Freedonia, AZ. Potential for occurrence is low to moderate in mid-elevation valleys.
Astragalus geyeri var. *triquetrus* (= *A. triquetrus*) (Geyer milkvetch, three corner milkvetch)	C2/CE/T/-	Pea family, annual. Stems 4-8 inches long. Leaves with fine pubescence, 3-5 cm long. Average of 9 elliptical leaflets. Pods triangular in cross-section. White flowers, April-May.	Sandy sites on flats, dunes and washes, with Krameria and Creosote. El. 1,500 - 2,500 ft.	Restricted to eastern Clark County including California Wash, and Garnet Valleys. Low to moderate potential for occurrence in these valleys.
Astragalus gilmanii (Gilman milkvetch)	-/-/W/-	Pea family, winter annual or biennial herb. Plants 3-15 cm tall, grey-hairy with 1 to several stems flowering on upper half. Flowers small, purple. Pods thin-papery, green with purple mottles. Flowers May-July.	Gravelly flats, brushy hillsides and canyon slopes, with Lycium, Ephedra, Yucca, Atriplex, Artemisia and pinyon-juniper. El. 4,500 - 8,000 ft.	Occurs primarily in Panamint Range, CA; also in Grapevine Mountains, Nye County, and Groom Range, Lincoln County. The last is in Tikaboo Valley. Low potential for occurrence.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Astragalus mohavensis var. *hemigyrus* (Half-ring milkvetch)	C2/-/E/-	Pea family, perennial. Bushy, silvery pubescent with leaves 5-10 cm long. 7-11 leaflets. Pods strongly curved. Purple flowers, April-June.	Limestone ledges, granite slopes and gravelly hillsides with creosote and juniper. El. 4,065 - 6,070 ft.	Reported at scattered locations in Clark County Nevada, and in CA. Occurs in Three Lakes Valley South and Las Vegas Valley in project area. Low potential for occurrence based on habitat.
Astragalus oophorus var. *lonchocalyx* (Long calyx milk-vetch)	C2/-/W/-	Pea family, perennial. Low and slender plant, stems to 1 dm long. Small leaflets to 1 cm long, ovate to elliptic in shape. Long, narrow purplish flower, May-June.	Dry gravelly hillsides and stony flats, limestone with pinyon-juniper and sagebrush. El. 6,000 - 8,600 ft.	Occurs in several mountain ranges in eastern Lincoln County, NV, and in adjacent parts of UT. Within project area, there are two records from Patterson Valley. Moderate potential for occurrence in suitable habitat in Patterson, Lake and southern Spring Valleys.
Astragalus uncialis (Currant milk-vetch)	C2/-/W/S	Pea family, perennial. Small plant with silvery-pubescent leaves, 1.5 - 7.5 cm long. Flower stalks are leafless, bear 1-3 large, purple flowers, May-June.	Dry knolls and slopes, saline sand or gravel derived from limestone with saltbush, greasewood, and sagebrush. El. 5,300 - 6,050 ft.	Occurs on upper valley slopes in northern and central Railroad Valley, also in Millard County, Utah. There is a high potential for occurrence at project facilities in Railroad Valley, and low to moderate potential in other northern valleys.
Brickellia knappiana (Knapp brickell-bush)	3C/-/W/-	Sunflower family. Slender willow-like shrub 1-2 m tall. Stems white, branched. Leaves lanceolate to narrowly ovate, 2.5-3.5 cm long. Small flower heads with 5-7 yellow disk flowers. Flowers September-October.	Streambanks, rocky slopes, and canyon walls, with shadscale. El. 2,500 - 4,000 ft.	Known in Nevada only from McCullough Mountains and from west side of Sheep Range, Clark County. Also occurs in CA. In project area, it occurs in Three Lakes South Valley. Low potential for occurrence at project facilities.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Calochortus striatus (Alkali mariposa, striped mariposa)	C2/-/W/-	Lily family, perennial. Has 2-3 slender, erect branches rising about 3 dm from a small underground corm. Leaves 4-25 cm wide, and as long as stems. 2-8 flowers in an umbel, light purple petals with darker purple veins. Gland on petal triangular, densely tufted with white hairs. Flowers April-June.	Alkaline meadows and spring seeps with saltgrass, yerba mansa (Anemopsis) and cleomella. El. 980 - 4,500 ft.	Known from Ash Meadows (Nye County), Las Vegas Valley, and from the Mojave Desert in California. Low potential for occurrence based on rare habitat.
Chrysothamnus eremobius (Remote rabbitbrush pintwater rabbit brush)	C2/-/W/-	Sunflower family. Much branched, low shrub (2-3 dm high). Leaves 4-8 cm long, nearly glabrous, oblanceolate. Yellow flowers, August-September.	Rugged, limestone cliffs with Cercocarpus, Ephedra. El. 4,600 - 5,600 ft.	Known from the Desert National Wildlife Range, in the Sheep and Pintwater Ranges. There is no potential for occurrence at or near project facilities due to the nature of habitat requirements.
Cordylanthus tecopensis (Tecopa birds-beak)	C2/-/T/-	Figwort family, annual herb. Stems 1-4 dm tall, branched throughout. Leaves glaucous, finely hairy, not toothed, up to 15 mm long. Flowers in loose spikes, corolla 13-18 mm long, pale lavender. Flowers July-October.	Moist saline or alkaline meadows, salt-encrusted clay soils, with saltgrass, saltbush, rushes, spike-rush. El. 1,400 - 5,000 ft.	Known from southern Nye and Esmeralda Counties, also California and Oregon. Although nearest known location is about 50 miles outside the project area, the species may occur in suitable habitat within the project area, based on its widely disjunct populations.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Cryptantha compacta (Mound cryptanth)	C2/-/-/S	Borage family, perennial. Forms dense mats 0.3 to 1.0 dm tall, with numerous stems 1-4 cm long which are covered with stiff hairs and often with blackish skin. Leaves are 0.5-1.5 cm long with bristles on lower surface. Sepals are 2.0 - 2.5 cm long, covered with dense hairs. Petals are white, with the tube equally the sepals.	Shallow, stony loam, rocky slopes and summits of desert ranges in salt desert and mixed desert communities. El. 6,230 - 7,300 ft.	Occurs in western Utah, in southwestern Millard, Beaver, and Tooele Counties. In project area, occurs in southern Snake Valley in Utah. Low potential for occurrence near project facilities in southern Snake Valley.
Cryptantha insolita (Las Vegas cryptantha)	C2/CE/PE/-	Borage family, biennial or short-lived perennial herb. Up to 4 dm tall, with one to several stems. Plant hairy and bristly. Elongated open inflorescence. Flowers white. Nutlets have distinct keel and tubercles. Flowers April-June.	White alkaline flats and rolling hillside, maybe with gypsum outcrops. El. 1,000 - 2,000 ft.	Known only from vicinity of Las Vegas and has not been seen in recent years. Possibly extinct. Low potential for occurrence near project facilities.
Cryptantha tumulosa (New York Mts. cat's eye, Mohave cryptantha)	3C/-/W/S	Borage family, perennial. 3 dm tall, one or several coarsely pubescent and bristly stems, from a woody taproot. Narrow inflorescence with white flowers. Flowers April-June.	Gravelly hillsides and washes on limestone, gravelly clay soils with sagebrush, mountain mahogany, and juniper. El. 4,000 - 7,100 ft.	Occurs in Clark County, NV, from the Desert National Wildlife Range to the Virgin Mountains, McCullough Mountains, and Spring Mountains. Also in CA. In project area, known from Sheep Mountains and Las Vegas Range. Very low to moderate potential for occurrence near project facilities in southern portion of project area.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Cryptantha welshii (Welsh's cat's eye, White River cryptantha)	C2/-/W/-	Borage family, biennial or short-lived perennial, from a taproot. One to several stems, 1-3 dm. tall. Stems have soft bristles and shorter hairs, leaves have pustulate-based bristles on lower side. Flowers white, with yellow centers, May-June.	Mounds on white tuffaceous deposits with rabbitbrush, sagebrush and other species. El. 4,900 - 6,500 ft.	Known from Garden, White River, and Jakes Valleys, Nye and White Pine Counties, NV. Moderate potential for occurrence in suitable habitat near proposed project facilities in Pahroc, Coal, and Garden Valleys.
Cymopterus basalticus (Intermountain Wavewing)	3C/-/W/-	Carrot family, perennial. Little or no stem from a thick tap root. Leaves 5-7 cm long and three to five lobed. Flowering stem glabrous, 6-12 cm high. Yellow or purplish flowers, May-June.	Bare basaltic rocks, sterile clay hills with pinyon-juniper and sagebrush. El. 5,800 - 7,000 ft.	Occurs only near Sacramento Pass, Snake Range, White Pine County, NV. Occurs on both sides of pass, in Spring and Snake Valleys. Moderate to high potential for occurrence at well sites and pipelines on upper valley slopes in these areas.
Draba sphaeroides var. *cusickii* (Draba cusickii) (Cusick's draba)	3C/-/W/-	Inflorescence and upper stems pubescent, stem leaf present. Leaves uniformly hirsute with short-stalked, 4-rayed hairs. Leaves 6-10 mm long. Flowers yellow, June-August.	Rocky limestone cliffs, limestone outcrops with pinyon-juniper. El. 8,000 - 11,000 ft.	Occurs in White Pine and Nye Counties in NV, also in OR and ID. In project area, recorded at several locations in mountains on east side of Railroad Valley, in Grant and White Pine Ranges. A very low potential for occurrence based on habitat requirements.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Epilobium nevadense (Nevada willowherb)	C2/-/W/S	Evening primrose family. Perennial with persistent woody branches and stout taproot. Stems upright, leafy, 15-40 cm tall. Leaves are narrow and folded. Few to several flowers in terminal clusters. Flowers pink-purple, late July-September.	Limestone talus slopes, cliffs and rock outcrops, with ponderosa pine, pinyon-juniper, or mountain brush. El. 7,400 - 9,200 ft.	Widely scattered in Clark and Lincoln Counties, NV, and in Millard and Washington Counties, UT. There are no recorded occurrences within the project area, but the species may potentially occur in small isolated disjunct populations in suitable habitat. Low potential for occurrence.
Erigeron cavernensis (Schell Mountain erigeron, Snake Mountain erigeron)	-/-/-/S	Sunflower family, long-lived perennial herb. Has persistent ashy to black leaf bases at the base of the rootstock. Stems slender, 1.7-6.0 cm tall, with leaves reduced in size upwards. Leaves copiously hairy with multicellular hairs. Flower heads solitary, 3.5-4.5 cm high. 16-23 ray flowers are white or purplish. Flowers May-July.	Limestone cliffs and rubble in limber pine and bristlecone pine communities. El. 10,000 - 11,000 ft.	Only known to occur at Cave Mountain in the Schell Creek Range (west side of Spring Valley) and Currant Mountain in White Pine Range (northeast of Railroad Valley), in White Pine County, NV. Due to its high elevation habitat, there is a very low potential for occurrence.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Erigeron ovinus (Sheep fleabane)	C2/-/W/-	Sunflower family, perennial, with short branching root stock. Leaves and stems densely pubescent. Basal leaves are obovate to 7 cm long. Stem leaves narrower and smaller. Solitary flower heads, pappus is a tawny to brownish color. Flowers June.	Mostly north-facing limestone rock outcrops, crevices and cliff bases with Pinus, Abies. El. 6,200 - 8,400 ft.	Occurs from Sheep Mountains north to Mount Irish Range, in Clark and Lincoln Counties. In project area, occurs in mountains bordering Three Lakes South, Tikaboo and Pahranagat Valleys. Occurrence at project facilities is unlikely due to habitat requirements.
Eriogonum holmgrenii (Holmgren's buckwheat)	C2/-/T/-	Buckwheat family, perennial. Dense, mat-forming, branching from woody base. Leaves whitish-green tomentose, 3-10 mm long. Leafless flower stalks, woolly-tomentose, to 3 cm tall. White to pink flowers, turning orange - deep red at maturity. June-August	Rock crevices or with limestone boulders on talus slopes with primrose, columbine, penstemon. El. 9,400 - 12,000 ft.	Occurs only on the highest parts of the Snake Range of White Pine County, between Spring and Snake Valleys. No potential for occurrence at proposed project facilities in the valleys several thousand feet lower in elevation.
Eriogonum nummularae var. *ammophilium* (Sand-loving buckwheat)	C2/-/-/-	Buckwheat family, perennial. Similar to var. *nummularae*, but with glabrous inflorescences. Leaves densely white pubescent below, green above. Flowers white with reddish midrib.	Desert shrub community, sandy soil. El. 5,000 - 5,500 ft.	Restricted to western Utah in Snake Valley. Low potential for occurrence at project facilities.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Ferocactus acanthodes var. *lecontei* (Barrel cactus)	-/-/W/S	Cactus family. Large cylindrical single-stem cactus up to 5-6 feet tall. Flat, stout, twisted or hooked reddish spines have rings. Flowers are 3-6 cm long, yellow or red-tinged. Flowers June-July.	Gravelly or rocky hillsides, canyon walls and washes. El. 1,800-5,000 ft.	Occurs in Clark and southern Lincoln Counties, NV, also in AZ, CA, and UT. Widely scattered in suitable habitat. High potential for occurrence near proposed project facilities in Three Lakes South, Tikaboo, Coyote Springs, Las Vegas, Garnet, Hidden, and California Wash Valleys.
Frasera gypsicola (Sunnyside elkweed)	C2/CE#/W/-	Gentian family. Pale green or whitish perennial herb 1-2 dm tall. Many branches pressed tightly together rise from a short wide root crown. Leaves opposite, grass-like, form a depressed mound. Flowers 4-parted, dull or shiny white. June-July	Fine, saline soil encrusted with mineral salts, with sagebrush and Stanleya. El. 4,900 - 5,000 ft.	Known from a single area near the Adams-McGill Reservoir, White River Valley, Nye County. Very low potential for occurrence in northwestern valleys in project area.
Hulsea vestita ssp. *inyoensis* (Pumice hulsea)	3C/-/W/-	Sunflower family. Tufted perennial herb 0.4-2.5 dm tall with spatula-shaped white woolly densely clustered basal leaves. Stems several, with linear bracts. Flower heads solitary, with yellow ray flowers. May-October.	Steep sandy slopes, sandy washes, gravelly drainages and washes, with Artemisia, Purshia, Chrysothamnus Atriplex and pinyon-juniper. El. 4,600-7,200 ft.	Restricted to North and South Belted Ranges and Eleana Range, Nye County, and Mineral County, NV, also in CA. Not known in project area, but could potentially occur in North Belted Range on edge of Penoyer Valley. Low potential for occurrence near proposed project facilities.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Jamesia tetrapetala (Waxflower)	C2/-/W/-	Hydrangea family. Low, much branched shrub with opposite, toothed leaves having 16 or fewer teeth. Inflorescence of 1 or 2 flowers, 4 petals and 8 stamens. Flowers June-July.	Cracks and crevices in Paleozoic limestone outcrops and talus at cliff bases, in wooded areas. El. 7,200 - 11,500 ft.	Occurs in project area in Highland Range on eastern edge of Dry Lake Valley, in Spring Valley and the Snake Range, and at the crest of the Grant Range between Railroad Valley and Garden Valley. Most records are at much higher elevations, so there is overall a low potential for occurrence near project facilities.
Lewisia maguirei (Maguire's bitterroot)	C2/-/W/S	Purslane family, perennial. Fleshy, branched, with a short, thick caudex with numerous rosy colored leaves. 2-3 flowers on a short stalk. White to pinkish petals. Flowers June - July.	Limestone screen slopes, loose denuded soils with pinyon - juniper and sagebrush. El. 7,500 - 7,800 ft.	Known only from area of Cherry Creek Summit, between Quinn Canyon Range and Grant Range, and between Railroad Valley and Garden Valley, in Nye County, NV. Low potential for occurrence near facilities.
Penstemon bicolor ssp. *bicolor* (Bicolored beardtongue)	C2/-/W/S	Figwort family, perennial. Up to 48 inches tall. Glaucous leathery leaves with toothed leaf margins. Base leaves have petioles, upper leaves are clasping the stem. Light yellow corolla. Flowers May-June.	Shallow gravelly washes and flats, roadsides with creosote bush, yucca, and blackbrush. El. 2,000 - 5,500 ft.	Occurs only in Clark County, NV. In the project area, recorded from Hidden Valley, Garnet Valley, and Las Vegas Valleys. High potential for occurrence near project facilities in these valleys.
Penstemon bicolor ssp. *roseus* (Rosy bicolored beardtongue)	C2/-/D/S	Figwort family, perennial. Similar to last but with pink to purplish-pink flowers. Flowers May - June	Shallow gravelly washes and flats, roadsides with creosote bush, yucca, and blackbrush. El. 2,000 - 5,500 ft.	Occurs only in Clark County, NV in the project area, recorded from Hidden Valley, Garnet Valley, California Wash, and Las Vegas Valleys. High potential for occurrence near project facilities, especially in these valleys.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Penstemon concinnus (Tunnel springs beardtongue)	C2/-/W/-	Figwort family, perennial. 1-2.4 dm high, with long, mostly basal, linear to lanceolate leaves, 3-7 cm long. Violet corollas. Flowers May-June	Gravelly, alluvial slopes or flats with sagebrush and pinyon-juniper. El. 6,200 - 8,200 ft.	Barely entering Nevada from Utah, in Nevada known only from a few localities in the Snake Range. In Utah, present in Millard, Iron, and Beaver Counties. Moderate potential for occurrence in Snake Valley.
Penstemon leiophyllus var. *francisci-pennellii* (Pennell's penstemon)	3C/-/W/-	Figwort family, perennial. 0.5-2 dm tall. Narrow stems, with opposite, entire, smooth to slightly pubescent and somewhat glaucous leaves, 11-47 mm long. Inflorescence blue to purple-blue corollas, 25-35 mm long. Flowers June-August.	Rocky calcareous slopes, shaded banks with limber pine, spruce, aspen. El. 8,500 - 11,000 ft.	Found in high mountains of White Pine, Lincoln, and NE Nye Counties, NV, including Wilson Creek, Snake, southern Schell Creek, Egan, and Grant Ranges. Within the project area, there are several known locations at high elevations in the Snake Range in Great Basin National Park. Low potential for occurrence near project facilities.
Penstemon moriahensis (Mt. Moriah beardtongue)	3C/-/W/-	Figwort family, perennial. Few to several ascending stems from root crown, 3.5-5 dm high, leaves 4-8 cm long, smooth, entire. Glandular inflorescences with large blue flowers. Flowers June-July.	Scrubby woodlands and open pine stands, to roadsides with sagebrush, mountain mahogany and open ponderosa pine stands. El. 7,200 - 9,200 ft.	Restricted to the area near Mount Moriah, Snake Range, and the Kern Mountains, White Pine County, NV. Low potential for occurrence near facilities in Spring and Snake Valleys based on habitat.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Penstemon pudicus (Bashful penstemon)	C2/-/T/-	Figwort family, perennial herb with a woody base. 2-4.5 dm high, with erect stems, and leaves up to 5 cm long. Large 25-35 mm blue to violet, glandular flowers. Sterile stamen bearded with yellow hairs. Flowers June-July.	Open, steep slopes, woodland borders, and along washes, in partial shade, with mountain mahogany, sagebrush and pinyon-juniper. El. 7,600 - 9,200 ft.	Known only from northern end of Kawich Range, Nye County. The species may occur in the southern Kawich Range, on the west side of South Railroad Valley, but has a low potential for occurrence near project facilities, based on habitat.
Penstemon thompsoniae ssp. *jaegeri* (Thompson beardtongue)	3C/-/W/-	Figwort family. Tufted or matted perennial herb, with elliptic ash colored leaves 0.5-1.2 cm long. Inflorescence leafy and glandular. Blue-violet flowers 12-14 mm long. Flowers May-July.	Gravelly limestone banks and hillsides with ponderosa pine, pinyon pine, and mountain mahogany. El. 5,500 - 10,000 ft.	Restricted to Spring Mountains and possibly Sheep Mountains, Clark Co. NV. The population in the Sheep Mountains may be a hybrid or intermediate form with P. thompsoniae spp. thompsoniae. Low potential for occurrence near proposed project facilities, based on habitat.
Peristyle megalocephala var. *intricata* (Large head rockdaisy)	3C/-/W/-	Sunflower family. 1.5-5 dm high, aromatic sub-shrub, with linear leaves and bright yellow discoid heads. Flowers June-September.	Rocky crevices, canyons, lower slopes, and washes on limestone, and dolomite and volcanic cliffs, with shadscale, sagebrush and pinyon-juniper. El. 2,600 - 4,800 ft.	Present in Clark, Nye, and Esmeralda Counties, NV. In the project area, occurs in the Sheep, Desert and Pintwater Ranges on the DNWR, and east to the Muddy Mountains. Low to moderate potential for occurrence near project facilities in Three Lakes Valley, Las Vegas Valley, and other southern valleys.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Polygala subspinosa var. *heterorhynca* (Spring milkwort)	3C/-/W/-	Milkwort family. Low subshrub with spine-tipped branches 1-2 cm long and elliptic leaves. Flowers have a yellow keel and purple petals. Flowers June-July.	Plains and dry hillsides with sagebrush and pinyon-juniper. El. 5,200-6,000 ft.	Occurs in Clark, Nye, and Lincoln Counties, primarily from the Nevada Test Site to Death Valley. The only known population near the project area is in the Groom Mountains, on the edge of the project area and the west side of Tikaboo Valley. Low to moderate potential for occurrence in northern Tikaboo Valley and adjacent Penoyer Valley.
Porophyllum pygmaeum (Pygmy poreleaf)	-/-/W/-	Sunflower family. Perennial herb from a slender woody rootstock, strongly scented. Stems 5-15 cm tall, very leafy. Leaves 10-15 mm long, 2 mm in diameter, nearly round, glandular. Heads solitary at the ends of stems, yellow-flowered. Flowers May-July.	Open alluvium with calcareous soils, with shadscale. El. 4,400 - 6,800 ft.	Occurs only in the Desert National Wildlife Range, between the Sheep Range and Desert Range. Moderate potential for occurrence in Three Lakes South Valley and northwestern Las Vegas Valley.
Primula nevadensis (Nevada primrose)	C2/-/T/S	Primrose family, perennial. Small herbaceous plant. Leaves 5-10 cm long. Violet corolla with yellow throat. Flowers July.	Limestone cliffs and talus slopes with bristlecone pine, columbine, gooseberry and alum root. El. 11,000 - 11,500 ft.	Known from the crest of the Snake Range between Spring and Snake Valleys, White Pine County, and the crest of the Grant Range between Railroad and Garden Valleys, Nye County, all within the project area. No potential for occurrence near project facilities, based on high elevation habitat.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Salvia dorrii var. *clokeyi* (Clokey's Mtn. Sage)	C2/-/W/S	Mint family, prostrate or mat-forming shrub 1-3 dm tall. Leaves gradually narrowed to the petiole, 14-22 mm long. Flowers pale blue to purple, April-July.	Limestone outcrops at high elevation. El. 6,000 - 9,000 ft.	Occurs in the Spring and Sheep Mountains. Within the project area, known from sites in the Sheep Range within the basins of Three Lakes South Valley, Coyote Springs and Tikaboo Valleys. No potential for occurrence near project facilities, based on habitat requirements.
Sclerocactus blainei (Blaine's pincushion)	C2/-/W/-	Cactus family. Plants solitary or sometimes colonial. Stems depressed hemispheric to cylindric, 3-15 cm with 6-12 tuberculate ribs, and 1-6 central spines. Flowers 8-10 cm long, pink to violet. Flowers May-June.	Limestone or volcanic gravel, with greasewood, shadscale, sagebrush and rabbitbrush. El. 5,200 - 6,000 ft.	Only known to occur at three locations with one in project area near Currant, Railroad Valley. Moderate potential for occurrence near project facilities in Railroad Valley.
Sclerocactus schlesseri (Schlesser's fishhook cactus)	C2/-/W/-	Cactus family. Stems typically solitary, 3-10 cm tall and 4-6 cm wide, with 13 ribs. Spines flexible, densely pubescent when young. Central spine 1, reddish brown to white, 3.5-5 cm long. Flowers funnelform, 3-4 cm long, violet-pink. Flowers June.	Salt desert shrub grass, on a Tertiary lacustrine deposit of somewhat gypsiferous sandy silts and silty clays, with galleta grass. El. 4,750 feet.	Only known to occur in Lincoln County, but not within the project area. Low potential for occurrence near project facilities.
Selaginella utahensis (Utah spikemoss)	C2/-/W/-	Spikemoss family, perennial herb with dense mat-forming habit, intricate branching and fleshy leaves. No flowers.	Ledges and cervices of sandstone cliffs. El. 4,000-8,000 ft.	Known only from the Spring Mountains in NV, and from Washington County, Utah. The species might occur within the project area in suitable habitat, but has a very low potential for occurrence near project facilities.

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Silene nachlingerae (Jan's catchfly)	C2/-/W/S	Pink family, perennial. 6-25 cm high, mostly unbranched with oblanceolate to linear, opposite leaves. 2-4 flowers per stem lacking petal appendages and auricles. Flowers August-September.	Mountain slopes on limestone soil with pines. El. 9,500 - 10,200 ft.	Occurs in White Pine and eastern Nye Counties, in the Snake, Schell Creek, and Grant Ranges, all within the project area. Low potential for occurrence at project facilities, based on high elevation habitat.
Sphaeralcea casepitosa (Jones globe-mallow)	C2/-/W/-	Mallow family, perennial. Thick, woody crown, stems to 20 cm long. Wide, thick ovate leaves, irregularly toothed, 2-4 cm long leaves and stems densely soft pubescent with long white hairs. Reddish orange flowers, May-June	Gravelly limestone soil, sandy soil with shadscale, shockly buckwheat, green molly, ephedra. El. 5,000 - 6,500 ft.	Known only from northern Railroad Valley in NV, and in Beaver and Millard Counties, UT including souther Snake Valley. Moderate potential for occurrence in Snake, Railroad and other northern Valleys.
Spiranthes diluvialis (Ute Lady's tresses)	T/CE#/T/LT	Orchid family, perennial. Herb 20-50 cm tall, leaves mainly basal, with middle and upper leaves reduced to bracts. Flowers white, long and slender, in a long spike. Sepals joined at the base, and the united petals form a hood above the lip.	Along streams and in wet meadows and seepage areas in riparian, wetland, and pinyon-juniper communities. El. 4,400 - 6,810 ft.	Occurs in Colorado, Utah, and historically from Nevada. In the project area, there is a 1956 record from the east side of the Deep Creek Range in the northern Snake Valley, Utah. Potentially present in wetlands in the project area, within its elevation range and habitat (principally, Spring, Snake, Lake, and Railroad Valleys).

TABLE 3-4
(Continued)

Species	Status Fed./State/ NNNPS/USFS[2]	Description	Habitat	Distribution [3]
Townsendia jonesii var. *tumulosa* (Charleston ground-daisy)	C2/-/W/S	Sunflower family, perennial. 2-4 cm tall herb, leaves to 2.5 cm long, hairy. Short peduncles, yellow disk flowers. Flowers June-August.	Ridges, loose sandy slopes, washes. Open places with ponderosa pine and sagebrush. El. 6,500 - 10,000 ft.	Known only from the Sheep Range in the project area, and from the Spring Mountains. Very low potential for occurrence near project facilities, based on habitat requirements.
Viola purpurea var *charlestonensis* (Mountain viola)	3C/-/W/S	Violet family. Perennial herb with entire leaves, dense white pubescence, pubescent petal spur, and yellow flowers. Flowers May-June.	Ponderosa and mountain brush on limestone faces, hills, slopes and dry washes. El. 6,560-9,510 ft.	Known from Spring Mountains, NV, and from Washington County, UT. Not known to occur in project area, but might occur in suitable habitat. Very low potential for occurrence near proposed project facilities based on habitat requirements.

[1] Sources: Ackerman 1981; Atwood et al. 1991; Cronquist et al. 1977, 1984, 1989; Heil and Welsh 1987; Kartesz 1987; Keil and Morefield 1989; Morefield and Knight 1991; Mozingo and Williams 1980; Munz and Keck 1964; Nevada Natural Heritage Program 1991; Spahr et al. 1991; U.S. Fish and Wildlife Service 1990, 1992; Utah Natural Heritage Program 1992; and Welsh and Thorne 1985.

[2] Status:
- Federal C2 = Federal Category 2 candidate species.
- Federal 3C = Federal Category 3 candidate species.
- Nevada CE = State critically endangered
- Nevada CE# = State recommended for listing as critically endangered
- NNNPS T = NNNPS species recommended for listing as threatened.
- NNNPS W = NNNPS watch list species (plants of uncertain abundance and distribution and/or those for which threats cannot be defined to a reasonable degree).
- NNNPS PE = NNNPS possibly extinct.
- NNNPS D = NNNPS delete (plants considered too abundant and widespread to merit special concern.
- USFS S = USFS sensitive by the USFS Intermountain Region.

3.5.2 Sensitive Wildlife Species

A variety of endangered, threatened, and sensitive wildlife species are potentially found in the CWP area. Information regarding these species was obtained from the USFWS, BLM, NDOW, and the NNHP (1990, 1991). Initially, information was collected for all of White Pine, Lincoln, Nye, and Clark Counties, in Nevada. All of the species reported to occur in these counties were screened for documented presence and/or habitat potential within the CWP area.

Based upon the analysis of potential habitat and documented occurrences, 30 species have the potential to be present within the CWP area. Table 3-5 identifies these species, their habitat, their known or probable distribution, and their legal status. The following discussion of species with the potential to occur in the project area includes: two federally endangered species (bald eagle, peregrine falcon); one federally threatened species (desert tortoise); and two of the candidate species of raptors not previously discussed (ferruginous hawk and northern goshawk).

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is listed by the USFWS as an endangered species. It is present in Nevada only as a winter visitant from November through March. Surveys have shown that Nevada maintains over 125 wintering bald eagles. Eastern and southern Nevada (including the CWP area), however, are less intensively used by wintering bald eagles than western Nevada (NDOW 1985).

Wintering bald eagles generally prefer roosting in mature cottonwoods or coniferous trees near open water. Lakes, reservoirs, wetlands, and rivers provide the preferred habitat for this species. Fish are the preferred food source; however, waterfowl, jackrabbits, and carrion are also utilized (NDOW 1985).

Threats to the bald eagle include pesticides in the environment (e.g., DDT), electrocution by contact with power transmission lines, and human activities including mining, logging, illegal hunting, and other activities that degrade or destroy suitable habitat and food supplies.

TABLE 3-5

SENSITIVE WILDLIFE SPECIES POTENTIALLY PRESENT WITHIN THE CWP AREA

Common Name	Scientific Name	Status Federal/State	Habitat	Distribution
Mammals				
Spotted Bat	*Euderma maculatum*	C2/SP	Caves and crevices in cliffs and rocky canyons	Entire Region
Pygmy Rabbit	*Brachylagus idahoensis*	C2/-	Sagebrush dominated communities	Northern Lincoln County, Northern Nye County, White Pine Co.
Desert Valley Kangaroo Mouse	*Microdipodops megacephalus albiventer*	C2/SS	Dry Lake Valley, not well researched	Lincoln County, Dry Lake Valley
Pahranagat Valley Montane Vole	*Microtus montanus fucosus*	C2/SS	Pahranagat Valley, not well researched	Pahranagat Valley
Birds				
Peregrine Falcon	*Falco peregrinus anatum*	FE/SE	Cliffs near riparian, wetland, or agricultural areas	Snake Range, Pahroc Valley, Coyote Springs Basin, Moapa and Virgin River Valleys
Bald Eagle	*Haliaeetus leucocephalus*	FE/SE	Trees near open water or rivers	Spring, Snake, Pahroc, Pahranagat, Railroad, Moapa Valleys
Northern Goshawk	*Accipiter gentilis*	C2/SP	Conifer and aspen groves used for breeding, winter at lower elevations along ranges, some valley communities	Spring and Snake Valleys
Ferruginous Hawk	*Buteo regalis*	C2/SP	Pinyon-juniper, desert shrub communities	Spring, Snake, Patterson, Garden, Pahranagat, and Railroad Valleys
Western Snowy Plover	*Charadrius alexandrus nivsus*	C2/SP	Sandy river banks and lake shores, sand dunes, alkali flats	Clark County, Nye County in suitable habitat
Black Tern	*Chilidonias niger*	C2/SP	Emergent vegetation in freshwater marshes, sloughs, wet meadows, known resident of Pahranagat Valley	Clark County, Lincoln County (particularly in Pahranagat Valley), White Pine Co.
Western Least Bittern	*Ixobrychus exilis hesperis*	C2/SP	Densely vegetated marshes, emergent vegetation	Clark County, Lincoln County, Pahranagat Valley
Loggerhead Shrike	*Lanius ludovicianus*	C2/SP	Low vegetation, open communities in valleys and foothills with suitable perches	Clark County, Lincoln County, Nye County
Long-billed Curlew	*Numenius americanus*	C3/SP	Shorebird that nests in upland grasslands, shrub communities, alkali flats, near ag lands	Clark County, Nye County, White Pine Co.
White-faced Ibis	*Plegadis chihi*	C2/SP	Marshes, lake shores, ag fields willow riparian areas	Clark County, Nye County
Phainopepla	*Phainopepla nitens*	-/SS	Mesquite, desert willow, catclaw	Moapa, Pahroc, Pahranagat Valleys
Reptiles				
Desert Tortoise	*Gopherus agassizii*	T/SP	Creosote bush/southern desert shrub communities	Southern Half
Chuckwalla	*Sauromalus obesus*	C2/-	Creosote bush habitat near rocky outcrops	Clark County, Lincoln County, Nye County
Gila Monster	*Heloderma suspectum*	C3/SP	Desert riparian, canyons and washes with larger shrubs	Coyote Spring Valley State Sensitive

TABLE 3-5
(Continued)

Common Name	Scientific Name	Status Federal/State	Habitat	Distribution
Amphibians				
Arizona Southwestern Toad	*Bufo microscaphus microscaphus*	C2/SS	Rivers, streams, arroyos, sandy banks	Clark County
Amargosa Toad	*Bufo nelsoni*	C2/SS	Desert springs	Nye County; Distribution unclear
Invertebrates				
MacNeill Sooty Wingskipper	*Hesperopsis gracielae*	C2/-	Associated with *Atriplex lentiformis* in river valleys	Clark County Moapa Valley
Pallid Skipper	*Polites sabuleti pallida*	--/--	Springs in Railroad Valley	Nye County in Railroad Valley
Moapa Warm Springs Riffle Beetle	*Stenelmis calida moapa*	C2/-	River bottom among gravel, rocks, and roots	Clark County, Lincoln County in suitable habitat
Pahranagat Pebblesnail	*Fluminicola merriami*	C2/-	Native to Hiko, Crystal, and Ash Springs and spring-fed ditches in Pahranagat Valley	Lincoln County in Pahranagat Valley
Schell Creek Mountain Snail	*Oreohelix nevadensis*	C2/-	Cleve Creek beneath cottonwood or aspen overstories and along dolomite rock slides with an understory of wold rose and squawbush	White Pine Co.
Baking Powder Flat Blue Butterfly	*Euphilotes Battoides ssp.*	C2/-	Associated with *Eriogonum shockleyi*	Spring Valley near Baking Powder Flat
White River Wood Nymph Butterfly	*Cercyonis pegala ssp.*	C2/-	Wet areas along the channel of the White River	Northern Nye County southern White Pine County along the White River
Railroad Valley Skipper	*Hesperia uncas ssp.*	C2/-		Railroad Valley, near Lockes
Wandering Skipper	*Pseudocopaeodes eunus eunus*	C2/-		Nye County
Grated Tryonia (White River Snail)	*Tryonia clathrata*	C2/-	Endemic to springs of the pluvial White River, including springs in Pahranagat Valley	Nye County, Lincoln County in White River and Pahranagat Valleys

Sources: U.S. Fish and Wildlife Service and Nevada Natural Heritage Program
Protection status:

- FE = Federally listed endangered (USFWS 1990a, 1990b)
- FT = Federally listed threatened (USFWS 1990a, 1990b)
- SE = State-listed endangered (NDOW 1984)
- ST = State-listed threatened
- SP = State-listed protected by NDOW
- SS = State-listed sensitive by NDOW
- C2 = Category 2 federal candidate (sufficient data are on file for possible listing as threatened or endangered, but additional data needed on vulnerability and threats (USFWS 1991)
- 3A = Federal category 3a (species presumed extinct)
- 3C = Category 3c federal candidate (considered too common for listing) (USFWS 1992)

Within the CWP area, the bald eagle may be present as a winter visitant anywhere in the Muddy River Valley from Moapa to Lake Mead, the entire Spring Valley, the entire Snake Valley, the North Pahroc Range near the White River, the Pahranagat Valley, and northern Railroad Valley North near Duckwater, where suitable winter habitat is available.

Peregrine Falcon *(Falco peregrinus)*

The peregrine falcon has been listed by the USFWS as an endangered species due to substantial population decline caused by pesticide contamination and habitat degradation. Historically, the peregrine falcon was probably a rare nesting inhabitant due to Nevada's arid climate. Records reveal only five nesting eyries: three in western Nevada and two in the eastern portion of the state. There is some evidence that nesting activity may have occurred in southern Nevada near the Colorado River. For nesting, peregrine falcons prefer large cliffs adjacent to productive hunting habitat. The nests are usually at high locations, with commanding views of the surrounding terrain.

The peregrine falcon generally preys upon birds including flickers, jays, doves, meadowlarks, pigeons, shorebirds, and ducks. When birds are scarce or unavailable, the peregrine will also prey upon small mammals, reptiles, and insects.

The historic use of pesticides such as DDT may have resulted in the elimination of the peregrine falcon as a breeding species in Nevada, as is the case in many western states. NDOW initiated a peregrine falcon reintroduction program in 1984, using the Ruby Lake National Wildlife Refuge as the first reintroduction site. A second reintroduction site on the west side of the Snake Range has also been utilized in recent years. This site is located within the CWP area in a canyon above Baking Powder Flat. Re-establishment efforts for this species continue to this day. A third reintroduction site has been designated on the east side of the Schell Creek Range, roughly 6 miles north of Highway 50 in Spring Valley. This site has not been used to date, but will probably be used within the next two years (Herron 1992).

Desert Tortoise (*Gopherus [Xerobates] agassizii*)

The desert tortoise is found throughout the Mojave and Sonoran deserts and may occur at the very edge of the Great Basin Desert. It has declined substantially in recent years throughout most of its range. The decline is probably due to a number of reasons, including a disease condition exacerbated by the stress of several drought seasons, loss of habitat, predation by common ravens (*Corvus corax*) whose populations increase with proximity to human development, and direct human disturbances such as illegal collection and shooting. In response to these declines, the USFWS listed the desert tortoise as a threatened species (USFWS 1990). Prior to federal listing, NDOW listed the desert tortoise as protected and rare in areas outside urban regions of Clark County (NDOW 1991).

In Nevada, the desert tortoise is found throughout Clark County, and the southern portions of Nye and Lincoln Counties (Patterson 1982). Desert tortoises are generally found below 4,600 feet elevation (Karl 1980), but isolated individuals may occur at elevations reaching 6,000 feet. Tortoises generally inhabit creosote bush scrub, characterized by creosote bush and bursage. At higher elevations tortoises may be found in blackbrush scrub which is characterized by blackbrush and frequently by Joshua tree and Mojave yucca. Perennial species are utilized by tortoises for shade and to stabilize burrow construction. Desert plantain (*Plantago insularis*) and desert mallow (*Sphaeralcea ambigua*) are important forage components in some parts of their range (Burge and Bradley 1976); in other areas tortoises feed on red brome (*Bromus rubens*), beavertail cactus and filaree (*Erodium circutarium*)(Esque et al. 1991).

Soil structure is an important limiting factor for tortoises. Soil must be friable enough for digging, yet sufficiently firm to prevent burrow collapse. Sandy loam with varying degrees of gravel is the soil type most suitable for burrow construction (Burge 1977). However, soils ranging from sand to heavy gravel in alluvial deposits may be used by tortoises to construct a stable burrow (Luckenbach 1982). Tortoises commonly dig burrows on bajadas or in the banks of washes and natural drainages.

Literature reviewed for this project included environmental documents and reports which describe previous biological studies of the desert tortoise in the project area. Specific sources of information included contacts with agency personnel (Cole 1992), and review of literature

(Berry and Nicholson 1984; Karl 1980; Dames & Moore, 1990; Esque 1986; RECON 1991). No field surveys were conducted specifically for this report.

Data on desert tortoise habitat areas were obtained from the BLM Stateline Resource Area office in Las Vegas, Nevada. A BLM interim desert tortoise habitat map (BLM 1989) indicates that the CWP area lies within regions of Category I, II, and III tortoise habitat. The management objective of Category I habitat, the most sensitive, is to maintain stable, viable populations and protect existing tortoise habitat values (BLM 1988). Data on desert tortoise density estimates in the project area were obtained from maps compiled by BLM.

Tortoise population densities vary throughout the CWP area as summarized in Table 3-6. In California Wash, tortoise population densities are estimated to be low to moderate. Moderate to high population densities are estimated for Hidden Valley, and tortoise densities in Garnet Valley range from low to very high. Density estimates are presently not available for Three Lakes Valley South; however, surveys intended to generate this information are currently in progress under a contract for the U.S. Air Force.

Critical habitat designation for the desert tortoise was finalized on February 8, 1994 (USFWS 1994). The CWP area includes an area designated by USFWS as the Mormon Mesa Critical Habitat Unit.

TABLE 3-6
DESERT TORTOISE DENSITIES BY VALLEY
WITHIN THE CWP AREA

BASINS	TORTOISE PRESENCE	TORTOISE RELATIVE POPULATION DENSITY	TORTOISE HABITAT CATEGORY
California Wash	Yes	Low - Moderate	II
Coyote Springs Valley	Yes	Moderate - Very high	I
Garnet Valley	Yes	Low - Very high	II and III
Hidden Valley	Yes	Moderate - High	I
Las Vegas Valley	Yes	Low	II
Pahranagat Valley	Yes	Low - Moderate	III
Three Lakes Valley South	Probable	Unknown	NC

NC - Not categorized
Source: BLM 1989

Ferruginous Hawk (*Buteo regalis*)

The ferruginous hawk has been classified by the USFWS as a Category 2 candidate for listing. A petition to list the ferruginous hawk as endangered was filed with the USFWS on June 1, 1991. In response, the USFWS prepared a 90-day finding that affirmed the recommendation of the petition, stating that formal listing of the ferruginous hawk as endangered may be warranted. Subsequent evaluations of population and distribution data by USFWS have recently reversed that finding. According to the USFWS, the ferruginous hawk will probably not be listed due to the discovery of a larger than expected overall population (Faanes 1992). At present, this species remains unlisted, but status review is on-going and a formal decision from the USFWS regarding listing is forthcoming.

This species is present in Nevada during the spring, summer, and fall seasons, usually wintering elsewhere. Ferruginous hawks nest in a variety of sites, usually where expansive views of open ground are available. The most common nesting area utilized consists of scattered juniper trees at the interface of pinyon-juniper woodland and desert shrub communities (Barber 1991). Ferruginous hawk nests have been observed on cliffs, bluffs, cut banks, in various types of trees, and on the ground. The ferruginous hawk specializes in hunting rodents, only occasionally utilizing birds or reptiles. Rabbits and ground squirrels are the preferred prey. Numerous ferruginous hawks have been observed in the project area hunting ground squirrels in white sage (winterfat) flat areas (Perkins 1992).

Ferruginous hawks return to Nevada in late February or early March and breed. During the egg incubation period (early to mid-April), this species is extremely sensitive to human disturbance. Ferruginous hawks will readily abandon their nest and eggs if disturbed. After the fledglings have hatched (early May), however, the nesting pair will tenaciously defend their nest and young. Given the high level of concern regarding this species, BLM has recommended avoidance of human activities that could potentially disturb nesting and/or incubating pairs until late May or June (Perkins 1992).

Within the CWP area, confirmed sightings of nesting ferruginous hawks have been documented in the Spring, Snake, Patterson, Garden, Pahranagat, and extreme northern Railroad Valley North (NDOW 1985; Perkins 1992; Podbourney 1992).

Northern Goshawk (*Accipiter gentilis*)

The northern goshawk is a year-round resident of Nevada. It has been classified by the USFWS as a Category 2 candidate for listing. NDOW has estimated there are 300 nesting pairs in the state. During most of the year, northern goshawks are found at higher elevations (approximately 7,000 to 9,000 feet) in mountain ranges. During the winter months, they roost at lower elevations, in foothills or valley habitats. Northern goshawks typically nest in aspen stringers near perennial streams in mature trees. Mammals are the most important food source for northern goshawks. Ground squirrels and cottontail rabbits are the most common prey. Some birds, such as flickers and jays are also utilized (NDOW 1985).

Within the CWP area, confirmed sightings of nesting northern goshawks have been documented in the Snake and Schell Creek Ranges, north of Highway 50 at the northern extent of the project area. Since they migrate to lower elevations during the winter months, northern goshawks may be present in Spring Valley and Snake Valley during that time of year. In addition, the northern goshawk may be present in the Mt. Charleston area of the Spring Mountains.

3.5.3 Sensitive Fish Species

Sensitive fish species described in this section include those that are federally listed as threatened or endangered, species that are candidates for federal protection, state listed species, and candidate species. Table 3-7 describes valleys containing sensitive fish species and their locations.

There are nine sensitive fish species or subspecies located in the CWP area, four of which are federally listed as endangered and one as threatened. Four species or subspecies are currently under consideration for federal protection. Category 1 (C1) candidates are taxa for which enough data are on file to support federal listing, while Category 2 (C2) candidates are taxa for which data are insufficient to warrant federal listing.

Information on these sensitive fish species was compiled from a review of literature including Nevada Natural Heritage Program data (NNHP 1991), Sigler and Sigler (1987), Page and Burr (1991); and personal communication (Deacon 1992; Hardy 1992; Heinrich 1992; and, Withers 1992). The majority of species locations described in this report was obtained from NNHP (1990, 1991).

USFWS (1991) has designated areas of critical habitat for three of the species in the CWP area as described in Table 3-8.

White River Springfish *(Crenichthys baileyi baileyi)*

This subspecies of White River springfish has been listed by the USFWS as endangered and by the State of Nevada as protected. Ash Spring in Pahranagat Valley and its outflow have been designated as critical habitat areas by the USFWS. While the springfish population endemic to this spring has shown an improvement since 1991, competition with exotic species and continued public disturbance has kept the population in a depressed state (Heinrich and Sjoberg 1992).

The White River springfish are in the family *Cyprinodontidae* and have many of the characteristics of this family. The White River springfish is distinguishable from the Hiko White River springfish by its smaller size and fewer number of dorsal and anal fin rays (Williams and Wilde 1981). The average adult is less than 2 inches in length and lives 3 to

TABLE 3-7

VALLEYS WITHIN THE CWP AREA CONTAINING SENSITIVE FISH SPECIES

SPECIES		Protection Status Federal/State			173B Railroad Valley North	184 Spring Valley	195 Snake Valley	209 Pahranagat Valley	212 Las Vegas Valley
Scientific Name[1]	Common Name[1]		Endemic	Temp. Range°C					
Crenichthys baileyi baileyi[2]	White River Springfish	E/P	X	21-37				X	
Crenichthys baileyi grandis[2]	Hiko White River Springfish	E/P		21-37				X	
Gila robusta jordani	Pahranagat Roundtail Chub	E/E	X	15-30				X	
Empetrichthys latos latos	Pahrump Poolfish	E/E		24-26		X			X
Crenichthys nevadae[2]	Railroad Valley Springfish	T/P	X	29-36	X				
Gila bicolor	Railroad Valley Tui Chub	C2/S			X				
Rhinichthys osculus velifer	Pahranagat Speckled Dace	C2/S						X	
Onocorhyachus clarki utah	Bonneville Cutthroat Trout	C1/G				X	X		
Relictus solitarius	Relict Dace	C2/S				X			

[1] Scientific and common names from USFWS Endangered and Threatened Species of Nevada, November 26, 1992.
[2] Critical habitat - USFWS

Source: Dames & Moore

Key to Federal Sensitive Species List:
E = Endangered
T = Threatened
C1 = Category 1 Candidate
C2 = Category 2 Candidate

Key to State Sensitive Species List:
P = Protected
E = Endangered
S = Sensitive
G = Game

TABLE 3-8

FEDERALLY DESIGNATED CRITICAL HABITAT[1] FOR SENSITIVE FISH SPECIES WITHIN THE CWP AREA

RESOURCE		CRITICAL HABITAT
SCIENTIFIC NAME	COMMON NAME	
Crenichthys baileyi baileyi	White River Springfish	Lincoln County, Nevada. Ash Springs and associated outflows plus surrounding land areas for a distance of 50 feet from the springs and outflows within the following areas: T6S, R60E, E½ Sec. 1 and T6S, R61E, NW¼ of NW¼ Sec. 6. Known constituent elements include warm water springs and their outflows and surrounding land areas that provide vegetation for cover and habitat for insects and other invertebrates on which the species feeds.
Crenichthys baileyi grandis	Hiko White River Springfish	Lincoln County, Nevada. Each of the following springs and outflows plus surrounding land areas for a distance of 50 feet from these springs and outflows: Hiko Spring and associated outflows within T4S, R60E, SW¼ of NE¼ Sec. 14 and NW¼ of SE¼ Sec. 14. Crystal Springs and associated outflows within T5S, R60E, all of NE¼ of Sec. 10 and NE¼ of SE¼ Sec. 10, SW¼ Sec. 11 and NW¼ of SW¼ Sec. 11. Known constituent elements include warm water springs and their outflows and surrounding land areas that provide vegetation for cover and habitat for insects and other invertebrates on which the species feeds.
Crenichthys nevadae	Railroad Valley Springfish	Nye County, Nevada, Duckwater area. Big Warm Spring and its outflow pools, streams, and marshes and a 50-foot riparian zone around the spring, outflow pools, streams, and marshes in T13N, R56E, NE¼ Sec. 31, SE¼ Sec. 31, NW¼ Sec. 32. Little Warm Spring and its outflow pools, streams, and marshes and a 50-foot riparian zone around the spring, outflow pools, streams, and marshes in T12N, R56E, Sec. 5. Nye County, Nevada, Lockes Area. North, Hay Corral, Big and Reynolds Springs and their outflow pools, streams and marshes and a 50-foot riparian zone around the springs, outflow pools streams, and marshes in T8N, R55E, SW¼ Sec. 11, NW¼ Sec. 14, SW¼ Sec. 14, SE¼ Sec. 15, NE¼ Sec. 15, SW¼ Sec. 15. Known constituent elements for all areas of critical habitat of the Railroad Valley springfish include clear, unpolluted thermal spring waters ranging in temperature from 30° to 35°C in pools, flowing channels, and marshy areas with aquatic plants, insects, and mollusks.

[1] Information in table obtained from USFWS Endangered and Threatened Species of Nevada, November 26, 1992.

4 years. These fish spawn during the warmer months. The 10 to 17 eggs laid are fertilized singly as they appear and incubation time is generally 5 to 7 days.

Warm, clear springs and associated outfalls with aquatic vegetation is required by White River springfish. The vegetation is used as cover and food and also provides cover for insects and other invertebrates on which the fish sometimes feed. Springfish tolerate temperatures between 21°C and 37°C and can endure low levels of dissolved oxygen.

Hiko White River Springfish (*Crenichthys baileyi grandis*)

The Hiko White River springfish is listed by the USFWS as endangered and by the State of Nevada as protected. Hiko White River springfish are located in Hiko Spring and Crystal Spring in the Pahranagat Valley and have been introduced to the Blue Link Spring in Mineral County. Hiko Spring and Crystal Spring are both designated as critical habitat by the USFWS. The populations in Hiko and Blue Link Spring are in stable condition. The population in Crystal Springs is in a severely depressed state, with an estimated population of only 20 to 30 fish (Heinrich 1992).

Spawning and habitat requirements for the Hiko White River springfish are the same as described above for the White River springfish.

Pahranagat Roundtail Chub (*Gila robusta jordani*)

Historically the Pahranagat roundtail chub was native to Crystal Spring, Hiko Spring, and Ash Spring in the Pahranagat Valley. It is now found only in a portion of the outflow of Ash Spring. This species is listed as endangered by both the USFWS and NDOW.

Pahranagat roundtail chubs have a relatively streamlined body and a depressed head. They are characterized by a slightly elevated back, a complete lateral line and a moderately forked caudal fin. This species may obtain a length of 17 inches and live 5 years (Page and Burr 1991).

Adult fish are found in a single large pool with undercut banks, overhead or submerged vegetation, and a firm sandy bottom. The species tolerates temperatures ranging from 15°C

to 30°C. Juvenile fish commonly utilize runs approximately 2 feet deep, but may be found in waters with depths up to 7.5 feet. They occur in areas with abundant aquatic cover with substrates that range from soft mud to firm sand (Hardy 1992).

Pahrump Poolfish (*Empetrichthys latos latos*)

This species is listed as endangered by both the federal and state agencies. The Pahrump poolfish were introduced to Shoshone Ponds in Spring Valley in an attempt to save them from extinction. This location is one of three existing areas where the species survives, with the other locations being the Desert National Wildlife Refuge and Spring Mountain Ranch State Park. The original population in Pahrump Valley and two subspecies are now extinct. The species inhabit small warm springs with temperatures ranging from 24 to 26°C. When acclimatized, this fish tolerates wide temperature ranges and low dissolved oxygen concentrations (Selby 1977). Evidence suggests a preference for deeper water (Sigler and Sigler 1987).

The Pahrump poolfish is of the family *Cyprinodontidae* and therefore shares some characteristics with *Crenichthys* such as the lack of lateral line or pelvic fins, thick bodies, and placement of the dorsal and anal fins far back on the body. Characteristics that distinguish this species include mottling, usually black or dark brown on silver, and its wide mouth. Females are larger and greenish brown with conspicuous mottling; males are silver or blue without mottling. This fish reaches a length of 2 inches and typically lives 2 to 4 years. Pahrump poolfish feed mainly on small invertebrates.

This species probably breeds in March or April but may reproduce most of the year. Breeding males develop orange-yellow dorsal, anal, and caudal fins and orange eyes.

Railroad Valley Springfish (*Crenichthys nevadae*)

The Railroad Valley springfish is federally listed as threatened and is protected by the State of Nevada.

The Railroad Valley springfish is native to Railroad Valley and historically occurs in a total of seven springs. Two of these springs, Big Warm Spring and Little Warm Spring, occur at

the north end of the valley, and the remaining five springs occur at the Lockes Pond complex (North Spring, Hay Corral Spring, Reynolds 1 Spring, Reynolds 2 Spring, and Big Spring). These springs and their outflow pools, streams, marshes and 50 feet surrounding these areas have been designated as critical habitat and are protected by the federal government (USFWS 1991). Railroad Valley springfish have also been introduced to springs in Sodaville, Mineral County (Williams 1983) and Chimney Hot Spring approximately 6 miles south of Lockes. The Chimney Hot Spring populations were introduced into man-made ponds below Chimney Hot Spring and were extirpated twice; once due to decreased water flows which dried the ponds, and once due to vandalism that increased the inflow from Chimney Hot Spring which heated the water beyond the tolerance of the fish. The springfish were re-introduced following both incidents (Minckley and Deacon 1991). At present, populations in the Railroad Valley appear to be stable or expanding (Heinrich and Sjoberg 1992).

The Railroad Valley springfish are in the family *Cyprinodontidae* and are characterized by a lack of lateral line or pelvic fins, thick bodies, and placement of the dorsal and anal fins far back on the body. This springfish is 0.5 inch to 2.8 inches in length with a massive body, two-thirds wide as deep and especially wide anteriorly. It has a single row of dark spots with pale bars between the spots (La Rivers 1962). Spawning occurs between March and October with young being most abundant June through October. Reproduction does not occur below 28°C or above 35°C, the optimum water temperature being 30°C (Williams 1983).

Railroad Valley springfish require clear, unpolluted thermal springs, with optimal temperatures ranging from 30 to 35°C and have a critical thermal maximum of 38.2°C. This species generally occurs in pools, flowing channels, marshy areas with aquatic plants, insects, and mollusks (USFWS 1991).

Railroad Valley Tui Chub *(Gila bicolor)*

The Railroad Valley tui chub is listed as a C2 species by USFWS and sensitive by the State of Nevada.

The tui are located in Kate Spring, Butterfield Spring, Blue Eagle Spring, Bull Creek, and Green Springs. This species also inhabits springs in Little Fish Lake Valley and Hot Creek

Valley. Populations once inhabited springs at Duckwater in Railroad Valley, but no longer exist there (Deacon 1992).

The tui chub obtains maximum size of 7 to 8 inches, has a deep, compressed body with a deep caudal peduncle, and is characterized by small rounded fins and a small terminal to slightly subterminal mouth which does not extend to the eye. This species is found in a variety of habitats ranging from quiet, vegetated mud-and-sand bottomed pools to large rivers and has developed different shapes, sizes and morphological adaptations in the various habitats (Page and Burr 1991). This chub feeds on invertebrates, vascular plants, algae, and fish. As the chub grows larger, algae plays an increasingly significant role in the diet. Tui chub spawn between late April and early August. The female is attended by several males while she lays her eggs in quiet, shallow, heavily vegetated waters (Sigler and Sigler 1987).

Pahranagat Speckled Dace *(Rhinichthys osculus velifer)*

The speckled dace is a federal C2 species and considered sensitive by the State of Nevada.

Pahranagat speckled dace is found in springs of the pluvial White River. It is rarely found in water deeper than 3 feet. In 1987 an undescribed species of speckled dace was found in L Spring and North Cottonwood Spring. These were removed from the original springs and placed in Maynard Spring, which is free of exotics.

The body of this fish is elongate and compressed laterally. The head is triangular with a pointed snout and subterminal mouth. Most fish of this species have a barbel at the corners of the mouth. This fish is also characterized by dark lateral stripes, splotches and speckles over entire body, small fins and a maximum size of 8 inches (Soltz and Naiman 1978).

Spawning may occur throughout summer, but is most common in June and July at temperatures around 18.5°C. Spawning males develop orange or red coloration around the lips, snout and the bases of the pectoral, pelvic, and anal fins. Spawning males also develop nuptial tubercles on rays and axils of paired fins. Areas with gravel and large rocks are utilized for breeding and egg-laying.

Bonneville Cutthroat Trout (*Oncorhynchus clarki utah*)

Bonneville cutthroat trout in White Pine County is listed as a federal C1 species and the State of Nevada lists the species as sensitive, but it is also considered a Nevada game species.

Bonneville cutthroat trout inhabit Pine Creek and Ridge Creek, located on the west slope of the Snake Range. Bonneville cutthroat trout occur on the east side of Snake Range in four areas: Lehman Creek, Hendrys Creek, Hampton Creek, and Water Canyon Creek. The populations in Hampton Creek and Water Canyon Creek were introduced from Pine Creek, Nevada and Goshen Creek, Utah. They occur in streams on the slopes of the Snake Range and are not found on the valley floor.

Cutthroat trout are named for the red mark which runs along both sides of the lower jaw. Other distinguishing characteristics include many black spots on their body, presence or absence of a faint red side stripe and the jaw being well behind the eye in adults (Page and Burr 1991). This species may grow to 14 to 16 inches in length and may live 7 to 8 years. It generally utilizes small clear streams and feeds on aquatic and terrestrial insects.

Spawning occurs when temperatures reach 5.5°C to 9.0°C. The upper temperature limit for gravid females and egg incubation is considered to be 14°C. The female vigorously brushes the gravel with her tail creating a redd on which she deposits her eggs, the male then swims over them depositing sperm. The pair then move upstream of the redd and cover the eggs with 5 to 7 inches of gravel, then move just downstream of the redd once spawning is complete. A typical redd is 2 feet long and 1.5 feet wide and located at depths of 7 to 10 inches of water (Sigler and Sigler 1987).

Relict Dace (*Relictus solitarius*)

The relict dace is listed as C2 by the USFWS and sensitive by the State of Nevada. This species was introduced to Keegan Ranch Spring, Shoshone Ponds South, Spring Valley Creek Springs, and Stonehouse Spring in Spring Valley. It is unclear whether populations remain extant (Deacon 1992).

This dace has a large, terminal mouth, lacking in horney ridges and barbels. The size and shape of the mouth are an indication of its opportunistic feeding patterns. It has a rather chubby body with small rounded fins and paddle-like pelvic fins suitable for quiet waters. The dorsal and pelvic fins are placed well back on the body. This fish probably lives 5 years and may obtain a length of 5 inches (Sigler and Sigler 1987).

The relict dace breeds from June to September, but young may be present at any time of the year. It is probable that the dace spawns on vegetation, as the substrate in their spawning areas is largely anaerobic (Hubbs et al. 1974). Both sexes usually spawn in their first year. The females may continue breeding beyond their second year, but males usually do not (Hubbs et al. 1974).

Relict dace are typically found in thermal springs, creeks, and marshes with dense covers of algae, rushes, and mosses. They also occur in nonthermal springs with dense vegetation. Maximum thermal tolerance is approximately 24°C. The relict dace is secretive and requires dense cover vegetation, especially during winter months (Sigler and Sigler 1987). If alarmed it will dive into soft mud or vegetation.

3.6 CULTURAL RESOURCES

Cultural resources include cultural properties and traditional lifeway values. Cultural properties are locations of past human activity, occupation, or use, and include archaeological, historic, or architectural sites, structures, or places with important public and scientific uses. They may include sites or places of traditional cultural or religious importance for specific social or cultural groups. Traditional lifeway values are useful in the maintenance of a specific social or cultural group's religious beliefs, cultural practices, or social interaction.

Regulations for "Protection of Historic Properties" (36 CFR Part 800), which primarily implement Section 106 of the National Historic Preservation Act (NHPA), define the key regulatory requirements. These regulations define a process for consulting with State Historic Preservation Officers (SHPOs), the federal Advisory Council on Historic Preservation (ACHP), and other interested parties to ensure that historic properties receive consideration as potential federal projects are planned and implemented in accordance with applicable regulations. The steps in this process are:

- Identifying and evaluating historic resources that may be affected by the proposed undertaking
- Assessing the potential effects of the undertaking on significant historic properties
- Consulting with the SHPOs, ACHP, and other interested persons to determine ways to avoid or reduce effects on historic properties
- Providing the ACHP a reasonable opportunity to comment on the proposed undertaking and its effects on significant historic properties
- Proceeding with the undertaking under the terms of a Memorandum of Agreement or in consideration of ACHP comments involving all historic properties

The general thrust of this process is to establish a process for identifying impacts of development on cultural resources and to create opportunities for adopting measures to avoid,

minimize, mitigate, or accept such impacts. The studies undertaken constitute an important initial step in this process.

Within the regulatory context of historic preservation, cultural resources are considered significant if they are determined eligible for inclusion in the National Register of Historic Places (NRHP). Historic cultural properties are National Register eligible if they are significant in American history, architecture, archaeology, engineering, or culture. They must possess integrity of location, design, setting, materials, workmanship, feeling, or association, and meet at least one of four criteria:

- Are associated with events that have made a significant contribution to the broad patterns of our history

- Are associated with the lives of persons significant in our past

- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction.

- Have yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60.4)

3.6.1 Cultural Resource Categories

In implementing these definitions it has become common practice to delineate three basic categories of resources: (1) prehistoric resources, (2) ethnographic sites, and (3) historic sites. As our nation's heritage, these resources provide an important means of building a perspective on our modern lives.

Prehistoric resources predate the era of written records, which in the CWP area began with exploration by Europeans. Prehistoric resources are archaeological sites that reflect more than 10,000 years of occupation by numerous American Indian cultures. Prehistoric archaeological sites are abundant in the American West. They range from ruins now preserved as national

monuments to small, simple scatters of chipped stone artifacts or broken clay pots. Inventories of 50,000 recorded sites per state are common, and increased levels of survey intensity indicate that literally hundreds of thousands more unrecorded and unevaluated archaeological sites dot the landscape.

Ethnohistoric resources (or traditional cultural properties) can be some of the most sensitive cultural resources for project planners to consider. The ethnohistoric era refers to the time when native ethnic groups were first described and documented by Europeans. Many ethnohistoric resources have special significance for contemporary American Indian groups because of their former or continuing occupation or use of given localities. Such resources are by no means limited to current Indian reservation boundaries and, in many cases, there is very little physical evidence of these traditional cultural properties. These resources are often considered sacred by Indian communities.

Historic resources are some of the best documented cultural resources in the CWP area. Most cities, as well as smaller towns and rural areas, have a variety of old buildings listed in the National Register of Historic Places or similar state registers. Other than old buildings, historic resources include ghost towns, mines, historic ranches, and a variety of structures, roads, and trails. Some historic resources that have disintegrated into archaeological sites are characterized by foundations, artifact scatters, or buried features.

3.6.2 Cultural History Overview

The CWP area has been occupied for thousands of years. This section briefly summarizes what is known about this long history of human use of the project area, which is situated within the central Great Basin area.

Prehistory

Five time periods or cultural (developmental) stages are presented: Pre-Llano (> 15,000 years before present [B.P.]), Paleoindian (ca. 15,000 to 10,000 B.P.), Archaic (Desert Archaic, ca. 10,000 to 1,500 B.P.), Late Prehistoric (Fremont, ca. A.D. 500 to 1300), and Proto-Historic (Numic, ca. A.D. 1300 to 1850).

The Pre-Llano is often characterized as a chopper-scraper horizon, or pre-projectile stage. Dates from 15,000 to 70,000 years B.P. have been proposed for sites ascribed to this stage, but the validity of these dates has been seriously questioned. The tool assemblages typically contain crude, percussion-flaked artifacts.

The Paleoindian period is more thoroughly documented than the Pre-Llano sequence. This period is sometimes referred to as the Early Big Game Hunting period. Material remains of the earliest stage of this period are primarily large, well-made lanceolate spear points, some of which are fluted. The vast majority of the resources are surface finds that lack depositional context. When found in stratified deposits, these projectile points are often associated with now extinct species of mammoth, bison, camel, mountain sheep, horse, and sloth.

The Archaic period is marked by the replacement of the larger lanceolate points with large, side-notched and indented stemmed forms as well as the appearance of grinding implements to process native plant foods. This change in projectile point morphology is generally acknowledged to be the result of the development of the atlatl (throwing stick). Archaic projectile point types include Humboldt, Northern Side-notched, and Pinto series points. After 4,000 B.P., the Elko series projectile points became dominant. Other artifacts of this period include basketry, fiber sandals, hard wood dart shafts, digging sticks, curved wooden clubs, serrated scapule saws, bone awls, and imported Olivella beads and shells from the California coast. During this period there was a shift from lacustrine resources to upland habitats where pinyon became an important resource.

The Late Prehistoric period saw a continuation of the previous hunting and gathering lifeways as well as the advent of horticulture. The Fremont culture, found primarily in Utah, also occupied eastern Nevada in the northern portion of the CWP area. Fremont peoples occupied semi-subterranean pit houses, and utilized adobe and stone masonry storage structures or granaries situated high on cliff faces. Cultural resources included gray, corrugated and painted pottery, clay figurines, stone balls, trough metates, and triangular bodied anthropomorphic figures found at pictograph sites. A major technological innovation which occurred throughout the Great Basin during this time period was the replacement of the atlatl and dart points by the bow and arrow. These smaller arrow point types include the Rose Spring and Eastgate series. The second well known culture of this period is that of the Virgin

Anasazi, who occupied the Colorado River plateau or the southeastern portion of the project area. These people, like the Fremont, were agriculturalist. The Virgin Anasazi grew maize and cotton, mined salt, and traded marine shell beads, turquoise, and painted pottery. They built pit houses and above ground masonry structures, and had communal storage facilities.

The Proto-Historic or Numic period is reminiscent of Archaic subsistence strategies: hunting and gathering. Diagnostic Numic artifacts include brown-ware pottery and Desert Side-notched arrow points. Numic groups (Paiutes) continued to occupy the region and were present at the time of contact with Euro-Americans during the 18th and 19th centuries, marking the end of the prehistoric era.

Ethnohistory

During the ethnohistoric period, the entire CWP area was inhabited by the Southern Paiute, who occupied a broader region extending across southern Utah and southern Nevada. The Southern Paiute belong to the Southern Numic branch of the Uto-Aztecan linguistic family. Mobile hunting and gathering was the primary subsistence strategy, although the Southern Paiute practiced limited agriculture. The main crops included maize and squash. This diet was augmented by small game animals and the collecting of pine nuts, grass seeds, and agave. The seasonal subsistence cycle was not greatly affected with the advent of horticulture. Groups of individual households moved together on hunting and gathering trips, leaving the elderly to tend fields. These groups would congregate for fall hunts, and share resources through the winter. Disruptions of this lifestyle began soon after early Mormon colonizing efforts in southern Nevada. By 1855, there were several Mormon communities in the area, including missions in Moapa and Las Vegas. Settlements and farms displaced Southern Paiute from their best gathering and horticultural lands. Before long, traditional food supplies throughout the region were further depleted by livestock, timbering, and other activities. Euro-American settlers and miners began arriving by the turn of the century, preventing the Southern Paiute from returning to their traditional lifeways. In 1872, many of the Paiute in southern Nevada were settled on the Moapa Indian Reservation, established on the upper Muddy River. Other reservations followed, including the Las Vegas Colony near the City of Las Vegas in 1911.

History

The expedition of Dominguez and Escalante is generally recognized as the first group of Europeans to enter the Great Basin. They skirted the eastern margin of the CWP area in Utah.

The earliest contact between Spaniards and native groups occurred as a result of trade activities, and in attempts to acquire slaves. Slavery was an integral part of the Spanish social system on the northern frontier, where wealthy landowners sought women and children to perform menial tasks around the house, and men to tend animals in the pastures. Great Basin Indian groups became subject to Ute and Navajo slave raiders by as early as 1813.

By 1830 the Old Spanish Trail became an established road. It followed, in part, the Escalante route and connected Santa Fe and Los Angeles. Extensive trade caravans traversed the Great Basin in search of slaves and other goods. The slave trade reached its peak during the period from 1830 to the middle of the 1840s. Despite antislavery policies, the Mormon militia was not able to put a stop to the slave trade until the 1850s.

While the effects of slave raiding were devastating, the contact allowed Western Shoshone and Southern Paiute groups to obtain numerous trade items from both whites and other Indians who intruded into their territory. They acquired horses, tepees, guns, kettles, metal knives, dogs, potatoes, and beans as a result of the contacts. Aboriginal leadership patterns also began to change as contact with other groups introduced the idea of formal chiefs.

The first white intervention into eastern Nevada occurred as a result of American and English competition within the fur trade. The Hudson's Bay Company sent a company of men under the leadership of Peter Skene Ogden to trap the Snake River and adjacent areas in 1826. They hoped to exterminate the beaver population in the region before the Rocky Mountain Fur Company could penetrate the area. In 1827, Jedediah Smith led a group of trappers employed by the Rocky Mountain Fur Company into the area near Ely during a return from California. His exact route through Nevada is unclear, but it is believed that he paralleled the route of modern Highway 6. His party entered the Ely district near the base of the Pancake Range and camped south of Lund after traveling through the White River Valley. They then crossed the Egan Range, went through the Steptoe Valley and camped in the Schell Creek

Mountains near Connors Canyon. The next day they came into Spring Valley near Majors Place, and then crossed Sacramento Pass into Snake Valley and left Nevada by heading east into Utah.

Mapping and exploration surveys also played a role in the history of eastern Nevada. Captain John Charles Fremont led five expeditions between 1842 and 1854 to explore the area belonging to Mexico. These expeditions were sponsored by the United States government.

3.6.3 Summary of Archaeological Research by Basin

The primary goal of the research was to collect survey and site location data for all sites recorded in the CWP area. This extensive file search was conducted at the Division of Environmental Assessment, Environmental Research Center, at the University of Nevada, Las Vegas regarding Clark, Lincoln and Nye counties, and at the Ely District Bureau of Land Management office in Ely, Nevada for White Pine County. Additional published data was obtained at the University of Nevada, Las Vegas library.

This information is presented according to hydrographic basins as shown in Figure 1-1. Each basin is characterized regarding the types and amounts of archaeological research which have occurred in them, and in terms of the kinds of sites which are likely to be encountered there based upon surveys previously conducted in that basin (see Table 3-9).

Spring Valley

There are a variety of open sites in Spring Valley which contain lithics, groundstone, and both Fremont and Shoshone type ceramics. Projectile point series range from Archaic types such as Pinto, Elko, and Humboldt through late Prehistoric and Proto-historic types such as Rosegate, Cottonwood Triangular, and Desert Side-notched. This basin has the largest number of sections surveyed (140), with 53 having cultural resources.

Snake Valley

While a fairly large amount of survey has been conducted within Snake Valley, it has been limited to the areas under BLM jurisdiction. Sites which are known to occur on private land

TABLE 3-9

FREQUENCY OF CULTURAL RESOURCES BY BASIN WITHIN THE CWP AREA

Valley	Density of Cultural Resources Percentage of Total Area Surveyed				Total Acres Surveyed
	High	Medium	Low	None	
Spring	2.1	9.3	31.1	57.5	61,450
Snake	7.9	8.4	33.0	50.7	28,450
Hamlin	--	--	--	--	0
Lake	0.0	0.0	56.0	44.0	5,290
Patterson	0.6	2.9	29.3	67.2	35,710
Dry Lake	0.0	6.0	51.9	42.1	42,790
Delamar	0.0	5.2	44.3	50.5	19,490
Coyote Springs	1.7	9.6	39.3	49.4	38,800
Hidden	0.0	4.2	54.6	41.2	13,490
Garnet	0.0	13.3	51.2	35.5	25,270
Las Vegas	1.2	2.0	48.3	48.4	24,020
Railroad North	1.6	6.5	28.0	63.8	25,660
Railroad South	0.0	0.0	35.2	64.8	1,050
Penoyer	0.0	0.0	10.4	89.6	13,860
Tikaboo	0.0	7.8	0.0	92.2	4,370
Pahranagat	2.3	5.3	41.3	51.1	28,370
Cave	0.0	5.6	35.8	58.6	10,630
Pahroc	0.0	1.9	34.2	63.9	21,610
Coal	0.0	0.0	72.9	27.1	2,365
Garden	0.0	0.0	34.9	65.1	3,440
Three Lakes South	13.2	0.0	7.9	78.9	9,250
California Wash	3.6	2.0	33.0	61.4	32,910

Sources: Dames & Moore

have been partially destroyed through agricultural practices and artifact collecting, so that the full extent of Fremont and Shoshone occupation of the valley may never be known. A good deal of the survey which has taken place suggests a large Fremont presence in the Baker and Garrison areas. Little survey work has been conducted within the more southerly portion of the valley, so that the extent of various cultural manifestations there remains unknown.

The Garrison site is a Fremont village that was excavated in 1954. The Baker Village site, like the Garrison site, is a Fremont village. The Baker site is unique in that it may be a regional trade center because turquoise, marine shells, and imported ceramics were excavated. Sites have also been recorded on the terraces above Silver Creek. These sites are village sites as well, containing Rosegate series projectile points along with groundstone. Thirty-three of the sixty-six sections surveyed have cultural resources.

Hamlin Valley

There have been very few surveys in Hamlin Valley, and very few sites have been recorded. Prehistoric sites consist of lithic scatters and ceramic scatters. Hamlin's geographic location, between Snake and Spring Valleys, may suggest that with increased survey, sites similar to those in these adjacent valleys may also be located in Hamlin Valley. Historic trash scatters and dumps are present in the CWP area.

Lake Valley

Much of the prehistoric use of Lake Valley appears to have been limited to temporary use of the valley to obtain particular resources. Prehistoric sites which have been recorded within the valley as a result of seismic line surveys are limited to lithic scatters and isolated finds. Isolated projectile points which have been recovered throughout the valley suggest that use has continued from the Archaic to the Proto-historic. Elko Series, Rosegate Series, and Cottonwood Triangular points have been recorded from isolated contexts throughout the valley. Seven of the fifteen sections surveyed have cultural resources.

Patterson Valley

A relatively few prehistoric sites have been recorded in Patterson Valley. Lithic scatters and isolated finds have been the main features found. A biface with an associated yucca fruit cache has also been recorded.

Historic use of Patterson Valley has mainly involved ranching and mining activities. Thirty-two of the eighty-two sections surveyed have cultural resources present.

Dry Lake Valley

Most of the sites found within Dry Lake Valley suggest that the area was used on a seasonal basis to procure particular resources. Common site types include lithic scatters, quarry sites, temporary campsites, and milling stations. Prehistoric people may have come into the area on a seasonal basis to procure plant foods and lithic raw materials. Over half (58) of the sections surveyed (102) have cultural resources.

Delamar Valley

Archaeological surveys within Delamar Valley have been limited to the central portion of the valley. Linear surveys for seismic lines and transmission lines have documented a variety of site types including lithic scatters, rockshelters with associated petroglyphs, pictograms and lithic scatters, isolated petroglyph sites, and isolated lithic and projectile point finds. Historic sites include an abandoned telephone/telegraph line and a bottle smash. Half (22) of the sections surveyed (44) have cultural resources.

Coyote Springs Valley

A great deal of survey has been conducted within Coyote Springs Valley. Most of these were linear surveys for transmission lines or seismic testing. The exception to this linear orientation occurred as a result of the proposed MX missile survey. That project and others have recorded a large number of sites within the basin.

A large number of roasting pits have been recorded within Coyote Springs Valley. Other site types include petroglyphs, open campsites, lithic scatters, rockshelters, and a quarry site.

Historic sites include a rock structure, a temporary camp/settlement, and historic trash scatters. Over half (46) of the sections surveyed (84) have cultural resources recorded.

Hidden Valley

Most of the survey which has been conducted in Hidden Valley has been limited to the areas directly adjacent to Highway 93.

Prehistoric sites include roasting pits, quarries, lithic scatters, open campsites, pot drops, and rockshelters. Historic sites include historic roads/trails, lithic debris scatters, and railroad construction sites. Temporally diagnostic projectile points which have been recovered in the valley suggest that occupation has occurred from the Archaic (Pinto points) to the present. Twenty of the thirty-five sections surveyed have cultural resources.

Garnet Valley

A variety of archaeological surveys parallel Interstate Highway 15 through Garnet Valley. Surveys have been conducted for gas transmission lines, power transmission lines, seismic lines, and highway department surveys. Sites which have been recorded include a large percentage of roasting pits and hearths, some with associated lithics and groundstone. A large number of caves and rockshelters have also been recorded in the vicinity, and some open campsites and lithic scatters are also present.

Historic use of the area is mostly related to railroad construction and maintenance. The Dry Lake Railroad Siding and associated historic structures, a railroad construction camp, and various historic trash scatters have been recorded within the CWP area. Forty-five of the seventy sections surveyed have cultural resources.

Railroad Valley North

The majority of archaeological reconnaissance conducted in Railroad Valley has been as a result of seismic line surveys. A variety of sites have been recorded including: open habitation/workshop sites, lithic scatters, rockshelters, chipping stations, lithic/groundstone concentrations, historic debris scatters, and prehistoric and historic isolates. Twenty-three of the fifty-nine sections surveyed have cultural resources.

Railroad Valley South

Very little archaeological reconnaissance has been conducted in the southern portion of Railroad Valley. Of the few sites recorded, lithic scatters are the most common type. A petroglyph site has also been reported. Only one of the six sections surveyed has cultural resources.

Penoyer Valley

Little survey has been conducted in Penoyer Valley; of the 29 sections surveyed, 5 sections have cultural resources recorded. These surveys located prehistoric campsites, lithic scatters, isolates (flakes and tools), and a quarry. One historic mine was recorded.

Tikaboo Valley North

There have been very few surveys or sites recorded in Tikaboo Valley. Of the ten sections surveyed, two sections have cultural resources. The resources are lithic scatters and isolated flakes and tools.

Pahranagat Valley

A wide array of site types have been recorded within the Pahranagat Valley. In particular, a fairly large number of rockshelters occur. Several of these shelters feature pictograms and petroglyphs, and have grinding slicks, lithic scatters, or other kinds of artifacts associated with them. There are also numerous pictograph and petroglyph panels found without any other

artifacts associated with them. Thirty-seven of the sixty-six sections surveyed have cultural resources.

Cave Valley

Investigation of Cave Valley was limited to the southern portion of this basin. While a large portion of this area has not had any archaeological investigation, some archaeological sites have been recorded. The types of prehistoric sites which have been found include lithic scatters, temporary camps (with lithic debris and groundstone tools), and isolated flakes and projectile points. Several Elko series projectile points have been recovered from the area, suggesting Archaic Period use of the region.

Historic sites within the valley are very limited, but consist of isolated can and bottle scatters. These kinds of isolated debris may have resulted from mining exploration of the area. Ten of the twenty-seven sections surveyed have cultural resources recorded.

Pahroc Valley

Archaeological remains which have been discovered within the Pahroc Valley are mostly limited to the north end. This is the result of differential survey work which has been mostly restricted to the northern portions of the valley. Prehistoric sites which have been recorded in the basin include rockshelters, lithic scatters, quarrying sites, petroglyphs with associated grinding slicks, and isolated finds.

Historic use of the valley has been intensive as a result of mining activities. Eighteen of the forty-nine sections surveyed have cultural resources.

Coal Valley

There has been very little survey in the Coal Valley. Of the five sections that have been surveyed, four have cultural resources. Surface scatters of lithic debitage, groundstone fragments, pottery shards, and Rose Spring and Elko series projectile points have been recorded around Coal Valley Dry Lake.

Garden Valley

The literature review revealed that relatively few sites have been identified in Garden Valley. A few surveys have been conducted in the north end of the valley which identified lithic scatters, isolates, and a stone alignment. The south end of the valley remains almost completely unsurveyed. Of the six sections surveyed, two have cultural resources.

Three Lakes Valley South

A large number of sites has been recorded in association with the dry lake beds in South Three Lakes Valley. In particular, a series of hearth features with associated lithic and groundstone assemblages has been found along the lake margins during the Nellis Air Force Bombing and Gunnery Range Survey. Aboriginal activities represented by these sites include quarrying of chert and chalcedony nodules found on the adjacent alluvial fan, tool manufacture, hunting, and encampment near the shoreline of the playa during periods of flooding.

Other types of sites noted during the literature review include rock features, rock rings, lithic scatters, milling stations, and historic debris scatters. Seven of the twenty-four sections surveyed have cultural resources.

California Wash

The California Wash area has been extensively surveyed, and a wide variety of sites has been recorded. Prehistoric site types include rockshelters, lithic scatters, Puebloan house ruins, bedrock metates, ceramic scatters, and house circles/rock rings. Historic sites include a historic battle site, the historic Logan Gypsum camp, a railroad construction camp, and historic dumps/trash deposits. Thirty-two of the eighty-one sections surveyed have cultural resources.

3.7 LAND USE

Federal, tribal, state, and private lands are located within the CWP area. Federal lands include lands under the jurisdiction of BLM, USFS, USFWS, and DOD. Tribal lands include all or portions of four Indian Reservations. State lands include state parks, state recreation areas and state wildlife management areas. Although not abundant, private lands are located throughout the CWP area. Each of these ownerships is discussed in more detail below.

3.7.1 Federal Lands

Bureau of Land Management

BLM has set up a program to analyze and resolve conflicts arising over the use of public lands and resources. BLM is also responsible for the protection of public lands, and plays an administrative role in such areas as grazing, recreation, and the utilization of natural resources throughout Nevada. Grazing is the predominant use of BLM lands within the CWP area, and 20 to 50 acres are normally required for one Animal Unit Month (AUM).

Districts and resource areas have been set up by BLM. Within the CWP area, the Las Vegas District manages a majority of the BLM lands. Ely and a small portion of Battle Mountain District comprise the northern region of the project area. BLM Resource Areas within the CWP are Caliente, Schell, and Tonopah.

Wilderness Study Areas

In response to Section 603 of the Federal Land Policy and Management Act (FLPMA) of October 21, 1976, several federal agencies were required to inventory and study lands under their jurisdiction in regard to possible inclusion of appropriate areas within the National Wilderness Preservation System (NWPS). Within the CWP area, BLM has evaluated numerous wilderness study areas (WSAs). The results of these studies and BLM's recommendations will be forwarded to the President and Congress through the Secretary of the Interior. The intent of the NWPS is the preservation of lands for future generations to enjoy in their natural state.

Wilderness areas can be designated only by an Act of Congress. BLM lands designated as Wilderness Areas will be managed in accordance with the Wilderness Act of 1964 and BLM's Wilderness Management Policy.

In general, areas studied by BLM were evaluated in regard to several key factors (BLM 1991):

- Size: The area must have at least 5,000 contiguous roadless acres of public land.
- Naturalness: Human imprints must be substantially unnoticeable.
- Outstanding opportunities: The area must offer either an outstanding opportunity for solitude or an outstanding opportunity for primitive or unconfined recreation.
- Special features: Ecological, geological, or other features of scientific, educational, scenic, or historic value.

In evaluating each WSA, BLM also considered whether the area could be effectively managed to preserve its wilderness character over a long period of time (BLM 1991). The Nevada Outdoor Recreation Association has extensively documented proposed WSAs in Nevada in an unpublished report which was reviewed for purposes of the report.

A total of 33 WSAs are located throughout the CWP area and all occur on BLM land. Table 3-10 lists the individual WSAs and, as shown, they range from 3,466 to over 185,000 acres and totally represent well over 1 million acres of public lands (BLM 1991).

U.S. Forest Service

Within the state of Nevada, the Humboldt National Forest (HNF) is managed by the USFS. Four discontinuous portions of the HNF are located within the CWP area. National forests are managed by the USFS to allow multiple use of resources.

U.S. Fish and Wildlife Service

Within the CWP, the USFWS manages both the Desert National Wildlife Range and the Pahranagat National Wildlife Refuge. Located less than 20 miles north of the North Las Vegas city limits, Desert National Wildlife Range provides valuable habitat for the desert

TABLE 3-10

WILDERNESS STUDY AREAS

Wilderness Study Area	WSA ID Code	Acres within WSA	Acres Recommended for Wilderness
South Pahroc Range	NV-050-0132	28,395	28,395
Clover Mountains	NV-050-0139	84,935	84,875
Meadow Valley Range	NV-050-0156	185,744	97,180
Mormon Mountains	NV-050-0161	162,887	123,130
Delamar Mountains	NV-050-0179	126,257	0
U.S. Fish & Wildlife No. 1	NV-050-0201	11,090	0
U.S. Fish & Wildlife No. 2	NV-050-0216	17,242	0
U.S. Fish & Wildlife No. 3	NV-050-0217	22,002	0
Lime Canyon	NV-050-0231	34,680	13,895
Million Hills	NV-050-0233	21,296	0
Garrett Buttes	NV-050-0235	11,835	0
Quail Springs	NV-050-0411	12,145	0
Jumbo Springs	NV-050-0236	3,466	0
The Wall	NV-060-0163	38,000	30,320
Blue Eagle	NV-060-0158/0199	59,560	0
Mt. Grafton	NV-040-0169	73,216	30,115
Far South Egans	NV-040-0172	53,224	42,316
Fortification Range	NV-040-0177	41,615	0
Table Mountain	NV-040-0197	35,958	0
White Rock Range	NV-040-0202	20,245	20,245
Parsnip Peak	NV-040-0206	88,175	53,560
Worthington Mountains	NV-040-0242	47,633	26,587
Weepah Spring	NV-040-0246	61,137	50,499
Muddy Mountains	NV-050-0229	96,170	36,850
Arrow Canyon Range	NV-050-0215	32,853	0
Nellis	NV-050-4R-15A,B,C	12,316	0
Marble Canyon	NV-040-0086	12,715	1,865
Riordan's Well	NV-040-0166	57,002	0
Tunnel Spring	NV-050-0166	5,400	2,180
South Egan Range	NV-040-0168	96,916	0

Source: BLM, 1991

bighorn sheep and mule deer. The refuge also provides habitat for threatened and endangered species. Most of this land has been administratively endorsed as suitable wilderness study area.

Pahranagat National Wildlife Refuge is located approximately 65 miles north of Las Vegas, and borders the northeast corner of the Desert National Wildlife Range. Both Upper Pahranagat Lake and Lower Pahranagat Lake are part of Pahranagat Wildlife Refuge.

Department of Defense

Designated land within Desert National Wildlife Refuge is considered part of Nellis Air Force Range (NAFR). Adjacent to both the Desert National Wildlife Refuge (southeast corner) and Las Vegas is another strip of NAFR; however, most of NAFR is outside of the CWP area. The NAFR is under the jurisdiction of the DOD, and provides habitat for numerous wildlife species and wild horses.

3.7.2 Tribal Lands

The Duckwater, Moapa River, and Las Vegas Paiute Indian Reservations and a portion of the Goshute Indian Reservation are located within the CWP area.

3.7.3 State Lands

As previously indicated, state lands include State Parks, State Recreation Areas, and State Wildlife Management Areas. State areas within or immediately adjacent to the CWP area include the following:

- Valley of Fire State Park
- Beaver Dam State Park
- Cathedral Gorge State Park
- Spring Mountain Ranch State Park
- Kershaw-Ryan State Recreation Area
- Echo Canyon State Recreational Area
- Wayne E. Kirch Wildlife Management Area

- Hay Meadow, Tule Field, Adams McGill, and Whipple Reservoirs and the surrounding area
- Ward Charcoal Ovens Historic State Monument

The state parks and recreation areas have been developed to offer various recreational opportunities to users. Generally, these areas are used for picnicking, scenic sightseeing, hiking, and camping and occasionally they offer hunting opportunities. If the park or recreational area has a lake or reservoir, it also may provide fishing and boating recreational opportunities.

The state wildlife management areas are managed to provide valuable habitat for local wildlife populations, and the enhanced habitat generally supports larger populations of wildlife species. Wildlife management areas also provide limited hunting opportunities.

3.7.4 Private Lands

Although quite limited in abundance, private land is located in all valleys in the CWP area except Hidden Valley. Much of the private land is associated with springs where available surface water is diverted for agriculture or to sustain meadow grass for livestock grazing. A limited amount of private land is associated with past mining operations.

3.7.5 Land Use within Specific Valleys

Acreages of the various land ownerships for each of the valleys in the CWP area are shown in Table 3-11. Overall, BLM administers almost 78 percent of the land within the project area; within specific valleys, the amount of BLM land varies between 29 and 99 percent in each basin. Tribal lands are located within three of the basins and represent between less than 0.1 percent in Snake Valley to almost 30 percent in California Wash. State lands are quite limited within the project area and represent less than 1 percent of the CWP area. Private lands occur in all valleys except Hidden Valley but within any one valley do not exceed 5 percent and represents less than 2 percent of the total CWP area. Land ownership within each of the valleys is briefly described below, and is illustrated on Figures 3-36 to 3-56.

TABLE 3-11

LAND USE WITHIN THE CWP AREA

Valley	Land Use Classification		Acreage
Spring	BLM		791,140
	National Forest (USFS)		221,520
	Federally Protected		7,430
	Water Reserve		460
	Private Land		44,450
		Total	1,065,000
Snake*	BLM		468,260
	National Forest (USFS)		192,680
	National Monument		540
	Federally Protected		2,110
	Tribal Land		170
	State Land		210
	Private Land		22,230
		Total	686,200*
Hamlin*	BLM		299,260
	National Forest (USFS)		27,790
	State Land		50
	Private Land		1,020
		Total	328,120*
Lake	BLM		332,300
	Federally Protected		8,170
	Water Reserve		50
	Private Land		14,780
		Total	355,300
Patterson	BLM		256,960
	Private Land		10,940
		Total	267,900
Dry Lake	BLM		572,400
	Water Reserve		150
	Private Land		2,650
		Total	575,200
Delamar	BLM		230,500
	Private Land		1,500
		Total	232,000

* Includes land use only in Nevada

TABLE 3-11
(Continued)

Valley	Land Use Classification		Acreage
Coyote Springs	BLM		198,530
	Wildlife Refuge (USFWS)		190,890
	DOD		1,790
	Water Reserve		40
	Private Land		1,050
		Total	392,300
Hidden	BLM		25,480
	Wildlife Refuge (USFWS)		27,220
		Total	52,700
Garnet	BLM		67,820
	Wildlife Refuge (USFWS)		22,650
	Federally Protected		200
	DOD		160
	Tribal Land		10,710
	Private Land		860
		Total	102,400
Railroad North	BLM		1,085,086*
	National Forest (USFS)		245,209
	Wildlife Refuge (USFWS)		11,695
	Federally Protected		5,342
	Water Reserve		375
	Tribal Land		3,775
	Private Land		20,518
		Total	1,372,000
Railroad South	BLM		336,860
	DOD		42,190
	Private Land		50
		Total	379,100
Penoyer	BLM		351,040
	DOD		87,500
	Federally Protected		1,350
	Private Land		7,910
		Total	447,800
Tikaboo	BLM		278,350
	DOD		212,910
	Wildlife Refuge (USFWS)		143,000
	Private Land		40
		Total	634,300

TABLE 3-11
(Continued)

Valley	Land Use Classification		Acreage
Pahranagat	BLM		450,730
	DOD		350
	Federally Protected		650
	Wildlife Refuge (USFWS)		33,030
	Recreation Land		1,360
	Private Land		11,880
		Total	498,000
Cave	BLM		216,000
	Federally Protected		8,080
	Water Reserve/Power Withdrawn		120
	Private Land		6,100
		Total	230,300
Pahroc	BLM		325,270
	Federally Protected		490
	Private Land		240
		Total	326,000
Coal	BLM		289,590
	Private Land		910
		Total	290,500
Garden	BLM		216,610
	National Forest (USFS)		99,040
	Private Land		2,950
		Total	318,600
Three Lakes South	BLM		57,920
	DOD		106,650
	Wildlife Refuge (USFWS)		31,380
	National Forest (USFS)		2,740
	Federally Protected		1,810
	Private Land		200
		Total	200,700
California Wash	BLM		138,865
	BOR		870
	Tribal Land		60,560
	Recreation Land		70
	State Land		1,000
	Private Land		4,590
		Total	205,955

Spring Valley

Land use within Spring Valley is shown on Figure 3-36. Federal lands include lands administered by BLM, USFS, and federally withdrawn lands and in total represent over 95 percent of the land in the valley. No state lands are located in the valley and private lands represent less than 5 percent of the Spring Valley.

Snake Valley

Land use within the Nevada portion of Snake Valley is shown on Figure 3-37. Lands administered by federal agencies represent over 96 percent of the land within the valley with BLM and USFS administering the largest amounts. The Great Basin National Monument is also located within Snake Valley. Limited amounts of tribal lands (Goshute Indian Reservation) and state land are present within the valley. Three percent of the land within the valley is private.

Hamlin Valley

Figure 3-38 shows the various land uses within the Nevada portion of Hamlin Valley. As shown, most land within the valley is administered by BLM (over 91 percent) and a smaller amount is administered by the USFS (8 percent). Limited amounts of state and private lands are located in the valley, but together they represent less than 1 percent of the land in the valley.

Lake Valley

Land within Lake Valley includes land administered by BLM and a limited amount of private lands (Figure 3-39). Totally, the federal holdings represent almost 96 percent of the valley and private lands represent the remaining 4 percent.

Patterson Valley

Only BLM and private lands are located in Patterson Valley (Figure 3-40). BLM lands represent 96 percent of the valley and private lands represent 4 percent.

Dry Lake Valley

Land use within Dry Lake Valley is shown on Figure 3-41. The majority of the land in the valley is administered by BLM with less than 1 percent in private ownership.

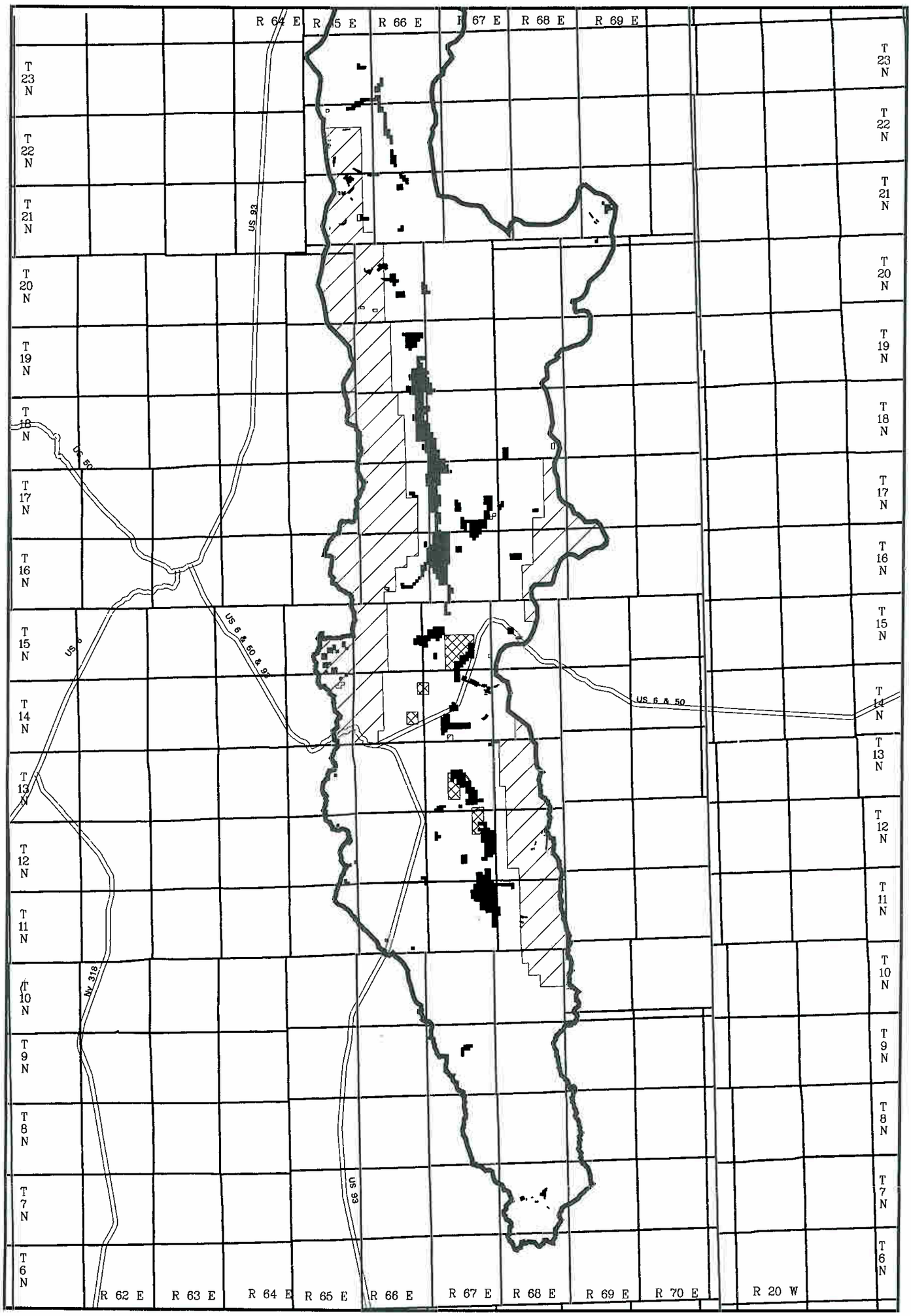


Figure 3-36 - Land use in Spring Valley WB184

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NAT'L PARK
- NAT'L TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

0 9

One inch = 9 miles.

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

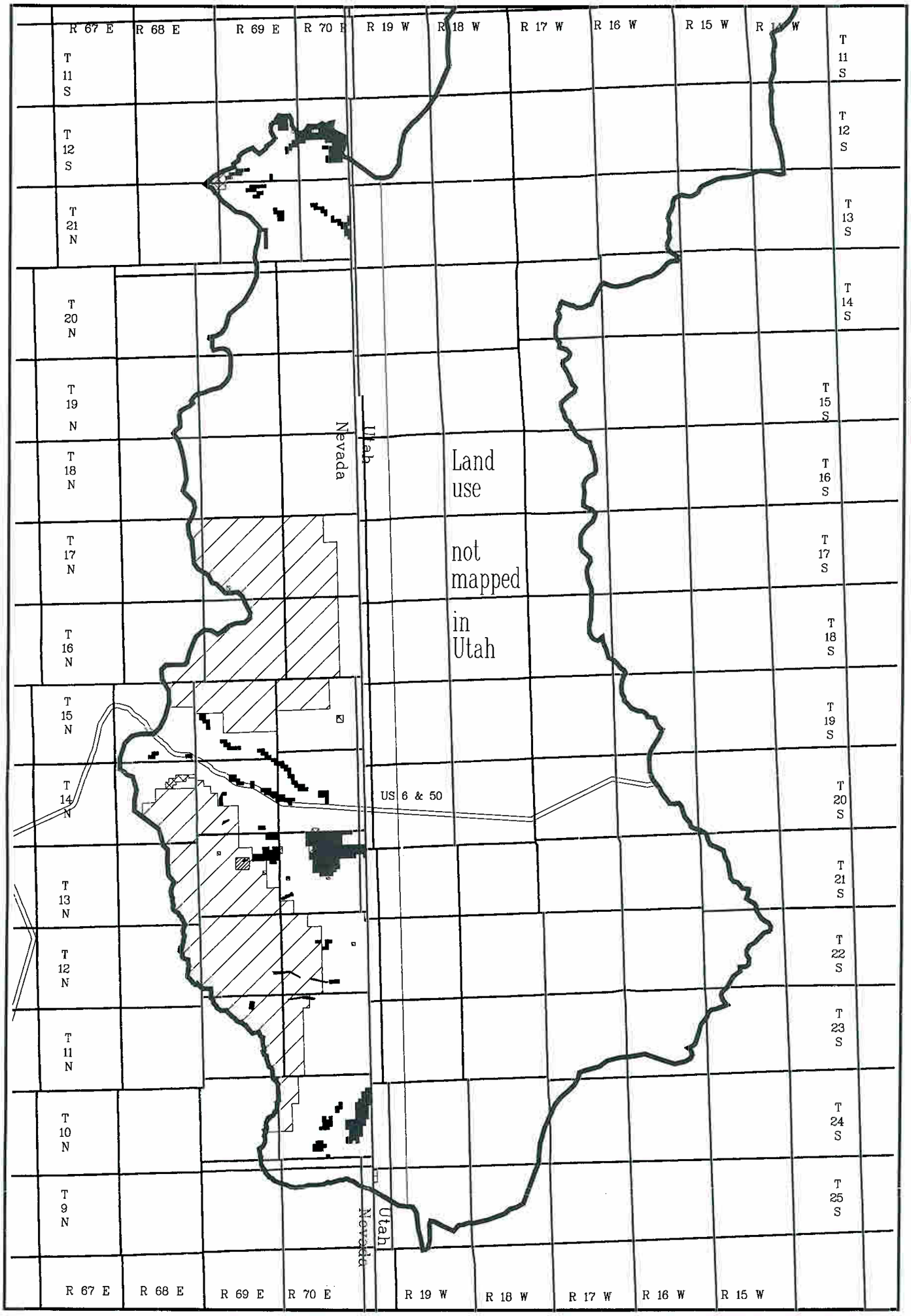


Figure 3-37 - Land use in Snake Valley WB195

Source: Bureau of Land Management Surface Management Status Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NAT'L PARK
- NAT'L TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

0 7

One inch = 7 miles.

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

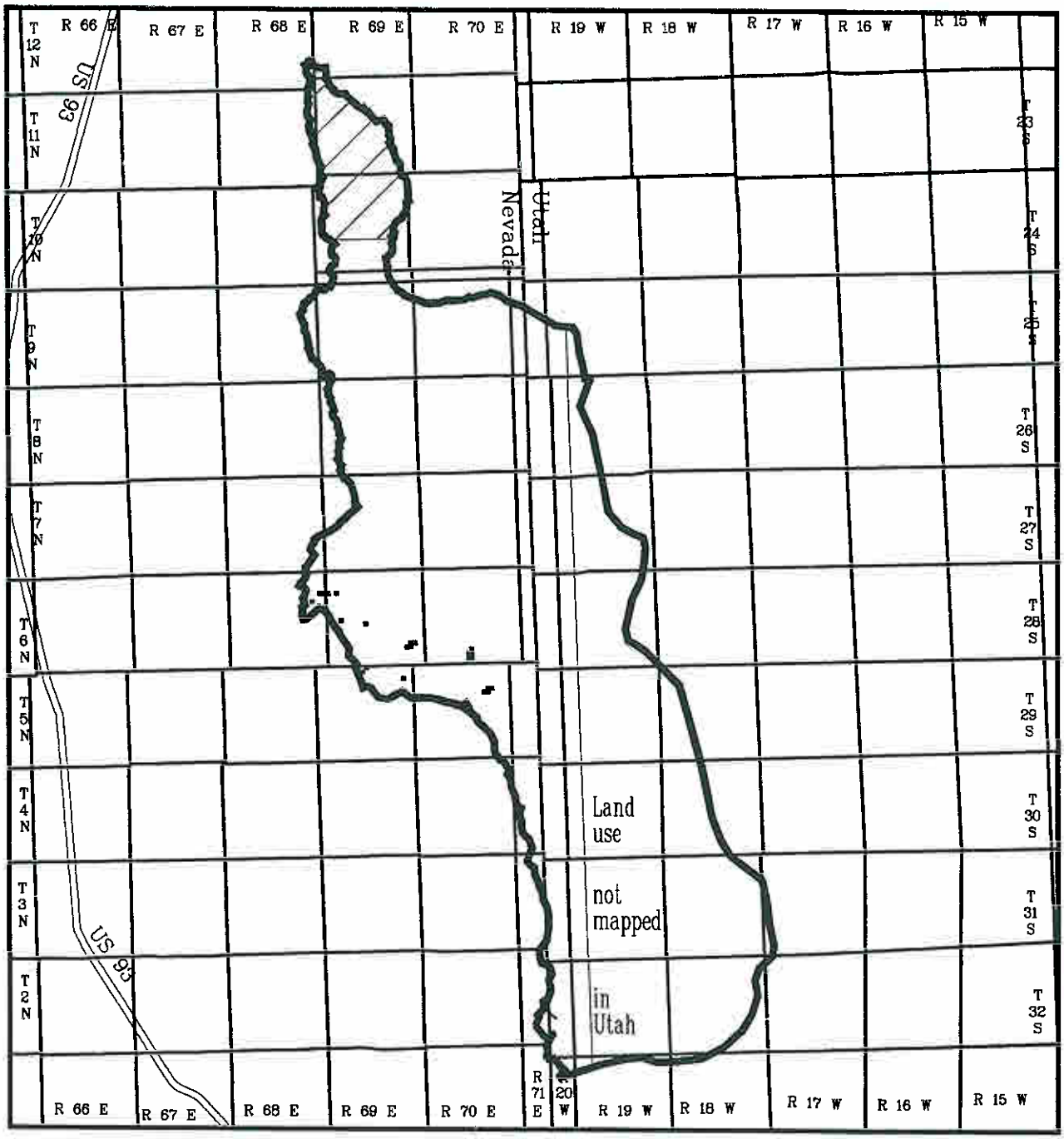


Figure 3-38 - Land use in Hamlin Valley WB196

Source: Bureau of Land Management Surface Management Status Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 11

One inch = 11 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

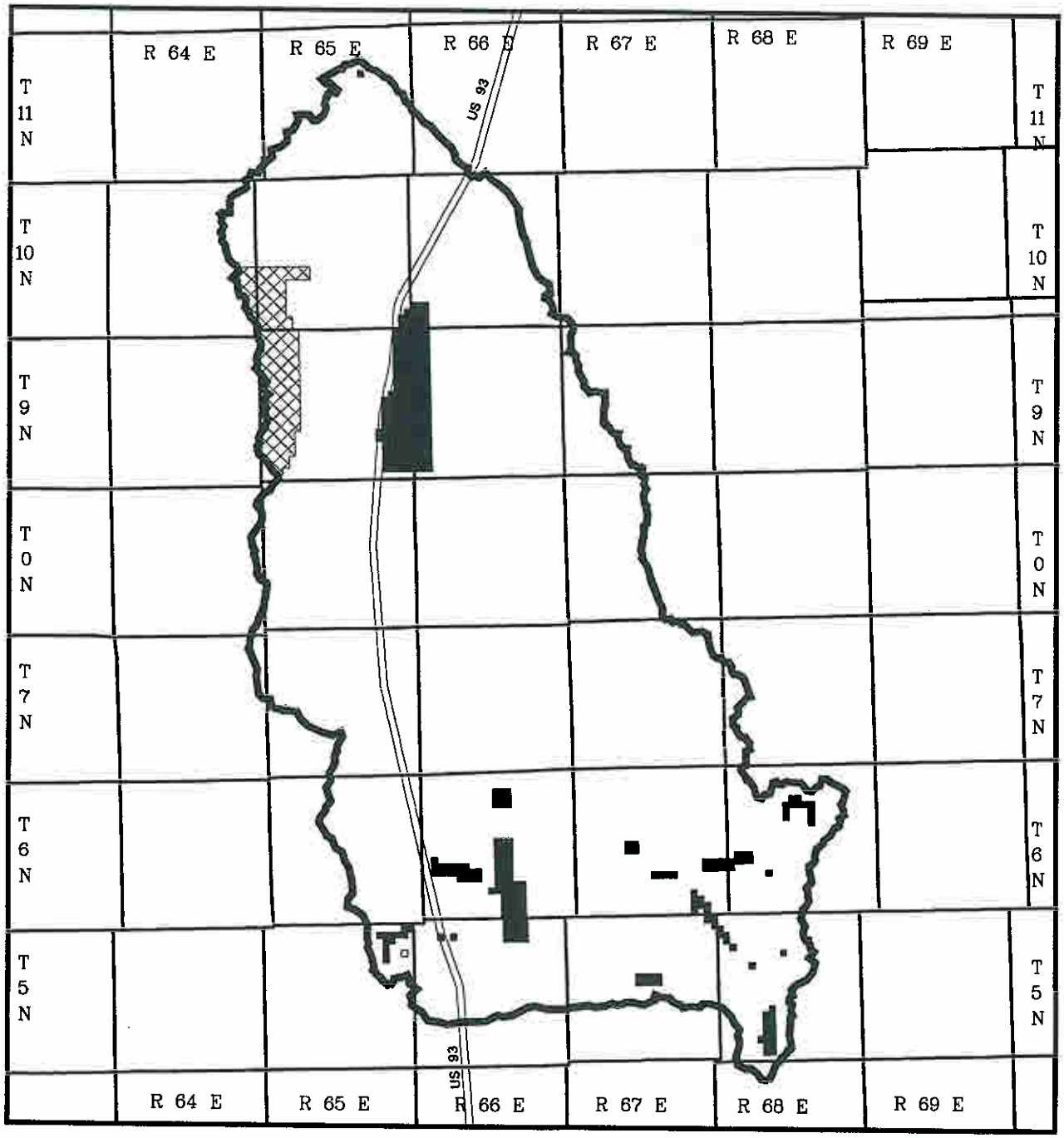


Figure 3-39 - Land use in Lake Valley WB183

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

Roads

0 7

One inch = 7 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

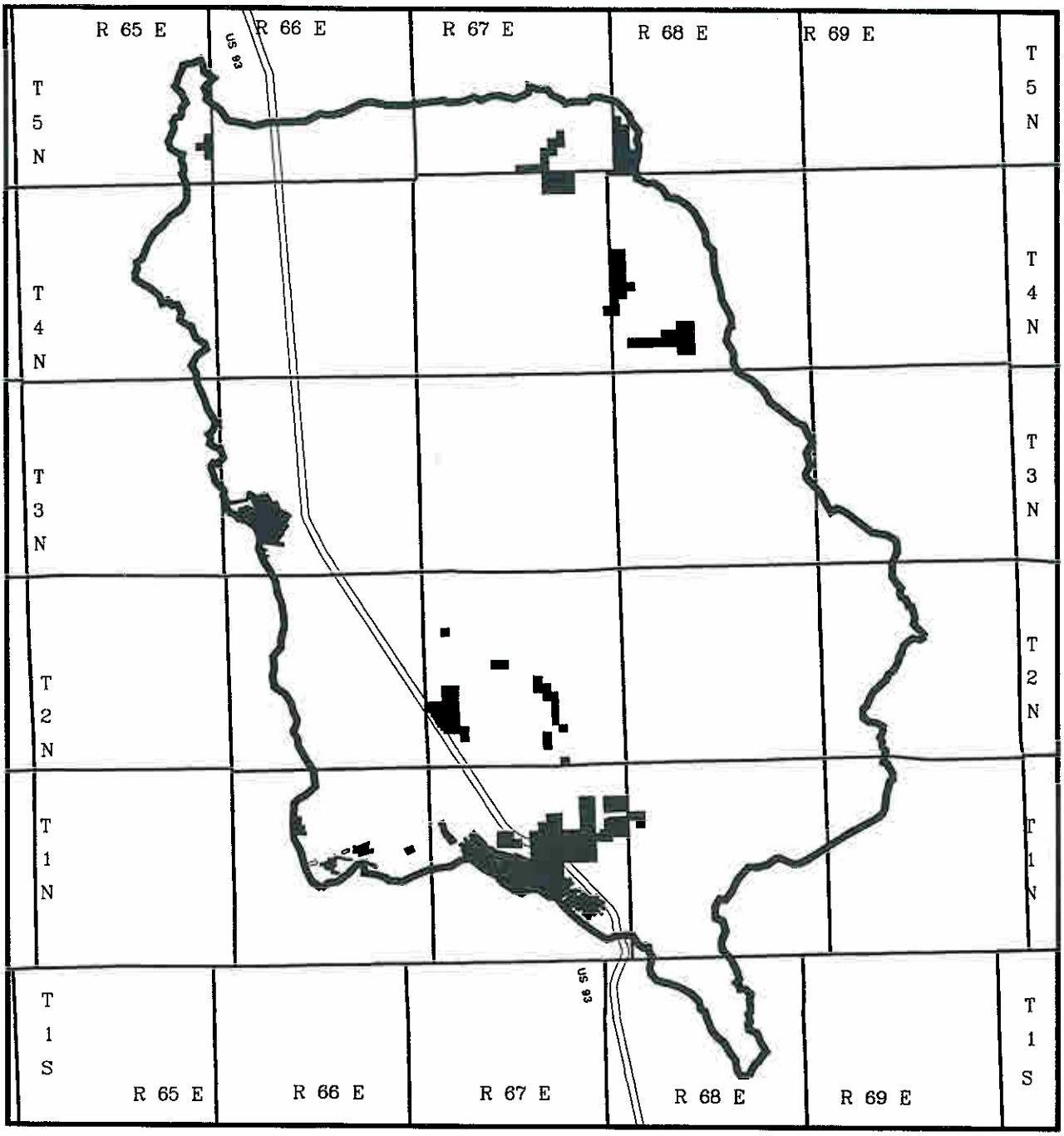


Figure 3-40 - Land use in Patterson Valley WB202

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

-N-

Roads

0 5

One inch = 5 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

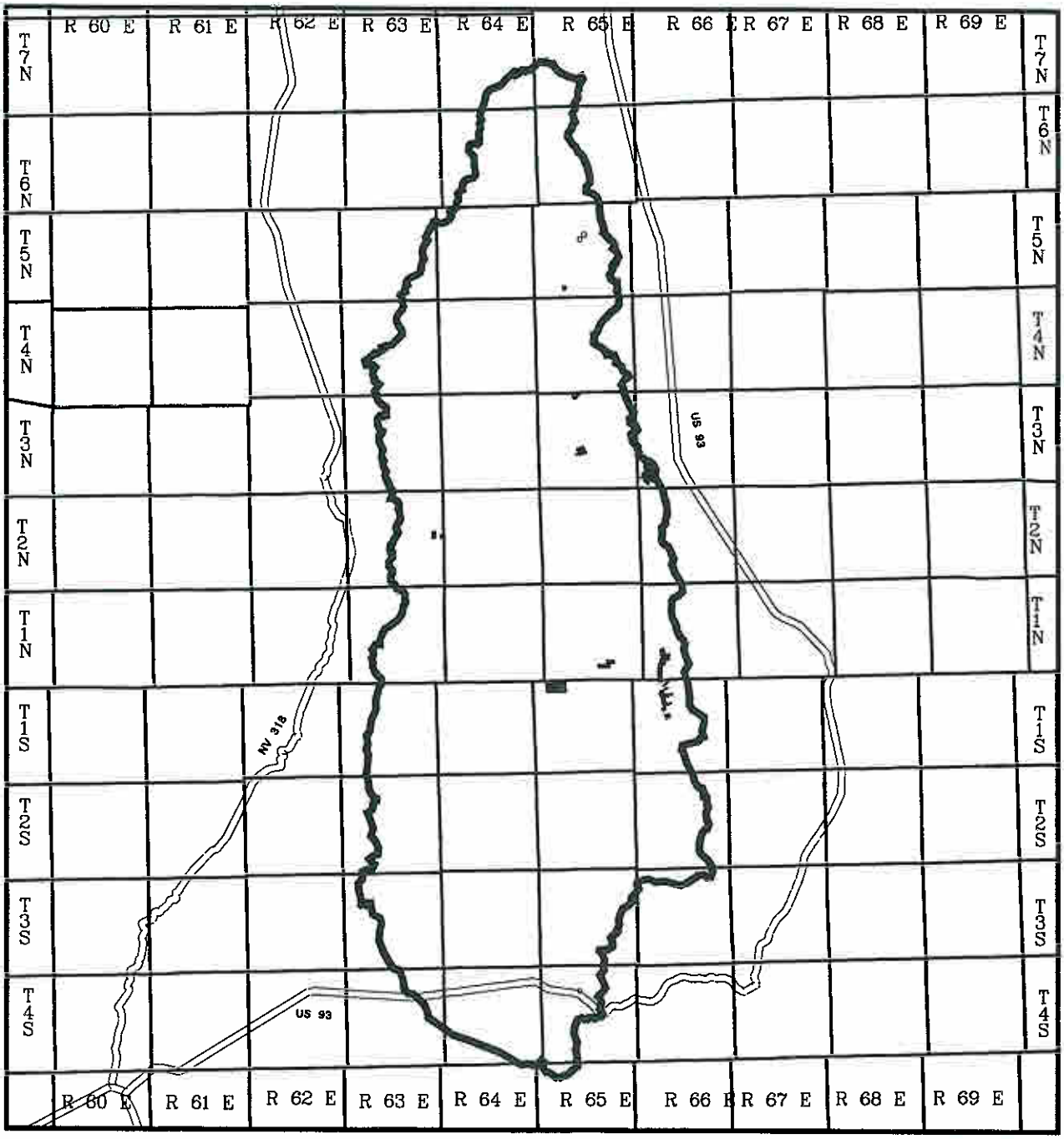


Figure 3-41 - Land use in Dry Lake Valley WB181

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

-N-

Roads

0 10

One inch = 10 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

Delamar Valley

BLM and private lands are located in Delamar Valley (Figure 3-42). Similar to Dry Lake Valley, over 99 percent of the valley is administered by BLM and private ownership represents less than 1 percent.

Coyote Springs Valley

As shown on Figure 3-43, portions of the Desert National Wildlife Refuge and Nellis Air Force Range are located within Coyote Springs Valley. The valley also includes BLM lands and private lands. Federal lands represent over 99 percent of the valley including BLM (50 percent), USFWS (49 percent), and DOD (less than 1 percent). Private lands represent less than 1 percent of the land in the valley.

Hidden Valley

Hidden Valley is the only valley within the CWP area that does not contain land in private ownership. As shown on Figure 3-44, land within the valley is about equally split between BLM and USFWS land (Desert National Wildlife Refuge). USFWS land represents 52 percent of the valley while BLM land represents 48 percent.

Garnet Valley

Land use within Garnet Valley is more diverse than most of the other valleys within the project area and includes BLM land, DOD/DOE land, USFWS land, federally protected land, tribal land, and private land (Figure 3-45). BLM and USFWS land account for most of the valley (66 and 22 percent, respectively). The Moapa River Indian Reservation encompasses almost 11 percent of the valley. Private land holdings in the valley represent slightly less than 1 percent of the acreage.

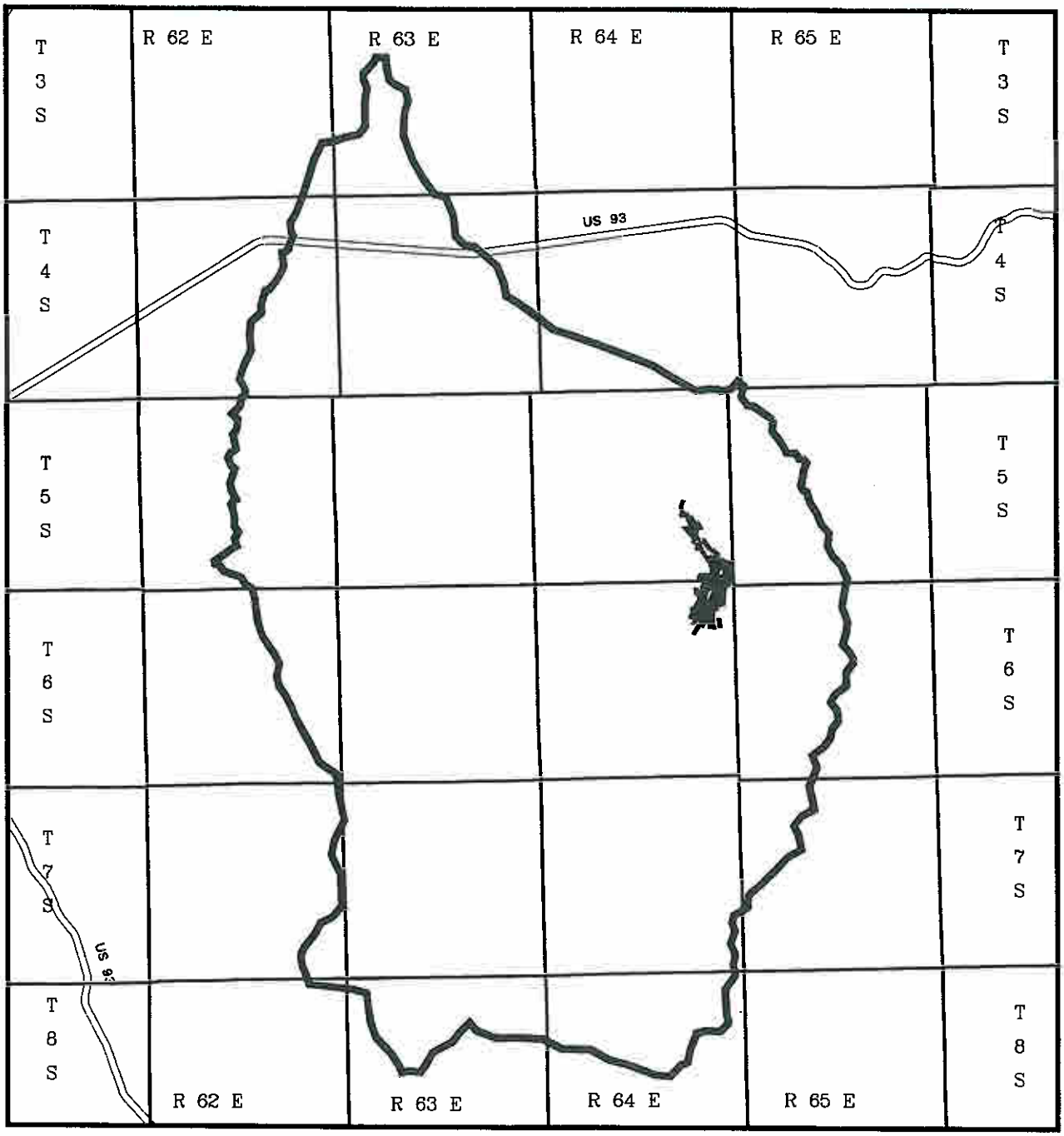


Figure 3-42 - Land use in Delamar Valley WB182

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

Roads

0 6

One inch = 6 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

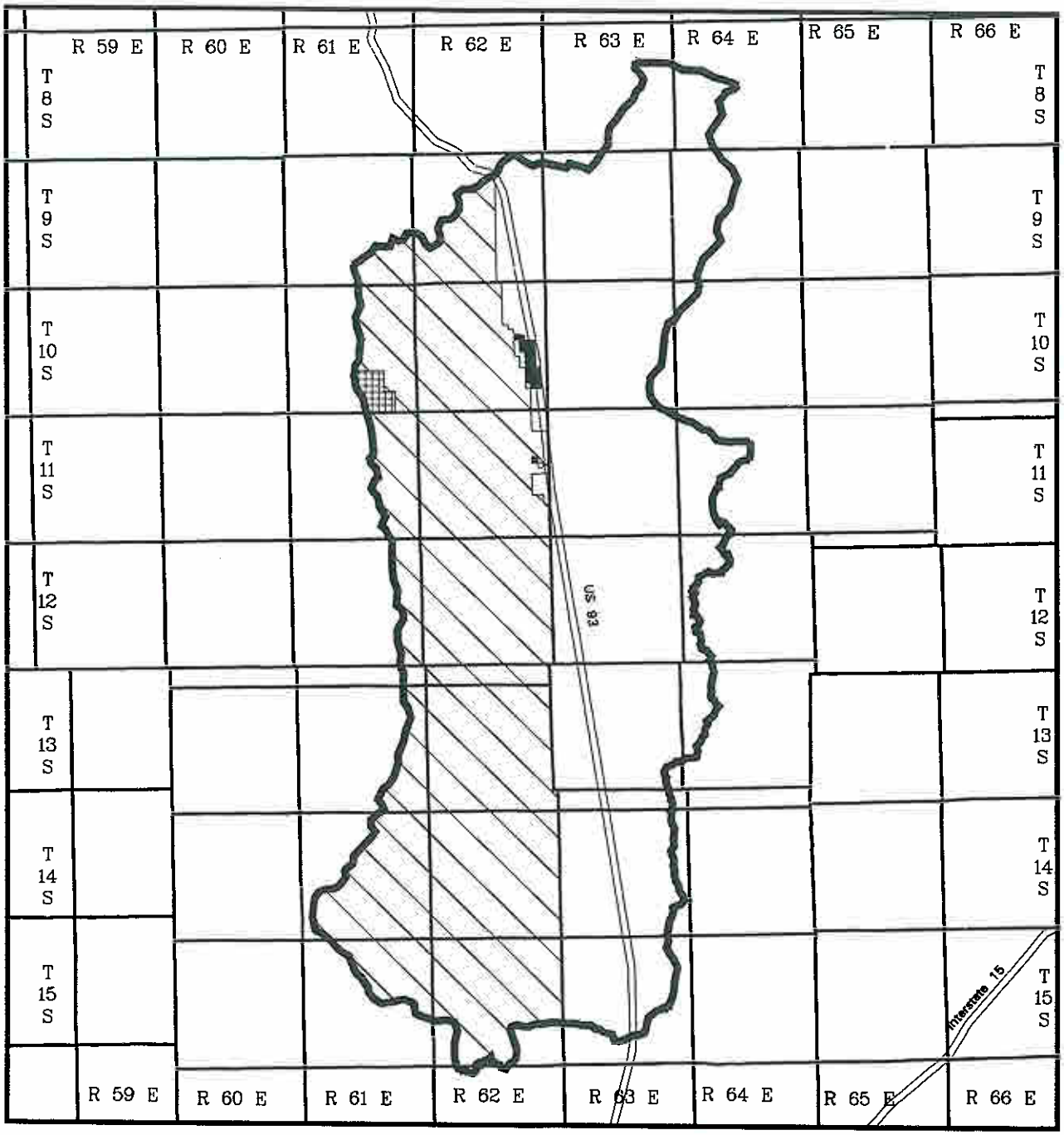


Figure 3-43 - Land use in Coyote Springs Valley WB210

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 8

One inch = 8 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

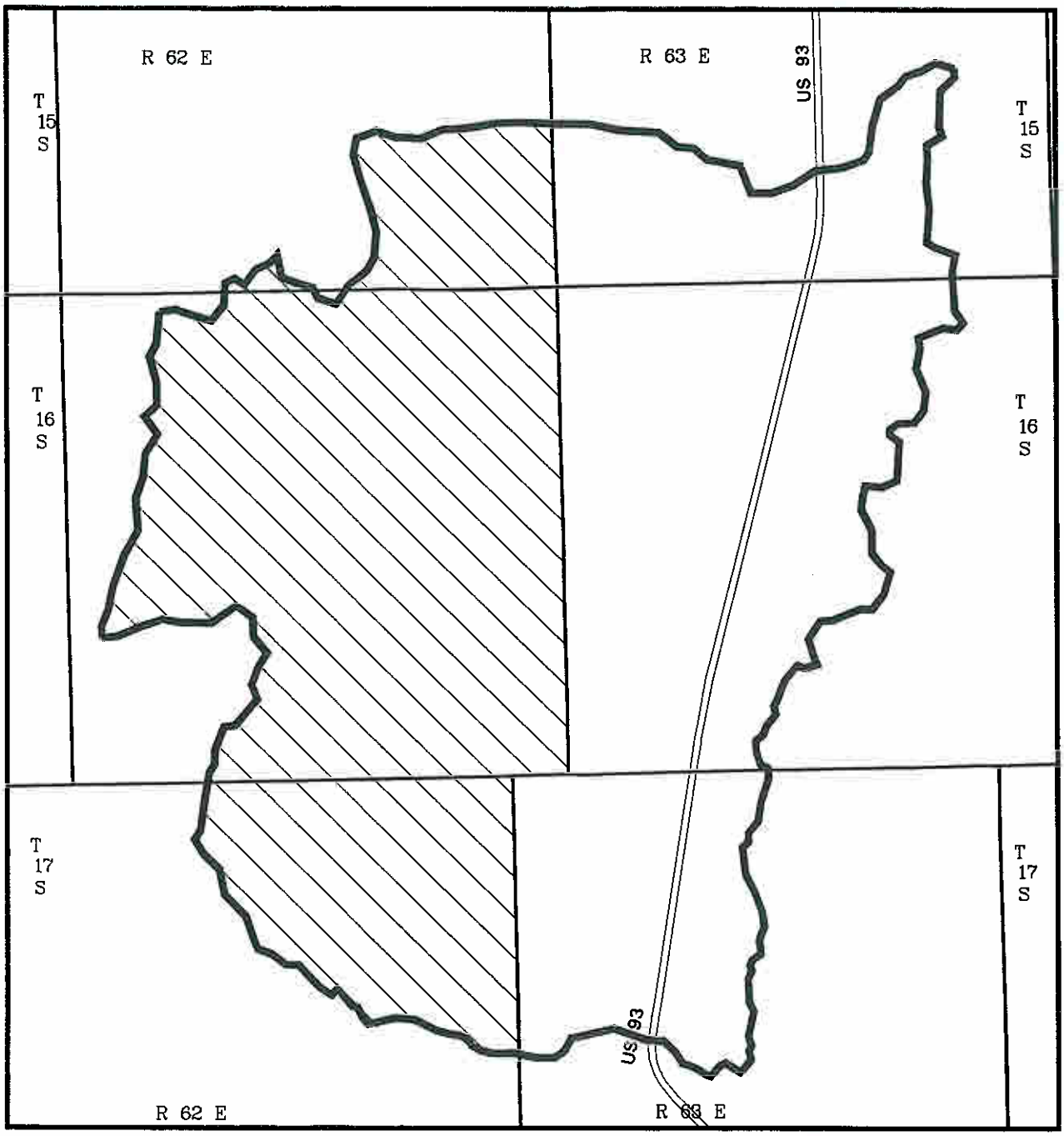


Figure 3-44 - Land use in Hidden Valley WB217

Source: Bureau of Land Management
Surface Management Status
Maps 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 3

One inch = 3 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

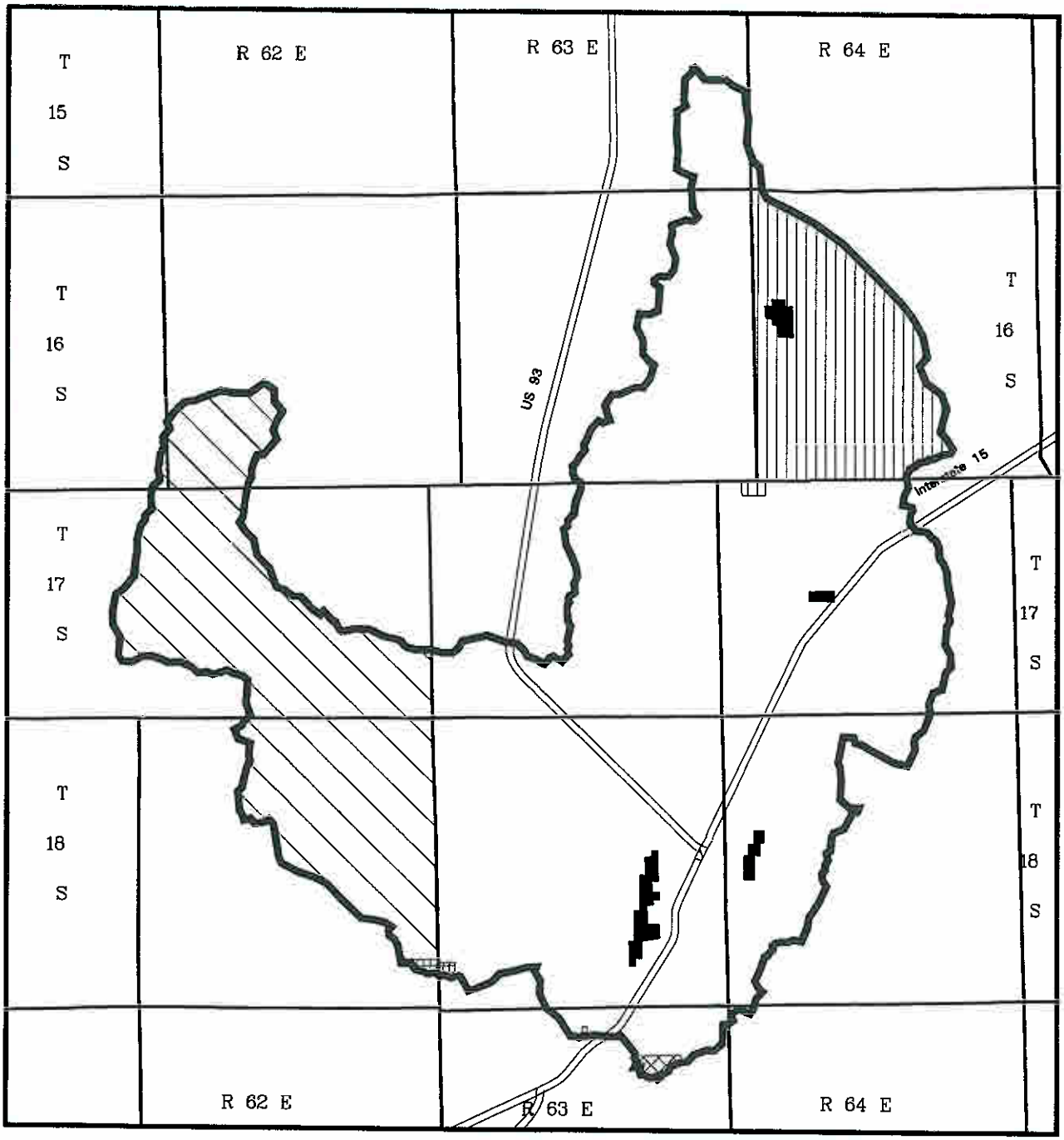


Figure 3-45 - Land use in Garnet Valley WB216

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 4

One inch = 4 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

Railroad Valley North

As shown on Figure 3-46, land use within Railroad Valley North includes BLM, federally protected, water reserve, USFS, USFWS, tribal, and private lands. The USFWS land includes the Railroad Valley Wildlife Management Area which includes several separate areas within the valley. Tribal lands are associated with the Duckwater Indian Reservation. Overall, federal lands represent over 98 percent of the valley's acreage; tribal lands represent less than 1 percent; and private lands represent slightly more than 1 percent of the acreage.

Railroad Valley South

Land use within Railroad Valley South includes BLM land, DOD land, and private holdings (Figure 3-47). Less than 1 percent of the valley is privately owned and the rest is federal land (BLM, 89 percent; DOD, 11 percent). A portion of the Nellis Air Force Range extends into southern Railroad Valley South, constituting the DOD land in the valley.

Penoyer Valley

Land use within Penoyer Valley includes BLM land, DOD land, federally protected, and private land as shown on Figure 3-48. Land administered by BLM represents 78 percent of the valley's acreage. DOD land represents an additional 20 percent, comprised of the northern portion of the Nellis Air Force Range which extends into Penoyer Valley. Private lands represent less than 2 percent of the valley. A portion of the Worthington Mountain WSA is also located in Penoyer Valley.

Tikaboo Valley

Figure 3-49 indicates that BLM, DOD/DOE, USFWS, and private lands are located in Tikaboo Valley. Essentially all of the land within the valley is owned by the federal government as land in private ownership represents less than 0.1 percent of the valley. Federal lands are split between BLM (44 percent), DOD/DOE (34 percent), and USFWS (22 percent). DOD land includes a portion of the Nellis Air Force Range, and USFWS land includes a portion of the Desert National Wildlife Refuge.

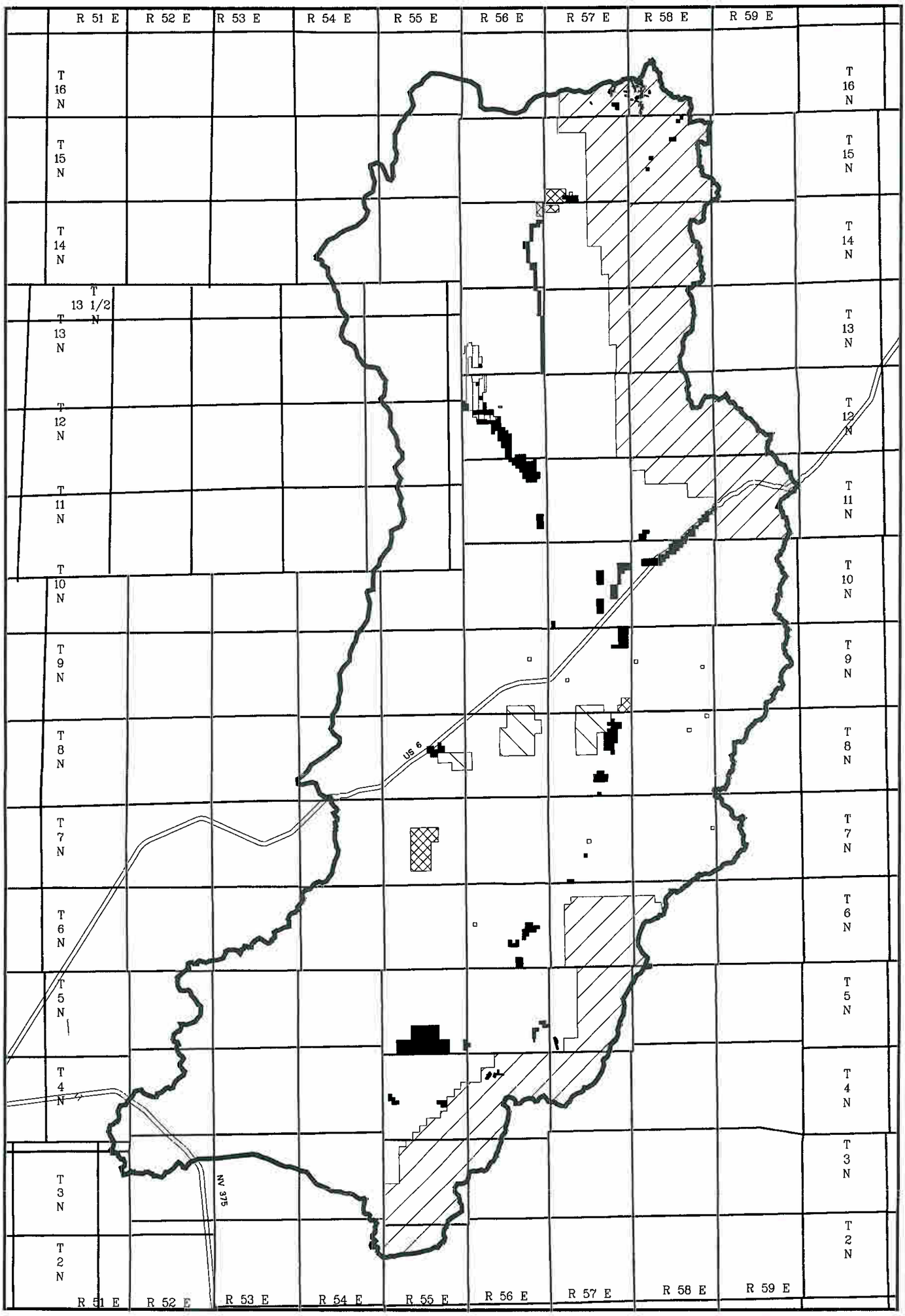


Figure 3-46 - Land use in Railroad Valley North WB173B

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NAT'L PARK
- NAT'L TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

0 8

One inch = 8 miles.

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

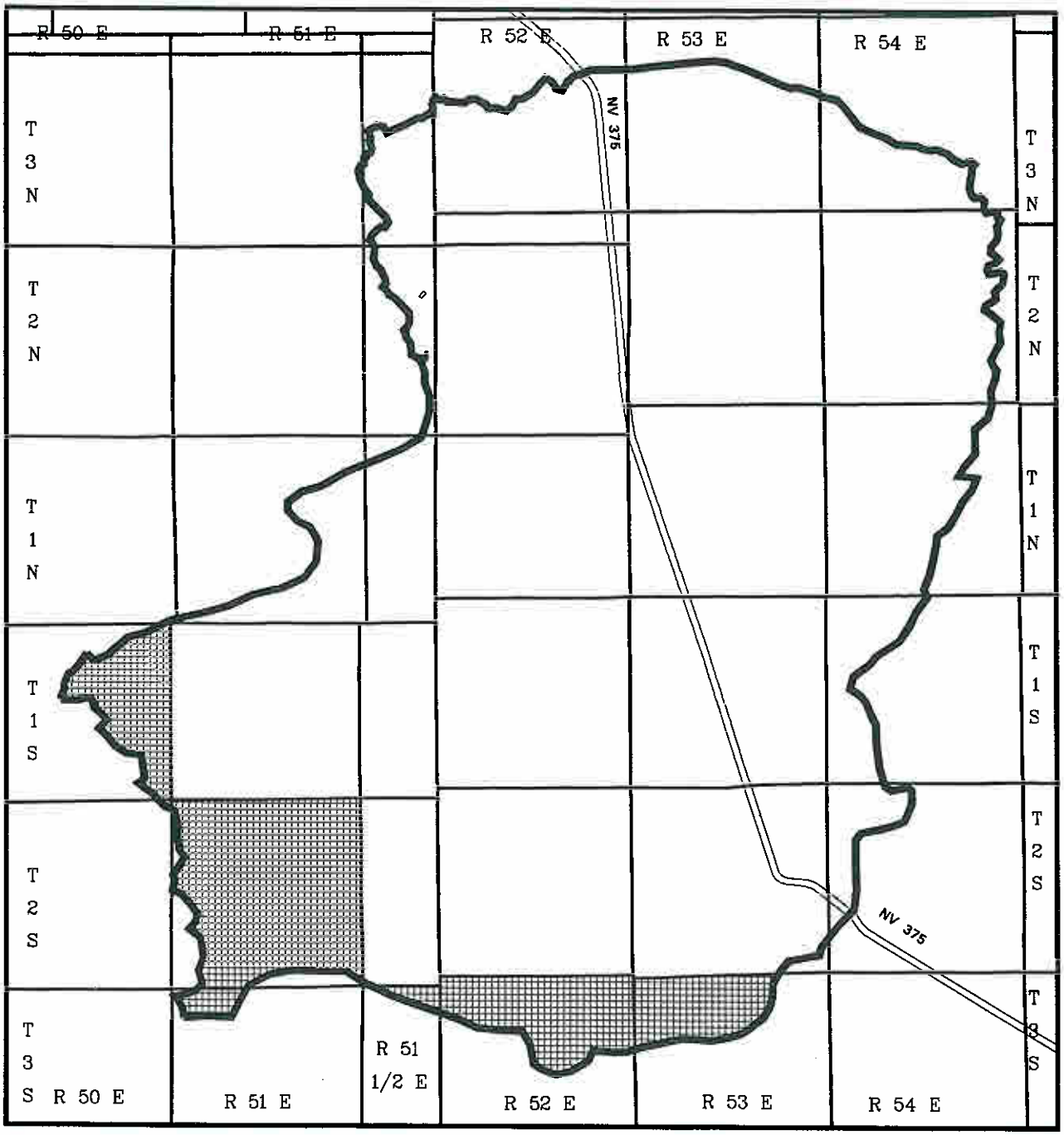


Figure 3-47 - Land use in Railroad Valley South WB173A

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 6

One inch = 6 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

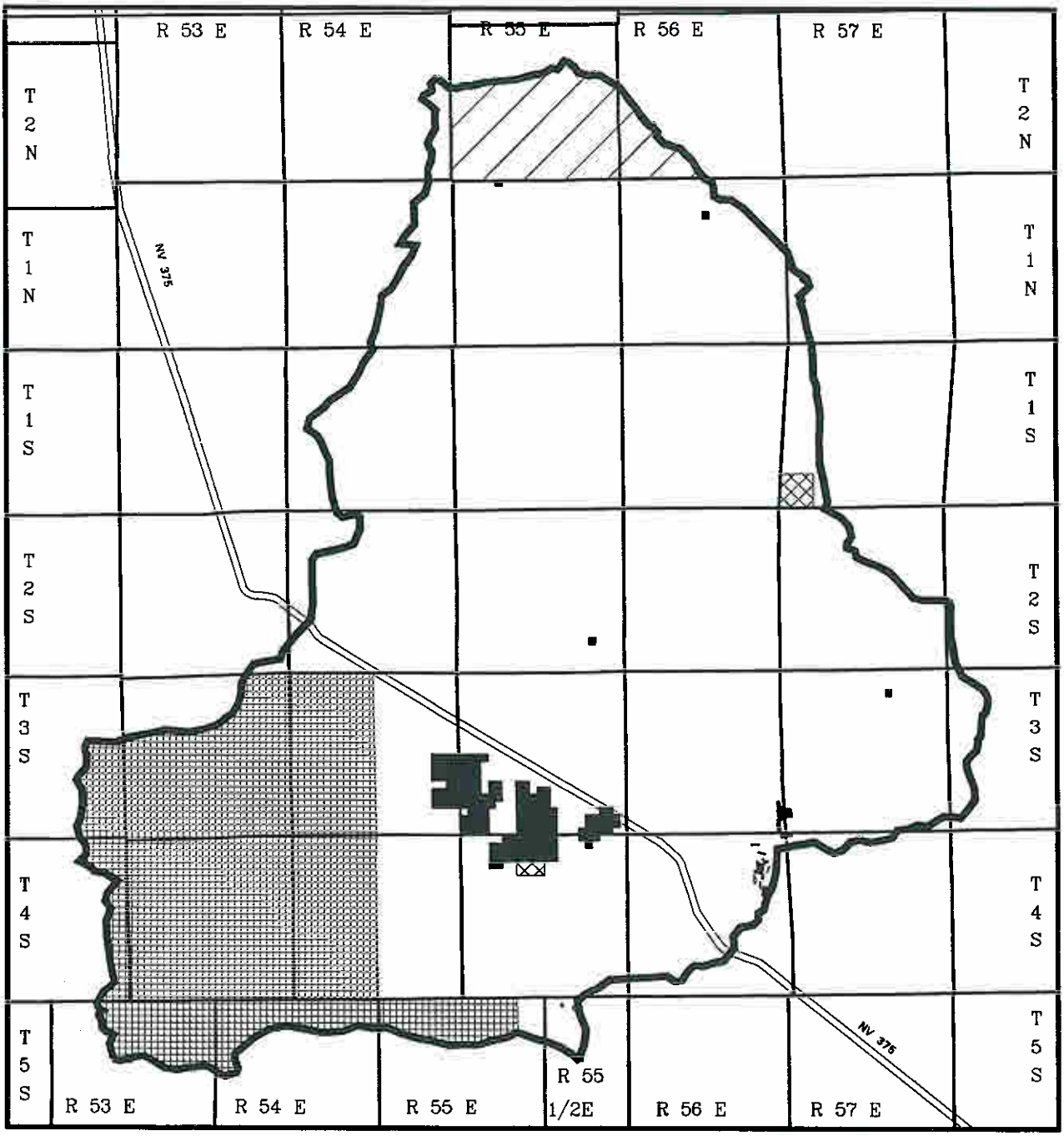


Figure 3-48 - Land use in Penoyer Valley WB170

Source: Bureau of Land Management Surface Management Status Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 6

One inch = 6 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

Pahranagat Valley

Land use within Pahranagat Valley is more diverse than most of the other valleys in the project area and includes BLM land, DOD land, USFWS land, recreational land, federally protected land, and private land (Figure 3-50). As shown, lands administered by BLM represent the largest portion of the valley (90 percent) with lesser amounts of USFWS land (7 percent), and private land (2 percent). DOD, federally protected, and recreation lands represent less than 1 percent of the valley's acreage.

Cave Valley

Figure 3-51 denotes the land uses that occur in Cave Valley, including BLM land, federally protected land, water and power reserved land, and private land. Most of the valley is administered by BLM (94 percent). Federally protected and private lands each represent approximately 3 percent of the valley's acreage.

Pahroc Valley

BLM, federally protected, and private lands are located in Pahroc Valley (Figure 3-52). Almost all of the land in the valley is administered by BLM. Private lands represent less than 0.1 percent of the valley.

Coal Valley

Almost all of the land (over 99 percent) within Coal Valley is administered by BLM (Figure 3-53). Less than 1 percent (910 acres) of the land within the valley is privately owned.

Garden Valley

As shown on Figure 3-54, most of the land in Garden Valley is owned by the federal government (BLM, 68 percent; USFS, 31 percent). The remaining 1 percent is privately owned.

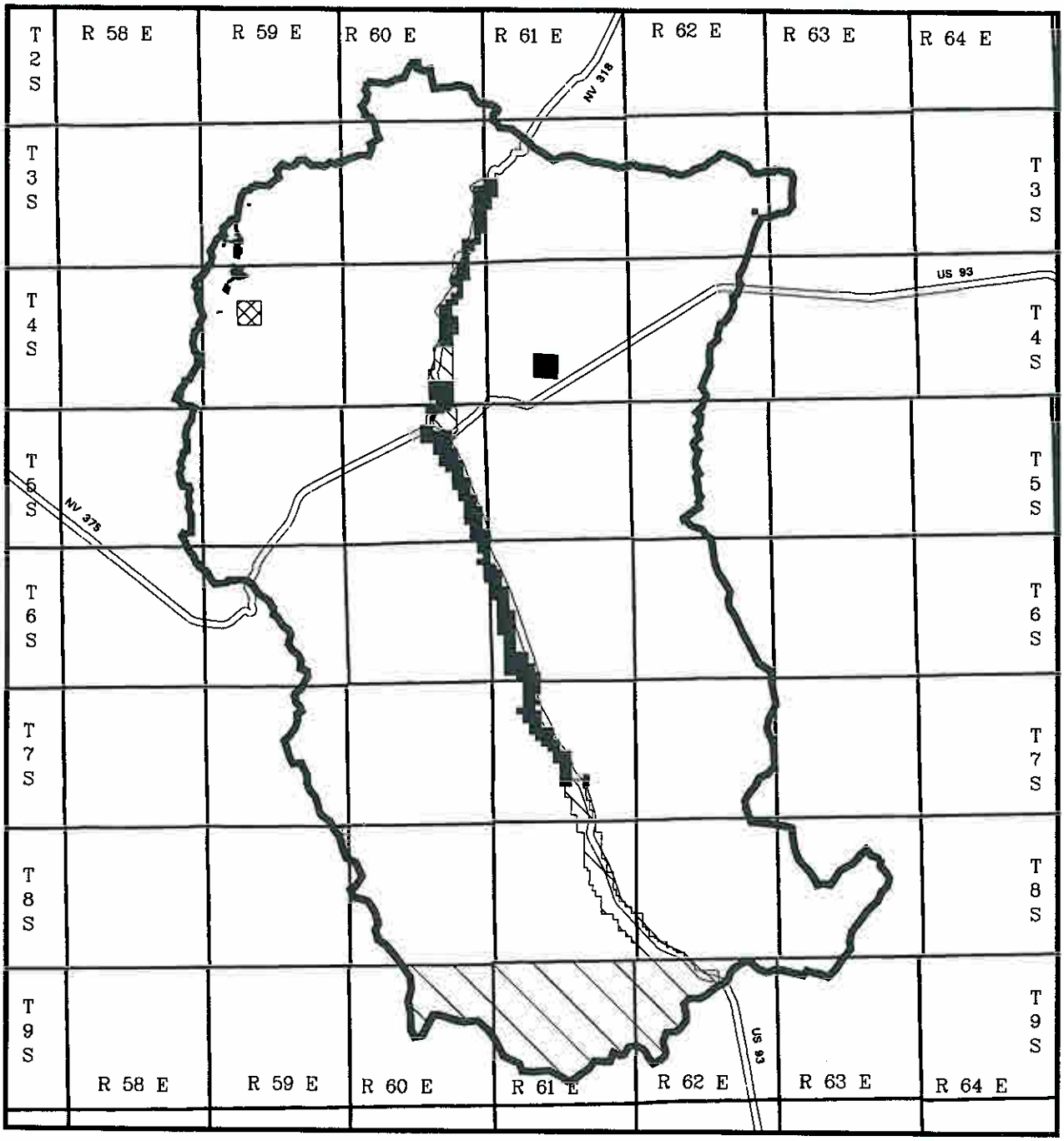


Figure 3-50 - Land use in Pahranagat Valley WB209

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

-N-

Roads

0 7

One inch = 7 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

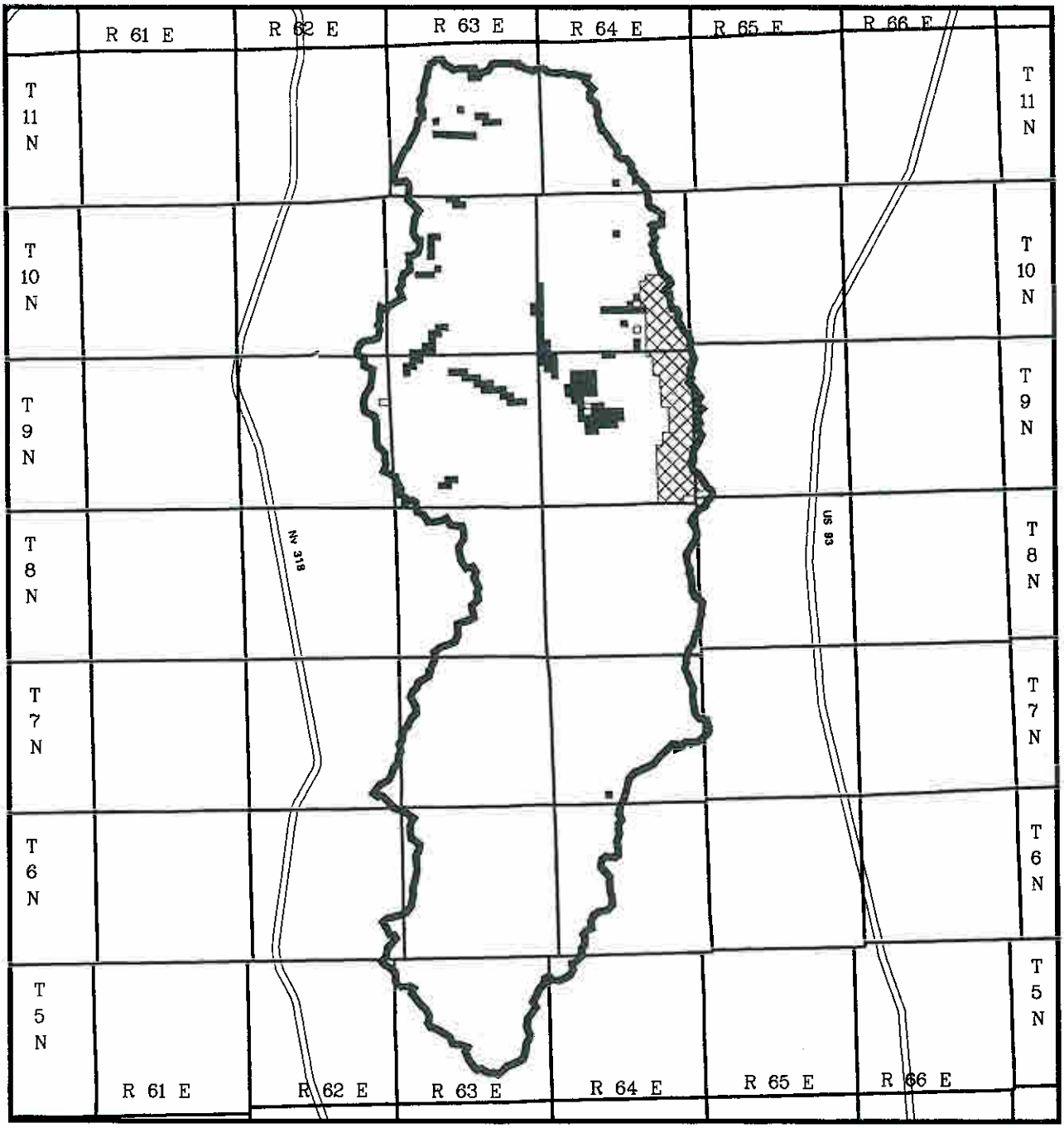


Figure 3-51 - Land use in Cave Valley WB180

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

-N-

Roads

0 6

One inch = 6 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

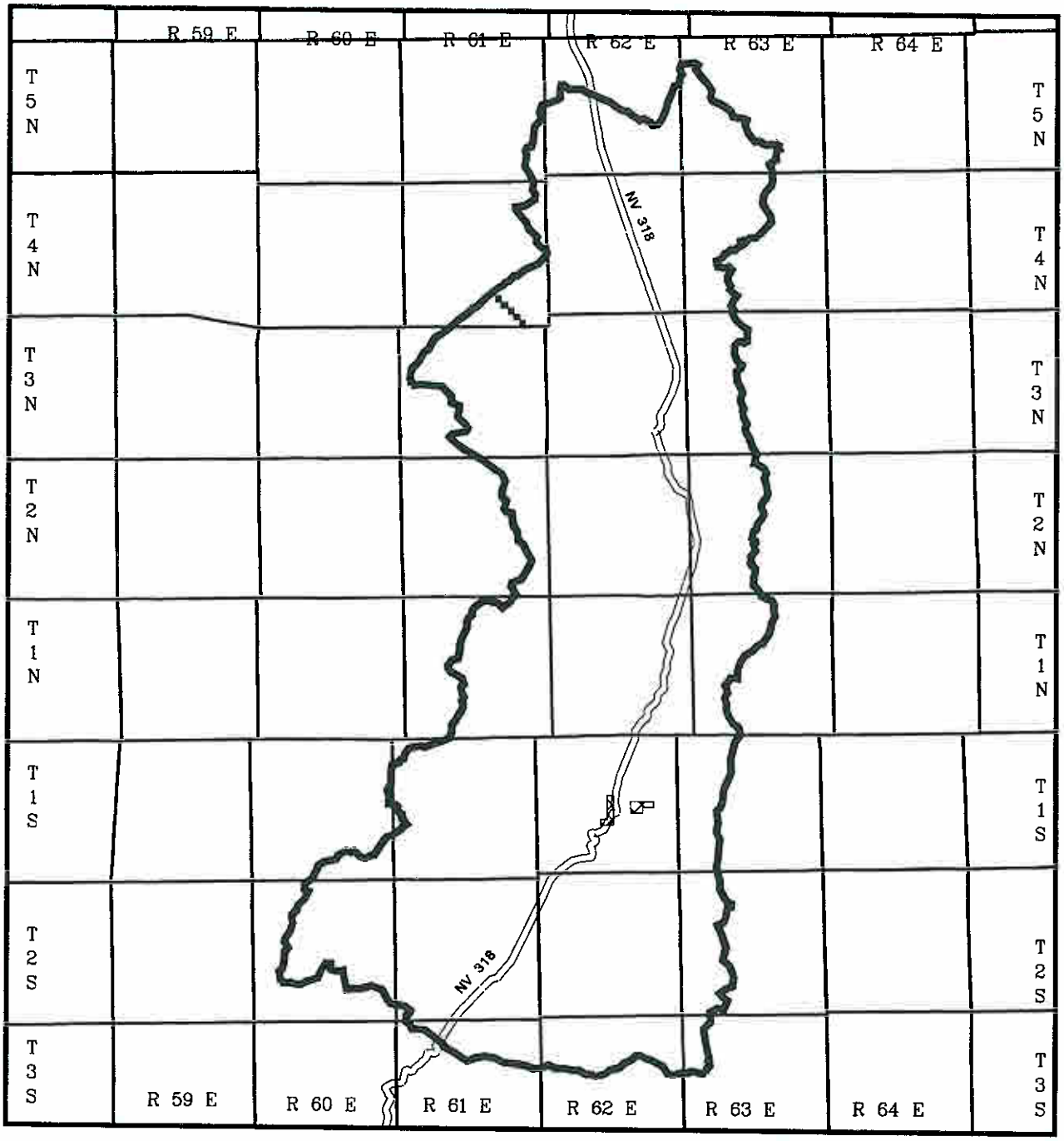


Figure 3-52 - Land use in Pahroc Valley WB208

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1991

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

N

0 8

One inch = 8 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

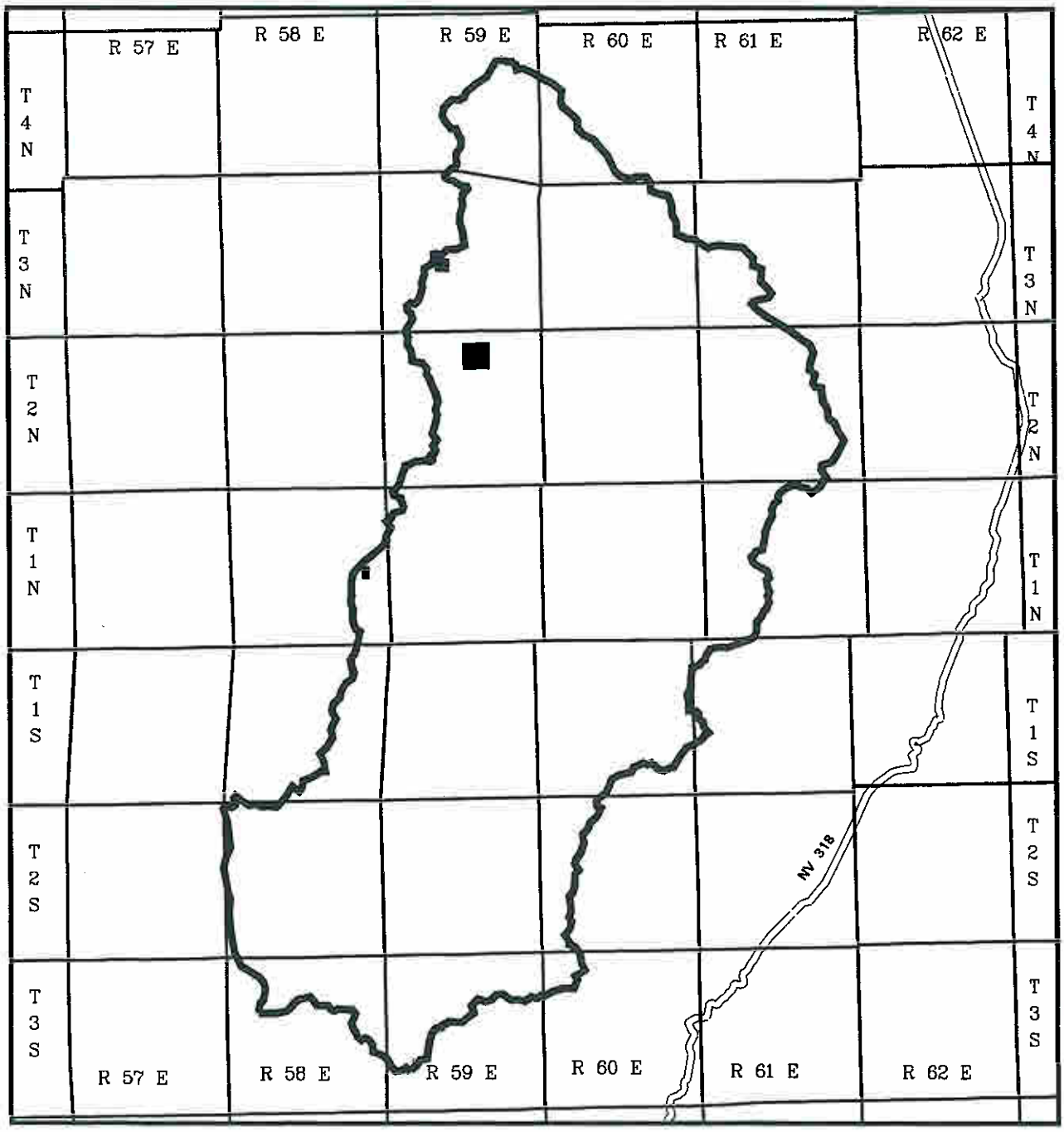


Figure 3-53 - Land use in Coal Valley WB171

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 7

One inch = 7 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

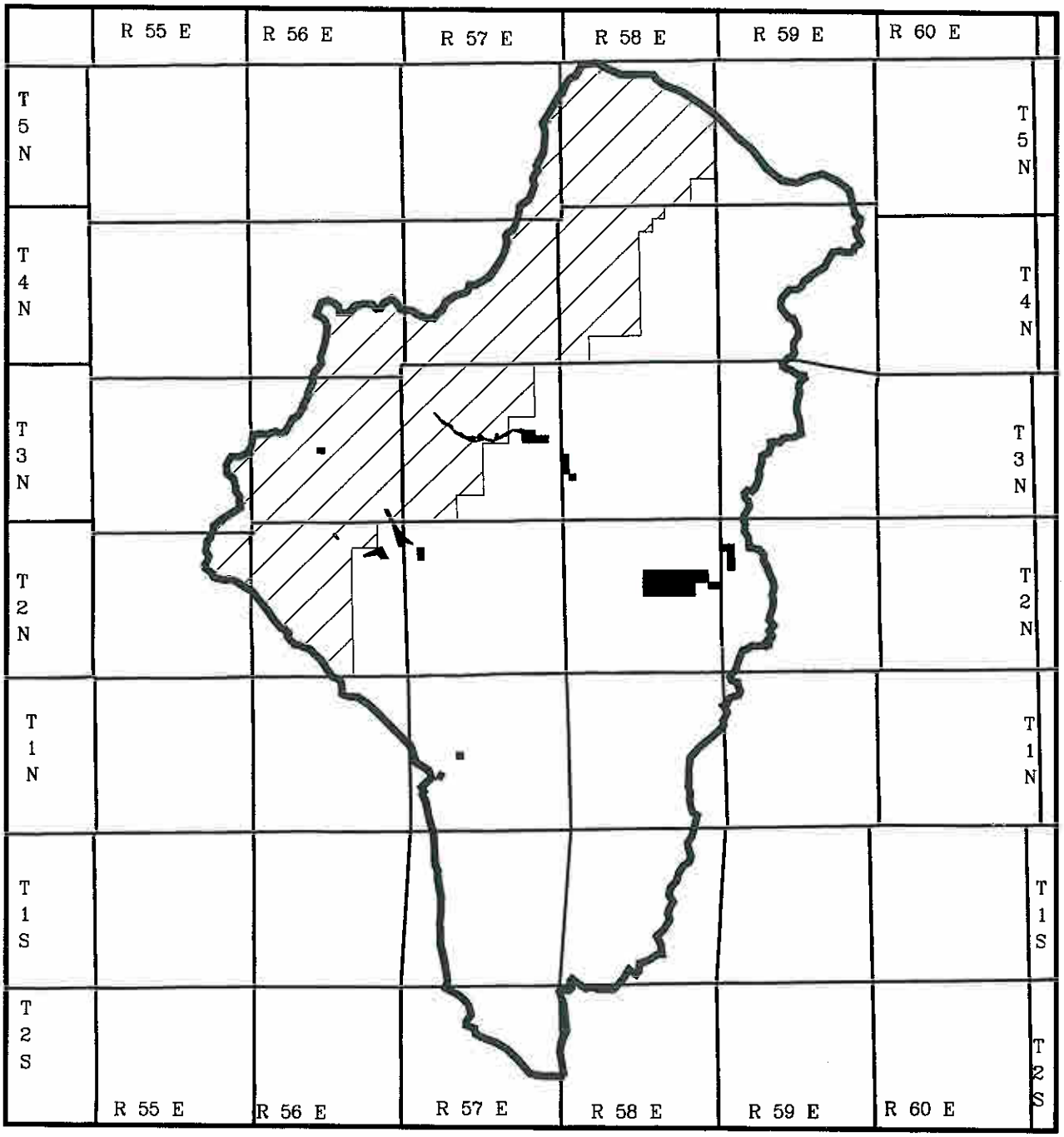


Figure 3-54 - Land use in Garden Valley WB172

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAIMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY
- Roads

-N-

0 7

One inch = 7 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

Three Lakes Valley South

Land use in Three Lakes Valley South is varied in comparison to most other valleys in the CWP area and includes BLM, DOD,USFWS, USFS, federally protected, and private lands (Figure 3-55). This valley is different from the other valleys in that BLM land does not represent the largest amount of land in the valley. DOD has the largest amount (53 percent) of land in Three Lakes Valley South and is followed by BLM (29 percent) and the USFWS (16 percent). Approximately 1 percent of the valley is USFS and a similar amount is classified as federally protected. Private lands are substantially less than 1 percent of the land in Three Lakes Valley South.

California Wash Valley

As shown on Figure 3-56, land use within California Wash Valley includes BLM lands, tribal lands, private lands, state lands, BOR lands, and recreation lands. BLM lands represent the largest amount (67 percent) with tribal lands being the second most abundant (30 percent). The tribal lands are represented by a portion of the Moapa River Indian Reservation. Private lands represent slightly more than 2 percent of the land in the valley.

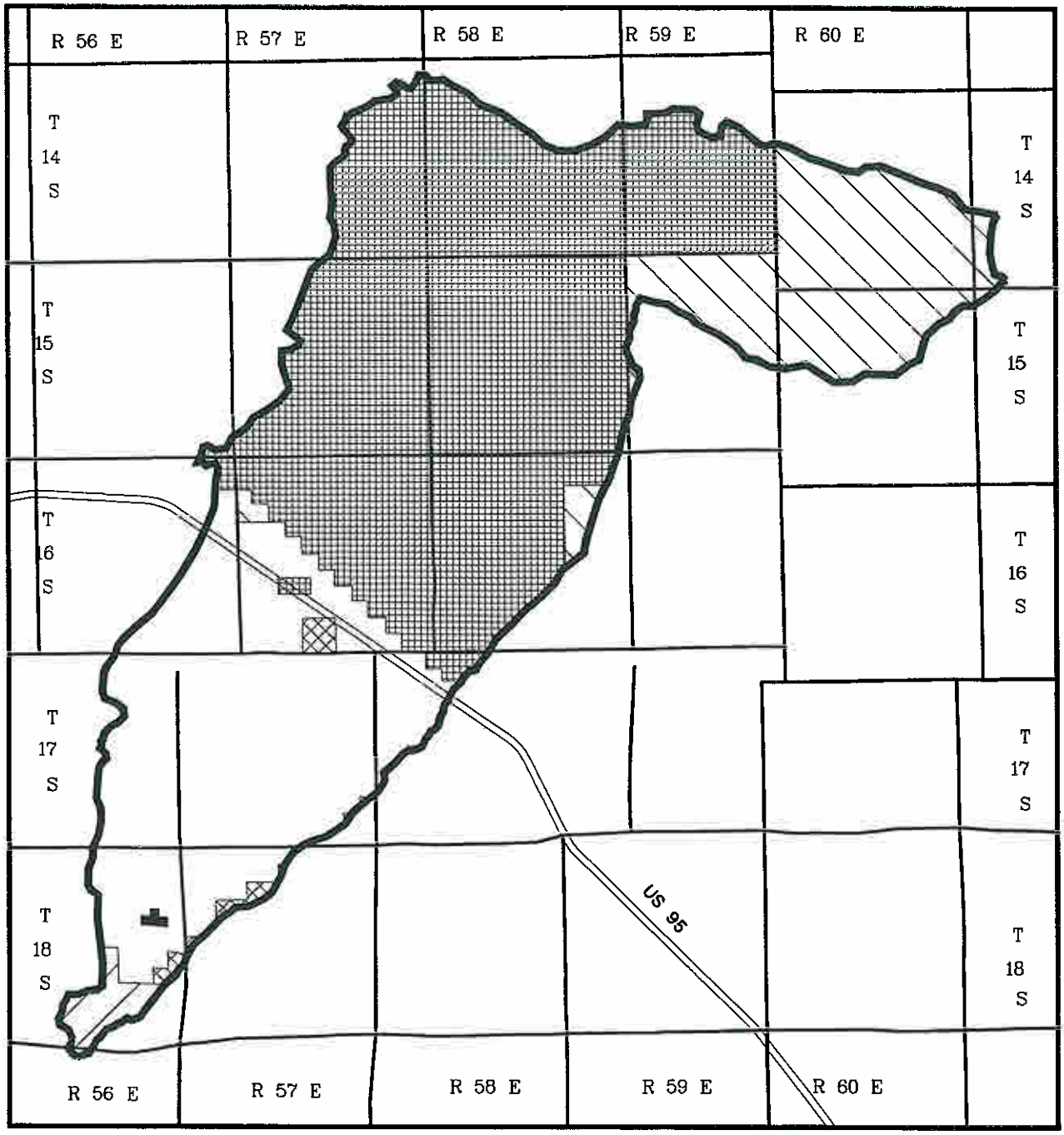


Figure 3-55 - Land use in Three Lakes Valley South WB211

Source: Bureau of Land Management
Surface Management Status
Maps, 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

-N-

Roads

0 7

One inch = 7 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

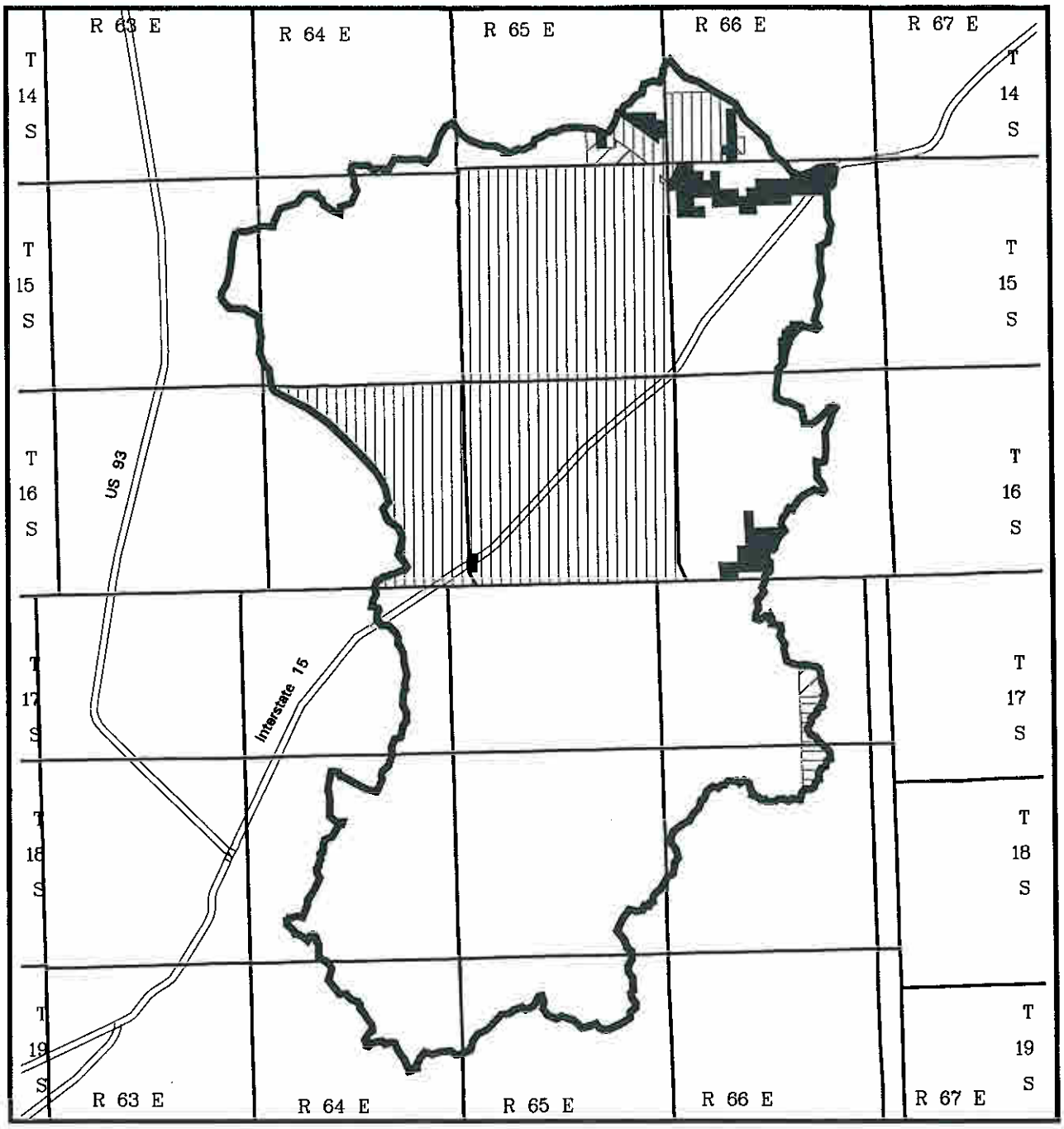


Figure 3-56 - Land use in California Wash WB218

Source: Bureau of Land Management
Surface Management Status
Maps 1976 - 1981

Legend:

- BUREAU OF LAND MANAGEMENT
- NATIONAL FOREST
- WILDLIFE REFUGES
- RECREATION
- BUREAU OF RECLAMATION
- INDIAN
- VARIOUS TYPES *
- PRIVATE
- NATL PARK
- NATL TEST SITE & DEPART OF ENERGY
- FEDERAL PROTECTED
- MILITARY

N

Roads

0 6

One inch = 6 miles

* " VARIOUS TYPES " INCLUDE : WATER RESERVES, BANKHEAD LAND USE LANDS, WATER & POWER RESOURCE SERVICE, POWER WITHDRAWALS, AND STATE LANDS

4.0
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