FINAL REPORT
LANDSCAPE ANALYSIS

CHAPTERS 3 AND 4:
CURRENT AND REFERENCE CONDITIONS

Prepared for:

USDA FOREST SERVICE
SPRING MOUNTAINS NATIONAL RECREATION AREA
HUMBOLDT-TOIYABE NATIONAL FOREST
Contract No. AG-9360-C-06-0003

Prepared by:

ENTRIX, INC.
Las Vegas, NV

Project No. 3138801

August 2008

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AML	Appropriate Management Level
ANL	Argonne National Laboratory
BLM	Bureau of Land Management
CCC	Civilian Conservation Corps
CNDDB	California Natural Diversity Database
County Road 202	Cold Creek Road
CUA	concentrated use area
dbh	diameter at breast height
DEM	digital elevation mode
ECOS	Environmental conservation online system
EO	element occurrence
ES	Ecological System
FS 071	Clark Canyon Cutoff Road
FS Road 537	Lovell Canyon Road
FS Road 582	off-highway vehicle
“G” rank	Global Rank
GBBO	Great Basin Bird Observatory
GFA	general forest areas
GIS	geographic information system
GMP	General Management Plan
GPS	Global Positioning System
HMA	Spring Mountains Herd Management Area Complex
Landsat ETM+	Multi-season satellite imagery
MSHCP	Multiple Species Habitat Conservation Plan
NCA	National Conservation Area
NDOW	Nevada Department of Wildlife
NNHP	Nevada Natural Heritage Program
NRCS	Natural Resources Conservation Service
NVC	US National Vegetation Classification
NVUM	National Visitor Use Monitoring
OHV	Off-highway vehicle
PAOT	Persons at One Time
“S” rank	State Rank
Spring Mountains NRA	Spring Mountains National Recreation Area
SR	State Route
SR 156	Lee Canyon Road
SR 157	Kyle Canyon Road

SR 158	Deer Creek Road
SWReGAP	Southwest Regional Gap Analysis Project
USFS	United States Forest Service
UTM	universal transverse mercator
WHT	wild horse territories
WSA	wilderness study area

1.0 INTRODUCTION

The third and fourth step in the process for conducting a landscape analysis is to describe the current and reference conditions on the Spring Mountains National Recreation Area (Spring Mountains NRA). The purposes of these steps are to:

- To develop information relevant to the issues and key questions that is more detailed than information from the characterization,
- To document the current distribution and condition of the core topics and other relevant ecosystem elements,
- To explain how ecological conditions have changed over time as the result of human influence and natural disturbances, and
- To develop a reference for comparison with current conditions and with key management plan objectives.

The first two sections of the chapter document the current and reference conditions of the Spring Mountains NRA as they relate to the two core topics: recreation and species viability. The first section documents current human use conditions, including a detailed description of recreational facilities and use by activity, as well as existing need and potential to develop additional recreational facilities. Other human activities (non-recreation) that may affect the viability of key species and habitats are also described. The second section presents the biological conditions on the Spring Mountains NRA. The vegetative communities are described, as are each of the 85 key species.

2.0 HUMAN USE CONDITIONS

This section documents the historic and current human presence and activities on the Spring Mountains NRA. The subsection on the history of human use summarizes the available information regarding the Native American presence, including their relationship to the Spring Mountains landscape and the cultural resources that remain a part of the landscape. This is followed by an overview of early Euro-American settlement and activities in the Spring Mountains. The subsection on current human use of the Spring Mountains thoroughly documents recreational facilities and use as well as other present-day activities such as infrastructure maintenance and development and resource management.

2.1 HISTORY OF HUMAN USE

Humans have been drawn to the Spring Mountains since prehistoric times, with conservative estimates suggesting the first arrival of humans between 14,000 to 11,500 years ago (Stoffle et al. 2004). The first Euro-American settlers, the Mormon pioneers, arrived in Spring Mountains in the 1850s, later followed by permanent settlements commencing in the 1870s. Euro-American presence at the Spring Mountains was originally motivated by resource extraction, primarily timber and mining, but has since primarily evolved into residential and recreational use.

Information on past uses and conditions on the Spring Mountains is an important data source for addressing the key issues and questions. Historical information not only provides background and insight into the source and causes of current uses and conditions, but it also provides insight into the potential consequences, both socially and biologically, of current uses. Sources for this section include the study '*The Puha Flows From It*,' local newspaper articles, and interviews with a Southern Paiute tribal member and Spring Mountains NRA staff.

2.1.1 American Indians

Studies have hypothesized that the western bands of Southern Paiutes, or *Nuwuvi* as they call themselves (people who speak the Numic language and are also sometimes referred to as Numic people), used the Spring Mountains from around A.D. 1150. Other estimates suggest that ancestors of these people were present in the area between 5,000 and 800 years ago (Stoffle et al. 2004). However, the actual duration of Southern Paiute occupation of the area remains a debatable issue for anthropologists, archeologists, and linguists. The early Southern Paiutes were mainly foragers, hunting rabbits, deer and bighorn sheep, and gathering seeds, roots, tubers, berries and nuts. They also used the springs in the area for raising corn, squash, melons, and gourds.

Traditional Southern Paiute territories were located in southern Nevada, northern Arizona, southeastern California, and southern Utah. The first reservation for these people was established in 1891 on 100 acres of land near the Santa Clara River in Shivwits, Utah. In Nevada, Southern Paiute communities are located in Las Vegas, Pahrump, and Moapa, while in Utah, Cedar City, Kanosh, Koosharem, Shivwits, and Indian Peaks are sites of Southern Paiute reservations.

Relationship to Landscape

The significance of the Spring Mountains for the Southern Paiute people is primarily based on the belief that Mt. Charleston (N~~u~~vagant~~u~~ or “Snow Mountain” to the Paiute) is the place of creation of all *Numic* (Southern Paiute) people. Since the peak represents a symbol of creation and creation is perceived to occur in its vicinity, the whole mountain range is sacred to these people. *Puha* (Paiute word for power), power or energy in the universe, is believed to be highly concentrated in the area. Places with high concentrations of *Puha* are often marked with physical symbols. *Puha* was created and placed in everything at the time of the Original Creation and is networked, thus connecting different elements at the will of the powerful elements. Examples of powerful elements include obsidian, crystals, medicinal plants, packrat nests, coyotes, wolves, cliff faces, and volcanic cliffs.

The web-like character of *puha* indicates that power may be concentrated at certain points in the web, thus creating powerful places. Powerful places tend to have distinct forms and powerful elements are attracted to these places. Also, since these places are used for conducting ceremonies and rituals, they may have marking signs or symbols such as rock paintings. Thus, features of places with power may be identified by their basic form, proximity to powerful elements, and concentrations of ceremonial offerings (like tools) or symbols (like storied rocks).

Three general types of places are creation places, ceremonial places, and residence places. The ceremonial places are further divided into places created and used for acquiring *puha* and those for using *puha* for balancing and healing ceremonies.

Some Southern Paiute people interacted with their landscapes by leaving signs or symbols. Examples of the more physical traces of these interactions are storied rocks and habitation sites, while examples of those held in cultural memory are the Creation Stories and Songscapes. Storied rocks are rocks decorated with either rock peckings or painted with pictographs. The Southern Paiute people still use some of the sites located in the Spring Mountains for ceremonies.

Songscapes provide a snapshot of these interactions in the form of a song that is mostly reserved for important events, like funerals. The Salt Song Trail passes directly over the Spring Mountains and this area serves as the halfway point of the journey of the deceased. This trail is regularly visited by the *Numic* people both physically and spiritually through songs. Other important song trails connected to the Spring Mountains are the Fox Trail and Mountain Sheep Song.

Medicinal and food plants are collected from the mountain, including pine nuts, from the area. Elements like packrat nests on the Deer Trail are used for ceremonies regarding birth. Botanical resources important to the Southern Paiute include willow, ash, mahogany, sumac, wild rose, different types of teas, and berries. Wildlife such as mammals and birds are also traditionally significant for the Tribes including hawks, eagles, desert tortoises, bighorn sheep, frogs, ants, bats, coyotes, and wolves.

Cultural Resources

Cultural resources encompass archeological, traditional, and built environmental resources, including but not necessarily limited to buildings, structures, objects, districts, and sites. In the context of the Spring Mountains cultural resources include remnants, artifacts, and symbols from Southern Paiute dwellings and ceremonies, and also the places and plants and animals that are traditionally important for the Southern Paiutes.

Due to the sensitive nature of these sites and respect for the American Indian traditions, the locations of these sites are not revealed in this analysis.

2.1.2 Euro-American Settlers

The first European presence in the area is believed to be through early explorations of Father Francisco Garces and the Dominguez-Escalante expedition in 1776 (Stoffle 2004). The Old Spanish Trail (also referred to as the Mormon Trail) was created in 1830 as a result of these developments.[1] The first Euro-American settlement in the Las Vegas valley occurred in the 1850s, when Mormon pioneers established a mission in the vicinity of Las Vegas. However, by 1858, the mission failed, and the settlers returned to Salt Lake City. In the 1870s, ranches started being developed in the valleys surrounding the Spring Mountains, particularly the Vegas Valley and Pahrump, laying the foundation for permanent settlements by Euro-Americans in the area.

Resource Extraction

Resource extraction in this context on the Spring Mountains refers to the permitted commercial development of resources by the federal managing agency. During the first 50 to 100 years of the Euro-American presence at the Spring Mountains (approximately 1850 to 1950), land use was characterized by resource developments, including mining, logging, grazing, and water development. The federal government acquired its first lands in the Mt. Charleston area in 1906 and managed it through the Forest Service, designating it the Mt. Charleston Forest Preserve. Much of the land in the Mt. Charleston area, however, was privately held until the late twentieth century. Until the 1988 National Forest and Public Lands of Nevada Enhancement Act

[1] Unless otherwise specified, information in this section is taken from three sources based on relevant time period:
1988 and older: Taylor, Richard B., 1988, *Mt. Charleston Lodge History Book,* Van Volumes, Ltd., Massachusetts.
1989 to 1993: Taylor, Richard B., 1993, *Mt. Charleston History Book, Vol. 3,* Beehive Press, Las Vegas.
1994 to 2001: Taylor, Richard B., 2001, *Mt. Charleston Resort History: Vol. 5,* Beehive Press, Las Vegas.

transferred the majority of the lands comprising the Spring Mountains NRA to the Forest Service, most of the area surrounding Mt. Charleston was managed by the Bureau of Land Management (BLM). Under BLM, several areas of the Spring Mountains were managed for resource development.

From the early twentieth century, the BLM managed much of the western side of the Spring Mountains for grazing. According to Forest Service personnel, most of the roads and water developments on the west side of the Spring Mountains were developed by ranchers. For example, the roads into Willow Creek, Carpenter Canyon, Lovell Canyon, Trout Canyon and Wallace Canyon were all built to access grazing lands. Additionally, there is remaining evidence of water development to provide water for livestock in many of these areas, including old dams, piping, and troughs at springs. The BLM had been trying to phase grazing out since the late 1980s, and when the Forest Service acquired the lands now comprising the Spring Mountains NRA, the remaining grazing permits were cancelled.

Portions of the Spring Mountains NRA were prospected and mined for lead, zinc, and gold. Mining activities on the Spring Mountains commenced when a group of Indians led the Mormons to outcroppings of lead ore at the base of Mt. Potosi in April, 1856 (Stoffle et al. 2004). Today, 13 mine pits, 9 mineshafts, and at least 56 mine prospects are found. These mines are primarily located in the Mt. Stirling area in the north, and in the Mt. Potosi area in the south. Some roads were built to access mines, such as the road in Cottonwood Valley that runs across Forest Service land to access a mine on BLM property.

Timber cutting on the Spring Mountains NRA occurred in the 19th and early 20th centuries. During the 1850s, Mormon pioneers cut logs from the area and also constructed the first lumber mill in Kyle Canyon. This small mill was established only to meet the local demand of the Mormon settlement. Later, the Kyle brothers, who owned a ranch located northwest of Las Vegas and Kyle Canyon, built a sawmill to supply lumber to several small settlements along the Colorado River. This was followed by establishment of several sawmills in the area providing timber for mines, rails, and buildings, including the Champion mill site near the junction of Deer Creek and Lee Canyon Roads, one in Clark Canyon on the west side of the range and one above the present community of Cold Creek. Timber was also extracted in the pinyon-juniper woodlands along Wheeler Wash to create charcoal.

The Nevada Department of Wildlife (NDOW) operated several fish hatcheries on the Spring Mountains between the 1960s and the 1980s. These hatcheries were located in Willow Creek and Cold Creek. Dams were constructed in Willow Creek for the hatchery, but these have since been removed, although traces of the dams are still visible. NDOW also maintained picnic tables and restrooms for recreationists near the hatcheries, but when ownership reverted to the BLM, the recreation facilities were removed.

There are several historical remnants of the early Euro-American resource extraction activities in the Spring Mountains NRA. The timber industry in the Spring Mountains is evident at the old sawmill in Clark Canyon, by the sawmill boilers at Willow Creek and Cold Creek, and by the charcoal kilns along the road to Wheeler Pass. The charcoal kilns were used to make charcoal to fire an ore smelter near Tecopa, California. There are now only foundations of early settler dwellings, including Lost Cabin and Cold Creek Ranch, near the community of Cold Creek. At Willow Creek, remnants remain of the fish hatchery dams, and irrigation pipes for watering livestock are visible in upper Carpenter Canyon.

The legacy of this period of activity was the development of a transportation system that allowed access to the Spring Mountains on all sides. As shown above, many of the early roads in the Spring Mountains were built to provide access to the natural resources (grazing, timber, mining, fish hatcheries) of the area. Almost all of the present-day roads and trails used for development and recreational purposes trace their origins to this period.

Development

Most of the land in Kyle and Lee Canyons was privately held at one time, enabling considerable development of these areas. The first major development in the Spring Mountains occurred in 1915, when E.W. Griffith purchased 80[2] acres of land, including Kyle Spring in Mt. Charleston, and named the area "Charleston Park." He also began a road project connecting the resort with the Tonopah Highway near Tule Springs. A few cabins were hastily built at Kyle Canyon Spring, while additional tents were provided for those wishing to enjoy mountain life. A log lodge was also built later that provided a pleasant gathering place for visitors.

In 1915, the first privately owned log cabin was built in the resort at Charleston Park, soon followed by other homes. Mt. Charleston was first opened as a vacation resort on the 4th of July in 1915, marking the commencement of formal development and recreation in the area. In 1934, the state highway department constructed an oiled paved road into the resort area over the 34 mile stretch that also included the original road. A fire station built in 1962 marked the first major civic improvement in Kyle Canyon. Also in 1962, Nevada Power Company started providing electrical service to the Hacienda's Rainbow Canyon subdivision in Kyle Canyon.

Currently, four small housing subdivisions exist in the Kyle Canyon area of Mt. Charleston: Old Town; Cathedral; Rainbow; and Echo Canyon. Old Town and Cathedral are the two oldest ones, located inside the final loop of Kyle Canyon Road. Old Town was originally created when a casino that owned land created small lots that were rented to visitors and later sold. In the summer of 1959, the owner and developer of the Hacienda motor-hotel chain in California and Nevada, acquired 1,400 acres within Kyle Canyon in the Mt. Charleston area, along with the famous Mt. Charleston Resort Lodge. Between 1959 and 1961, the lots within the parcel were sold with agreements by purchasers to build cabins within one year, in order to ensure rapid development and discourage land speculators. The result was a successful subdivision, called Rainbow Canyon, which eventually led to the development of the newest subdivision higher up the main road, Echo Canyon. By 1984, 300 families were permanently residing on Kyle Canyon, while the overall population in the mountains grew to 1,050 in 1989. Most of the private lands In the Mt. Charleston and Lee Canyon areas are zoned and allows for construction of a home or placement of a mobile home. However, in a subdivision, mobile homes are prohibited. Any home can be built if it meets county building codes. In the recent past, plans for more subdivisions and changes in zoning patterns have met sharp opposition from residents and conservationists based on issues regarding the environment, water availability, and fire hazards.

Recreation

The Spring Mountains have long been a popular recreation destination. Mt. Charleston was first formally opened as a vacation resort by the late State Senator E.W. Griffith and his two associates on July 4, 1915. Visitation for recreation purposes has steadily increased since that time, as have the types of recreational activities pursued.

[2] He eventually bought 1,400 acres according to an article published on July 04, 1940.

CAMPGROUNDS

J.T. McWilliams developed some of the first campgrounds in the Spring Mountains NRA on private land in the early 20th century. He built a large campground in Lee Canyon that is now split into Dolomite and McWilliams Campgrounds and Old Mill Picnic Area. In 1989 there were six campgrounds in the Kyle and Lee Canyon areas. These campgrounds are:

- Kyle Canyon, 22 units;
- Fletcher View, 12 units;
- Hilltop, 36 units; McWilliams, 40 units;
- Dolomite, 31 units, and
- Mahogany Grove with two group units.

Pre-2000, there were more campgrounds and picnic areas in the Spring Mountains than there are presently. In the last ten to twenty years there have been closures of several campgrounds, including Gary Abbott Campground (located near Bonanza Trailhead in a recently designated Wilderness Area) and the Mary Jane Falls campground. Additionally, the Deer Creek picnic area was previously a campground with more sites.

TRAILS

Many trails in the Spring Mountains NRA were originally roads to water sources or mines. For example, the Cathedral Rock Trail and the South Loop Trail were formed out of roads that provided access to spring systems. Another road off of Kyle Canyon went to Stanley B mine; this road was closed as a motorized route, but is often hiked (although it was never designated as a Forest Service System trail). The first organized hike to the top of Mt. Charleston was made in the summer of 1915. Trail use has diversified over time from serving mainly hikers and equestrians to including backpackers, mountain bikers, cavers, and rock climbers.

VACATION LODGING

There has been vacation lodging at Mt. Charleston in Kyle Canyon since 1959. The first lodging was in the form of vacation cabins at “Charleston Park,” followed by the original Mt. Charleston Lodge, which operated between 1959 and 1961. It had seven rooms for rent and provided the only rental units on the mountains during that period. The lodge was burned down in fire in December of 1961 and was not reconstructed due to financial constraints. The second Mt. Charleston Lodge (formerly called Mt. Charleston Restaurant and Lodge), often called the “old lodge,” was built in 1966 and has 24 individual log cabins and a popular restaurant. Since 1988, the lodge has also offered horse-drawn sleigh rides in winter and hay rides in summer. Permitted sleigh ride usage on National Forest System land has varied significantly with the amount of snow fall:

- In the winter of 2004-2005, a relatively heavy snow year, the sleigh ride service had 3709 customers.
- In the winter of 2006-2007, a light snow year, there were only 729 customers.

The Mt. Charleston Hotel, Event, and Conference Center (originally called Mt. Charleston Inn Hotel and later Mt. Charleston Hotel) was built around 1984 in Kyle Canyon with modern comforts like indoor Jacuzzis, saunas, 63 rooms, including three luxury suites and 22 king-sized rooms. Additionally, a bed-and-breakfast named Almost Heaven Mountain Retreat (formerly called Almost Heaven Bed and Breakfast Lodging House) opened in 1996.

SKIING AND SNOWBOARDING

The first winter sports held at Mt. Charleston were staged in the winter of 1936 under the auspices of the Las Vegas Junior Chamber of Commerce. A ski area with a rope tow was constructed in Kyle Canyon, but was moved to Lee Canyon to benefit from the higher elevation and colder temperatures. Skiing began at Lee Canyon in 1954 with the installation of a tow rope, and the Las Vegas Ski and Snowboard Resort started operating in 1963 with one ski run, a 1,428 feet long motor-driven rope ski lift, and a toboggan run. By 1993, the resort had 13 runs on 40 acres of maintained slopes. In 1987, a snow-making system was operational and in 1989, 85 high powered lights were installed to enable night skiing for the first time at the ski resort. The resort was fully opened for snowboarding in 1993. The resort was sold by the Highfield family in 2003 to the POWDR Corporation based in Salt Lake City, Utah. POWDR Corporation has a 40 year special use permit. During the 2004-05 ski season, approximately 57,000 people visited the resort, with about 20 percent of the weekend skiers from out-of-state (Las Vegas Ski and Snowboard Resort personnel pers. comm. 2006). During the early portion of the 2004-05 ski season the resort noted a substantial amount of visitors (more than 29,000 skiers). The calendar year 2005 is relevant since it is the year for which National Visitor Use Monitoring (NVUM) data are reported for other recreation activities on the Spring Mountains NRA. During 2005 numbers were substantially lower than for the 2004-2005 season, at approximately 28,000 skiers. Both use figures are reported to reflect that the resort had unusually high use during the 2004-2005 season, and to allow for comparison of 2005 with other activities for which NVUM data were collected. For comparison, use numbers for the last three seasons were: 57,305 visits for the 2004-2005 season, 54,500 for 2005-2006, and 48,817 for 2006-2007. It is postulated that the declining use numbers reflect low snow years. The 2006-2007 season was the shortest in recent history due to lack of snow.

ICE SKATING

Prior to 1959, the old Mt. Charleston Lodge had a pond that, when frozen over, became a free ice-rink. In December 1960, a mechanical open-air ice-rink was opened at the Mt. Charleston Lodge. In December of 2005, the only year-round outdoor ice skating rink in the area opened in Mount Charleston Hotel, Event and Conference Center. The plexi-foam rink measures 74 feet by 35 feet and can accommodate up to 100 skaters.

2.2 CURRENT HUMAN USE

Current information regarding recreation in the Spring Mountains NRA is presented in this section. The distribution and condition of recreational facilities and sites are first described, followed by a presentation of available information on recreation use divided by activity. As the type of visitor is important to understanding recreation demand, information on the characteristics and needs of visitors to the NRA is also presented. The review of recreation conditions concludes with a discussion of the need for additional facilities and the landscape and management factors influencing future recreational development.

Although the human use key questions guiding this landscape analysis are focused on recreation, to address the key questions regarding the core topic of species viability, information on other activities affecting key species and habitat is important. The final section in this chapter describes the location and extent of these other activities, with particular focus on potential to impact key species and habitats.

2.2.1 Recreational Facilities and Locations

The following discussion describes recreation facilities and their locations. Maps of each management area are included to illustrate the locations of both designated and non-designated facilities. After each facility description, a summary of the physical characteristics is provided, including a description of the typical "footprint", estimated use levels and timing, and where possible, an estimate of recreation use that may occur outside of the typical footprint. Sources of information for this section include published materials distributed by the Forest Service regarding the Spring Mountains NRA, interviews with NRA staff and recreation user groups, geographic information system (GIS) data on infrastructure, and the Spring Mountains NRA Transportation Study prepared by Parsons-Brinkerhoff (2005).

See Developed Canyons and Wilderness Area Map, Mt. Stirling Wilderness Study Area Map, and the West Side Map (Figures 2-1 through 2-3).

Developed Facilities

CAMPGROUNDS

Six developed campgrounds are in the Spring Mountains NRA. Two campgrounds are located in each of the Kyle and Lee Canyons, and two are located along Deer Creek Road. During the summer months when all campgrounds are open, total capacity is 145 sites. There are 122 single sites, 20 double sites, 1 triple site, and 2 large group sites. The group sites at Mahogany Grove accommodate up to 60 people. At Fletcher View, campground sites have RV hookups. All campgrounds have drinking water, three facilities have flush toilets and the other three have vault toilets. All of the campgrounds are located in conifer forest settings at 7,000 feet of elevation or above, with the highest campgrounds located at 8,500 feet. According to Forest Service recreation specialists, the higher elevation campgrounds are the most popular in the summer due to their cooler climate. Table 2-1 summarizes the location and facilities of the developed campgrounds. Tables 3-5, 3-7, 3-9, and 3-11 summarize the distribution of developed campgrounds across major vegetation types. While Kyle Canyon, Hilltop, and Fletcher View Campgrounds have received renovations in the last 16 years, no new campgrounds have been constructed in more than 30 years and therefore no campgrounds have been constructed on the lower elevation lands added to National Forest jurisdiction under the Nevada Enhancement Act of 1988.

The 45 restrooms located at campgrounds and other recreation sites are cleaned and maintained on a daily to weekly basis, depending on the time of the year and frequency of use. Most routine campground maintenance activities are conducted by concessionaire; operating campgrounds and other developed recreation facilities are under Forest Service special use permit. Some of the recreation site maintenance is accomplished directly by Forest Service staff.

Figure 2-1 Designated and Non-Designated Recreation Facilities in Developed Canyons and Wilderness Management Areas

Figure 2-1 BACK

Figure 2-2 Designated and Non-Designated Recreation Facilities in Mt. Stirling Wilderness Study Area

Figure 2-2 BACK

Figure 2-3 Designated and Non-Designated Recreation Facilities in West Side

Figure 2-3 BACK

Table 2-1 Developed Campgrounds Located on the Spring Mountains NRA

Developed Campground	General Location	Elevation	Flush Toilets	Number/Type of Sites	Approximate Season of Use
Kyle Canyon	Kyle Canyon	7,000	No	19 single, 6 double	April to October
Hilltop	Deer Creek	8,400	Yes	31 single, 3 double, 1 triple	May to October
Dolomite	Lee Canyon	8,500	Yes	30 single	May to October
McWilliams	Lee Canyon	8,500	Yes[1]	31 single, 9 double	May to October
Fletcher View	Kyle Canyon	7,100	No	11 single, 2 double	Year Round
Mahogany Grove	Deer Creek	8,000	No	2 group (up to 60 people)	May to October

Source: www.fs.fed.us/r4/htnf/recreation/camp_picnic/NRA_camp/NRA_camping.shtml, site accessed on January 19, 2007.
[1]One out of five toilets in McWilliams Campground is flush; the others are vault toilets.

Usage Level: According to the NVUM survey, 61,768 visitors were estimated to camp at developed campgrounds in 2005. Developed camping is concentrated in the summer months, particularly on weekends. Although one developed campground is open during the winter, all other campgrounds are open from either April or May to October.

Activity Adjacent to Footprint: People usually stay within 100 feet of campground, 35 percent of people venture out.

Footprint: Distance buffer of about 150 feet around campground area outer road to incorporate sites off of road.

Area of Influence: 100 feet in each direction

PICNIC AREAS

There are five developed picnic areas located in the developed canyons. A day use fee is required in all developed picnic areas except Deer Creek. The group picnic sites at Cathedral Rock Group Picnic Area and Foxtail Group Picnic Area charge a fee as well. Most of the picnic areas close for the winter in late October, but Cathedral Rock Picnic Area in Kyle Canyon remains open in the winter, as does the Foxtail Picnic Area in Lee Canyon. In the summertime, Foxtail is a group picnic area, while in the winter it becomes an individual site day use area. There are a total of 161 picnic sites available in the summer, including 5 group sites accommodating 60 to 100 people. Table 2-2 summarizes the location and facilities of the NRA developed picnic areas. Tables 3-5, 3-7, 3-9, and 3-11 summarize the distribution of picnic areas across major vegetation types (basically all sites are in conifer forest settings). No new picnic areas have been constructed in more than 30 years and consequently no picnic areas have been constructed on the lower elevation lands added to National Forest jurisdiction under the Nevada Enhancement Act of 1988 (although Sawmill Trailhead, which opened in 2006, does have picnic tables included with its facilities).

Table 2-2 Developed Picnic Areas Located on the Spring Mountains NRA

Developed Picnic Area	General Location	Elevation (feet)	Sites	Parking[1]	Approximate Season of Use
Cathedral Rock	Kyle Canyon	7,600	72 single	150	May through October
Cathedral Rock Group	Kyle Canyon	7,600	2 (one accommodates 75, one accommodates 60)	N/A	May through October
Deer Creek	Deer Creek	8,200	7 single	50	May through October
Old Mill	Lee Canyon	8,300	61 single, 13 double	148	May through October
Foxtail Group	Lee Canyon	8,300	3 group sites in summer (80 to 100 people each), used as single sites in winter as parking allows	90	Year Round

[1]NRA Transportation Study, 2005

Usage Level: In 2005, the NVUM survey estimated that approximately 79,000 people picnicked in the developed picnic areas in the NRA. There is high use in the winter when there is snow and during the summer.

Activity Adjacent to Footprint: People usually stay within 10-15 yards (on foot); perhaps 15 percent of people venture out of the picnic area.

Footprint: Distance buffer of about 150 feet around picnic area outer road to incorporate sites off of road (using aerial photos).

Area of Influence: 50 feet in each direction

TRAILHEADS

There are nine trailheads; all are located on the east side of the Spring Mountains, with just two (Bonanza and Griffith Peak) located outside of the developed canyons at Cold Creek and Harris Springs. Four trailheads are located in Kyle Canyon, two in Lee Canyon, and two located along Deer Creek Road, all located within biodiversity hotspots. Parking areas associated with the trailheads are fairly small, less than ¼ acre in size. Upper and Lower Bristlecone trailheads are located in close proximity to Dolomite and McWilliams campgrounds. While all the other sites have been in place for 30 years or more, Sawmill is a new facility that opened in 2006. It currently accesses an extensive user-created trail system but a very limited (about 1 mile) amount of Forest System trail mileage. Fletcher View Trail does not have a parking area associated with it, leading people to parallel park along the road. Table 2-3 indicates the availability of parking at trailheads. Tables 3-5, 3-7, 3-9, and 3-11 (Section 3) summarize the distribution of trailheads across major vegetation types in the Spring Mountains NRA.

Table 2-3 Forest System Trail Access on the Spring Mountains NRA

Trailhead	General Location	Parking Capacity[1]
Sawmill	Lee Canyon	54 cars, 4-6 horse trailers
Lower Bristlecone	Lee Canyon	6-8 cars
Griffith Peak	Harris Springs	6 cars
Bonanza	Cold Creek	4-5 cars
Mary Jane Falls	Kyle Canyon	40 cars
Trail Canyon	Kyle Canyon	9 cars
Cathedral Rock	Kyle Canyon	12 cars
Robbers Roost	Deer Creek	10 cars
Echo	Kyle Canyon	5 cars
North Loop	Deer Creek	15 cars

[1]Spring Mountains NRA Natural Resource Specialist

There is a lot of activity in the areas around all of the trailheads located in Kyle Canyon and along Deer Creek Road. According to a recreation specialist at the Forest Service, people will often leave the system trail to look at a view or explore a rock or other natural feature. People don't typically venture farther than 20 yards from the trailhead.

DEVELOPED CANYON TRAILHEADS

Usage Level: There are 75-100 users daily during summer weekends, 6-10 people per day during summer weekdays and insignificant use during winter.[3]

Activity Adjacent to Footprint: There is a lot of activity in the areas around developed Canyon trailheads. People don't typically venture farther than 20 yards from the trailhead. An estimated 20 percent of people leave the trailhead/trail area. Some trails do not have parking areas associated with them, leading people to parallel park along the road.[4]

Footprint: Approximately 5,000 square feet, but varies considerably (circular area with a radius of approximately 40 feet).

Area of Influence: 20 feet in each direction.

TRAILHEADS OUTSIDE OF DEVELOPED CANYONS

Usage Level: Moderate summer weekend usage (30-60 hikers per weekend day, 6-10 per weekday day, light summer equestrian usage (6 per weekend day, 1-2 per weekday day).

Activity Adjacent to Footprint: Very little, usually limited to within 15-30 feet.

[3] Spring Mountains NRA Recreation Specialist.
[4] Spring Mountains NRA Recreation Specialist.

Footprint: Typically about 5,000 square feet, but varies considerably (circular area with a radius of approximately 40 feet).

Area of Influence: 20 feet in each direction.

SKI AREA

The Las Vegas Ski and Snowboard Resort, located near the end of Lee Canyon, is the closest downhill skiing to Las Vegas. The resort includes 11 runs and features a vertical drop of 860 feet. The three chair lifts and one surface lift at the ski area can move 3,500 skiers per hour uphill.

Usage Level: Winter skiers numbered approximately 48,800 during the 2006-2007 season on 11 runs.[5] The ski area also maintains 3 chair lifts and other equipment during the summer months.

Activity Adjacent to Footprint: None.

Footprint: Area of the ski area extending to the outer edge of ski runs.

Area of Influence: 100 feet around outer edge of ski runs.

Roads

There are over 375 miles of roads in the Spring Mountains NRA, of which the vast majority are unpaved (Table 2-4). Many of these roads were developed for resource development (see above section). These roads are now primarily utilized to access residential and recreation areas as well as by people driving for pleasure. Although there is just one designated scenic overlook in the Spring Mountains NRA – Desert View Overlook along Deer Creek Road – there are several roadside areas where motorists can pull off to enjoy vistas. These include four sites in the Lovell Canyon area (two along the lower sections of Lovell Canyon Road, one at Rocky Gap Pass, and one at Lovell Summit Pass), two along the Harris Springs Road, two in Wallace Canyon, two at Willow Creek, one in Carpenter Canyon, one along Kyle Canyon Road (just east of the Deer Creek Road junction), one at Cold Creek, and one at Wheeler Pass. Tables 3-5, 3-7, 3-9, and 3-11 summarize the distribution of roads across major vegetation types in the Spring Mountains NRA.

Table 2-4 Miles of Road in the Spring Mountains NRA

Management Area	Paved	Improved, Non-Paved	Unimproved
Developed Canyons	45.9	26	94.9
Mt Stirling	0	0	37.0
Wilderness Areas[1]	0	0	0
West side NRA	22.7	22.8	120.9

[1]The actual management area is the Mt. Charleston Wilderness Area, but it has been modified to include the Rainbow and LaMadre Wilderness Areas. These wilderness areas have been removed from the West Side Management Area 13.

[5] Las Vegas Ski and Snowboard Resort, 2006.

PAVED ROADS

The majority of paved road mileage provides access into the developed canyons. The transportation in the developed canyons consists of three primary State Routes (SR): Kyle Canyon Road (SR 157), Lee Canyon Road (SR 156), and Deer Creek Road (SR 158). These roads are also designated as State Scenic Byways. They provide access to the campgrounds, trail heads, picnic areas, educational and interpretive facilities, the Las Vegas Ski and Snowboard Resort, and to local residential, commercial and other land uses. Kyle Canyon and Lee Canyon Roads provide regional access to and from the Las Vegas Valley via U.S. 95. Kyle Canyon, Lee Canyon, and Deer Creek areas receive the majority of visitors to the Spring Mountains NRA.

There are also paved roads into the Spring Mountains NRA from the north and the south. Cold Creek Road (County Road 202) provides paved access on the northeastern end into the Cold Creek area, while Lovell Canyon Road (FS Road 537) provides access into Lovell Canyon from SR 160. State Route 160 also provides access as it crosses the southern portion of the Spring Mountains NRA just north of the Mt. Potosi area.

Paved access to the southwest side of the Spring Mountains NRA is accessed by Lovell Canyon, a limited maintenance road, which is connected to SR 160 by the Clark Canyon Cutoff Road (FS 071). All other access on the west side is via unpaved roads.

Usage Level: High traffic levels in all seasons; Average daily traffic counts vary from approximately 500 vehicles on Lee Canyon Road to 1,500 to 3,000 vehicles on Kyle Canyon Road.

Activity Adjacent to Footprint: Motorized activity (parking) limited to within 10 feet, Foot traffic (picnicking, hiking, exploration) off the road in the developed canyons above and along the Deer Creek Road can spread to within 1/10 mile (foot traffic – picnicking, hiking, exploration, snow play) of the road, but there are a limited number of people who leave the 10 foot area.

Footprint: Width of 50 feet (outside shoulder edge to outside shoulder edge)

Area of Influence: 20 feet in each direction measured from the footprint edge

UNPAVED ROADS

There are approximately 56 miles of improved, unpaved roads and approximately 251 miles of unimproved roads in the Spring Mountains NRA. Improved roads have dirt or gravel surfaces and can be accessed by any type of vehicle, while unimproved roads may require 4-wheel drive and higher clearance vehicles. On the west side of the Spring Mountains NRA, an improved, unpaved road provides access to Trout Canyon while on the south side an improved road (FS Road 582) enables travel from SR 160 up to Potosi Pass. There are also approximately 120 miles of unimproved access roads on the west and south sides that provide access into such areas as Lovell Summit, Carpenter Canyon, Wallace Canyon (from both Clark Canyon and Carpenter Canyon), Younts Spring area, Lost Cabin Spring area, Buck Spring area, and Potosi Wash and the mines around Mt. Potosi in the south.

In the Mt. Stirling area, there is unimproved access from the north to areas around Big Timber Spring, Cold Spring, Rock Spring, and Jaybird Spring while from the west there

is access to the areas around Horseshutem Spring, Crystal Spring, and Rainbow Spring. There is also an unimproved road from the Clark Canyon Cutoff Road that parallels the boundary of the Mt Stirling Wilderness Study Area and crosses over Wheeler Pass into the Cold Creek area.

Usage Level: Low to high use. Most use occurs April through October on weekends with less use on weekdays. Relatively low use November through March.

Activity Adjacent to Footprint: Typically limited to within 20 feet of the road, where people frequently park during times of peak use. Negligible outside of areas captured in concentrated use area inventory, which are discussed under the "Concentrated Use Areas" section.

Footprint: Width of 25 feet (outside shoulder edge to outside shoulder edge)

Area of Influence: 20 feet in each direction measured from the footprint edge

Trails

The Forest Service manages over 50 miles of trails associated with the twelve developed "system" trails. These are all located on the east side of the Spring Mountains NRA in the developed canyons (Lee and Kyle) or in the Mt. Charleston Wilderness Area. Routine maintenance of these trails is carried out throughout the summer and most of the spring and involves clearing debris from water bars and other drainage structures on the trails, cutting brush along trails, and removing trees that have fallen on the path. Occasionally, heavier maintenance may be required following flooding or other natural events. Tables 3-5, 3-7, 3-9, and 3-11 summarize the distribution of trails across major vegetation types in the Spring Mountains NRA.

FOREST SERVICE SYSTEM TRAILS (NON-MOTORIZED)

There are twelve Forest Service system trails on the Spring Mountains NRA, with a total length of approximately 51 miles (Table 2-5). Roughly 34 miles of system trails are located in wilderness, with the remaining mileage located in Kyle and Lee Canyons. According to a Forest Service recreation specialist, the higher mileage trails (2 or more miles in length) tend to receive less use than the low mileage trails; on a summer weekend day, there may be 30 to 60 people on a weekend day on higher mileage trails but 75 to 100 people on a weekend day on the lower mileage trails. It can become fairly crowded on the lower mileage trails.

The higher mileage trails, however, tend to support the full range of trail-based activities including hiking, backpacking, snowshoeing, and equestrian use while the low mileage trails tend to primarily attract hikers. The Bristlecone Trail is the only system trail supporting mountain bike use, as most of the higher mileage trails are located primarily in wilderness where mountain bike use is not permitted. Many of the lower mileage trails are too steep and rocky for mountain bikers. Equestrians use nearly all of the higher mileage trails, with the Griffith Peak Trail being the least popular due to lack of easy access with a horse trailer. However, according to a representative of a local trails club, many of the trails on the Spring Mountains are too narrow and have too uneven a surface for many equestrians. The Griffith Peak Trail and the Bonanza Trail are the lowest use trails because they have remote access off of east-side roads (Harris Springs Road and Cold Creek Road, respectively).

All designated trails are at high elevations, with the lowest elevation trail (Fletcher View Trail) starting at nearly 7,000 feet. These trails thus provide opportunities for outdoor recreation at cooler temperatures during the summer months. Other than snow-based trail use, however, there is limited accessibility to trails in the winter.

Table 2-5 Forest System Trails on the Spring Mountains NRA

Trail	Length (miles)[1]	Starting Elevation (feet)	Elevation Change (feet)	Primary Uses[2]	General Usage
Griffith Peak	5.0	8,400	2,100	Hiking, Backpacking, Skiing	Low
Bonanza	14.0	7,546	2,762	Hiking, Backpacking, Equestrian	Low
South Loop	8.3	7,600	4,318	Hiking, Backpacking, Equestrian	Moderate
North Loop	10.3	7,600	4,318	Hiking, Backpacking, Equestrian	Moderate
Trail Canyon	2	7,800	1,500	Hiking, Backpacking, Equestrian	Moderate
Bristlecone	6.1 (Loop)	8,680	720	Mountain Biking, Hiking, Backpacking, Equestrian	Moderate
Mummy Springs	0.3	9,940	N/A	Hiking, Backpacking	Low
Cathedral Rock	1.4	7,600	1,000	Hiking	High
Fletcher Canyon	1.8	6,890	430	Hiking	High
Mary Jane Falls	1.5	7,840	1,040	Hiking	High
Robbers' Roost	0.1	8,370	190	Hiking	High
Desert View	0.1	8,229	N/A	Hiking	High

[1]Distances are one-way unless otherwise noted.

[2]There is also limited snowshoe use on Griffith Peak, Bonanza, South Loop, North Loop, Trail Canyon and Bristlecone Trails. There is also limited cross country skiing on Bristlecone Trail.

There is little conflict among the different user groups on the non-motorized trails. Hikers typically do not bother equestrians or horses, and most hikers are excited to see horses. Horseback riding is also compatible with mountain biking as long as there is good visibility, moderate to low use, and not very steep terrain so bikes can approach slowly. Busy multi-use trails can be a challenge for mountain bikers as they often have to dismount to pass hikers or horseback riders. Also, while mountain biking and horseback riding may impact the footprint of the trail more, they venture off of the trail less often then hikers and therefore likely have less impact on vegetation and other resources.

HIGH USE, LOW MILEAGE TRAILS

Fletcher Canyon, Desert View, Robber's Roost, Mary Jane Falls, Cathedral Rock, and the beginning section of Bonanza near Lee Meadows.

Usage Type: Hikers are often accompanied by dogs (by county ordinance, dogs should be on-leash). There are very few mountain bikers or equestrians. There is also low usage during non-summer months.

Usage Level: High summer weekend hiker usage. There is light winter usage (6-10 hikers per day).

Activity Adjacent to Footprint: Off-trail exploration / activities usually limited to within 20 yards of trail with approximately 15 percent of users leaving the trail once or twice.

Footprint: 2 foot wide average trail width.

Area of Influence: 60 feet in each direction measured from the footprint edge.

LOW TO MODERATE USE, HIGH MILEAGE TRAILS

Griffith Peak, South Loop, North Loop, Bonanza, Mummy Springs, Bristlecone, and Trail Canyon.

Usage Type: Hikers are often accompanied by dogs (by county ordinance, dogs should be on-leash). There are a small number of backpackers who camp off of these trails. With exception of Bristlecone, very light mountain bike usage. There is light winter usage for snowshoeing or cross-country skiing. Equestrians must use weed free hay.

Usage Level: Moderate summer weekend usage (30-60 hikers per weekend day, 6-10 per weekday day, light summer equestrian usage (6 per weekend day, 1-2 per weekday day).

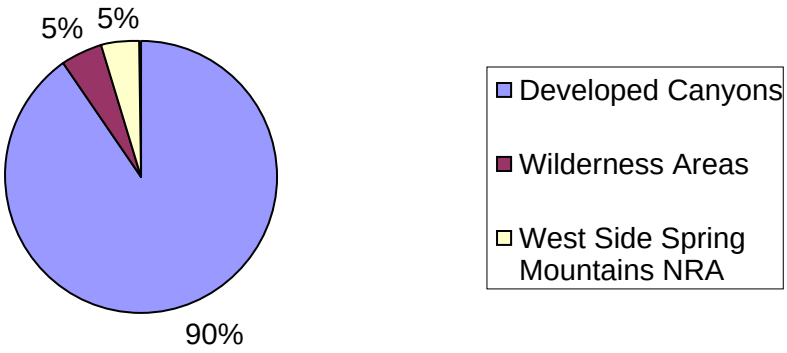
Activity Adjacent to Footprint: Off trail exploration / activities usually limited to within 10 yards to a mile from the trail, with approximately 50 percent of users leaving the trail once or twice.

Footprint: 2 foot wide average trail width.

Area of Influence: 15 feet in each direction measured from the footprint edge.

USER CREATED TRAILS (NON-MOTORIZED)

In addition to the Forest System trails, there are many miles of user-created trails. These "unofficial" trails have been developed through informal usage and were not constructed by the Forest Service, nor are they maintained. The Forest Service has mapped 178 miles of these user-created trails, but a complete inventory has not been conducted. There is uncertainty regarding the comprehensiveness of the data, but a Forest Service recreation specialist indicated that most major user-created trails are likely included. Figure 2.4 indicates that 91 percent of the mapped user-created trails are in the developed canyon management area; these mileages should be interpreted with caution as they may signify more where inventory efforts have been concentrated than actual trail mileage.



Source: Forest Service GIS data layers

Figure 2-4 Percentage of Mapped User-Created Trails by Management Area (see Section 2.2.5) on the Spring Mountains NRA

User-created trails are common around trailheads, campgrounds, picnic areas, parking areas, and concentrated dispersed use sites. Equestrians, mountain bikers, and hikers all have played a role in creating user-created trails. Some of the trails are associated with a particular use, but most are multi-use trails.

Usage Type: Hikers, mountain bikers, and equestrians use these trails.

Usage Level: Low use by hikers, mountain bikers, and equestrians.

Activity Adjacent to Footprint: Activity usually limited to within 15 feet, 25 percent of users on average leave the trail once or twice.[6]

Footprint: 2 feet width

Area of Influence: 15 feet in each direction measured from the footprint edge.

MOTORIZED TRAILS

There are over 110 miles of mapped user created motorized trails. While not all motorized trails have been mapped, a Forest Service recreation specialist roughly estimated that the Geographical Information Systems (GIS) mapped inventory may include approximately 85 percent of all motorized trails. Of those 110 miles, 54 miles have been designated as Forest System Trails (open to motorized travel) on the Spring Mountains NRA Motor Vehicle Use Map, which implements the 2004 Motorized Trails Designation Project decision. With the establishment of the Motor Vehicle Use Map, motor vehicle travel is prohibited off of designated roads and motorized trails per the USDA Forest Service travel management rule (36 CFR part 212).

There are motorized trails in all non-wilderness management areas of the NRA (motorized travel is not allowed in wilderness areas). Table 2-6 presents the available

[6] Spring Mountains NRA Recreation Specialist.

data on mileage and location of existing user created motorized trails by designation. The data is based on mapping of user-created motorized trails that occurred in 2003 for Motorized Trails Designation Project (which officially designated motorized trails on the Spring Mountains NRA and prohibited motorized use on all areas not designated as motorized trails or roads). This data was likely not comprehensive at the time of the inventory, and as trails are continually being created and existing ones expanded by the few off-highway vehicle (OHV) users who go off of existing trails, Table 2-6 likely under-represents the current mileage of user-created motorized trails on the Spring Mountains NRA.

Table 2-6 Motorized Trails Designation Project Outcome on the Spring Mountains NRA

Motorized Trail Project Designation	Management Area	Mapped Miles
User-created trails that have been designated as OPEN to continued motorized use	Developed Canyons	25.8
	Mt. Stirling	6.9
	West-Side NRA	20.9
	Total	53.6
User-created trails that were not designated; motorized use is thereby prohibited.	Developed Canyons	24.1
	Mt. Stirling	10.7
	West-Side NRA	21.9
	Total	56.8
All Mapped User-Created Motorized Trails	Developed Canyons	49.9
	Mt. Stirling	17.7
	West-Side NRA	42.8
	Total	110.4

Source: Humboldt-Toiyabe National Forest GIS data coverage of motorized trails.

Usage Type: Used almost exclusively for OHV recreation. Most OHV use is day use, but there are those who camp also. Some people use OHV to explore or hunt, while the primary purpose of other OHV users is to simply ride their vehicles on roads and trails.

Usage Level: According to NVUM, over 24,000 visitors to the NRA recreated with OHV in 2005, mainly riding on summer weekends. OHV use is concentrated in the warmer months between April and October. Observations of use by Forest Service recreation staff indicate about 110 OHV users per month may ride at various locations between November and March. Once the Motorized Trails Designation Project decision is implemented, there will be no use of motorized vehicles except on designated motorized trails and routes.

Activity Adjacent to Footprint: Most OHV users stay on the existing motorized trails, but new trails are sometimes created by the few who ride off trail. In general, OHV users stay within 10 feet of trail for motorized activity and 10 yards of trail for on-foot activity, with an estimated 10 percent of users leaving the trail infrequently.

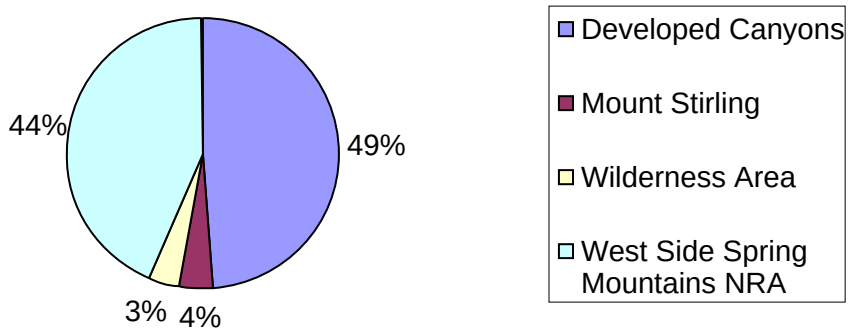
Footprint: 6 foot wide average trail width.

Area of Influence: 20 feet in each direction measured from the footprint edge.

Dispersed Use Sites

CONCENTRATED USE AREAS

Any site outside of the developed recreation areas can be a dispersed recreation site. There are, however, many sites that receive repeated visitation. A concentrated use area (CUA) inventory was conducted and GIS mapped to document non-developed areas where there is visible sign of recreation use. The CUA project did not include trails unless the trails were associated with a concentrated use area. The CUA inventory documented approximately 1,000 sites covering approximately 93 acres. Although it is known that there are CUA sites not captured by this inventory, a Forest Service recreation manager estimated that the project documented approximately 95 percent of all dispersed sites with visible signs of repeated visitation for recreational purposes or impact on resources at the time of the inventory. The distribution of the documented CUA sites by management area is presented in Figure 2.5. Tables 3-5, 3-7, 3-9, and 3-11 summarize the distribution of CUAs across major vegetation types in the Spring Mountains NRA. Within each management area, CUA sites are typically located along roads. The primary recreation activities at CUA sites are camping, picnicking, target shooting, and general relaxing.



Source: Humboldt-Toiyabe National Forest GIS data coverage of the Concentrated Use Area Inventory.

Figure 2.5 Percentage Concentrated Dispersed Use Areas by Management Area (see Section 2.2.5) on Spring Mountains National Recreation Area

Limiting the footprint and potential impacts on resources associated with dispersed site recreation can be challenging as they are not developed sites. Campsites in particular can be difficult to manage as they often get bigger over time. The number of sites also often increases over time. On the west side, the Forest Service has placed some big boulders around sites to constrain the areas people can park to limit the size of the site.

Usage Type: These sites include camping as well as day use activities such as target shooting, and picnicking.

Usage Level: According to the NVUM survey, in 2005 over 4,400 visitors camped outside of the developed sites in non-developed dispersed areas. All areas with visible impact are recorded in the CUA.

Activity Adjacent to Footprint: People usually only venture out of the CUA about 60-90 feet. An estimated 35 percent of people may wander out of the CUA area.[7]

Footprint: Polygons mapped from CUA inventory, ranging from about 10 square feet to over 90,000 square feet in size.

Area of Influence: 100 feet in each direction measured from the footprint edge, to reflect that some people as stated above wander outside of the CUA area.

SNOW PLAY AREAS

The majority of the snow play in the Spring Mountains is in the developed canyons along Lee Canyon Road, Kyle Canyon Road, and Deer Creek Road. Although snow play takes place all along these three roads above snowline, there are several popular locations of concentrated snow play use in the area. In upper Kyle Canyon, the Old Ski Tow near the Mary Jane Falls Trailhead and the area known as Suicide Hill near the end of the Kyle Canyon Road are often used for snow play. In Lee Canyon, the Lee Canyon Meadows and the Foxtail Picnic Area are also popular. The total acreage of these concentrated use snow play areas is approximately 260 acres. All of the above areas are not Forest Service officially designated snow play areas, but simply where people tend to gather for playing in the snow.

Usage Type: Sledding and general snow play activities such as snowball fights and making snowmen. There is often trash left in snow play areas.

Usage Level: Unknown number of people, however during winter weekends with snow, the developed canyons can become quite congested with people coming to snow play.

Activity Adjacent to Footprint: Concentrated snow play use is within the digitized polygons provided by Forest Service.

Footprint: Digitized polygons from information provided by Forest Service

Area of Influence: None

CLIMBING AREAS

The limestone at Mt. Charleston provides world-class rock climbing that draws expert rock climbers from all over the world. The climbing season typically begins in April and continues through October. There are three primary rock climbing areas in the Mt. Charleston Wilderness Area: the Hood near the Trail Canyon Trailhead, the Glass House near the Robber's Roost Trailhead, and the Ice House located off of Deer Creek Road. There are also rock climbing and bouldering areas (lateral climbing close to the ground without a rope) outside of the wilderness, located near the Mary Jane Falls Trailhead, which have not been mapped.

[7] Spring Mountains NRA Recreation Specialist.

Usage Type: Rock climbing up cliffs using ropes and hardware.

Usage Level: Unknown as rock climbing was not a surveyed activity in the NVUM survey, and the Forest Service does not track the number of visits by rock climbers.

Activity Adjacent to Footprint: Very little as climbing areas accessed via user created trails, which are included in the user-created non-motorized trail activity.

Footprint: 1,250 square feet surrounding the midpoint of the climbing wall to include the climbing wall and surrounding area (20-foot radius circle).

Area of Influence: None.

CAVING AREAS

Due to the limestone geology of the Spring Mountains, there are numerous caves in the area, many of which show some signs of visitation. As these caves provide habitat to sensitive species and are easily impacted, the locations of the caves are confidential. The Southern Nevada Grotto organizes caving trips and maintains a cave register at several sites. There are approximately 33 mapped caves and tunnels, of which 20 are in West Side Management Area 13, 12 are in Developed Canyon Management Area 11, and 1 is in Mt. Stirling Management Area 14.

Usage Type: Exploration in the cave.

Usage Level: Many of the caves show some signs of visitation. Caves receive low use, with perhaps fewer than 100 people visiting the caves annually. Use of tunnels is unknown.[8]

Activity Adjacent to Footprint: Activity around cave sites includes accessing the cave via a user created trail or via rappelling, depending on the terrain surrounding the cave.

Footprint: 1250 square feet surrounding the midpoint of the climbing wall to include the cave opening and surrounding access area (20-foot radius circle).

Area of Influence: None

Wilderness

While not a recreation facility, wildernesses in the Spring Mountains NRA constitute a distinct type of recreation area characterized by more natural, wild, and primitive qualities. There are three wildernesses: Mt. Charleston Wilderness, Rainbow Wilderness, and LaMadre Wilderness. There is also one wilderness study area (WSA), the Mt. Stirling WSA. Nearly 80,000 acres of the Spring Mountains NRA are designated as wilderness (25 %), and nearly 58,000 acres (18 %) are designated as a WSA.

While there are exceptions for existing private rights and administration of the area, the Wilderness Act of 1964 specifies that there shall be no permanent roads, temporary roads, installation of structures within a wilderness, or use of motorized or mechanized transport. The

[8] NRA Recreation Specialist.

Act thus restricts human recreation in the wilderness to such non-mechanized recreation as hiking, horseback riding, photography, wildlife viewing, and rock climbing.

WSAs are areas that the BLM identified or studied to determine whether or not that area should be recommended for wilderness status to Congress. The 1988 National Forest and Public Lands of Nevada Enhancement Act resulted in the transfer of the BLM-identified WSA to the Forest Service. The WSA designation requires that the wilderness characteristic(s) be protected until Congress decides whether or not to designate the area as wilderness.

The Mt. Charleston Wilderness is the largest wilderness in the Spring Mountains, encompassing approximately 55,000 acres. Rainbow Mountain Wilderness and LaMadre Mountain Wilderness together comprise approximately 25,000 acres. Nearly all wilderness area recreation in the Spring Mountains NRA occurs in the Mt. Charleston Wilderness, as it is most easily accessed and includes 34 miles of Forest Service system trails as well as 13 rock climbing walls with approximately 138 different climbing routes. In contrast, there are no Forest Service system trails or major rock climbing sites in the LaMadre Mountain Wilderness or Rainbow Mountain Wilderness portions of the Spring Mountains NRA. The Mt. Stirling WSA has no designated Forest Service system trails, but it does offer some challenging non-system hiking routes.

2.2.2 Recreation Use

Available data on the level and distribution of recreation usage by activity is summarized in this section. Although it is difficult to know exactly how many people are visiting the area, what they are doing and where they are doing it, information from a variety of sources is compiled in an effort to estimate the current status of recreation activities. Recreation use data in this section is drawn primarily from the 2005 NVUM survey results for the Spring Mountains NRA.

The NVUM process is designed to provide an estimate of recreation visits, where a recreation visit is defined as “one person entering and exiting [a designated recreation area] for the purpose of recreating”. In any single visit an individual may participate in multiple activities and visit numerous sites within the recreation area. A recreation visit may be of any length, from 15 minutes to 15 days. The NVUM process selects a stratified random sample of times and locations to conduct traffic counts and interviews of recreation visitors. Estimates of visitation for the sampled year are within 15 percent of actual visitation, at the 80 percent confidence level.[9] Data from the NVUM survey is supplemented with interviews with Forest Service recreation specialists.[10] Other sources of data include concessionaire data and Forest Service management and planning documents.

According to the NVUM survey, there were 335,600 visitors as a whole in 2005. Visits to individual sites totaled 441,200 in 2005. Visitors pursue a wide variety of recreation activities throughout the year. The most popular summer activities are sightseeing, hiking/walking, camping, picnicking, and general relaxing. Summertime recreation in the Spring Mountains NRA also includes rock climbing, horseback riding, mountain biking, OHV use, backpacking, and caving. Winter recreation is concentrated in snow-based activities, with general snow play the most popular activity. Snow recreation also includes downhill skiing at Las Vegas Ski and Snowboard Resort, as well as a limited amount of snowshoeing and cross-country skiing. The popularity and unique recreation environment of the Spring Mountains NRA is reflected in

[9] English, Donald B.K. et al, “Forest Service National Visitor Use Monitoring Process: Research Method Documentation”, United States Forest Service Southern Research Station, General Technical Report, SRS-57.

[10] Interviewed Spring Mountains NRA personnel include Amy Meketi, Anise Ellis, Larcy Miller, Connie Moen, Suzanne Shelp, and Lucas Woolf.

survey responses to a question asking people about substitute recreation sites; just 50 percent of visitors indicated that they would have gone to another recreation location if they could not recreate at the Spring Mountains NRA.

Statistics on recreational participation from the NVUM survey are presented in the Table 2-7, followed by a detailed description of each primary recreational activity.

Table 2-7 Self-Reported Recreation Participation on Spring Mountains NRA, 2005

Activity	Percentage Self Reported Participation	Estimated Annual Number Participating	Percentage Self Reported as Main Activity	Estimated Annual Number as Main Activity
Viewing natural features	58	255,896	12	52,944
Hiking/walking	57	25,1484	29	127,948
Relaxing	47	207,364	12	52,944
Viewing wildlife	43	189,716	3	13,236
Driving for pleasure	42	185,304	8	35,296
Picnicking	18	79,416	5	22,060
Developed camping	14	61,768	8	35,296
Nature center activities	13	57,356	Less than 1%	0
Nature study	10	44,120	Less than 1%	0
Visiting historic sites	9	39,708	Less than 1%	0
OHV use	7	30,884	1	4,412
No activity reported	6	26,472	17	75,004
Downhill skiing	5	22,060	5	22,060
Other non motorized	2	8,824	1	4,412
Backpacking	2	8,824	Less than 1%	0
Resort use	2	8,824	0	0
Gather forest products	2	8,824	0	0
Bicycling	2	8,824	1	4,412
Primitive camping	1	4,412	1	4,412
Other motorized activity	1	4,412	1	4,412
Horseback riding	1	4,412	0	0
Hunting	1	4,412	0	0
Snowmobiling	0	1,300	Less than 1%	0
Cross-country skiing	0	700	42	300
Non motorized water	0	700	100	700

Source: National Visitor Use Monitoring (NVUM) Program Survey, Final report, USDA Forest Service, 2006.

Notes: Percentages reported above have been rounded. Annual number participating estimated by multiplying annual number of site visits by self reported percentage of participation for a given activity.

Hiking / Walking

An estimated 57 percent of visitors in 2005 hiked or walked as one of their activities during their visit. This indicates that there were 251,484 visitors hiking. Hiking was the most common

primary activity for visitors, with approximately 29 percent of all visitors citing this as their main activity. Hiking at the Spring Mountains NRA includes hiking on designated Forest Service trails, user-created trails, and trail less areas. Most hiking occurs between April and October, though there are a few visitors who will hike in the winter if there is not too much snow.

The most heavily used hiking trails are the lower mileage, designated trails in the developed canyons, such as Mary Jane Falls, Cathedral Rock, Desert View, and Fletcher Canyon. According to a Forest Service recreation specialist, on a summer weekend day there can be an estimated 75 to 100 hikers on these trails. As hikers on these trails are always fairly close to their vehicles and know where they are, they often venture off of the trail to explore or to return via a different route to their vehicles.

Demand for longer mileage hiking trails, while lower, is still very strong. On a summer weekend day, there can be 60 hikers on each of many of the longer designated trails, such as South Loop, Trail Canyon, or North Loop. In general, hikers on the higher mileage trails tend to stay on the trail and do not venture far off the trail to explore or wander through other areas. Although the vast majority of hikers are day hikers, there are overnight hikers who backpack into more remote areas of the Spring Mountains and camp in dispersed sites. The NVUM survey estimates that there are over 6,700 visits (2 percent of all visits) to the NRA by backpackers.

Camping

Camping includes camping in developed campgrounds located in Kyle and Lee Canyons and along the Deer Creek Road as well as a moderate amount of camping at non-developed locations (Concentrated Use Areas). The NVUM survey estimates that in 2005 14 percent of visitors, or almost 62,000 visitors, camped during their visit. Overnight visitors tended to stay just one or two nights; the average length of stay for overnight visitors was 1.5 days (34.9 hours).

The overwhelming majority of overnight visitors in 2005, 90 percent (62,000 visitors), were estimated to camp at developed campgrounds. Developed camping is concentrated in the summer months. Although one developed campground is open during the winter, all other campgrounds are open from either April or May to October. According to concessionaire data for 2005, the developed campgrounds were most heavily used from April to June, with over 5,800 total sites occupied during this timeframe. As expected, demand is heaviest on the weekends, although there are significant numbers of campers during the weekdays.

Based on the NVUM survey, over 4,412 visitors annually are estimated to camp in non-developed locations (Concentrated Use Areas) throughout the Spring Mountains NRA in 2005. Use of these dispersed sites is not regulated and does not require a user fee. Dispersed camping sites are generally located along motorized roads. Additionally, there is a small amount of dispersed camping by backpackers in the wilderness. For larger dispersed camping groups, the Forest Service encourages use of eight specific dispersed group camping spots located throughout the Spring Mountains NRA. Two are located in Macks Canyon, two in Lovell Canyon, one in Wheeler Well, one at the Bonanza Trailhead, one off of Deer Creek near a well used archery spot, and one in Blue Tree (popular with equestrian users).

Picnicking

It is estimated that in 2005, 18 percent of all visitors, or about 80,000 people picnicked during their stay. Picnicking includes picnicking at developed picnic areas as well as at non-developed locations (Concentrated Use Areas) throughout the Spring Mountains NRA. During the summer,

there are often many picnickers at dispersed locations throughout the developed canyons above the intersection with the Deer Creek Road.

Snow Recreation

Snow recreation includes downhill skiing, general snow play, and a small amount of cross country skiing and snowshoeing. The Las Vegas Ski and Snowboard Resort, located near the end of Lee Canyon, is the closest downhill skiing to Las Vegas. The three chair lifts and one surface lift at the ski area can move 3,500 skiers per hour uphill. Management at the Las Vegas Ski and Snowboard Resort reports that approximately 57,000 skiers visited the area during the 2004-05 ski season.

In addition to downhill skiing, general snow play is a very popular form of winter recreation. There are no designated areas for snow play, but there are several areas in the developed canyons that are common snow play areas, including the Lee Canyon Meadow and in around Foxtail Picnic Area, Macks Canyon, and near the old ski tow by the Mary Jane Falls Trailhead. Generally everywhere in the developed canyons and along Deer Creek Road can become a snow play area, particularly areas that have a slope for sledding. People usually stay within 0.2 mile from roads to snow play.[11] On winter weekends when there is good snow, the developed canyons can become quite congested with people coming to play in the snow.

There are several management concerns associated with snow play. Every year there are serious injuries, including occasional fatalities, resulting from snow play collisions when sledders slide into other sledders, trees, parked cars, or the road. Additionally, there is often a lot of trash left on the ground in snow play areas.

According to the NVUM survey, there were nearly 700 visitors cross-country skiing in 2005. A popular cross-country skiing route is from the lower Bristlecone Trailhead connecting to the back of Lee Canyon meadow. People also snowshoe in this area, as well as on several of the Forest Service designated trails. Snowshoers and skiers also hike up Griffith Peak and ski or snowshoe down.

Off-Highway Vehicle (OHV) Use

About 31,000 visitors (7 %) in 2005 to the Spring Mountains NRA recreated with OHV based on the NVUM data. OHV use is particularly popular in the Wheeler, Lovell, Potosi, and Cold Creek areas. According to a Forest Service recreation specialist, on a weekend summer day an estimated 50 to 100 OHV users may be in the Wheeler area while 30 to 50 OHV users may be in Lovell Canyon. The other west side canyons such as Clark, Wallace and Carpenter receive less OHV use but are also popular. There are significantly fewer users on weekdays. OHV use is concentrated in the warmer months between April and October. According to NRA recreation staff, between November and March, monthly OHV use at all locations in the NRA has been estimated at approximately 110 OHV users. Most OHV use is day use, but there are those who camp also. Some people use OHV to explore or hunt, while the primary purpose of other OHV users is to ride their vehicle on trails.

Most OHV users stay on the existing motorized trails and Forest System roads, but new trails are often created by the few who ride off trail. Noise from OHV use can reduce enjoyment of the Spring Mountains for some visitors. Additionally, OHV noise can affect residents of the Spring

[11] Personal communication with Spring Mountains NRA Recreation Specialist, May 2006.

Mountains. The community of Cold Creek, in particular, is located close to popular OHV use areas and can be negatively affected by the noise.

Sightseeing and Scenic Driving

Nevada SR 156, 157, and 158 provide easy access to the developed areas of the Spring Mountains NRA in Kyle Canyon, Deer Creek, and Lee Canyon are popular sightseeing roads (all are designated Scenic Byways). From these roads, people can experience the forested landscape of the higher elevations in the Spring Mountains, view spectacular geologic formations as well as wildlife, and enjoy beautiful desert vistas. Sightseeing and scenic driving are two of the most popular activities at the Spring Mountains NRA. Approximately 58 percent of visitors in 2005 cited viewing natural features as an activity they enjoyed on their visit, while approximately 42 percent drove for pleasure (approximately 185,000 visitors).

Horseback Riding

Equestrians ride on roads, Forest System trails, user created non-system trails, and also through trail-less areas in washes. Equestrians must use weed free hay to prevent the spread of invasive weeds. There is a lot of equestrian use on the west side, particularly in the Lovell Canyon area. On a summer weekend there may be 20 to 30 horseback riders in the Lovell area. Equestrian usage on several of the longer mileage Forest Service designated trails is estimated to average approximately 10 horseback riders per summer weekend day. Total equestrian usage of the Spring Mountains NRA in 2005 was estimated by the NVUM survey at approximately 4,412 visits annually.

Bicycling

In 2005, about 8,800 visitors bicycled in the Spring Mountains NRA, as estimated by NVUM. Bicycling includes both mountain bikers on trails and road bikers. As many of the trails are in wilderness areas, there are limited trails open to mountain bikers. However, the Bristlecone Trail off of Lee Canyon is a popular trail for mountain bikers. There are also mountain bike trails in the Cottonwood Valley area, but most of the trails in this area are located on BLM land, with minimal mileage on the Spring Mountains NRA.

Target Shooting

There are no designated target shooting areas on the Spring Mountains NRA. However, there are several popular locations where people tend to target shoot. One area is located at the gravel pit in Lovell Canyon at milepost 6 on Lovell Canyon Road, another is located at the helispot in Kyle Canyon, and there a few locations in the Wheeler area. Target shooters are required to have a backdrop, and may not shoot over a road or within a camping or parking area, but are not otherwise restricted. An estimated 10 to 15 visitors may target shoot on a weekend summer day.

Rock Climbing

The Spring Mountains provide world class limestone climbing that attracts rock climbers from long distances. According to the 2006 Spring Mountains Wilderness Rock Climbing Inventory, there are three climbing areas on the Spring Mountains, all located in the Mt. Charleston Wilderness Area accessible from the developed canyons. A total of 138 routes on 13 walls are climbed at these three areas. There are also climbing areas located outside of the wilderness areas, but these have not been inventoried. Rock climbing was not a surveyed activity in the NVUM survey, and the Forest Service does not track the number of visits by rock climbers.

Caving

There is some warm season visitation (April through October) of the approximately 10 caves. The Forest Service does not track visitation of the caves, but a Forest Service recreation specialist estimates that there are fewer than 100 people caving per year. Visitation varies by cave; some caves require technical skills (for example, rappelling) to reach, while another cave is visible from a main road and is easy to reach.

Wilderness Recreation

There were approximately 61,900 visits to wildernesses in 2005 according to NVUM. A wilderness can not be accessed by mechanized transport, but only by hiking or on horseback. As the NVUM survey estimated that the total number of visitors hiking, walking, or horseback riding in the Spring Mountains was approximately 195,000 in 2005,[12] it follows that approximately 24 percent (61,900 of 195,000) of all hiking/walking and horseback riding visits were in a wilderness. Based on wilderness permit data, there were approximately 270 wilderness visitors that backpacked in 2005.[13] In addition to hiking and backpacking, other wilderness recreation includes wildlife viewing, nature study, and rock climbing.

Hunting

Hunting and trapping are allowed, but these activities are regulated and hunters and trappers must possess a valid license from NDOW.

The Spring Mountains NRA is not a popular destination for big game hunting due to the low densities of big game species. These include elk, deer, desert bighorn sheep, and mountain lion. In addition to a license, a permit/tag is required for this activity and in most years, these permits are only issued to Nevada residents. For 2006, three permits were issued for elk, twenty-eight for deer (does not include antlerless permits), and four for desert bighorn sheep. There is a fixed quota for mountain lions, but due to their low numbers and scattered population, only one is harvested in a good year. The number of tags issued is about the same every year, unless there is a considerable variation in population of a certain species.

Some rabbit hunting also occurs in the area, in addition to trapping bob-cats, fox, and coyotes. Upland game birds include chukar, Gambel's quail, and mourning dove. Hunting for these game birds is the most common type of hunting in the Spring Mountains. Popular areas for bird hunting include Lovell Canyon, Mt. Stirling, and Mt. Potosi, and most of the west side. In the fall hunting season, hunters often comprise the largest proportion of visitors to the west side.

The NVUM survey estimates that there were approximately 3,300 visits by hunters in 2005. It is expected that the impact of hunters on key species and habitats is small. Hunters often follow roads to look for game, or follow game through trail-less areas. As hunters do not typically follow the same route through trail-less areas, vegetation is not tread on repeatedly and new trails are rarely formed.

2.2.3 Profile of Recreation Visitors

The characteristics of visitors to a recreation area influence the type of activities pursued and the facilities desired. Therefore, to better understand the drivers of current recreation demand,

[12] Numbers in Table 2.8 may not sum to this value due to rounding.
[13] NRA Recreation Specialist.

this section presents a general profile of people who visit the Spring Mountains NRA. In addition to demographic characteristics, including gender, race, age, and income levels, the trip characteristics and perceptions of these visitors are discussed. Two sources of information provide the basis for the review: 1) The NVUM survey results for the Spring Mountains NRA, and 2) A review of surveys and reports of current and past visitor use and visitor characteristics on Federal lands in Clark County, Nevada, conducted by Argonne National Laboratory (ANL). Data from U.S. Census Bureau are used to compare the profile of Spring Mountains NRA visitors to the local populations of Clark and Nye counties.

Demographics

Nearly two-thirds of all visitors in 2005 were male, making up 60.7 percent of the total, with females comprising the remaining 39.3 percent. Although the Spring Mountains NRA provides recreation opportunities for people of all ages, the majority (60 % of the visitors in 2005 was between 20 and 49 years old (Table 2-8). The numbers of visits made by individuals in the 50 to 59 years age group and those less than 16 years old were about the same, with the former comprising about 15 percent and the latter accounting for approximately 14 percent of visitors. Individuals above 60 years of age comprised just fewer than nine percent of all visitors. Wilderness visitors were predominantly male (66 %), and between 20 to 49 years old (75 %).

Table 2-8 Age Distribution of Visitors to Spring Mountains NRA, 2005

Age Class	% of NRA Visits	Number of Survey Responses
Under 16	13.6%	411
16-19	2.7%	67
20-29	19.3%	356
30-39	18.2%	424
40-49	22.2%	472
50-59	15.4%	379
60-69	6.4%	160
70+	2.2%	56
Total	100%	2,325

Source: National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.

In terms of race and ethnic mix, visitation generally reflects the racial composition of southern Nevada. In 2005, approximately 89 percent of all visitors were White, which roughly corresponds to the 2000 Census indicating that 72 percent of the Clark County population and 90 percent of the Nye County population were similar. The proportion of visits by other racial and ethnic groups include five percent American Indians/Alaska Natives, four percent African Americans, three percent Asians, and one percent Hawaiians/Pacific Islanders.[14] Hispanics/Latinos, who represented 22 percent of the Clark County population in 2000, comprise approximately 15 percent of the visitors to the Spring Mountains NRA, and are included within the White and American Indian/Alaska Native categories.

[14] The percentages may not sum to a 100 percent since the respondents to the survey were given the option to select multiple categories of the five race categories.

In 2005, the majority of visitors were wealthier than average southern Nevada residents. Whereas average Clark County earnings per job were $41,743 in 2003, almost 70 percent of Spring Mountains NRA visitors had annual incomes of $50,000 or more and 25 percent had incomes exceeding $100,000 annually (see Table 2-9). The largest proportion of visitors 28.2 percent had incomes between $50,000 and $74,000. A little over 12 percent of visitors earn under $25,000 annually.

Table 2-9 Income Distribution of Visitors to the Spring Mountains NRA

Annual Income Category	% of Visits
under $25k	12.1
$25-49k	18.3
$50-74k	28.2
$75-99k	16.6
$100-149k	19.3
$150k+	5.4

Source: National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.

The majority visitors in 2005 were local, with 81 percent traveling 75 miles or less (72 % traveled 50 miles or less). Relatively few visitors traveled mid-range distances between 76 and 500 miles, this group represented only four percent of visits. However, the Spring Mountains NRA attracted many visitors from outside the region; 15 percent of visits were by people living over 500 miles from the Spring Mountains NRA.

Trip Characteristics

Visitors are typically accompanied by one to two other people. The average group size in 2005 was 2.9 people, while the median party size was 2.0. The vast majority of visitors, 82 percent, visit just one site while at the Spring Mountains. The average national forest visit length of stay was 10.8 hours. The average site visit was 6.2 hours, but time spent varied by type of site with visitors to day use sites spending an average of about 1.4 hours, while campers using the developed overnight facilities typically stay for 34.9 hours (1.5 days). Since averages may be influenced by a few people staying a long time, the median value is also important to note. The median value for site visits is 1.8 hours with the average is 6.2 hours. This means there were several visitors with a long length of stay but the majority of visitors stayed about 1.8 hours.

In 2005, many visitors were repeat visitors. Approximately 23 percent of visitors came to the area over five times a year. The remaining 77 percent visited between one and five times every year. As the NVUM survey data groups all visitors who visit between one and five times a year, it is unclear what percent of people (within this subgroup) were repeat visitors.

The primary attraction drawing visitors is the scenic natural beauty. Of surveyed visitors, 73 percent indicated this as one of their main reasons for visiting. A majority of people also came to enjoy the cooler temperatures and to seek solitude in the quiet surroundings (59 % and 54 % respectively). Another 36 percent came to enjoy the snow in winter, while 25 percent stated they found it a good escape from the city since it is a short drive away from cities in Clark and Nye Counties. 19 percent of visitors selected water/springs as an attraction. Another 31 percent of the visitors indicate the free use of facilities as an incentive to visit. Surveyed visitors were free to select multiple attractions (Table 2-10).

Table 2-10 Reasons People Visit the Spring Mountains NRA

Reason to Visit	% of Those Surveyed
Natural/Beautiful Scenery	73%
Cooler Temperatures	59%
Quiet/Solitude	54%
Snow in the Winter	36%
Free Use	31%
Escape From City. Short Drive to a Mountain Environment	25%
Water/Springs	19%
Other	8%
Source: Results from supplemental questions to National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.	

Visitor Perceptions

Another NVUM survey question regarding overall measures of visitor satisfaction indicates that visitors were highly satisfied with their experiences (see Table 2-11). Satisfaction with access was very high, at between 81 and 90 percent satisfaction for three different types of areas – developed sites, undeveloped areas or general forest areas (GFAs), and designated wildernesses. In terms of facility development, perception of safety, and provision of services, the majority of respondents reported satisfaction in all elements in all types of areas. However, services in the dispersed areas received a substantially lower level of satisfaction, with just over 54 percent of respondents reporting satisfaction.

Table 2-11 Visitor Satisfaction at the Spring Mountains NRA

Satisfaction Element	Developed Sites	Undeveloped Areas (GFAs)	Designated Wilderness
Access	87.7%	80.9%	89.6%
Developed Facilities	77.9%	62.8%	81.2%
Perception of Safety	95.6%	97.3%	90.4%
Services	79.2%	54.3%	81.2%
Source: National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.			

2.2.4 Future Recreation Development

Indicators of Additional Facility Demand

Signs of high recreational use and overflow at facilities can indicate a need for additional recreation development. Demand for additional parking facilities during high use seasons is particularly apparent. Parking lots often fill during holiday weekends and winter snow events, leading visitors to park along roads and highways. The parking problem is especially evident following winter snow events as the snow attracts a high number of visitors, but large portions of parking areas are inaccessible due to snow conditions. On winter weekends with snow, people often park along both sides of the roads in the developed canyons. As the side of the road is often covered with snowdrifts created by snowplows, roadside parking often reduces the highway to one-way traffic. This creates a safety hazard as emergency vehicles have difficulty accessing the canyons.

Parking areas can also overflow on summer weekends, particularly on holiday weekends. Parking on the side of the road in the summer can lead to resource damage, as soils are compacted and vegetation crushed. In general, off-road parking is concentrated within 10 to 15 feet along the highways in the developed canyon (SR 157, SR 156) above Deer Creek Road.

There is also evidence of facility demand not being met at picnic areas in the developed canyons. During high use summer weekends, each site at Cathedral Rock Picnic Area may turn over three or four times in a single day. On some weekends, people are turned away due to a lack of available sites. Lack of available facilities can encourage visitors to picnic outside of designated areas. Likewise, campgrounds are typically full on summer weekends, and are also increasingly heavily used on weekdays during the summer.

Observed demand for additional facilities is supported by results from the NVUM survey indicating that visitors desire more facilities. A supplemental question to the NVUM survey directly solicited input on additional facilities. Table 2-12 shows responses to the question, "What additional facilities, amenities, or recreation opportunities would you like provided on the Spring Mountains NRA?" These results should be interpreted with some caution as only 135 visitors were surveyed on this question.

Table 2-12 Additional Facilities, Amenities, or Recreation Opportunities Desired at the Spring Mountains NRA

Response	Percentage of Respondents
Hiking trails	41%
Education/Nature trails	36%
Place to buy coffee and snacks	30%
Picnic areas	29%
Mountain bike trails	26%
Snow play areas	23%
Visitor Center(s)	23%
Tent campgrounds	22%
Other	18%
Shops	13%
Wayside pullouts and exhibits	12%
Group campgrounds	11%
Equestrian Trails	8%
RV campgrounds	8%

Source: Results from supplemental questions to National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.

Hiking trails was the most frequently mentioned desired facility (41%), followed by education and nature trails (36%). Mountain bike trails were mentioned by about one in four respondents (26%). Clearly, survey respondents are interested in seeing more trails. Picnic areas and a place to buy coffee and snacks were mentioned by about one in three respondents (29% and 30%, respectively).

Survey results also indicate that visitors may desire additional facilities in order to experience less crowded conditions. Several questions from the NVUM survey and the supplemental questions asked indicate the importance of solitude to visitors. Responses to the question, "what drew you to visit the Spring Mountains NRA?" indicate that many visitors had expected uncrowded conditions. More than half of the respondents to this question indicated that experiencing "quiet/solitude" is what drew them to the area. In response to a different question regarding the biggest problems, 18 percent of visitors surveyed cited traffic congestion as one of the top two problems, while another 24 percent of respondents indicated overcrowding.

Parking areas can also overflow on summer weekends, particularly on holiday weekends. Parking on the side of the road in the summer can lead to resource damage, as soils are compacted and vegetation crushed. In general, off-road parking is concentrated within 10 to 15 feet along the highways in the developed canyon (SR 157, SR 156) above Deer Creek Road.

Table 2-13 presents survey response ratings to an NVUM question about crowding at the Spring Mountains NRA. Responses were rated from 1 (hardly anyone there) to 10 (overcrowded). Visitors were asked about crowding at four types of locations: day use developed sites, overnight use developed sites, GFAs, and designated wilderness. Overnight visitors gave the highest crowding ratings, while visitors to wilderness areas rated crowding the lowest among the aforementioned four location types. Less than one percent of visitors to wilderness areas rated crowding at the upper half of the scale (6-10). In contrast, approximately 52 percent of overnight users and about 14 percent of day users rated crowding at the upper half of the scale. This may indicate that additional developed facilities, particularly campgrounds, may be desired by some visitors to lessen crowding during peak use periods.

Table 2-13 Rate of Crowding at the Spring Mountains NRA – by Type of Location

Rating	Day Use Developed Sites	Overnight Use Developed Sites	Undeveloped Areas (GFAs)	Designated Wilderness
10-overcrowded	1.4%	0.0%	0.0%	0.0%
9	0.9%	23.4%	0.0%	0.1%
8	2.8%	23.4%	0.0%	0.0%
7	4.2%	4.7%	6.3%	0.1%
6	4.3%	0.3%	0.0%	0.1%
5	12.7%	37.8%	13.0%	10.2%
4	14.1%	0.0%	18.9%	5.4%
3	10.4%	9.9%	22.5%	14.9%
2	18.3%	0.3%	16.7%	15.8%
1- hardly anyone there	30.9%	0.3%	22.5%	53.3%

Source: National Visitor Use Monitoring (NVUM) Program Survey, Final Report, USDA Forest Service, 2005.
Note: Responses may not sum to 100 % due to rounding

Interviews with Spring Mountains NRA staff also provide insight about where there are potential crowding issues and demands for additional facilities. The most heavily used trails include the Mary Jane Falls, Cathedral Rock, and the Fletcher Canyon Trails, which are short trails leading to scenic, natural sights. These trails are used by approximately 65 to 100 individuals per day during summer weekends. Additional short scenic trails could help disperse hikers to reduce crowding.

While Forest Service recreation specialists indicated that longer mileage trails are not overly crowded, they did perceive that many trail users would like to see more trails. More trails would increase variety and solitude for trail users. On a summer weekend it is hard to find solitude while hiking unless you leave the Forest Service trail system. Additionally, there are no Forest Service trails accessible from the west side. Increasing trails and other facilities on the west side is expected to attract new visitors and diversify the recreational opportunities offered.

There is also evidence of facility demand not being met at picnic areas in the developed canyons. During high use summer weekends, each site at Cathedral Rock Picnic Area may turn over three or four times in a single day. On some weekends, people are turned away due to a lack of available sites. Lack of available facilities can encourage visitors to picnic outside of designated areas. Likewise, campgrounds are typically full on summer weekends, and are also increasingly heavily used on weekdays during the summer.

Observed demand for additional facilities is supported by results from the NVUM survey indicating that visitors desire more facilities. A supplemental question to the NVUM survey directly solicited input on additional facilities. Table 2-12 shows responses to the question, "What additional facilities, amenities, or recreation opportunities would you like provided on the Spring Mountains NRA?" These results should be interpreted with some caution as only 135 visitors were surveyed on this question.

Addressing the transportation facility demand, a study conducted by Parsons Brinckerhoff (2005) assessed transportation needs and provided recommendations. Based on an extensive public outreach program, broad consensus was reached among stakeholders and the general public that the existing transportation infrastructure is inadequate to meet the escalating demands placed on the Spring Mountains NRA. However, due to environmental and other constraints, options for adding additional roadway and parking capacity are limited. The transportation study recommended an approach that maximizes existing capacity through a variety of management strategies and coordination with other anticipated infrastructure improvements, such as the planned multi-use Middle Kyle Canyon Village Visitor Center (see below).

Planned Future Activities

Spring Mountains NRA staff currently have projects underway to address recreation demand for visitor centers, additional trails, interpretive programs and facilities, and various facilities on the west side. Each is described below.

MIDDLE KYLE CANYON COMPLEX

The proposed Middle Kyle Canyon Complex would provide additional facilities and trails in the Developed Canyons Management Area 11. The proposed project would be located along Kyle Canyon Road (SR 157), which is the heaviest traveled entrance to the Spring Mountains NRA. The proposed development would be located away from the most environmentally and culturally sensitive sites within the upper canyon area. The project would include a variety of recreational activities away from sensitive areas, including development of a "village" area, a day use activity area (trails, interpretive features, and children's fishing pond), a main camping and picnic area, a network of multi-use trails, and administrative facilities.

The "village" area would include the most intensive level of development, including meeting areas, retail space, food concessionaires, and a plaza area, an area for artists,

a parking structure, and a transit area. The camping area would also be highly developed and would include tent and group campsites, RV sites with hookups, showers and restrooms, and nearby trails. In addition to housing administrative facilities, the area north of Kyle Canyon Road would provide numerous recreational facilities, including a horse rental concession area, an equestrian campground, multi-use trails, and an OHV trailhead. The eastern area would be located adjacent to Harris Springs Road and would include a trailhead, mountain bike/hiking trails, and a mountain bike rental concession area.

The Middle Kyle Canyon Complex project also includes several restoration activities. Many disturbed sites such as abandoned roads, trails, and utility sites would be restored and revegetated while illegally dumped materials would be removed. Use of some roads would be restricted as selected Forest Service Roads would be closed to motor vehicles; while others would be converted to non-motorized trail use. Additionally, non-native trees and shrubs would be removed from the area. Restoration activities would also include restoring historic artifacts such as the Civilian Conservation Corps (CCC) Kyle Guard Station. Finally, traffic and circulation in the area would be improved by identifying safe trail crossings over Kyle Canyon Road and Deer Creek Road.

BLUE TREE TRAIL SYSTEM

The dual purpose of the Blue Tree Trail System project is to designate a 50-mile multi-use trail system that is easily accessible from the newly constructed Sawmill Trailhead, and to minimize user-created trail impacts to sensitive plant and animal species and cultural resources. The project area encompasses Deer, Lee and Mack's Canyons. This trail system would provide equestrians, mountain bikes, and hikers with non-motorized trails ranging in difficulty from easy to difficult. The proposed project would include a seasonal closure on Forest Road 571A for wildlife protection purposes, closure and rehabilitation of four miles of motorized road segments, and closure and rehabilitation of 15 undesignated campsites.

In addition to designating existing trails and constructing new trails, many miles of user created routes would be:

- Closed and rehabilitated;
- Upgraded to meet Forest Service standards for the type and difficulty of trail planned;
- Relocated to avoid resource impacts;
- Relocated to areas where the trails can be better maintained in the long run;
- Repaired, from minor brushing to tread reconstruction or widening.

LOVELL TRAILS

The Lovell Trails project will increase non-motorized trail opportunities in Lovell Canyon. Approximately nine miles of new equestrian and hiker trails and a trailhead facility with minimal amenities are presently being constructed. Road repairs on Forest Road 536 will enable appropriate access for equestrian trailers.

The trails will be located within the lower to middle reaches of Lovell Canyon on the west side of the Spring Mountains NRA and will be almost entirely within the LaMadre Wilderness. The trail system will include loop opportunities of moderate difficulty for equestrians and hikers. All trails will be constructed to allow clearance to equestrian users and pack strings.

A primitive trailhead is scheduled for completion in 2008 adjacent to Forest Road 536 in Lovell Canyon, ¼ mile west of the intersection with road 537, outside of the wilderness. This trailhead will include parking for ten vehicles, including up to five horse trailers. Parking for trailers will be a “drive through” design, including adequate parking and turn-around space and informational signing. Plans do not include restroom facilities, trash pick-up, or drinking water. Camping will not be allowed at the trailhead although overnight vehicle parking will be allowed for trail users.

To provide appropriate access to the proposed trailhead, Lovell Creek (on Forest Road 536 just west of the intersection with Forest Road 537) will be bridged using the most appropriate structure. In addition, a small stream that is intersected by Forest Road 536 approximately ¼ mile west of road 537 will be channeled into an appropriate culvert.

LEE MEADOWS

This proposed project would provide erosion control, wild horse management, vegetation rehabilitation, and improved visitor traffic and circulation.

Erosion control would be implemented within the meadow area by reducing the effects of channelized water flow. Channelized water flow would be slowed using a variety of control devices including rocks, logs, root wads, and gabions.

Wild horse management presently includes:

- Keeping wild horses from the Upper Lee Canyon;
- Maintaining the repair of the exclusion fence; and
- Keeping the wild horses in the Cold Creek area at the Herd Management Allotment Objective.

Vegetation within the proposed project area would be enhanced by implementing the following:

- Encouraging or planting stabilizing vegetation on the channel sides;
- Managing for attractive, resilient native species within the meadow to meet biological and recreational objectives;
- Minimizing introduction of invasive plant species and the existing populations of invasive plants;
- To the degree possible, increasing the abundance, health and vigor of sensitive plant species on the meadow perimeter ; and

- Treating the forest stands within the meadow to meet Wildland Urban Interface and visual/scenic standards.

Visitor traffic and circulation to and within the project area/meadow would be improved by designating and/or facilitating visitor foot traffic to and from the meadow by constructing multiple bridges over the existing drainage trench and stream between Highway 156 and Lee Meadow.

MASTER PLAN FOR INTERPRETATION

NVUM survey results (Table 2-12) showed a strong need for interpretive programs and facilities. A master plan for interpretation was completed in 2005. The plan established goals and objectives, major themes, evaluated existing interpretation features, and made recommendations, including an implementation schedule, for future interpretive facilities and programs.

WEST SIDE MASTER PLAN

The Forest Service has just completed a draft master plan for the west side of the Spring Mountains NRA. The plan's preferred option presents a variety of "concept" level locations of various types of recreation facilities. Site specific locations for these proposed facilities are subject to biological and cultural resource inventories, as well as more site specific engineering analyses. Some of the proposed facilities include campgrounds, trails, trailheads, and picnic facilities.

Constraints to Future Recreation Development

Although demand for recreational facilities is likely to continue to grow, several landscape factors may constrain the location and extent of future recreation development. A brief discussion of such factors, including slope, road access, utility infrastructure, resource conservation, and land use, is given below. More detailed analysis will be provided in Chapter 5, Synthesis.

Slope is a limiting landscape factor that significantly constrains development. Much of the Spring Mountains NRA is located on steep ground. Approximately 191,000 acres or 59 percent of these lands are on slopes exceeding 30 percent. This restricts future recreation development due to "cut and fill" requirements to create level areas for parking, day use and camping. Slope is also a consideration for trail building as it affects hiker fatigue and enjoyment as well as impact on resources due to increased erosion associated with greater trail slope.

The extent and quality of road access also influences future development. For visitors desiring recreation opportunities at developed facilities, easy access (for example, recreation facilities and trailheads within 0.25 mile of a road) is an important attribute. Based on comments in the NVUM survey it is reasonable to assume a substantial proportion of visitors are looking for recreation opportunities at more developed sites.

While access from the east side is relatively easy due to several major highways in Clark County (SR 156, 157, and 160), access to the west side of the Spring Mountains is much more time consuming. Travel time to the developed canyons from the Las Vegas area is about 30 to 40 minutes. Travel time to dispersed use areas from Pahrump is 60 minutes or longer. Due to resource protection goals and steep slopes it is unlikely that additional, new roads will be developed in the Spring Mountains.

In addition to road access, access to water and electricity infrastructure limits the locations available for highly developed facilities. This constraint limits areas suitable for campgrounds or picnic areas with flush toilets, showers, or hookups for recreational vehicles as the cost to extend power or water lines can be prohibitively expensive. Lands located near the essential infrastructure are primarily situated in the developed canyons and along roads with residential development.

Key species habitat also constrains future development. A total of 85 special status species of plants, vertebrate wildlife, insects, and snails are potentially present. Many of these species occur in the cooler, higher elevation areas, where recreation demand is greatest. Construction and use of developed facilities in special status species' habitat may be restricted in order to protect species viability. Additionally, there is a standard in the General Management Plan for the Spring Mountains National Recreation Area (GMP; USFS 1996) that states that there will not be any new recreation development near riparian areas, or within the 50-year floodplain.

Locations of heritage resources and areas of importance to American Indians limit where recreation development may occur. Some locations, particularly heritage sites, may be developed as part of interpretive and education programs. However, other lands considered sacred, or areas where vandalism of heritage resources may occur, would be restricted from recreation development.

Finally, private lands impose a constraint on ideal locations for future recreation developments. There are 4,656 acres in private ownership, on which numerous private residences and structures are located. Additionally, there are recreational residences (authorized to operate under special use permit) located on Forest Service land. Generally, private landowners prefer that recreation developments not be located near their properties. For example, in a recent trailhead planning process, the preferred location for the trailhead was close to a residential area. The location for the planned trailhead was altered, however, in order to provide more distance from the residential area. As private development is typically located along roads, and often in popular recreation areas such as Kyle Canyon, there is high potential for private developments to influence recreation planning.

2.2.5 Effect of Management Direction on Recreation Opportunities

This section focuses on how current management direction may affect the availability and diversity of recreation opportunities. Current management direction is summarized since it directly addresses the question "How does current agency management direction affect the availability and diversity of recreation opportunities?" Management direction is reviewed in this document from three documents: the GMP for the Spring Mountains NRA (USFS 1996), the Clark County Multiple Species Habitat Conservation Plan (MSHCP; RECON 2000), and the Conservation Agreement for the Spring Mountains National Recreation Area, Clark and Nye counties, Nevada (CA; USFS 1998). The MSHCP incorporates the GMP measures in Section 2.8.4, as well as the entirety of the CA, as well as providing its own measurable biological goals. Both the CA in 1998 and the MSHCP in 2000, are documents that the Forest Service became a signatory, along with USFWS and Clark County. These three documents reflecting current management direction are important since they include conservation measures that provide a foundation for analysis of recreation impacts on special status species habitat.

The GMP identifies four management areas (described in Chapter 1). The current management policy for lands in two of these management areas, the wilderness and the WSA constrains future motorized recreation development. In Management area 12 no additional development

will occur. No facility or road development will occur within Management Area 14. Designated wilderness and the WSA comprise approximately 43 percent of the Spring Mountains NRA.

The numerous goals discussed in the GMP could potentially influence future recreation development; as summarized below.

- Conserve the health, diversity, integrity, and beauty of the ecosystem. Many people, including American Indians, find inherent value in natural ecosystems and processes and are linked to the land through spiritual and cultural ties. Sustaining ecological processes and functions will allow the next generations to enjoy the Spring Mountains NRA as the present does.

- Protect American Indian cultural and heritage resources. This goal recognizes the right of American Indians to continue use of traditional areas, and to practice traditional beliefs according to their culture. Heritage resources provide important information on the past. Heritage resource sites are a reminder of how important humans are to ecosystems. The goal will be to continue to protect and preserve heritage resources, while providing opportunities for interpretation and public education.

- Avoid disruption to current uses and users of the Spring Mountains.

Where consistent with the above, provide additional opportunities for recreation.

Additional guidance on current management direction is found in the CA and later incorporated into the MSHCP. The CA and MSHCP list conservation actions pertaining to protection, restoration, and education, all of which can influence recreation development. See Chapter 1 for more detail on all three of these documents.

Additional guidance on current management direction is found in the Report and Five-Year Analyses (USFS Intermountain Region 2003). This report lists conservation actions pertaining to protection, restoration, and education, all of which can influence recreation development. Some of the actions have already been implemented and constrain future recreation use. For example, closing the last 0.25 mile of the road into Carpenter Canyon will limit any future OHV use that may have otherwise occurred.

The 2003 conservation report also lists actions that could influence future recreation development in the Spring Mountains NRA. Some of these actions could serve as the foundation for new interpretation programs. Other actions are more oriented towards educating all members of the public, not just individuals who recreate on the Spring Mountains NRA.

- Use all opportunities when contacting the public to distribute materials on biodiversity protection and ecosystem management.

- Develop a series of environmental protection programs for presentation to schools, user groups, town board meetings, and other community events.

- Develop and distribute information directed at specific user groups such as climbers, cavers, equestrians, OHV users that emphasize protection of riparian habitats, alpine areas, and other sensitive areas.

- Provide information to summer home residents on Palmer's chipmunk and rough angelica conservation.
- Develop driving tour programs via tapes or low frequency radio to provide information that highlights the area's unique resources and biodiversity.
- Design and install informational signs per Interagency Agreement # 14-48-0001-94605. Signs will be located outside the Wilderness areas, at trailheads or near sensitive habitats, and will provide information on low impact recreation and ecological resource protection.

2.2.6 Use of the Above Data for Analysis Purposes – Chapter 5 Preview

In Chapter 5, the Landscape Assessment will evaluate the current status and key management objectives of recreation facilities and activities using the measures listed below. These key measures include:

- Footprint acres
- Area of influence acres
- Number of units (campsites and picnic areas)
- Capacity Persons at One Time (PAOTs)
- Seasonal Capacity PAOT days
- Capacity parking
- Annual visits
- Facility Condition Index
- Miles of Routes
- Wilderness Stewardship Rating
- Percentage satisfied with overall forest visit
- Percentage satisfied with access
- Percentage satisfied with facilities
- Percentage satisfied with safety
- Percentage satisfied with services
- Percentage satisfied with feeling crowded or overcrowded
- Percentage of sites occupied

The recreation information contained in the preceding sections in Chapter 3 presents the basis for this evaluation and analysis.

2.2.7 Non-Recreation Human Use

Although the majority of activity occurring on the Spring Mountains NRA is recreational use, there are other uses that may affect key species and their habitats. Some uses are managed by the Forest Service, such as maintenance of infrastructure and resource management, while others, such as state roads and private lands, are managed by other entities. These activities are described below, with particular emphasis on activity location. The potential effects to key species and habitats will be analyzed later in this document.

Managed by the Forest Service

Non-recreation activities managed by the Forest Service with the potential to affect key species and habitat include Forest Service maintenance of infrastructure, resource management measures, as well as resource extraction by visitors. Information for this section is based on Forest Service documents and interviews with Forest Service personnel and NDOW.[15]

BUILDINGS

The administrative buildings owned and managed by the Forest Service are all located in Management Area 11, e.g. Kyle Canyon, Lee Canyon, and Deer Creek. These include a guard station, visitor facilities, and a house.

The guard station, located in Kyle Canyon, comprises about six building structures, including a visitor center, offices, and barracks. The house in Lee Canyon provides seasonal accommodation to Forest Service personnel and is a historical site. Due to the historical status of the house, the Forest Service is required to preserve the historical nature of the structure under the National Historical Preservation Act. Both these sites are accessible through paved roads. Maintenance is carried out on these structures in accordance with National Historic Preservation Act and is done with special care in order to avoid disturbing the surrounding habitat.

Collection of garbage from Forest Service facilities is also mostly carried out by contractors on a daily to weekly basis. In addition to this, garbage along the roads is also regularly picked up. Both these activities are done carefully to minimize impact to the habitat.

ROADS

The Forest Service manages paved, gravel, and dirt roads. Most of the paved roads do not receive regular maintenance. Most maintenance of Forest Service roads occurs in May and early June. Frequency of maintenance depends on the type of road and winter weather conditions. Lovell Canyon Road is the only paved road maintained by the Forest Service, and it is usually maintained a couple of times a year. Graded, unpaved roads are typically maintained every year if they are high use roads, or every other year if they receive less use. Four-wheel drive roads are maintained on average every ten to twenty

[15] Interviewed Spring Mountains NRA personnel include Terry Jerrell, Elaine Jones, Amy Meketi, Larcy Miller, Suzanne Shelp, Eric Walker, and Dewey Warner. Geoffrey Schneider of the Nevada Department of Wildlife also provided information on hunting in the Spring Mountains NRA.

years. It is expected that road management by the Forest Service has limited impact on species and their habitat outside the immediate vicinity of roadways.

FIRE MANAGEMENT

The total number of fires recorded by the Forest Service on the Spring Mountains NRA since 1953 is 101, resulting in a total of 97,727 acres burned. Current fire management activities are based on suppression response (confine, contain, or control) to wildfires. The use of heavy, mechanized equipment and chemicals is avoided to the extent possible in order to minimize impacts to species and their habitat. These are only used when the "fire danger is very high, the wildland/urban interface is threatened, and/or the fire season requires aggressive action." Bulldozers are used only as a last resort, when human lives and private property is threatened. Priority is given to the use of hand lines and water in order to put out less dangerous fires. Additionally, efforts are underway to develop a network of shaded fuel breaks to interrupt continuous stands of fuel. Thus, the extent to which the fire management activities impact species and their habitat is dependent upon the location and level of fire danger.

INVASIVE WEEDS MANAGEMENT

Methods regarding management of invasive weeds by the Forest Service vary by site and weed species. The preferred method is to pull weeds out manually without using herbicides, especially in sensitive plant habitat. However, the use of herbicides cannot be avoided in certain situations when it is not feasible to pull weeds out by hand due to the expanse of the area. In such cases when weeds have to be chemically treated, other species and their habitat may be impacted.

BURROS AND HORSES

Wild burros (*Equus asinus*) and horses (*Equus caballus*) are also present within the Spring Mountains NRA. Burros tend to occur more commonly at lower elevations, while horses typically locate in the vicinity of Cold Creek, Horseshutem Spring and Cottonwood Pass. Portions of the Spring Mountains NRA designated suitable for wild horses and burros are located south of SR 160 and on sections of the western and northern parts of the Spring Mountains NRA outside of the Mt. Charleston Wilderness and the developed canyons (USFS 1996). Both species have been introduced to the Spring Mountains and can disturb the natural landscape by trampling and consuming vegetation, contributing to trailing and the associated erosion, and dispersing seeds of non-native plants in their hooves and droppings (Mack 1981).

FIREWOOD GATHERING

Gathering of wood for fuel purposes is allowed, but regulated. The season commences on October 1 and ends on February 28 every year. The Forest Service issues permits to local residents for this purpose. Each permit costs $20 per cord of wood and there is a limit of three cords per household. Firewood gathering is also limited to designated areas that vary every season. Individuals issued permits are informed of locations and other safety issues through a packet of information provided with the permit. The number of cords gathered every season varies, but is usually between 275 to 300 cords. About 300 cords were gathered in the 2005-2006 season. Firewood gathering areas are typically concentrated along the following roads: Deer Creek Road, Lee Canyon Road east of the junction with Deer Creek Road, Macks Canyon, the Clark Canyon Cutoff Road and up into the Wheeler Pass Area, and Lovell Summit. However, in the 2004-2005 and 2005-

2006 firewood gathering seasons, collection locations also included several areas in Kyle Canyon. Tables 3-5, 3-7, 3-9, and 3-11 show the distribution of firewood gathering across major vegetation types.

MINING

Following the passage of the Spring Mountains National Recreation Area Act, almost all of the Spring Mountains NRA is withdrawn from mining under the mineral leasing and geothermal leasing laws (USFS 1996). The exception to this withdrawal is a parcel of approximately 480 acres located in the southern portion near Mt. Potosi that remain open to entry under mineral and leasing laws. Additionally, any valid mineral rights existing at the time of the Spring Mountains National Recreation Area Act are not affected by the withdrawal.

WATER EXTRACTION

There are numerous wells that serve the vacation homes and resorts. The location of these wells has not been mapped, but they are likely concentrated in the developed canyons and around Cold Creek. Additionally, there are water holding structures, also known as guzzlers, which were constructed for cattle and now provide water for wildlife.

Managed by Non-Forest Service Entities

There are also activities outside the jurisdiction of the Forest Service that may impact key species and habitat. Specifically, there are numerous pockets of private lands and privately managed developments, as well as state roads. Information for this section is based on published documents and interviews with Forest Service personnel[16].

PRIVATE LANDS / DEVELOPMENT WITHIN THE NRA

The Mt. Charleston community, located in the upper portion of Kyle Canyon is home to 900 residents. The community includes a school, public library, community center, and fire department. There are also private residences in Lee and Cold Creek Canyons; many residents choose to live in these areas for the solitude and natural beauty they provide. Cold Creek is entirely surrounded by National Forest land and is a popular OHV riding area because of its cooler temperatures and scenic riding. Many OHV riders stage in parking areas that are adjacent to private property. Some residents have expressed concerns regarding speeding, trespassing, noise and user-created trails. Riding in this area is sometimes a source of conflict between OHV users and residents.

The residential areas affect fire management on the Spring Mountains NRA. The Forest Service prohibits fires within one mile of residential areas. There are several communities that were rated as having “extreme” or “high” community wildfire hazard ratings. Ratings were based on a points system, with points assigned to five categories: community design, construction material, defensible space, availability of fire suppression resources, and physical conditions such as vegetative fuel loads and topography. A summary of fire risk and recommended fuel treatments for communities is provided in Table 2-14. As indicated in the table, Kyle Canyon has the highest number of acres recommended for treatments.

[16] Interviewed Spring Mountains NRA personnel include Amy Meketi, Larcy Miller, Suzanne Shelp, Lucas Woolf, and Eric Walker.

Table 2-14 Fire Risk and Fuel Treatments within Spring Mountains NRA Communities

Community[1]	Number of Residences	Community Hazard Rating	Area Recommended for Fuel Treatments
Kyle Canyon	335 homes	Extreme	1,875 acres
Lee Canyon	68 homes	Extreme	870 acres
Mountain Springs	36 homes	Extreme	38 acres
Torino Ranch Children's Camp	N/a	High	36 acres
Trout Canyon	35 homes	Extreme	75 acres

Source: Nevada Community Wildfire Risk/Hazard Assessment Project, 2005 draft report prepared by Resource Concepts
[1]Only communities with ratings of "extreme" or "high" are included.

In addition to residential communities, private developments include the Las Vegas Ski and Snowboard Resort in Lee Canyon, the Torino Youth Ranch in Lovell Canyon, and several hotels in Kyle Canyon. In the winter, the ski resort typically serves up to 28,000 skiers in a single season, while in the summer it conducts maintenance activities. The Mt. Charleston Hotel and the Mt. Charleston Lodge provide visitors with food and accommodations in Kyle Canyon, while the Torino Youth Ranch in Lovell Canyon provides summer programs for southern Nevada youth.

The effects of private lands and development can extend onto Forest Service land due to increased activity in developed areas. For example, trails are likely to form near residential or developed areas. Additionally, ground water withdrawn on private lands may affect the long-term viability of the springs. Some species depend on these springs, and may therefore be indirectly affected by private development. Also, as the Forest Service has little or no authority on what is happening on private lands, it is possible that development or other activities may directly result in loss of species habitat.

ROADS

The state highway transportation system includes three primary routes, including Kyle Canyon Road (SR 157), Lee Canyon Road (SR 156), and Deer Creek Road (SR 158). Nevada Department of Transportation is currently responsible for operations and maintenance issues on these roadways. Maintenance activities on these roadways are expected to impact habitat only in areas immediately adjacent to the roads.

3.0 ECOLOGICAL CONDITIONS

An assessment of current conditions for each key species provides an environmental baseline that includes the consequences of all past and present actions. Comparison with past ecological conditions, within the limits of existing information, provides a context or reference for which to evaluate current conditions, assess species' trends, and help understand how the ecological setting has changed over time as a result of both natural processes and the influence of various anthropogenic factors. For this analysis, reference conditions are generally defined as 1998, when the CA established a baseline from which management goals for these species would be measured, and again in 2000, with the signing of the MSHCP. However, a more historical perspective is applied in assessing current ecological conditions based on vegetation communities. This approach defines the status of each key species upon which the effects of future actions (or inaction) may be assessed.

The current status of each of the 85 key species has been summarized using existing data sources, including the MSHCP (RECON 2000), the recent compilation of Forest Service data (SWCA 2005a, b), other information from Forest Service files, and various reports. Species occurrence data available through the Nevada Natural Heritage Program (NNHP) (including Morefield 2001) provided much of the site-specific information for these species as well as additional data on species' distributions throughout their ranges.[17] Site-specific species occurrence data from these and other sources were compiled into a geo-referenced format using geographic information system (GIS) technologies to provide a "mapped occurrences database" that portrays the distribution of each species. The data used to generate the mapped occurrences database were compiled from various sources whose data were often based on different criteria. The data sources and the special mapping criteria and data analysis used for each of the databases or GIS data layers are presented in Appendix A.

For correct compilation and interpretation of the mapped occurrences database, it should be noted that the database was created from various data sources that were inconsistent in the criteria used for mapping accuracy and standards for recording a species' occurrence (e.g., a bat roost site versus a foraging fly-by). For plants, point locations often referred to where an individual was recorded, but the extent of a contiguous population was not always identified; for other occurrences plant population boundaries had been delineated in the field using Global Positioning System (GPS) technology; and, for other occurrences there are varying levels of mapping accuracy. For animals, occurrence records may indicate a random incidental observation of a transient individual, a nest or roost site, or a foraging area - each with different implications for analysis of impacts to, and management of the associated habitats. For less mobile species such as reptiles and small mammals, any observation could be safely assumed to indicate occupied habitat, though the geographic extent of occupied habitat could not be discerned. For mobile species such as birds and bats, a sighting may or may not indicate special habitat needs.

3.1 VEGETATION COMMUNITIES CLASSIFICATION

The diverse mosaic of vegetation ensembles found in the Spring Mountains are a result of differences in elevation, geologic substrate, substrate weathering, soils, slope, aspect, precipitation, and successional response to disturbances such as catastrophic wildfire and grazing. The many resulting ensembles have been variously classified by biologists and geographers as cover types, associations, alliances, series, habitat types, ecological systems, and zones. Ecologists use cross-walked classifications in order to correlate modern names with the classic names published in the scientific literature. Appendix B provides a cross-walk to clarify the major names used for vegetation ensembles of the Spring Mountains NRA.

Clokey (1951) provided the first framework for describing species distributions in the Spring Mountains, based upon the single most important species. Occasionally locally important co-dominants were recognized with additional taxa. The following ensembles were arranged alphabetically, with the locally important ensembles indented. Conspicuously absent are any riparian ensembles.

[17] The Nevada Natural Heritage Program database has not yet included many element occurrences for key species reported in studies from 1996 to date. For example, we estimate that the mostly unprocessed Nachlinger and Reese (1996) occurrences represent approximately 12% of the currently known locations for the 85 key species.

Artemisia tridentata

Cercocarpus ledifolius

Juniperus osteosperma
- *Juniperus osteosperma*
- *Cercocarpus ledifolius-Pinus monophylla-Juniperus osteosperma*

Larrea tridentate
- *Larrea tridentate*
- *Mixed desert shrubs*

Pinus longaeva
- *Pinus longaeva*
- *Pinus longaeva-Pinus flexilis*

Pinus flexilis
- *Pinus flexilis*
- *Pinus flexilis-Pinus ponderosa var. scopulorum-Pinus monophylla*
- *Pinus longaeva-Pinus flexilis*

Pinus monophylla
- *Pinus monophylla*
- *Pinus monophylla-Juniperus osteosperma*

Pinus ponderosa var. scopulorum

Populus tremuloides

Quercus gambelii
- *Quercus gambelii*
- *Quercus gambelii-Arctostaphylos pungens*

Quercus turbinella

Deming (1963) published a broad classification of the vegetation of Clark County, previously used in manuscript form in Clark County Schools during the 1950s. It recognizes five life zones and eight plant belts. Four zones are applicable to the Spring Mountains NRA: Boreal, Transition, Upper Sonoran, and Lower Sonoran (Southern Desert). Six plant belts are applicable: **timberline**, **foxtail pine**, **yellow pine**, **pinyon-juniper**, **Joshua tree** and **bursage**. The **timberline** belt is actually the vegetation above timberline, which would correspond to our ***Ivesia cryptocaulis*** series.

The Spring Mountains NRA is too small for finer levels of delineation on national maps. Küchler (1964) maps the Spring Mountains in his **galleta-three awn shrubsteppe** type (*Hilaria-Aristida*), although his **Great Basin sagebrush**, type 32 (*Artemisia*), **blackbrush**, type 33 (*Coleogyne*), **juniper-pinyon woodland**, type 21 (*Juniperus-Pinus*), and **mountain mahogany-oak scrub**, type 31 (*Cercocarpus-Quercus*) are the ones that actually apply (*sensu* West 1988). Also, as part of the National Hierarchical Framework of Ecological units, mapping had been developed down to the Region and Subregion (section) scale (Bailey 1976; Bailey et al. 1994; McNab and Avers 1994) These maps identified the Spring Mountains range as part of the **Mojave Desert** section (322A) of the **American Semi-Desert and Desert Province (322).**

Nachlinger and Reese (1996) developed a vegetation classification system which describes the patterns of vegetation distribution specifically for the Spring Mountains NRA. It named fourteen series, thirty-one associations, and five provisional habitat types, arranged into six broad azonal and zonal vegetation bands. These zonal types were Desert Shrublands; Low Conifer Woodland, Montane Shrubland and Chaparral; High Conifer Forest and Woodland; and Alpine. Azonal types included Steep Slopes and Clifflands; and Riparian and Springs. This ordination derived classification was descriptive and never used to map the series, associations and habitats they described. Nachlinger and Reese's system predated the 1997 National Vegetation

Classification Standard, thus the series and associations it named did not include a descriptor for the physiognomy of the vegetation. Nevertheless, it is the most comprehensive study of the vegetation of the Spring Mountains NRA and presents the finest level of plant community classification. Appendix B provides a cross-walked classification of Nachlinger and Reese (1996) types to a wide variety of classification schemes, as well as the actual vegetation plots upon which the various names are based.

The Southwest Regional Gap Analysis Project (SWReGAP), implemented by the U.S. Geological Survey Biological Resources Discipline and Environmental Protection Agency, mapped the distribution of plant communities within five southwestern states (Arizona, Nevada, Utah, Colorado, and New Mexico). The SWReGAP vegetation classification (Lowry et al. 2005) is derived from NatureServe's Ecological Systems Classification (Comer et al. 2003). However, the lack of natural community element occurrences in the NNHP database prevented sufficient consideration of the unique Spring Mountain vegetation communities when either classification was drafted. The SWReGAP automated vegetation mapping was based on 30m resolution LANDSAT imagery. Its low resolution limited both the accuracy of vegetation mapping and the delineation of small areas of homogeneous vegetation with limited ground-truthing. Their map was field verified as only 65 percent accurate in identifying Ecological Systems in the NV-5 Region covering Clark County (Lowry et al. 2005) and as low as 22.6 percent in identifying Alliances in the eastern Nevada NV-4 Region (Sajwaj et al. 2003). SWCA (2005a) concluded that the SWReGAP mapping units do not always coincide directly with the species-specific plant associations that are actually present on the ground in the Spring Mountains and not all vegetation species identified in the SWReGAP vegetation classifications occur in the Spring Mountains (SWCA 2005a).

To address these SWReGAP classification and mapping limitations, ENTRIX manually remapped the Ecological Systems of the Spring Mountains NRA, using 1-m resolution Forest Service color DOQQs from 2004, 0.61m panchromatic QuickBird imagery from 2006 and 2.44m 4 band multispectral QuickBird imagery from 2006. ENTRIX also utilized existing vegetation plot data from Nachlinger and Reese (1996) and Draper et al. (2005) to provide both validation points for mapping and to update the plant community classification for the Spring Mountains to comply with the 1997 Federal Geographic Data Committee "Vegetation Classification Standard." This resulted in 29 Ecological Systems for Clark County, 20 of which are found on the Spring Mountains NRA (Reese, 2007). These Ecological systems are as follows:

1. Intermountain Basins Semi-Desert Grassland Ecological System [only red brome (*Bromus madritensis* ssp. *rubens*) dominated recent wildfires]

2. Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System

3. Mojave Mid-Elevation Mixed Desert Scrub Ecological System

4. Sonora-Mojave Semi-Desert Chaparral Ecological System

5. Great Basin Pinyon-Juniper Woodland Ecological System

6. Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System

7. Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System

8. Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System

9. Inter-Mountain Basins Semi-Desert Grassland Ecological System [mis-applied, sensu Southern Rocky Mountain Montane-Subalpine Grassland Ecological System]

10. Sonora-Mojave Mixed Salt Desert Scrub Ecological System

12. North American Warm Desert Cienega Ecological System

16. North American Warm Desert Bedrock Cliff and Outcrop Ecological System

17. Inter-Mountain Basins Cliff and Canyon Ecological System

18. Rocky Mountain Alpine Bedrock and Scree Ecological System

19. Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System

20. Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System

21. North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System

22. North American Warm Desert Riparian Woodland and Shrubland Ecological System

23. North American Warm Desert Wash Ecological System

25. Rocky Mountain Subalpine-Montane Fen Ecological System

Note – numbers correspond to the ecological systems as listed within the National Vegetation Classification System (see Footnote 20).

The Nachlinger and Reese (1996) vegetation series were correlated with SWReGAP ecological systems by SWCA (2005a). A total of 17 SWReGAP ecological system mapping units were recognized within the Spring Mountains NRA.[18] The Nachlinger and Reese (1996) vegetation classification system is hierarchical, where several vegetation series are grouped under one of six general vegetation zones within the Spring Mountains NRA. Subsections are herein presented following a simplified organization of the Nachlinger and Reese (1996) plant community zones.

The overlap of human activities and ecological systems are described below in the section for each plant community zone.[19] An analysis of the data retrieved from the Forest Service GIS data layers indicates that, in general, the greatest overlaps are occurring at lower elevations with the low conifer plant community zone receiving the majority of the impacts (85 % of 149,174 acres) followed by the desert shrublands plant community zone (80 % of 105,781 acres overlap with human activities).

- Most of this impact occurs in the designated horses/burros area: 60 percent of the desert shrublands community and 82 percent of the low conifer community. Thirty-five percent

[18] The SWReGAP types are referred to as “mapping units” because they were based on automated classification methodology and did not necessarily characterize the actual vegetation of the ecological system mapped.

[19] These discussions and statistics are based on spatial analysis of zones derived from the SWReGAP Ecological Systems GIS coverage. There are significant differences between the results of that automated classification and the Ecological Systems of the Spring Mountains map based on manually mapping of QuickBird and USFS color DOQQ imagery).

of the riparian and springs community is affected by the designated horses/burros area, while little to none of the high conifer (7 %), alpine (zero %), or steep slopes and cliffs (3 %) communities are affected.

- Fires that have burned since 1953 have affected the second highest amount of land. Prior to 2002, 18 percent of the desert shrublands community and 27 percent of the low conifer community were affected. Fifteen percent of the riparian and springs community has burned, while little to none of high conifer (3 %), alpine (less than 1 %), or steep slopes and cliffs (1 %) communities have burned. Since 2002, massive wildfires have burned the Cottonwood Pass, Lost Cabin Spring, Lovell Canyon, and Wheeler Pass areas. Some of these fires have been in areas burned in the recent past. Based on QuickBird mapping, 3.75 percent of the Spring Mountains NRA are recent burns dominated by annual grasses, especially *Bromus madritensis* ssp. *rubens*. A small percentage (1.55) is recent burns with rapid succession to perennial herbaceous vegetation mixed with chaparral shrubs. A very small percentage (0.74) is older burns in which *Agropyron desertorum* was seeded at rates high enough to out-compete native vegetation.

- Less than 1 percent of each plant community zone overlaps with campgrounds, picnic areas, concentrated dispersed use areas, and ski run areas; though these activities are concentrated in Kyle and Lee canyons. Firewood cutting has also impacted a very low percentage of each community zone; less than 1 percent of each is impacted, except the low conifer community zone (2 % impacted) and the riparian and springs community zone (1 % impacted).

- Additional overlapping activities that occur mostly at the lower elevations include climbing routes, utilities, paved and unpaved roads, open and closed motorized trails, and non-system trails.

- System trails overlap the higher elevations (high conifer and alpine plant community zones) the most, not only as a percentage of the total area but in total number of miles as well.

See Ecological Systems of the Spring Mountains NRA. (Figure 3.1)

Figure 3-1 Ecological Systems – Spring Mountains National Recreation Area

Figure 3-1 BACK

Legend Details to Figure 3-1

Code	Ecological System
0	Cultural Vegetation
0, 3	Cultural Vegetation/Mojave Mid-Elevation Mixed Desert Scrub Ecological System: Seral and Transitional Stages
1	Inter-Mountain Basins Semi-Desert Grassland Ecological System
1, 3	Inter-Mountain Basins Semi-Desert Grassland/Mojave Mid-Elevation Mixed Desert Scrub Ecological System: Seral and Transitional Stages
1, 4	Inter-Mountain Basins Semi-Desert Grassland/Sonora-Mojave Semi-Desert Chaparral Ecological System: Seral and Transitional Stages
1, 5	Inter-Mountain Basins Semi-Desert Grassland/Great Basin Pinyon-Juniper Woodland Ecological System: Seral and Transitional Stages
1, 17	Inter-Mountain Basins Semi-Desert Grassland/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
2	Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System
2, 3	Sonora-Mojave Creosotebush-White Bursage Desert Scrub/Mojave Mid-Elevation Mixed Desert Scrub Ecological System: Seral and Transitional Stages
3	Mojave Mid-Elevation Mixed Desert Scrub Ecological System
3, 4	Mojave Mid-Elevation Mixed Desert Scrub/Sonora-Mojave Semi-Desert Chaparral Ecological System: Seral and Transitional Stages
3, 4, 5	Mojave Mid-Elevation Mixed Desert Scrub/Sonora-Mojave Semi-Desert Chaparral/Great Basin Pinyon-Juniper Woodland Ecological System: Seral and Transitional Stages
3, 5	Mojave Mid-Elevation Mixed Desert Scrub/Great Basin Pinyon-Juniper Woodland Ecological System: Seral and Transitional Stages
3, 5, 16	Mojave Mid-Elevation Mixed Desert Scrub/Great Basin Pinyon-Juniper Woodland/North American Warm Desert Bedrock Cliff and Outcrop Ecological System: Seral and Transitional Stages
3, 7	Mojave Mid-Elevation Mixed Desert Scrub/Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System: Seral and Transitional Stages
3, 16	Mojave Mid-Elevation Mixed Desert Scrub/North American Warm Desert Bedrock Cliff and Outcrop Ecological System: Seral and Transitional Stages
3, 17	Mojave Mid-Elevation Mixed Desert Scrub/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
3, 19	Mojave Mid-Elevation Mixed Desert Scrub/Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System: Seral and Transitional Stages
3, 22	Mojave Mid-Elevation Mixed Desert Scrub/North American Warm Desert Riparian Woodland and Shrubland Ecological System: Seral and Transitional Stages
3, 22, 23	Mojave Mid-Elevation Mixed Desert Scrub North American Warm Desert Riparian Woodland and Shrubland/North American Warm Desert Wash Ecological System: Seral and Transitional Stages
3, 23	Mojave Mid-Elevation Mixed Desert Scrub/North American Warm Desert Wash Ecological System: Seral and Transitional Stages
4	Sonora-Mojave Semi-Desert Chaparral Ecological System
4, 5	Sonora-Mojave Semi-Desert Chaparral/Great Basin Pinyon-Juniper Woodland Ecological System: Seral and Transitional Stages
4, 6	Sonora-Mojave Semi-Desert Chaparral/Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System: Seral and Transitional Stages
4, 7	Sonora-Mojave Semi-Desert Chaparral/Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System: Seral and Transitional Stages
4, 8	Sonora-Mojave Semi-Desert Chaparral/Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System: Seral and Transitional Stages
4, 17	Sonora-Mojave Semi-Desert Chaparral/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages

Legend Details to Figure 3-1

Code	Ecological System
5	Great Basin Pinyon-Juniper Woodland Ecological System
5, 6	Great Basin Pinyon-Juniper Woodland/Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System: Seral and Transitional Stages
5, 7	Great Basin Pinyon-Juniper Woodland/Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System: Seral and Transitional Stages
5, 16	Great Basin Pinyon-Juniper Woodland/North American Warm Desert Bedrock Cliff and Outcrop Ecological System: Seral and Transitional Stages
5, 16, 17	Great Basin Pinyon-Juniper Woodland/North American Warm Desert Bedrock Cliff and Outcrop/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
5, 17	Great Basin Pinyon-Juniper Woodland/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
6	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System
6, 7	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland/Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System: Seral and Transitional Stages
6, 8	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland/Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System: Seral and Transitional Stages
7	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System
7, 8	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland/Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System: Seral and Transitional Stages
7, 17	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
7, 22	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland/North American Warm Desert Riparian Woodland and Shrubland Ecological System: Seral and Transitional Stages
8	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System
8, 17	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
9	Inter-Mountain Basins Semi-Desert Grassland Ecological System, Sensu Southern Rocky Mountains Montane-Subalpine Grassland Ecological System
12	North American Warm Desert Cienega Ecological System
12, 20	North American Warm Desert Cienega/Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System: Seral and Transitional Stages
16	North American Warm Desert Bedrock Cliff and Outcrop Ecological System
16, 17	North American Warm Desert Bedrock Cliff and Outcrop/Inter-Mountain Basins Cliff and Canyon Ecological System: Seral and Transitional Stages
17	Inter-Mountain Basins Cliff and Canyon Ecological System
18	Rocky Mountain Alpine Bedrock and Scree Ecological System
19	Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System
19, 25	Rocky Mountain Subalpine-Montane Riparian Shrubland/Rocky Mountain Subalpine-Montane Fen Ecological System: Seral and Transitional Stages
20	Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System
21	North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System
22	North American Warm Desert Riparian Woodland and Shrubland Ecological System
23	North American Warm Desert Wash Ecological System
25	Rocky Mountain Subalpine-Montane Fen Ecological System
X	Cultural Features

3.1.1 Desert Shrubland Plant Community Zone

Current Conditions

The desert shrublands include the lower elevations of the Spring Mountains NRA. Generally, the lack of precipitation and high temperature result in sparse vegetation composed primarily of low-growing shrubs and perennial herbs, with a flush of annual grasses and forbs in years of adequate rainfall. With the spread of non-native grasses, primarily red brome and cheatgrass (*Bromus madritensis* ssp. *rubens* and *B. tectorum*), continuous fuels now occur in much of the desert shrub zone in which fires can spread rapidly and widely. These fires may result in changes in the species composition and density of shrubs, as well as increasing the spread of non-native grasses, which in turn promotes more fires. Red brome, cheatgrass, and other non-native plant species are widely distributed throughout the desert shrub zone.

Reference Conditions

Information from similar Mojave Desert ecosystems was used to help identify trends and changes that would be similar to those found in the Spring Mountains NRA. Repeat photography has shown little change over the last 100 years in undisturbed Mojave Desert areas near the Death Valley (Webb et al. 1987) suggesting the low elevations of the Spring Mountains NRA consisted of widely spaced desert shrubs and perennial bunchgrasses with a biological soil crust occupying the interspaces. Dramatic changes to Mojave Desert vegetation became apparent where early ranching, farming, or mining activities occurred (Webb et al. 1987). This included a loss of the biological soil crust and an increase of annual exotic grasses.

Physical disturbance can severely alter the biological soil crust, a matrix of cyanobacteria, algae, lichens, and fungi covering the interspaces between plants on the soil surface (Belnap et al. 2001). These crusts bind together soil particles which reduce erosion, increase water retention, and provide a source of organic matter that is a source of nitrogen to the surrounding plants. The biological soil crust can be found in the pinyon pine communities down through the lower elevations. The crust is extremely fragile, and physical disturbance can disrupt the cyanobacterial filaments holding soil particles together (Belnap and Gillette 1998). Physical disturbance to crust may lead to a loss of fine soil particles from wind and water erosion (Belnap and Gillette 1998). Highly disturbed desert communities also have been shown to be more susceptible to exotic grass invasion (Mack 1981).

Historically, fire was not a regular part of the lower elevation desert shrub communities; lightning strikes may have started localized fires, but the large interspaces between shrubs limited the ability of the fire to spread. Now, however, the introduction of exotic grasses in the Mojave Desert often creates an uninterrupted fuel layer that allows fire to spread rapidly across a landscape.

The vegetation shifts following present-day fires are currently being examined. A 1987 fire in the blackbrush (*Coleogyne ramosissima*) community within the Spring Mountains NRA resulted in a complete change of the dominant vegetation type. Blackbrush cover, 30 percent in unburned areas, was replaced by brittlebush (*Encelia virginensis*), as well as invasive species such as stork's bill (*Erodium circutarium*), and the annual grasses red brome and cheatgrass (*Bromus madritensis* ssp. *rubens* and *B. tectorum*) (Brooks and Matchett 2003). The considerable abundance of annual grasses following a fire increases risk of future fires, as well as reduces the natural recolonization by natives as annual grasses outcompete many native species for limited resources such as water and nitrogen (Evans et al. 2001).

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Larrea tridentata* (Creosote bush) Series**, characterizing it as restricted to the Pahrump Valley in the lowest elevations of the Spring Mountains NRA. Its elevation averages 1176 meters and ranges from 1155 to 1210 meters; aspects average 199° degrees and range from 118-290 degrees; slopes average 7 percent and range from 3-16 degrees. Parent materials are primarily gravelly alluvium, or rarely limestone; landform types are typically alluvial fans, or occasionally flood plains (arroyos) or low relief rolling uplands; plot positions are primarily on upper slopes of alluvial fans, or rarely lower slopes of limestone outcrops. The series consists of the stable and long-lived *Larrea tridentata-Ambrosia dumosa* association and the periodically flash-flooded *Hymenoclea salsola* association; climatically dynamic and transitional to the more calcareous and coarser soiled mixed desert scrub series in its upper elevations; slopes were transitional to the desert mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering were also factors.

Prevalent vegetation was sparse-shrubland; comprised of no trees; 22 percent shrub cover averaging 0.5 meter high, with 6.8 percent medium and 16 percent low cover; 10.8 percent graminoid cover averaging 0.17 meter, with 10.8 percent low cover; 1.4 percent forb cover averaging 0.3 meter, with 1.4 percent low cover; no fern cover; and 0.8 percent bryophyte and lichen cover.

The dominant plant was *Larrea tridentata* (10 %). The average number of perennial taxa was 11, and ranged from 7 to 15. There were no known species of concern from this series. Common associates were: *Ambrosia dumosa*, *Bromus madritensis* ssp. *rubens,* Coleogyne ramosissima, *Ephedra nevadensis*, *Eriogonum inflatum*, *Krameria erecta*, *Krascheninnikovia lanata*, *Menodora spinescens, Xylorhiza tortifolia* var. *tortifolia* and *Yucca brevifolia*.

Natural disturbances included frequent wind erosion, rare flash flooding, and water erosion. Artificial disturbances included common historic cattle grazing and occasional wild horse and burro grazing. *Bromus madritensis* ssp. *rubens* was present as a ubiquitous exotic plant. Apparent trend parameters had seven indicating a stable or upward trend and three indicating a downward trend. Conservation status averaged fair quality, fair condition, excellent viability, and good defensibility. Average biodiversity rank was 3.0.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the **Mixed Desert Shrub Series**, characterizing it as occurring throughout the lower elevations of the Spring Mountains NRA. Elevation averaged 1,554 meters and ranged from 1,195 to 1,725 meters; aspects averaged 217 degrees and ranged from 50 to 360 degrees; slopes averaged 9 percent and ranged from 2 to 25 degrees. The series includes the stable and long-lived *Coleogyne ramosissima-Thamnosma montana* association and a seral and periodically flash-flooded *Gutierrezia microcephala-Salazaria mexicana* association; climatically dynamic and transitional to the treed *Coleogyne ramosissima/Juniperus osteosperma* series with shallower surface horizons, and locally to the *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* and *Artemisia tridentata* series in its upper elevations, and the *Larrea tridentata* series in lower elevations; slopes are transitional to the desert mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also are factors.

Parent materials were commonly gravelly alluvium, derived from quartzite, mixed alluvium (with quartzite), and rarely calcareous shale, mixed sedimentary, or limestone. Landform types were commonly alluvial fans or dissected rolling uplands, occasionally low relief rolling uplands or undefined alluvial-colluvial features, or rarely alluvial mountain valley fans, flood plains, or terraces. Plot positions were commonly on lower, short or mid slopes, or occasionally moderate

valley alluvial fans or upper slopes of alluvial fans, or rarely moderate valley flood plains, lower slopes of alluvial fans, or wide valley terraces.

Prevalent vegetation was a shrubland, dominated by deciduous, xerophytic shrubs; 1 percent tree cover averaging 1.2 meters high, with 1 percent medium cover; 36.4 percent shrub cover averaging 0.7 meter, with 18.6 percent medium and 18.2 percent low cover; 1.4 percent graminoid cover averaging 0.16 meter, with 1.2 percent low cover; 2 percent forb cover averaging 0.61 meter, with 1.5 percent medium, 1.0 percent low, and 0.5 percent ground cover; 0.1 percent fern cover, averaging 0.01 meter, with 0.1 percent ground cover; and 1.2 percent bryophyte and lichen cover.

The dominant plants were *Coleogyne ramosissima*, *Gutierrezia microcephala*, *Salazaria mexicana*, *Menodora spinescens*, and *Thamnosma montana*. The common associates were *Bromus madritensis* ssp. *rubens*, *Ephedra nevadensis*, *Ephedra viridis*, *Yucca baccata*, and Yucca brevifolia. Average number of taxa is 14 and ranges from 11 to 21; thus, relative species richness is high. There were no known species of concern in this series.

Natural disturbances included common grazing by native animals, occasional colluvial deposition, wind erosion, and mass-wasting, rare water erosion and flash flooding. Artificial disturbances included frequent wild horse and burro grazing, rare OHV and mountain bike use, horse trails, and historic cattle grazing. *Bromus madritensis* ssp. *rubens* was present as a widespread exotic plant. Apparent trend parameters had six indicating a stable or upward trend and two indicating a downward trend. Conservation status averages good quality, fair condition, excellent viability, and good defensibility. Average biodiversity rank was 2.9.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Coleogyne ramosissima/Juniperus osteosperma* (Blackbrush/Utah juniper) Series,** characterizing it as occurring throughout lower elevations. Elevation averaged 1,737 meters and ranged from 1,455 to 1,945 meters; aspects averaged 192 degrees and ranged from 9 to 346 degrees; slopes averaged 13 degrees and ranged from 2 to 30 degrees. It is a stable and long-lived series transitional to the rockier mixed desert shrub series at lower elevations, the less sandy *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* series*,* the rockier *Artemisia tridentata* series in its upper elevations, and the deeper soil *Pinus monophylla/Artemisia tridentata* series at the highest elevations; slopes are transitional to the desert mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also were factors.

Parent materials were commonly gravelly alluvium, limestone, or sandstone, occasionally calcareous sandstone, calcareous shale, quartzite, mixed sedimentary, or dolomite, and rarely mixed alluvium, calcareous siltstone, or mixed rock. Landform types were commonly alluvial fans and terraces, low relief rolling uplands, or moderate relief rolling uplands, occasionally alluvial mountain valley fans, or rarely residual mountain slopes (including dissected, dissected convex and undissected slopes), structurally controlled dipping layered rocks, or ridges. Plot positions were primarily on slopes, occasionally narrow ridges, wide valleys, terraces, and floodplains, shoulders, or rarely wide ridges, or mid and upper slopes of alluvial fans.

Prevalent vegetation was a shrubland, occasionally a sparse-shrubland or a dwarf-shrubland, dominated by deciduous shrubs and short conifers; 9.6 percent tree cover averaging 2.5 meters high, with 8.5 percent medium cover; 28.6 percent shrub cover averaging 0.5 meter, with 15.5 percent medium and 12.3 percent low cover; 2 percent graminoid cover averaging

0.15 meter, with 1.7 percent low cover; 1.0 percent forb cover averaging 0.21 meter, with 1.1 percent low cover; no fern cover; and 2.5 percent bryophyte and lichen cover.

The dominant plants were *Coleogyne ramosissima*, *Juniperus osteosperma*, and *Pinus monophylla*. Common associates were: *Bromus madritensis* ssp. *rubens, Ephedra viridis*, *Gutierrezia microcephala*, and *Yucca baccata*. Average number of taxa was 13 and ranged from 5 to 17. There were no known species of concern in this series.

Natural disturbances included frequent wind erosion, occasional water erosion, mass-wasting, colluvial deposition, fire, and rare flash flooding. Artificial disturbances included frequent wild horse and burro grazing, occasional historic cattle grazing and fire, and rare logging. *Bromus madritensis* ssp. *rubens* was present as a widespread exotic, while *Bromus tectorum*, *Chenopodium album*, and *Schismus arabicus* were present as infrequent exotic plants. Apparent trend parameters had eight indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged fair quality, fair condition, excellent viability, and excellent defensibility. Average biodiversity rank was 2.7.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* (Blackbrush-Stansbury cliffrose) Series**, characterizing it as scattered on Potosi Mountain, in the lower Deer Creek and Lee Canyon Highway area, north and northwest of Wheeler Peak, and lower Coal Spring Canyon. Elevation averaged 1,761 meters and ranged from 1,490 to 1,985 meters; aspects averaged 189 degrees and ranged from 14 to 350 degrees; slopes averaged 20 degrees and ranged from 1 to 33 degrees. An apparently stable series transitional to the finer textured soils of the *Coleogyne ramosissima/Juniperus osteosperma* series and *Coleogyne ramosissima-Thamnosma montana* association, the generally higher elevation *Pinus monophylla/Artemisia tridentata* series, and the denser treed *Artemisia tridentata* series; slopes are transitional to the sparser treed desert mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also are factors.

Parent materials were primarily limestone, or occasionally mixed sedimentary. Landform types were commonly rolling uplands of dissected, low and moderate relief, and residual mountains with dissected straight slopes, undissected slopes, dissected convex slopes, and ridges, or rarely mass-wasted slopes. Plot positions were primarily on mid slopes, occasionally narrow ridges, or rarely wide ridges.

Prevalent vegetation was a sparse-shrubland, occasionally a dwarf-shrubland or a shrubland, dominated by deciduous and evergreen shrubs; 1 percent tree cover averaging 0.4 meter high, with 1 percent medium cover; 24 percent shrub cover averaging 0.5 meter, with 11 percent medium and 12 percent low cover; 2.2 percent graminoid cover averaging 0.2 meter, with 2.2 percent low cover; 1.5 percent forb cover averaging 0.25 meter, with 1.2 percent low, and 0.5 percent ground cover; no fern cover; and 1.8 percent bryophyte and lichen cover.

The dominant plants were *Coleogyne ramosissima*, *Purshia mexicana* var. *stansburiana*, and *Yucca baccata*. Common associates were *Bromus madritensis* ssp. *rubens*, *Ephedra viridis*, *Gutierrezia microcephala*, *Poa sandbergii*, and *Sphaeralcea ambigua* ssp. *monticola*. Average number of taxa was 15 and ranged from 8 to 23. The sole plant species of special concern was *Eriogonum heermannii* var. *clokeyi*. There were no animal species of concern.

Natural disturbances included frequent mass-wasting and wind erosion, common colluvial deposition and water erosion, and occasional native animal grazing. Artificial disturbances

included abundant wild horse and burro grazing, rare historic cattle grazing, camping, and OHV use. *Bromus madritensis* ssp. *rubens* was commonly present and *Bromus tectorum* rarely present as exotic plants. Apparent trend parameters had six indicating a stable or upward trend and three indicating a downward trend. Conservation status averaged fair quality, fair condition, excellent viability, and excellent defensibility. Average biodiversity rank was 2.9.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Artemisia tridentata* (Big sagebrush) Series**, characterizing it as scattered on the eastern side, most common in lower Deer Creek, ranging south to Kyle Canyon and north to Cold Creek. Elevation averaged 1,827 meters and ranged from 1,645 to 1,900 meters; aspects averaged 164 degrees and ranged from 11 to 360 degrees; slopes averaged 14 degrees and ranged from 4 to 26 degrees. A presumably stable series transitional to the less sparsely treed *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* series, and the less gravel-surfaced *Pinus monophylla/Artemisia tridentata* series at generally higher elevations; and to the finer soil textured *Coleogyne ramosissima/Juniperus osteosperma* series; lower slopes are transitional to the less sparsely treed montane mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also are factors.

Parent materials were occasionally calcareous conglomerate, limestone, mixed alluvium, or quartzite, or rarely gravelly alluvium. Landform types were typically rolling uplands of low relief with or without dense drainage, and dissected or moderate relief uplands, or occasionally alluvial fans, or rarely colluvial fans, alluvial terraces, or alluvial mountain valley fans. Plot positions were commonly on lower, mid, and short slopes, occasionally on narrow ridges, or mid slopes of alluvial fans, or rarely wide valley terraces.

Prevalent vegetation was a shrubland, dominated by an evergreen shrub; 2.1 percent tree cover averaging 1.8 meters high, with 1.4 percent medium cover; 31 percent shrub cover averaging 0.6 meter, with 13 percent medium and 19 percent low cover; 2.2 percent graminoid cover averaging 0.1 meter, with 2 percent low cover; 1.2 percent forb cover averaging 0.19 meter, with 1.1 percent low cover; no fern cover; and 1.1 percent bryophyte and lichen cover.

The dominant plant was *Artemisia tridentata*. Common associates were *Bromus madritensis* ssp. *rubens*, *Coleogyne ramosissima*, *Ephedra viridis, Juniperus osteosperma*, *Pinus monophylla*, *Sitanion hystrix*, and *Yucca baccata*. Average number of taxa was 14 and ranged from 7 to 21. There are no known species of concern in this series.

Natural disturbances included frequent native animal grazing, occasional wind erosion and colluvial deposition, and rare mass-wasting. Artificial disturbances included abundant wild horse and burro grazing, and occasional OHV use. *Bromus madritensis* ssp. *rubens* was frequently present as an exotic plant. Apparent trend parameters had eight indicating a stable or upward trend and one indicating a downward trend. Conservation status averages good quality, good condition, excellent viability, and excellent defensibility. Average biodiversity rank was 2.6.

Impacts, Activities, and Features

Table 3-1 identifies the various activities and features that occur in desert shrubland communities and presents the acreage, number, or mileage of overlap associated with each activity or feature (not necessarily a negative impact), as derived by GIS analysis of the SWReGAP map.

Table 3-1 Activities and Features that Occur in Desert Shrubland Communities on the Spring Mountains NRA

Activity	Unit of Measure	Desert Shrubland
Campgrounds	Acres	0
Picnic Areas	Acres	0
Concentrated Dispersed Use Areas	Acres	34
Ski Area Runs	Acres	0
Private Land	Acres	1730
Fire Burns since 1953	Acres	19285
Designated Horses/Burros Area	Acres	63129
Firewood Cutting	Acres	252
Insect Damage (2003 and 2004)	Acres	154
Climbing Routes	Number	0
Trailheads	Number	0
Springs	Number	50
Invasive Species	Number	266
Mines/Caves	Number	69
Buildings	Number	62
Utilities	Miles	11
Paved Roads	Miles	98
Unpaved Roads	Miles	611
Open Motorized Trails	Miles	34
Closed Motorized	Miles	27
System Trails	Miles	0
Non - System Trail	Miles	78
Perennial Streams	Miles	6

Ecological System Types

Larrea tridentata Series

Hymenoclea salsola Association
(= North American Warm Desert Wash Ecological System)
Larrea tridentata-Ambrosia dumosa Association
(= Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System)

Mixed Desert Shrub Series

Gutierrezia microcephala-Salazaria mexicana Association
(= North American Warm Desert Wash Ecological System)
Coleogyne ramosissima-Thamnosma montana Association
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System)

Coleogyne ramosissima/Juniperus osteosperma Series
Coleogyne ramosissima Association
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System)
Coleogyne ramosissima/Juniperus osteosperma Association
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System)
Coleogyne ramosissima/Juniperus osteosperma-Pinus monophylla Association
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System, rarely the Great Basin Pinyon-Juniper Woodland Ecological System)

Coleogyne ramosissima-Purshia mexicana var. *stansburiana* Series
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System)

Artemisia tridentata Series
(= Mojave Mid-Elevation Mixed Desert Scrub Ecological System)

SWReGAP mapped four ecological systems which are not considered here for the following reasons:

INTER-MOUNTAIN BASINS SEMI-DESERT SHRUB STEPPE

No vegetation alliances which define this Ecological System (ES) have been documented to occur, nor are they to be expected. Delineation of this ES was done in error by the SWReGAP project. Areas which the SWReGAP mapped to this ES are probably Intermountain Basins Semi-Desert Grassland Ecological System (semi-natural, early successional stages after wildfires) and Mojave Mid-Elevation Mixed Desert Scrub ES (later successional). Areas which the SWReGAP mapped to this ES within the Red Rock Canyon National Conservation Area (NCA) are probably Sonora-Mojave Creosotebush-White Bursage Desert Ecological System.

INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND

Unlike mountain ranges to the north (especially the Inyo) and west (especially the Grapevine Mountains in Death Valley NP), *Artemisia tridentata* dominated communities are limited in area within the Spring Mountains NRA. Within the Spring Mountains NRA, they should best be considered either a minor desert to montane transition zone, a successional stage in the montane zone resulting from wildfire, or a zone confined to washes within pinyon-juniper woodlands. Furthermore, those areas with *Artemisia tridentata* dominance in the Spring Mountains NRA have a low vegetal cover of grasses. We have elected to map areas which would classify to the *Artemisia tridentata* Series of Nachlinger and Reese (1996) as being with the Mojave Mid-Elevation Mixed Desert Scrub ES.

Our placement of *Artemisia tridentata* in the Mojave Mid-Elevation Mixed Desert Scrub ES is a provisional solution. The *Artemisia tridentata* ssp. tridentata - *Grayia spinosa* Shrubland Alliance is the only one listed for the Mojave Mid-Elevation Mixed Desert Scrub ES, but *Grayia spinosa* has not been found to occur with *Artemisia tridentata.* However, neither do the many Inter-Mountain Basins Big Sagebrush Shrubland ES associations with *Artemisia tridentata* and various grass species as co-dominate; thus, there is no perfect fit. *Coleogyne ramosissimum* replaces *Grayia spinosa* as the most common associated shrub in the Spring Mountains NRA, further illustrating that it is a poor fit to the Inter-Mountain Basins Big Sagebrush Shrubland ES. In TWINSPAN classification, the Nachlinger and Reese (1996) *Artemesia tridentata* Series falls

between the physiognomic similar *Coleogyne ramosissimum-Purshia mexicana* var. *stansburiana* Series and the dissimilar Ceanothus greggii Association.

INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE

This ES is presently recognized as the Inter-Mountain Basins Montane Sagebrush Ecological System. The same arguments apply to its exclusion from the Ecological Systems of the Spring Mountains NRA map as were stated for Inter-Mountain Basins Big Sagebrush Shrubland. Additionally, the Spring Mountains NRA is not characterized by a treeless high elevational *Artemisia tridentata* community situated between montane and sub-alpine woodland zones, like in the Inyo Mountains.

GREAT BASIN XERIC MIXED SAGEBRUSH SHRUBLAND

While *Artemisia nova* can be mapped as a vegetation alliance, it was only found as dominant in a single plot which was not particularly xeric. None of the *Artemisia* dominated areas are co-dominated by grasses, a character which defines the alliances within this ES. It is in a transitional zone which is difficult to classify within a particular ES. We have elected to treat *Artemisia nova* as a monotypic, chaparral community which we included with the Sonora-Mojave Semi-Desert Chaparral Ecological System.

Nachlinger and Reese (1996) found *Artemisia tridentata* in eight plots, classified to three different vegetation series. They did not cluster in TWINSPAN analysis, suggesting that *Artemisia nova* is not a diagnostic species in vegetal classification. *Artemisia tridentata* and *Artemisia nova* communities need further study to better identify the subspecies of the former and any possible *Artemisia nova* dominated areas along Deer Creek misidentified as *Artemisia tridentata*.

Table 3-2 provides a reference for comparison between the SWReGAP vegetation community types and the corresponding vegetation series within the desert shrubland plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-2 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series Within the Desert Shrubland Plant Community Zone on the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
Sonora-Mojave Creosote bush-White Bursage Desert Scrub	Creosote Bush
Sonora-Mojave Mixed Salt Desert Scrub	
Inter-Mountain Basins Semi-Desert Shrub Steppe	Mixed Desert Shrub
Inter-Mountain Basins Big Sagebrush Shrubland	Big Sagebrush
Inter-Mountain Basins Montane Sagebrush Steppe	
Mojave Mid-Elevation Mixed Desert Scrub	Blackbrush/Utah Juniper
Great Basin Xeric Mixed Sagebrush Shrubland	Blackbrush/Stansbury Cliffrose

The following SWReGAP Ecological Systems are to be found on the Spring Mountains NRA.

SONORA-MOJAVE CREOSOTEBUSH-WHITE BURSAGE DESERT SCRUB ECOLOGICAL SYSTEM

NatureServe regionally defines this ES as forming a "vegetation matrix in broad valleys, lower bajadas, plains, and low hills in the Mojave and lower Sonoran deserts. This desert scrub is characterized by a sparse to moderately dense layer (2 to 50 % cover) of xeromorphic microphyllous and broad-leaved shrubs. *Larrea tridentata* and *Ambrosia dumosa* are typically dominants, but many different shrubs, dwarf-shrubs, and cacti may co-dominate or form typically sparse understories. Associated species may include *Atriplex canescens, Atriplex hymenelytra, Encelia farinosa, Ephedra nevadensis, Fouquieria splendens, Lycium andersonii*, and *Opuntia basilaris*. The herbaceous layer is typically sparse, but may be seasonally abundant with ephemerals. Herbaceous species such as *Chamaesyce* spp., *Eriogonum inflatum, Dasyochloa pulchella, Aristida* spp., *Cryptantha* spp., *Nama* spp., and *Phacelia* spp. are common."

The Sonora-Mojave Creosotebush-White Bursage Desert Scrub ES is mapping unit three on the Ecological Systems of the Spring Mountains National Recreation Area map. It comprises 0.09 percent of the area of the Spring Mountains NRA. An additional 0.09 percent was mapped as transitional to other ecological systems.

MOJAVE MID-ELEVATION MIXED DESERT SCRUB ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as "extensive desert scrub in the transition zone above *Larrea tridentata - Ambrosia dumosa* desert scrub and below the lower montane woodlands (700 to 1,800 meter elevations) that occurs in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this ecological system is quite variable. Co-dominants and diagnostic species include *Coleogyne ramosissima, Eriogonum fasciculatum, Ephedra nevadensis, Grayia spinosa, Menodora spinescens, Nolina* spp., *Opuntia acanthocarpa, Salazaria mexicana, Viguiera parishii, Yucca brevifolia*, or *Yucca schidigera*. Desert grasses, including *Achnatherum hymenoides, Achnatherum speciosum, Muhlenbergia porteri, Pleuraphis jamesii, Pleuraphis rigida*, or *Poa secunda*, may form an herbaceous layer. Scattered *Juniperus osteosperma* or desert scrub species may also be present."

The Mojave Mid-Elevation Mixed Desert Scrub Ecological System is mapping unit 3 on the Ecological Systems of the Spring Mountains NRA map. It comprises 25.70 percent of the area. An additional 3.87 percent was mapped as transitional to other ecological systems, including 2.98 percent as transitional to the Great Basin Pinyon-Juniper Woodland Ecological System.

NORTH AMERICAN WARM DESERT WASH ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as being "restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America. Although often dry, the intermittent fluvial processes define this system, which are often associated with rapid sheet and gully flow. This system occurs as linear or braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable ranging from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. The woody layer is typically intermittent to open and may be dominated by shrubs and small trees such as *Acacia greggii, Brickellia laciniata, Baccharis sarothroides, Chilopsis linearis, Fallugia paradoxa, Hymenoclea salsola, Hymenoclea monogyra, Juglans microcarpa, Prosopis* spp., *Psorothamnus*

spinosus, Prunus fasciculata, Rhus microphylla, Salazaria mexicana, or *Sarcobatus vermiculatus*."

The North American Warm Desert Wash ES is mapping unit 12 on the Ecological Systems of the Spring Mountains NRA map. It comprises at least 0.06 percent of the area.[20] An additional 0.03 percent was mapped as transitional to other ecological systems.

3.1.2 Low Conifer Plant Community Zone

Current Conditions

The low conifer woodland zone is defined by medium elevation, medium slopes, and by its dominant vegetation: singleleaf pinyon *(Pinus monophylla),* big sage *(Artemisia tridentata),* pointleaf manzanita *(Arctostaphylos pungens),* and curlleaf mountain mahogany (*Cercocarpus ledifolius* var. *intermontanus)*. Utah juniper (*Juniperus osteosperma*) tends to grow at lower elevations and in more arid areas as its scaled foliage allows it to conserve water more effectively than pinyon pine. Juniper-dominated woodlands tend to include open savannas of scattered trees and wooded shrublands, without a significant herb or grass component. Pinyon pine dominates at higher elevations, and tends to form more closed-canopied stands that exhibit forest like dynamics and species composition, commonly including a significant shrub component of mountain mahogany with limited herbs and grasses. Pinyon-juniper and juniper woodlands, which are not fire tolerant, are encroaching into shrublands as a result of fire suppression. However, climatic warming may currently be limiting their invasion into lower elevation shrublands due to drought mortality and poor reproduction under heat stress.

Reference Conditions

Studies of low conifer ecosystems throughout the southwest were used to assess the changes associated with the pinyon and juniper woodlands in the Spring Mountains NRA. Foremost in these studies are the changes associated with the introduction of exotic species, which includes altered plant cover, density, richness, and subsequently fire regime in these woodlands. Additional differences associated with current conditions of the low conifer ecosystems include the loss of the biological soil crust due to recreation and historic grazing.

Whereas fire was largely absent from desert shrubland communities, fire was a dominant component in the low conifer pinyon-juniper vegetation communities. Nachlinger and Reese (1996) report the desert ceanothus association is often associated with old burns, specifically in Lovell Summit and Wallace Canyon. Higher tree densities, contributing to losses in herbaceous vegetation cover and associated increases in soil erosion, characterize the reduction of fire in these ecosystems. These increases in tree density have caused declines in herbaceous understories; and, as the grasses are choked by the shade, needle mats, and competition from the dominant ensue. Tree rings also record how local forests have changed over the past century since the widespread surface fires ceased, and show increasing numbers of trees establishing during the 20th century (Allen 1998).

A natural fire regime is important in maintaining *Cercocarpus ledifolius* in the ***Pinus monophylla-Cercocarpus ledifolius* var*. intermontanus/Artemisia tridentata*** association. Many stands in the Spring Mountains NRA have not been burned for many years and have high

[20] This Ecological System was only mapped when it occupied wide arroyos. Additional acreage can be expected if mapping detail was increased.

fuel loads, and may be too late in seral development for prescribed fire. Continued fire suppression will likely reduce *Cercocarpus ledifolius* dominance over time. Since Austin (1967) reported this as the most important upland bird habitat, loss of the habitat may have detrimental effects on avifaunal populations. Gruell et al. (1985) reported that reduction in fire frequency and size of fires has restricted stand development in *Cercocarpus ledifolius* communities. They stated that vigorous stands (mostly <60 yrs. old), are not candidates for prescribed burning, nor are *Artemisia tridentata*-dominated stands with scattered *Cercocarpus ledifolius*. Prolonged fire suppression reduces post fire recovery potential and reduces the number of seed-bearing *Cercocarpus ledifolius* trees. Fire is most likely to improve *Cercocarpus ledifolius* productivity in seral stands with competitive, non reproducing conifers. They concluded that there is little or no rationale for suppressing wildfires in localities where *Cercocarpus ledifolius* are being out competed by conifers.

Climatic changes can have profound effects on this vegetation community. The high heat that accompanied the recent drought was the underlying cause of death for millions of pinyon pines throughout the Southwest (Breshears et al. 2005). At study sites in Arizona, Colorado, New Mexico and Utah, 40 to 80 percent of the pinyon trees (*Pinus edulis*) died between 2002 and 2003. The researcher confirmed the massive regional dieback of vegetation through both aerial surveys and analysis of satellite images of those states' pinyon-juniper woodlands. The drought coupled with particularly high temperatures increased the probability that the trees will be more susceptible to insect infestations and fire.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for ***Arctostaphylos pungens* (Point leaf manzanita) Series**, characterizing it as occurring throughout montane sites in areas of old burns, most commonly in large burns in the Lovell Summit and Wallace Canyon areas. Elevation averaged 2,139 meters and ranged from 1,705 to 2,445 meters; aspects averaged 167 degrees and ranged from 12 to 330 degrees; slopes averaged 17 degrees and ranged from 2 to 35 degrees. The series was typically late seral after fire, with tree cover probably related to time since last significant burn; transitional to less intensely burned vegetation, including the *Pinus monophylla-Juniperus osteosperma/Artemisia tridentata* association, the thinner soils and denser treed *Pinus monophylla-Cercocarpus ledifolius* var. *intermontanus/Artemisia tridentata* association, and the denser treed *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* association. Steeper slopes are transitional to the montane mass-wasted slopes habitat and the near-vertical *Cercocarpus intricatus* cliffland series.

Parent materials were commonly gravelly alluvium derived from mixed sedimentary, occasionally quartzite, limestone, calcareous siltstone, mixed alluvium, and calcareous sandstone, or rarely conglomerate, or dolomite; landform types were commonly moderate relief rolling uplands, or occasionally dissected rolling uplands, dissected residual mountain convex slopes, alluvial fans, or alluvial flood plains; plot positions were commonly on mid and upper slopes, occasionally on lower slopes, or wide valley terraces and flood plains, or rarely mountain valley alluvial fans, narrow valley levees, upper slopes of alluvial fans, or narrow ridges.

Prevalent vegetation was a shrubland dominated by sclerophyllous, evergreen and deciduous shrubs; comprised of 16 percent tree cover averaging 4.1 meters high, with 4.7 percent tall and 12 percent medium cover; 42 percent shrub cover averaging 1.0 meter, with 33 percent medium and 11 percent low cover; 1.7 percent graminoid cover averaging 0.1 meter, with 1.6 percent low cover; 1.3 percent forb cover averaging 0.17 meter, with 1.3 percent low cover; no fern cover; and 0.4 percent bryophyte and lichen cover.

The dominant plants were *Arctostaphylos pungens*, *Garrya flavescens*, and *Ceanothus greggii*, with *Pinus monophylla* attaining occasional local co-dominance. Common associates were *Amelanchier utahensis, Artemisia tridentata, Cercocarpus ledifolius* var. *intermontanus, Ephedra viridis, Juniperus osteosperma, Opuntia erinacea, Purshia mexicana* var. *stansburiana, Quercus gambelii,* and *Yucca baccata.* The average number of taxa was 14 and ranged from 7 to 29. There were 2 plant species of concern: *Astragalus aequalis* and *Penstemon thompsoniae* var. *jaegeri*. There were 4 animals of concern: *Chlosyne acastus robusta, Hesperia colorado mojavensis*, *Speyeria zerene carolae,* and *Neotamias palmeri*.

Natural disturbances included common colluvial deposition and fire, occasional mass-wasting, water erosion, wind erosion, and rare flash flooding. Artificial disturbances included common fire and wild horse and burro grazing, rare trampling, terracing and seeding, woodcutting, OHV use, hiking and horseback riding, and mountain bike use. *Agropyron desertorum, Bromus inermis*, *Bromus madritensis* ssp. *rubens, Bromus tectorum*, and *Chenopodium album* were present as occasional exotic plants. Apparent trend parameters have seven indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged fair to poor quality, fair condition, excellent viability, and excellent defensibility. Average biodiversity rank was 3.2.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Pinus monophylla/Artemisia tridentata* (Singleleaf pinyon pine/big sagebrush) Series**, characterizing it as widespread, primarily at montane elevations. Elevation averaged 2,151 meters and ranged from 1,515 to 2,715 meters; aspects averaged 193 degrees and ranged from 2 to 360 degrees; slopes averaged 19 degrees and ranged from 2 to 40 degrees. It is a long-lived stable series; transitional in lower elevations to the sparsely treed *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* series, the lower elevation *Coleogyne ramosissima/Juniperus osteosperma* series, and the *Artemisia tridentata* series with more surface gravel; transitional in higher elevations to the deeper soiled and taller treed *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* series; transitional to the *Arctostaphylos pungens* series in burned areas; slopes are occasionally adjacent to clifflands of the *Cercocarpus intricatus* series and transitional to the sparser treed montane mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also are factors.

Parent materials were commonly limestone or mixed sedimentary, occasionally quartzite, gravelly alluvium, dolomite, or rarely conglomerate, calcareous conglomerate, calcareous siltstone, mixed alluvium, mixed rock type, or calcareous shale. Landform types were commonly rolling uplands of dissected, moderate, and low relief with or without dense drainage, residual mountains with undissected, dissected convex, or dissected straight slopes, or ridges and clifflands, or alluvial fan terraces and floodplains, mountain valley alluvial fans, occasionally moderate valleys, or rarely alluvial terraces or colluvial fans. Plot positions were typically slopes of all landform types, occasionally mass-wasted slopes, narrow ridges, or moderate valley floodplains, colluvial deposits and terraces, or rarely wide ridges, wide valley alluvial fans, floodplains, and terraces, shoulders, narrow valley colluvial deposits and stream bottoms, and upper slopes of alluvial fans.

Prevalent vegetation was a woodland, occasionally a sparse-woodland and infrequently a shrubland dominated by conifers, deciduous and evergreen sclerophyllous trees, and soft shrubs in understory; comprised of 32 percent tree cover averaging 4.0 meters high, with 7.9 percent tall, 23.9 percent medium, 1.5 percent low cover, and 0.1 percent ground cover; 21.3 percent shrub cover averaging 0.9 meter, with 13.4 percent medium and 8.8 percent low cover; 1.6 percent graminoid cover averaging 0.16 meter, with 1.4 percent low cover;

2.2 percent forb cover averaging 0.19 meters, with 1.6 percent low and 0.7 percent ground cover; no fern cover; and 1.0 percent bryophyte and lichen cover.

The dominant plants were *Pinus monophylla*, *Artemisia tridentata*, *Juniperus osteosperma*, and *Cercocarpus ledifolius* var. *intermontanus*. Common associates were *Ephedra viridis, Opuntia erinacea*, *Poa fendleriana*, and *Sitanion hystrix*. Average number of taxa was 16 and ranged from 6 to 30. Plant species of concern included *Astragalus oophorus* var. *clokeyanus*, *Eriogonum heermannii* var. *clokeyi*, *Lesquerella hitchcockii*, *Phacelia hastata* var. *charlestonensis*, and *Salvia dorrii* var. *clokeyi*. Animal species of concern included *Chlosyne acastus robusta, Euphilotes ancilla purpura, Euphydryas anicia morandi*, *Myotis evotis*, *Myotis volans*, and *Neotamias palmeri*.

Natural disturbances included frequent colluvial deposition, common native animal grazing and wind erosion, occasional fire, water erosion, and mass-wasting, rare fungal infection, snow accumulation, windthrow, alluvial deposition, and flash flooding. Artificial disturbances included frequent wild horse and burro grazing, occasional OHV use, woodcutting and logging, fire, rare digging, trash, trampling, hiking and horseback riding, and historic cattle grazing. *Agropyron desertorum* and *Bromus madritensis* ssp. *rubens* were commonly present, with *Bromus tectorum* and *Chenopodium album* infrequently present as exotic plants. Apparent trend parameters had eight indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged fair to good quality, fair condition, good to excellent viability, and good to excellent defensibility. Average biodiversity rank was 3.1.

Impacts, Activities, and Features

Table 3-3 identifies the various activities and features that occur in low conifer communities and presents the acreage, number, or mileage of overlap associated with each activity or feature, as derived by GIS analysis of the SWReGAP map.

Table 3-3 Activities and Features that Occur in Low Conifer Communities on the Spring Mountains NRA

Activity	Unit of Measure	Low Conifer
Campgrounds	Acres	51
Picnic Areas	Acres	18
Concentrated Dispersed Use Areas	Acres	50
Ski Area Runs	Acres	0
Private Land	Acres	2047
Fire Burns since 1953	Acres	28131
Designated Horses/Burros Area	Acres	86308
Firewood Cutting	Acres	1650
Insect Damage (2003 and 2004)	Acres	8801
Climbing Routes	Number	11
Trailheads	Number	5
Springs	Number	59
Invasive Species	Number	77
Mines/Caves	Number	32
Buildings	Number	186
Utilities	Miles	10
Paved Roads	Miles	98
Unpaved Roads	Miles	510
Open Motorized Trails	Miles	19

Table 3-3 Activities and Features that Occur in Low Conifer Communities on the Spring Mountains NRA

Activity	Unit of Measure	Low Conifer
Closed Motorized	Miles	28
System Trails	Miles	5
Non - System Trail	Miles	86
Perennial Streams	Miles	9

Ecological System Types

Arctostaphylos pungens Series
Ceanothus greggii Association
(= Sonora-Mojave Semi-Desert Chaparral Ecological System)
Arctostaphylos pungens-Garrya flavescens Association
(= Sonora-Mojave Semi-Desert Chaparral Ecological System)

Pinus monophylla/Artemisia tridentata Series
Pinus monophylla-Juniperus osteosperma/Artemisia tridentata Association
(= Great Basin Pinyon-Juniper Woodland Ecological System, rarely Sonora-Mojave Semi-Desert Chaparral Ecological System)
Pinus monophylla-Cercocarpus ledifolius var. *intermontanus/Artemisia tridentata* Association
(= Great Basin Pinyon-Juniper Woodland Ecological System, rarely Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System)
Pinus monophylla/Artemisia tridentata Association
(= Great Basin Pinyon-Juniper Woodland Ecological System)

Table 3-4provides a reference for comparison between the SWReGAP vegetation community types and the corresponding vegetation series within the Low Conifer plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-4 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series within the Low Conifer Plant Community Zone on the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
Sonora-Mojave-Baja Semi-Desert Chaparral	Point Leaf Manzanita
Great Basin Pinyon-Juniper Woodland	Pinyon Pine/Big Sagebrush

SONORA-MOJAVE SEMI-DESERT CHAPARRAL ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as being “composed of evergreen shrublands on sideslopes transitioning from low-elevation desert landscapes up into woodlands of the western Mojave and Sonoran deserts. It extends from northeast Kern County, California, into Baja Norte. Associated species include *Quercus john-tuckeri, Quercus cornelius-mulleri, Quercus berberidifolia, Arctostaphylos patula, Arctostaphylos pungens, Arctostaphylos glauca, Rhus ovata, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus greggii, Garrya flavescens, Juniperus californica*, and *Nolina parryi*.”

The Sonora-Mojave Semi-Desert Chaparral Ecological System is mapping unit 4 on the Ecological Systems of the Spring Mountains NRA map. It comprises 8.23 percent of the area. An additional 2.15 percent was mapped as transitional to other ecological systems, including 1.63 percent as transitional to the Great Basin Pinyon-Juniper Woodland Ecological System.

GREAT BASIN PINYON-JUNIPER WOODLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as occurring "on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It is typically found at lower elevations ranging from 1,600 to 2,600 meters. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Woodlands dominated by a mix of *Pinus monophylla* and *Juniperus osteosperma*, pure or nearly pure occurrences of *Pinus monophylla*, or woodlands dominated solely by *Juniperus osteosperma*, comprise this system. *Cercocarpus ledifolius* is a common associate. On the east slope of the Sierras in California, *Pinus jeffreyi* and *Juniperus occidentalis* var. *australis* may be components of these woodlands. Understory layers are variable. Associated species include shrubs such as *Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, Coleogyne ramosissima, Quercus gambelii, Quercus turbinella*, and the following bunch grasses: *Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus)*, and *Poa fendleriana*."

The Great Basin Pinyon-Juniper Woodland Ecological System is mapping unit 5 on the Ecological Systems of the Spring Mountains NRA map. It comprises 28.46 percent of the area. An additional 0.91 percent was mapped as transitional to other ecological systems.

3.1.3 High Conifer Plant Community Zone

Current Conditions

The high conifer forest and woodland zone is defined by higher elevations, moist slopes, deep soils with higher organic content, and by its dominant vegetation: quaking aspen (*Populus tremuloides*), white fir *(Abies concolor),* limber pine (*Pinus flexilis*), bristlecone pine (*Pinus longaeva*), and Ponderosa pine (*Pinus ponderosa* var. *scopulorum*). The dominant tree at the lower elevations of the high conifer forest is the ponderosa pine. Historically, the ponderosa pine forest was composed of generally large trees with an open, grassy understory. With increasing fire suppression activities, the density of smaller trees has increased, increasing the accumulation of standing and down woody fuels. When fires do occur under these conditions, they can burn with greater intensity and may cause mortality of large trees that would have normally survived light intensity fires. Where fires have killed conifers at the higher elevations, *Ribes cernuum* and *Ceanothus greggii* chaparral have appeared. White fir forms dense, shady forests, and receives enough snowfall that these ecosystems may remain too moist to burn in most years. But occasionally it does become flammable during dry periods. At the highest elevations, scattered bristlecone pines present targets for lightning strikes, but woodlands at these elevations are generally so open that widespread fires are not expected to occur very often.

The increased density of trees in the high conifer forest leads to stressed trees that are now more susceptible to insects and disease. Dwarf mistletoe, fir engraver beetle, and white-spored gall rust are all potential threats to this community.

Reference Conditions

The high conifer zone in the Spring Mountains NRA has limited information dating back to early European settlement. Similar ecosystems throughout the southwest have experienced a change in the structure, density, and vegetation composition due to fire suppression, logging, and grazing, and it is probable the Spring Mountains have responded in a similar fashion. Historical records from around the year 1900 show that the density of trees measuring 12 inches or greater in diameter at breast height (dbh) ranged from 8 to 51 trees per acre in the Southwest (Allen 1998). These forests were characterized as open and park-like, with diverse grasses, forbs, and shrubs in the understory prior to fire suppression, with numbers of trees in different age classes evenly distributed (i.e., approximately equal numbers of young, middle-aged, and old trees). Today's forests in the Southwest are crowded with small-diameter ponderosa pines, leaving little room for the diversity of plant species that once flourished in the understory. Total tree densities now often exceed 1,000 trees per acre (Allen 1998). The majority of the trees are young, 50 to 100 year old trees with diameters of 3 to 6 inches dbh, fewer trees in the 6- to 9-inch class and even less in the 9- to 12-inch dbh class. Fire resistant trees, over 12 inches dbh, are relatively uncommon. High densities of small-diameter trees with low crown heights serve as ladder fuels for wild fires, carrying flames into the treetops of larger trees with devastating effects. Current fuel loads now cause fires to burn hotter, increasing their destructive potential.

In a forest composed mainly of ponderosa pine trees, numerous fire history studies have shown that fire occurred often in these forests in the centuries preceding European settlement. These fires may have burned through the forest as frequently as every few years. Because fire was so common, fuels did not accumulate, and the forest remained open, with a grassy understory that fed frequent fires but left larger trees intact. For example, some ponderosa pine stands now have well over 2,000 stems/acre, in contrast to 120 years ago when only about 50 stems/acres were present (Allen 1998).

At higher elevations, ponderosa pine intermixes with aspen, limber pine, and other tree species, and fire was also fairly common in these forest and woodland alliances. Some of these fires may have burned less frequently but more intensely than those at lower elevations, since there is typically more moisture, more growth, and hence more fuel at these higher elevations (Allen 1998). Where fires did kill conifers at these elevations, aspen groves appeared. Within the Spring Mountains NRA, aspen is generally confined to avalanche chuts were periodic scouring eliminates competing conifers.

Early settlers wrote that intense, large fires occurred in Engelmann spruce and subalpine fir forests on occasion (Allen 1998). These fires killed large swaths of mature trees and created room for new aspen groves, but they also generally burned in a patchwork pattern, sparing some conifer groves in drainages or on cool north-facing slopes. At the highest elevations, where scattered bristlecone pines and subalpine firs were present, widespread fires were very rare (Allen 1998).

These different forest types and fire regimes make it difficult to generalize about forest fire in the Spring Mountains. Notably, revegetation efforts following forest fires have been ongoing since the first half of the twentieth century. In 1937, the Boy Scouts assisted the Nevada Division of

Forestry by planting 5,000 trees, and in 1938, they planted an additional 2,500 trees in a burned area (Las Vegas Age 1938).

In 1910, it was determined that approximately 45,000 acres of timberlands in the Charleston area were infected with pine beetles (Las Vegas Age 1910), at a rate of 3 trees per 100 acres. All trees identified as being infected were felled, and either the tree was burned, or the bark was removed and burned. The logs were allowed to decay until 1939, when J.A. Bower opened a sawmill that turned the wood into merchantable lumber (Las Vegas Age 1939). This was not the first sawmill in the Charleston mountain area. The Kyle Brothers operated a mill in the early 1900's located near Mt. Charleston Park, and Mormon missionaries used lumber from the area to establish the first mission in 1855. A sawmill in Lee Canyon, and one in Deer Creek Canyon was owned and operated by Willard H. Ashton (Las Vegas Age 1939). However information regarding amount of timber harvested was unavailable.

A Forest Health Survey (Guyon and Munson 2000) by the Forest Service in 1999 identified various areas and species affected by insect and disease. Within Kyle Canyon, dwarf mistletoe was the most common pest on white fir, although infection was discontinuous, with heavily infected individuals occurring in patches. The fir engraver beetle was fairly common, with approximately 8 percent of the white fir surveyed infected. In Lee Canyon, white-spored gall rust was widely distributed wherever its host, the ponderosa pine, could be found, and as much as 90 percent of the areas surveyed for the gall rust were possibly infected. In contrast, Kyle Canyon, which was actively managed for this disease in the 1970s, had little infection (Guyon and Munson 2000).

Nachlinger and Reese (1996) provide 1994-95 reference conditions for the ***Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* (White fir-ponderosa pine-curlleaf mountain mahogany) Series**, characterizing it as occurring primarily on the eastern slopes of the Spring Mountains NRA, with scattered locations on Potosi Mountain and in western slope canyons at montane elevations. Elevation averaged 2,517 meters and ranged from 2,160 to 2,930 meters; aspects averaged 179 degrees and ranged from 0 to 357 degrees; slopes averaged 18 degrees and ranged from 5 to 51 degrees. It is a stable and long-lived series; transitional in burned areas to the *Arctostaphylos pungens* series; transitional throughout its range to the shorter treed *Pinus monophylla/Artemisia tridentata* series, which typically occurs on slopes with greater insolation; transitional at higher elevations to the less shrubby *Pinus flexilis-Abies concolor* series; transitional in riparian areas to the *Rosa woodsii* var. *ultramontana* series at lower elevations and the *Dodecatheon redolens-Aquilegia formosa* series at higher elevations; slopes are occasionally adjacent to clifflands of the *Cercocarpus intricatus* series and transitional to the sparser treed montane mass-wasted slopes habitat at the angle of repose, although substrate type and degree of weathering also are factors.

Parent materials were commonly limestone, occasionally calcareous conglomerate, dolomite, mixed sedimentary, gravelly alluvium, or mixed rock type, or rarely mixed alluvium, calcareous siltstone, quartzite, or conglomerate; landform types were commonly residual mountains with dissected convex or straight slopes, undissected slopes, clifflands, and ridges, or occasionally rolling uplands with dissected or moderate relief, or alluvial and colluvial terraces, fans, flood plains, and mountain valley fans, or rarely mass-wasted slopes; plot positions were commonly on upland slopes, occasionally ridges, moderate valley colluvial deposits, stream channels, terraces, and flood plains, or rarely narrow valley levees, colluvial deposits, and stream channels, mid slopes of alluvial fans, or wide valley terraces and flood plains.

Prevalent vegetation was a woodland, and occasionally a forest or sparse-woodland dominated by a mix of conifers, and cold-deciduous and evergreen sclerophyllous trees; comprised of 41.6 percent tree cover averaging 9.1 meters high, with 23.7 percent tall and 17.5 percent medium cover; 15.6 percent shrub cover averaging 0.7 meter, with 9 percent medium and 7.7 percent low cover; 1.6 percent graminoid cover averaging 0.16 meter, with 1.4 percent low cover; 10.5 percent forb cover averaging 0.2 meter, with 9.2 percent low and 1.8 percent ground cover; 0.1 percent fern cover; and 1.1 percent bryophyte and lichen cover.

The dominant plants were *Abies concolor*, *Cercocarpus ledifolius* var. *intermontanus*, and *Pinus ponderosa* var. *scopulorum*. Common associates were *Carex rossii*, *Poa fendleriana*, *Populus tremuloides*, *Ribes cereum*, *Sitanion hystrix,* and *Symphoricarpos oreophilus*. Average number of taxa was 18 and ranged from 7 to 32. Plant species of concern included *Angelica scabrida, Arenaria kingii* ssp. *rosea, Astragalus aequalis, Astragalus oophorus* var. *clokeyanus, Cirsium eatonii var. clokeyi, Haplopappus compactus, Physaria hitchcockii* var. *hitchcockii, Pedicularis semibarbata* var. *charlestonensis, Penstemon leiophyllus* var. *keckii, Penstemon thompsoniae* ssp. *jaegeri, Phacelia hastata* var. *charlestonensis, Salvia dorrii* var. *clokeyi, Townsendia jonesii* var. *tumulosa, and Viola charlestonensis.* Animal species of concern included *Euphilotes ancilla purpura*, *Euphydryas anicia morandi, Hesperia colorado mojavensis*, *Icaricia icarioides austinorum*, *Icaricia shasta charlestonensis, Limenitis weidemeyerii nevadae*, *Speyeria zerene carolae, Myotis evotis*, *Myotis volans,* and *Neotamias palmeri.*

Natural disturbances included fire, common native animal grazing and colluvial deposition, occasional mass-wasting and flash flooding, rare water and wind erosion, alluvial deposition, and avalanches. Artificial disturbances included fire, occasional woodcutting and logging, wild horse and burro grazing, rare trash, hiking and horseback riding, utility corridor clearing, and trampling. There were no exotic plants present. Apparent trend parameters had eight indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged fair to good quality, fair to good condition, good to excellent viability, and good to excellent defensibility. Average biodiversity rank was 4.2.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Pinus flexilis-Abies concolor* (Limber pine-white fir) Series**, characterizing it as throughout the higher elevations, montane to subalpine, mountains and ridges. Elevation averaged 2,886 meters and ranged from 2,530 to 3,130 meters; aspects averaged 173 degrees and ranged from 4 to 355 degrees; slopes averaged 22 degrees and ranged from 1 to 40 degrees. A long-lived, stable series; transitional in lower elevations to the *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* series with denser woody vegetation, and in higher elevations to the rockier soiled, shorter treed, and less shrubby *Pinus longaeva* series; riparian areas are generally transitional to the *Dodecatheon redolens-Aquilegia formosa* series; steep slopes greater than the angle of repose are probably transitional to an undefined mass-wasted slope habitat, with neighboring clifflands transitional to the *Cercocarpus intricatus* series.

Parent materials are common limestone, occasionally dolomite, quartzite, or mixed sedimentary, or rarely mixed rock type. Landform types are typically residual mountains with dissected convex slopes, ridges, clifflands, and undissected slopes, or rarely moderate relief rolling uplands or mass-wasted slopes. Plot positions are frequently on upper slopes or occasionally ridges.

Prevalent vegetation was a woodland, and occasionally a forest or sparse-woodland, dominated by a suite of conifers; comprised of 33.1 percent tree cover averaging 9.4 meters high, with 24.1 percent tall and 9 percent medium cover; 10.2 percent shrub cover averaging 0.7 meter,

with 4.8 percent medium and 6.9 percent low cover; 1.9 percent graminoid cover averaging 0.12 meter, with 1.8 percent low cover; 3.9 percent forb cover averaging 0.12 meters, with 2.9 percent low and 1.6 percent ground cover; no fern cover; and 0.9 percent bryophyte and lichen cover.

The dominant plants were *Abies concolor*, *Pinus flexilis*, and *Pinus longaeva*. Common associates were: *Carex rossii*, *Castilleja martinii* var. *clokeyi*, *Haplopappus compactus*, *Juniperus communis* var. *depressa*, *Pedicularis semibarbata* var. *charlestonensis*, *Poa fendleriana,* and *Ribes cereum*. Average number of taxa was 17. Plant species of concern included: *Arenaria kingii* ssp. *rosea, Cirsium eatonii* var. *clokeyi, Draba jaegeri*, *Haplopappus compactus*, *Physaria hitchcockii* var. *hitchcockii*, *Pedicularis semibarbata* var. *charlestonensis, Penstemon leiophyllus* var. *keckii, Phacelia hastata* var. *charlestonensis*, *Salvia dorrii* var. *clokeyi*, *Townsendia jonesii* var. *tumulosa*, and *Viola charlestonensis.* Animal species of concern included: *Euphydryas anicia morandi*, *Hesperia colorado mojavensis*, *Icaricia icarioides austinorum*, *Icaricia shasta charlestonensis*, *Limenitis weidemeyerii nevadae, Speyeria zerene carolae,* and the frequent (in two associations) *Neotamias palmeri*.

Natural disturbances included frequent colluvial deposition and fire, common wind erosion, occasional water erosion, fire, native animal grazing, mass-wasting, and rare snow accumulation. Artificial disturbances included fire, occasional wild horse and burro grazing, rare wood harvesting, vehicle trails, and hiking and horseback riding. *Bromus inermis* was rarely present as an exotic plant. Apparent trend parameters had seven indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged fair to good quality, good to excellent condition, excellent viability, and excellent defensibility. Average biodiversity rank was 4.7.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Pinus longaeva* (Bristlecone pine) Series**, characterizing it as occurring only in the higher subalpine elevations. Elevation averaged 3,265 meters and ranged from 2,920 to 3,495 meters; aspects averaged 185 degrees and ranged from 32 to 354 degrees; slopes averaged 22 degrees and ranged from 3 to 34 degrees. A stable and very long-lived series; transitional to the rockier and treeless *Ivesia cryptocaulis* series at the upper limits of the bristlecone pine and the less rocky and taller treed *Pinus flexilis-Pinus longaeva* association at lower elevations; *Stipa lettermanii-Agryopyron trachycaulum* and *Stipa-lettermanii-Oxytropis oreophila* associations occupy relatively small openings within this sparse woodland; riparian areas are transitional to the *Cirsium eatonii* var. *clokeyi/Juniperus communis* var. *depressa* association; transitional to *Cercocarpus intricatus* cliffland series and perhaps an undefined mass-wasted slope habitat on steep, unstable, and poorly vegetated slopes.

Parent materials were primarily limestone, occasionally mixed sedimentary, or rarely dolomite, quartzite, or calcareous siltstone. Landform types were always residual mountains, commonly clifflands or ridges, and occasionally dissected convex mountain slopes or rarely undissected mountain slopes. Plot positions were commonly on upper or mid slopes, or occasionally on wide or narrow ridges.

Prevalent vegetation was a sparse-woodland dominated by conifers; comprised of 17.2 percent tree cover averaging 6.8 meters high, with 13.4 percent tall and 3.9 percent medium cover; 3.5 percent shrub cover averaging 0.2 meter, with 1.2 percent medium and 2.4 percent low cover; 5.5 percent graminoid cover averaging 0.1 meter, with 5.1 percent low cover; 5 percent forb cover averaging 0.08 meter, with 2.8 percent low and 2.8 percent ground cover; 0.2 percent fern cover; and 0.9 percent bryophyte and lichen cover.

The dominant plant was *Pinus longaeva*. Common associates were *Carex rossii, Erigeron clokeyi*, *Lesquerella hitchcockii*, *Ribes montigenum*, *Sitanion hystrix*, and *Stipa lettermanii*. Average number of taxa was 13 and ranged from 2 to 19. Plant species of concern included *Antennaria soliceps, Arenaria kingii* ssp. *rosea*, *Cirsium eatonii* var. *clokeyi*, *Draba jaegeri, Draba paucifructa, Erigeron uncialis* ssp. *conjugans, Haplopappus compactus, Physaria hitchcockii* var. *hitchcockii, Pedicularis semibarbata* var. *charlestonensis, Penstemon leiophyllus* var. *keckii, Phacelia hastata* var. *charlestonensis, Potentilla concinna, Salvia dorrii* var. *clokeyi, Silene clokeyi, Sphaeromeria compacta, Synthris ranunculina, Townsendia jonesii* var. *tumulosa,* and *Viola charlestonensis.* There were two butterfly species of concern: *Euphydryas anicia morandi* and *Icaricia shasta charlestonensis*.

Natural disturbances included frequent fire, common native animal grazing and colluvial deposition, occasional mass-wasting and wind erosion, rare drought, and windthrow. Artificial disturbances included frequent fire, rare camping, trash, and wild horse and burro grazing. *Bromus madritensis* ssp. *rubens* and *Taraxacum officinale* were rarely to infrequently present as exotic plants. Apparent trend parameters had seven indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged excellent quality, excellent condition, excellent viability, and excellent defensibility. Average biodiversity rank was 5.1.

Impacts, Activities, and Features

Table 3-5 identifies the various activities and features that occur in high conifer communities and presents the acreage, number, or mileage of overlap associated with each activity or feature, as derived by GIS analysis of the SWReGAP map.

Table 3-5 Activities and Features that Occur in High Conifer Communities on the Spring Mountains NRA

Activity	Unit of Measure	High Conifer
Campgrounds	Acres	65
Picnic Areas	Acres	44
Concentrated Dispersed Use Areas	Acres	9
Ski Area Runs	Acres	38
Private Land	Acres	845
Fire Burns since 1953	Acres	3743
Designated Horses/Burros Area	Acres	9953
Firewood Cutting	Acres	158
Insect Damage (2003 and 2004)	Acres	3639
Climbing Routes	Number	1
Trailheads	Number	5
Springs	Number	38
Invasive Species	Number	1
Mines/Caves	Number	5
Buildings	Number	229
Utilities	Miles	75
Paved Roads	Miles	209
Unpaved Roads	Miles	27

Table 3-5 Activities and Features that Occur in High Conifer Communities on the Spring Mountains NRA

Activity	Unit of Measure	High Conifer
Open Motorized Trails	Miles	0.1
Closed Motorized	Miles	1.0
System Trails	Miles	40
Non - System Trail	Miles	16
Perennial Streams	Miles	3

Ecological System Types

Abies concolor-Pinus ponderosa var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* Series

Abies concolor-Juniperus scopulorum Association
(Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System, rarely Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System)

Abies concolor-Pinus ponderosa var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* Association
(= Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System, rarely Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System and Inter-Mountain Basins Cliff and Canyon Ecological System

Populus tremuloides-Abies concolor Association
(= Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System, rarely Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System)

Pinus flexilis-Abies concolor Series

Pinus flexilis-Pinus longaeva Association
(= Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System, rarely Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System)

Pinus longaeva-Pinus flexilis/Juniperus communis var. *depressa* Association
(= Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System)

Pinus longaeva Series

Pinus longaeva Association
(= Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System)

Stipa lettermanii-Oxytropis oreophila Association
(= Inter-Mountain Basins Semi-Desert Grassland Ecological System [mis-applied, sensu Southern Rocky Mountains Montane-Subalpine Grassland Ecological System])

Stipa lettermanii-Agropyron trachycaulum Association
(= Inter-Mountain Basins Semi-Desert Grassland Ecological System [mis-applied, sensu Southern Rocky Mountains Montane-Subalpine Grassland Ecological System])

SWReGAP mapped two ecological systems which are not considered here for the following reasons.

ROCKY MOUNTAIN MONTANE MESIC MIXED CONIFER FOREST AND WOODLAND

This Ecological Community probably extends no further west in southern Nevada than the Virgin Mountains of Mojave County, AZ and Clark Co., NV. Many of the characteristic species of the alliances within this ES are absent within the Spring Mountains NRA. Delineation of this ES within the Spring Mountains NRA was done in error by the SWReGAP project. We have probably mapped the SWReGAP Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland mapping unit as Intermountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System.

ROCKY MOUNTAIN MONTANE DRY-MESIC MIXED CONIFER FOREST AND WOODLAND

This Ecological Community probably extends no further west in southern Nevada than the Virgin Mountains of Mojave County, AZ and Clark Co., NV. Many of the characteristic species of the alliances within this ES are absent within the Spring Mountains NRA. Delineation of this ES within the Spring Mountains NRA was done in error by the SWReGAP project. We have probably mapped the SWReGAP Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland mapping unit as Intermountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System.

Table 3-6provides a reference for comparison between the SWReGAP vegetation community types and the corresponding vegetation series within the High Conifer plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-6 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series Within the High Conifer Plant Community Zone on the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	White Fir/Ponderosa Pine/Curlleaf Mountain Mahogany
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	Limber Pine/White Fir
Inter-Mountain Basins Subalpine Limber Bristlecone Pine Woodland	Bristlecone Pine

These SWReGAP ecological systems are considered here.

INTER-MOUNTAIN BASINS ASPEN-MIXED CONIFER FOREST AND WOODLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as occurring “on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho, western Wyoming, and in north-central Montana in the Big Snowy Mountains. It also occurs in localized settings in the Klamath Mountains of California, as well as in the Sierra Nevada and adjacent Great Basin mountains (Inyo, White, Warner, and Modoc Plateau). Elevations range from 1,700 to 2,800 meters. Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. The tree canopy is composed of a mix of deciduous and coniferous species, codominated by

Populus tremuloides and conifers, including *Pseudotsuga menziesii, Abies concolor, Abies lasiocarpa, Abies magnifica, Picea engelmannii, Picea glauca, Picea engelmannii, Picea pungens, Pinus contorta, Pinus flexilis, Pinus jeffreyi, Pinus contorta var. murrayana*, and *Pinus ponderosa*. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species become dominant. Common shrubs include *Amelanchier alnifolia, Prunus virginiana, Acer grandidentatum, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, Symphoricarpos albus*, or *Mahonia repens*. Herbaceous species include *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Achnatherum, Hesperostipa, Nassella*, and/or *Piptochaetium* spp. (= *Stipa* spp.), *Achillea millefolium, Arnica cordifolia*, *Asteraceae* spp., *Erigeron* spp., *Galium boreale, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system. This is the typical meadow edge aspen-conifer setting in the Sierra Nevada where frequently, due to fire suppression, the conifers are replacing aspens."

The Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System is mapping unit 7 on the Ecological Systems of the Spring Mountains NRA map. It comprises 7.34 percent of the area. An additional 0.57 percent was mapped as transitional to other ecological systems.

INTER-MOUNTAIN BASINS SUBALPINE LIMBER-BRISTLECONE PINE WOODLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as extending "from the Mojave Desert and Sierra Nevada across the central Great Basin to the central Wasatch and western Uinta mountains. These open woodlands are typically found on high-elevation ridges and rocky slopes above subalpine forests and woodlands. Sites are harsh, exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Parent materials include dolomitic, limestone or granitic rocks. Occurrences can be found on all aspects but are more common on southwestern exposures on steep convex slopes and ridges between 2,530 and 3,600 meters (8,300-12,000 feet). Stands are strongly dominated by *Pinus flexilis* and/or *Pinus longaeva*. *Pinus monophylla* may be present in lower-elevation stands. If present, shrub and herbaceous layers are generally sparse and composed of xeric shrubs, graminoids and cushion plants. Associated species may include *Antennaria rosea, Arenaria kingii, Artemisia tridentata, Cercocarpus intricatus, Chamaebatiaria millefolium, Cymopterus cinerarius, Elymus elymoides, Erigeron pygmaeus, Eriogonum ovalifolium, Festuca brachyphylla, Koeleria macrantha, Leptodactylon pungens, Ribes cereum*, or *Ribes montigenum*."

The Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System is mapping unit 8 on the Ecological Systems of the Spring Mountains NRA map. It comprises 5.37 percent of the area. An additional 0.25 percent was mapped as transitional to other ecological systems.

INTER-MOUNTAIN BASINS SEMI-DESERT GRASSLAND ECOLOGICAL SYSTEM [SENSU SOUTHERN ROCKY MOUNTAINS MONTANE-SUBALPINE GRASSLAND ECOLOGICAL SYSTEM]

The *Stipa lettermanii-Oxytropis oreophila* Association and *Stipa lettermanii-Agropyron trachycaulum* Association were two of the few Nachlinger and Reese (1996) series and associations computerized by the NNHP prior to the development of the Ecological Systems classification. Comer et al. (2003) placed these associations into the Inter-Mountain Basins Semi-Desert Grassland Ecological System, despite their greater affinity to *Pinus longaeva* than to any desert flora. This classification placement should be reexamined since the two associations better fit the Southern Rocky Mountains Montane-Subalpine Grassland Ecological System description on the NatureServe Explorer website.

NatureServe regionally describes the Inter-Mountain Basins Semi-Desert Grassland Ecological System as a "widespread ecological system [which] occurs throughout the Intermountain western US on dry plains and mesas, at approximately 1,450 to 2,320 meters (4,750 to 7,610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials, but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or co-dominated by *Achnatherum hymenoides, Aristida* spp., *Bouteloua gracilis, Hesperostipa comata, Muhlenbergia* spp., or *Pleuraphis jamesii*, and may include scattered shrubs and dwarf-shrubs of species of *Artemisia, Atriplex, Coleogyne, Ephedra, Gutierrezia*, or *Krascheninnikovia lanata*.

The NatureServe description for Southern Rocky Mountain Montane-Subalpine Grassland Ecological System is a "Rocky Mountain ecological system [which] typically occurs between 2,200 and 3,000 meters elevation on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3,350 meters on warm aspects. Soils resemble prairie soils in that the A horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia, Danthonia parryi, Festuca idahoensis, Festuca arizonica, Festuca thurberi, Muhlenbergia filiculmis*, or *Pseudoroegneria spicata*. The subdominants include *Muhlenbergia montana, Bouteloua gracilis*, and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus."

The mapping unit interpreted as the Southern Rocky Mountains Montane-Subalpine Grassland Ecological System is numbered 9 on the Ecological Systems of the Spring Mountains National Recreation Area map. It comprises 0.20 percent of the area

3.1.4 Alpine Plant Community Zone

Current Conditions

The Spring Mountains alpine zone is defined primarily by its high elevation, soils that are shallow and gravelly, and by the two dominant endemic plants: Charleston ivesia (*Ivesia*

cryptocaulis) and Charleston tansy *(Sphaeromeria compacta)*. This area of the Spring Mountains NRA has had limited human development, however, given the high elevation and short growing season, this vegetation zone is very fragile and impacts are often long lasting.

Reference Conditions

Because this area has not experienced excessive recreation, logging, or fire, it also has little information regarding early conditions. Similar ecosystems were used to discuss possible impacts to the Spring Mountains alpine ecosystem.

Backcountry hikers are most likely the greatest impact in this zone. One high-elevation study tracked 100 passages by each of four groups (hikers, horses, motorcycles, and bicycles) over control plots on two trails in different national forests (Wilson and Seney 1994). For some of the passages, the researchers pre-wetted the trail with a fixed quantity of water using a rainfall simulator. The researchers measured sediment runoff, which correlates with erosion. They found no statistically significant difference between measured bicycling and hiking effects. They did find that horses caused the most erosion of the trails, followed by motorcycles traveling up wetted trails. They also suggested that precipitation would cause erosion on existing trails, even without the presence of human travel during those rain events. They concluded that trail design, construction, and maintenance are important factors in controlling erosion.

One little-studied impact is the unwitting transport of invasive species into deep woods. Seeds are dispersed on tent bottoms, pant legs, boots, and in the feces of pack animals. Invasive plants gain their first footholds in sunny disturbed areas, along trails, or around shelters (Mack 1981). From these trail locations, they have the potential to expand into previously non-invaded communities. Therefore, it seems likely that the historic density of weeds in the alpine community of the Spring Mountains was lower than current conditions.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Ivesia cryptocaulis* (Hidden ivesia) Series**, characterizing it as occurring above treeline in the alpine areas. Elevation averaged 3,501 meters and ranged from 3,455 to 3,627 meters; aspects averaged 118° and ranged from 16 to 258°; slopes averaged 18° and ranged from 1 to 42°. This is a stable, long-lived series with high levels of natural disturbance, transitional to the less gravelly and treed *Pinus longaeva* series at lower elevations; transitional on the steepest slopes to an unclassified sparsely vegetated cliffland type.

Parent materials were primarily limestone or occasionally mixed sedimentary. Landform types were commonly residual mountain ridges or occasionally residual mountain clifflands. Plot positions were commonly on upper slopes, occasionally narrow ridges, or rarely on wide ridges.

Prevalent vegetation is a forbland dominated by cespitose perennial herbs and bunch grasses; comprised of 2.9 percent tree cover averaging 0.5 meter high, with 2.9 percent medium and 0.2 percent low cover; 0.3 percent shrub cover averaging 0.1 meter, with 0.03 percent low cover; 2.7 percent graminoid cover averaging 0.05 meter, with 1.2 percent low and 1 percent ground cover; 4.4 percent forb cover averaging 0.04 meter, with 1.9 percent low and 2.6 percent ground cover; 0.2 percent fern cover; and 0.3 percent bryophyte and lichen cover.

The dominant plant was *Ivesia cryptocaulis*. Common associates were *Aquilegia scopulorum, Astragalus lentiginosus* var. *kernensis*, *Erigeron clokeyi, Festuca ovina* var. *brevifolia, Lesquerella hitchcockii, Oxytropis oreophila, Poa sandbergii, Sitanion hystrix,* and *Sphaeromeria compacta*. Average number of taxa was 13 and ranged from 3 to 19. Plant species of concern included *Antennaria soliceps, Cirsium eatonii* var. *clokeyi, Draba jaegeri,*

Ivesia cryptocaulis, Physaria hitchcockii var. *hitchcockii, Potentilla concinna, Silene clokeyi, Sphaeromeria compacta,* and *Synthris ranunculina.* There was one butterfly species of concern: *Euphydryas anicia morandi*.

Natural disturbances included common fire, colluvial deposition, mass-wasting, and occasional native animal grazing. Artificial disturbances included common fire, occasional camping, and rare digging disturbance. There were no exotic plants present. Apparent trend parameters had seven indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged excellent quality, excellent condition, excellent viability, and excellent defensibility. Average biodiversity rank was 6.3.

Impacts, Activities, and Features

Table 3-7 identifies the various activities and features that occur in alpine communities and presents the acreage, number, or mileage of overlap associated with each activity or feature, as derived by GIS analysis of the SWReGAP map.

Table 3-7 Activities and Features that occur in Alpine Communities on the Spring Mountains NRA

Activity	Unit of Measure	Alpine
Campgrounds	Acres	0
Picnic Areas	Acres	0
Concentrated Dispersed Use Areas	Acres	0
Ski Area Runs	Acres	0
Private Land	Acres	20
Fire Burns since 1953	Acres	0
Designated Horses/Burros Area	Acres	0
Firewood Cutting	Acres	0
Insect Damage (2003 and 2004)	Acres	0
Climbing Routes	Number	0
Trailheads	Number	0
Springs	Number	0
Invasive Species	Number	0
Mines/Caves	Number	0
Buildings	Number	0
Utilities	Miles	0
Paved Roads	Miles	0
Unpaved Roads	Miles	0
Open Motorized Trails	Miles	0
Closed Motorized	Miles	0
System Trails	Miles	3
Non - System Trail	Miles	0.1
Perennial Streams	Miles	0

Ecological System Types

Ivesia cryptocaulis Series
(= Rocky Mountain Alpine Bedrock and Scree Ecological System)

SWReGAP mapped one ecological system which is not considered here for the following reason.

ROCKY MOUNTAIN SUBALPINE MESIC MEADOW

No vegetation alliances which define this Ecological System (ES) have been documented to occur within the Spring Mountains NRA, nor are they to be expected. Delineation of this subalpine ES within alpine zones of the Spring Mountains NRA was done in error by the SWReGAP project. Areas which the SWReGAP mapped to this ES within the Spring Mountains NRA are probably Rocky Mountain Alpine Bedrock and Scree Ecological System (above treeline) and high elevational areas of the apparently mis-classified Intermountain Basins Semi-Desert Grassland Ecological System (parklands with subalpine forest). The latter is probably better classified as part of the Southern Rocky Mountains Montane-Subalpine Grassland Ecological System.

Table 3-8 provides a reference for comparison between the SWReGAP vegetation community type and the corresponding vegetation series within the Alpine plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-8 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series within the Alpine Plant Community Zone on the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
Rocky Mountain Subalpine Mesic Meadow	Hidden Ivesia

This SWReGAP ecological system is considered here.

ROCKY MOUNTAIN ALPINE BEDROCK AND SCREE ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as “restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, west into the highest mountain ranges of the Great Basin. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with nonvascular- (lichen) dominated communities. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. There can be sparse cover of forbs, grasses, lichens and low shrubs.”

The Rocky Mountain Alpine Bedrock and Scree Ecological System is mapping unit 18 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.23 percent of the area.

3.1.5 Steep Slopes and Cliffs Plant Community Zone

Current Conditions

The steep slopes and cliffland zone is defined by high elevation, shallow and gravelly soils, and by steep, mass-wasted slopes or near-vertical cliff faces. Because this area is largely inaccessible, the current conditions of cliffs and rock outcrops are most likely similar to the environment prior to European Settlement.

Reference Conditions

Research on the cliff zones is currently underway in many mountain ecosystems, but remains largely unknown for specifics to the Spring Mountains. Use of these areas is limited by the difficulties associated with accessing and developing these areas. Recreational rock climbing is probably responsible for some of the impacts to this zone, including the creation of use trails created by climbers approaching the cliffs, cliff-top damage to soils and tree roots, and soil compaction at the staging areas at the bottom of the crags.

A study compared climbed and unclimbed cliffs of the Niagara Escarpment in Ontario of clifftop, cliff-face, and lower staging areas. Preliminary results indicated a significant decrease in the abundance, richness and diversity of vascular plants, bryophytes, lichens, and land snails between climbed and unclimbed areas (McMillan and Larson 1999).

Rock climbing may also be a source of disturbance for cliff-nesting raptors. Climbing in close proximity to a nest site may disrupt foraging, nesting, and roosting behavior of the adult, which could in turn affect overall breeding success. Rock climbing may be a more substantial impact to nesting raptors than hikers in this zone because of the length of time spent in one place as opposed to merely passing by. Because few scientific studies exist that specifically relate to recreation disturbance and its impact on cliff-nesting raptors (and none have been found that relate to climbing) it is impossible to adequately address this impact.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the **Desert Mass-wasted Slopes Habitat**, characterizing it as occurring throughout the Spring Mountains NRA, but poorly documented. Elevation averaged 1,548 meters and ranged from 1,210 to 1,890 meters; aspects averaged 78 degrees and ranged from 25 to117 degrees; slopes averaged 48 degrees and ranged from 29 to 80 degrees. It is typically seral habitat with high levels of natural disturbance; transitional to a variety of less steep series, including mixed desert shrub at lower elevations, *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* and *Artemisia tridentata* series in its upper elevations, and *Pinus monophylla/Artemisia tridentata* series at the highest elevations; the steepest slopes were transitional to an unsampled desert clifflands type.

Parent materials were calcareous sandstone, limestone, or quartzite; landform types were commonly residual mountain clifflands, or occasionally residual mountain undissected slopes; plot positions were on upland slopes. Ground cover was comprised of 1 percent soil, 19 percent gravel, 64 percent rock fragments and bedrock, 7 percent litter, 1 percent wood, and 8 percent basal vegetation.

Prevalent vegetation was a sparse-shrubland dominated by woody and suffrutescent shrubs; comprised of no tree cover; 20 percent cover averaging 0.8 meter high, with 10 percent medium and 10 percent low cover; 3 percent graminoid cover averaging 0.25 meter, with 3 percent low and 1 percent ground cover; 3 percent forb cover averaging 0.3 m, with 1 percent medium,

3 percent low and 1 percent ground cover; no fern cover; and 1 percent bryophyte and lichen cover.

There are no consistently dominant plants. Common associates were *Aristida purpurea* var. *glauca*, *Brickellia atractyloides*, *Bromus rubens*, *Haplopappus linearifolius* var. *interior*, *Lepidium fremontii* var. *fremontii*, *Prunus fasciculata* var. *fasciculata*, *Sitanion hystrix*, and *Thamnosma montana*. Average number of taxa was 11 and ranged from 7 to 16. There were no known species of concern from this habitat. Noted natural disturbances were limited to mass-wasting and rare fire. Artificial disturbances included occasional wild horse and burro grazing and fire. *Agropyron desertorum* was rarely present and *Bromus madritensis* ssp. *rubens* commonly present as exotic plants. Apparent trend parameters had 9 indicating a stable or upward trend and 2 indicating a downward trend. Conservation status averaged good quality, good to excellent condition, excellent viability, and excellent defensibility. Average biodiversity rank was 3.7.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the **Montane Mass-wasted Slopes Habitat**, characterizing it as occurring throughout the Spring Mountains NRA. Elevation averaged 1,902 meters and ranged from 1,550 to 2,377 meters; aspects averaged 169 degrees and ranged from 0 to 352 degrees; slopes averaged 38 degrees and ranged from 16 to 90 degrees. A seral habitat with high levels of natural disturbance; transitional in lower elevations to the *Coleogyne ramosissima-Purshia mexicana* var. *stansburiana* and the *Artemisia tridentata* series; transitional in higher elevations to the *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* and probably the *Pinus flexilis-Abies concolor* series; transitional to the *Arctostaphylos pungens* series in heavily burned areas; steep slopes were adjacent to clifflands of the *Cercocarpus intricatus* series.

Parent materials were commonly quartzite, occasionally calcareous sandstone, or rarely limestone, conglomerate, or gravelly alluvium. Landform types were commonly residual mountains, clifflands, and dissected straight slopes, occasionally landslides, or rarely mass-wasted slopes, alluvial fan terraces, or colluvial basins. Plot positions were primarily on slopes or rarely narrow valleys.

Prevalent vegetation was a sparse-shrubland dominated by evergreen and deciduous shrubs; comprised of 5.5 percent tree cover averaging 1.3 meters high, with 0.4 percent tall, 5.4 percent medium cover; 23 percent shrub cover averaging 0.8 meter, with 17 percent medium and 5.9 percent low cover; 1.5 percent graminoid cover averaging 0.36 meter, with 2.4 percent low cover; 1.4 percent forb cover averaging 0.2 meter, with 1.3 percent low cover; no fern cover; and 2.3 percent bryophyte and lichen cover.

There were no consistently dominant plants. Common associates were *Artemisia ludoviciana*, *Artemisia tridentata*, *Ephedra viridis*, *Pinus monophylla*, *Poa fendleriana*, *Prunus fasciculata* var. *fasciculata*, and *Sitanion hystrix*. Average number of taxa was 12 and ranged from 6 to 16. Plant species of concern were *Eriogonum heermannii* var. *clokeyi* and *Penstemon fruticiformis* var. *amargosae*. There were no animal species of concern.

Natural disturbances included mass-wasting, occasional native animal grazing, wind erosion, colluvial deposition, and rare fire and water erosion. Artificial disturbances included rare fire. *Agropyron desertorum* was rarely present and *Bromus madritensis* ssp. *rubens* occasionally present as exotic plants. Apparent trend parameters had nine indicating a stable or upward trend and two indicating a downward trend. Conservation status averaged good quality,

excellent condition, excellent viability, and excellent defensibility. Average biodiversity rank was 3.5.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Cercocarpus intricatus* (Dwarf mountain mahogany) Series**. They characterized it from plots primarily on the eastern side, but in need of further study, especially at high elevations. Elevation averaged 2,354 meters and ranged from 1955 to 2,505 meters; aspects averaged 98 degrees and ranged from 10 to 206 degrees; slopes averaged 84 degrees and ranged from 70 to 94 degrees. This is a stable, long-lived series on bedrock, but seral on conglomerate and fractured quartzite cliffs; transitional on less steep slopes to desert mass-wasted slopes and montane mass-wasted slopes habitat where colluvium has accumulated; may occur adjacent to other types where colluvium is absent (e.g., riparian zones and arroyos).

Parent materials were commonly limestone, occasionally conglomerate, or rarely mixed rock type. Landform types were typically residual mountain clifflands, occasionally older alluvial surfaces, or rarely residual mountain undissected slopes. Plot positions were primarily on slopes (with lower slopes typically sampled), or rarely in narrow valley bottoms.

Soils were typically absent, although pockets of residuum had no A horizon, a moderate effervescence, and are about 13 percent sand and 4 percent rock fragments.

Prevalent vegetation was a sparse-dwarf-shrubland dominated by evergreen and deciduous shrubs and cespitose perennials; comprised of 0.1 percent tree cover averaging 0.04 meter high, with 0.1 percent low cover; 4.2 percent shrub cover averaging 0.4 meter, with 0.6 percent medium and 7.2 percent low cover; 0.6 percent graminoid cover averaging 0.12 meter, with 0.4 percent low and 0.1 percent ground cover; 2.6 percent forb cover averaging 0.1 meter, with 1.2 percent low and 1.9 percent ground cover; 0.2 percent fern cover, averaging <0.01 meter, with 0.2 percent ground cover; and 1.7 percent bryophyte and lichen cover.

The dominant plants were *Cercocarpus intricatus* and *Ivesia jaegeri*. Common associates were *Ephedra viridis, Jamesia americana* var. *rosea,* and *Petrophytum caespitosum*. Average number of taxa was 8 and ranged from 3 to 14. Plant species of concern included *Erigeron uncialis* var. *conjugans*, *Eriogonum heermannii* var. *clokeyi*, *Glossopetalon clokeyi*, and *Ivesia jaegeri*. There were 2 mammals of concern: *Myotis volans* and *Corynorhinus townsendii pallescens.*

Natural disturbances included frequent mass-wasting and rare water erosion. Artificial disturbances included occasional climbing. No exotic plants were present. Apparent trend parameters had six indicating a stable or upward trend and none indicating a downward trend. Conservation status averages good quality, good to excellent condition, excellent viability, and good to excellent defensibility. Average biodiversity rank was 5.0.

Impacts, Activities, and Features

Table 3-9 identifies the various activities and features that occur in steep slopes and cliff communities and presents the acreage, number, or mileage of overlap associated with each activity or feature, as derived by GIS from analysis of the SWReGAP maps.

Table 3-9 Activities and Features that Occur in Steep Slopes and Cliff Communities on the Spring Mountains NRA

Activity	Unit of Measure	Steep Slopes and Cliffs

Table 3-9 Activities and Features that Occur in Steep Slopes and Cliff Communities on the Spring Mountains NRA

Activity	Unit of Measure	Steep Slopes and Cliffs
Campgrounds	Acres	0
Picnic Areas	Acres	0
Concentrated Dispersed Use Areas	Acres	0.8
Ski Area Runs	Acres	0
Private Land	Acres	122
Fire Burns since 1953	Acres	1125
Designated Horses/Burros Area	Acres	3789
Firewood Cutting	Acres	18
Insect Damage (2003 and 2004)	Acres	84
Climbing Routes	Number	1
Trailheads	Number	0
Springs	Number	3
Invasive Species	Number	0
Mines/Caves	Number	4
Buildings	Number	0
Utilities	Miles	0.04
Paved Roads	Miles	8
Unpaved Roads	Miles	31
Open Motorized Trails	Miles	0
Closed Motorized	Miles	0.01
System Trails	Miles	0.5
Non - System Trail	Miles	0.4
Perennial Streams	Miles	0.2

Ecological System Types

Desert Mass-wasted Slopes Habitat

(= North American Warm Desert Bedrock Cliff and Outcrop Ecological System, rarely Mojave Mid-Elevation Mixed Desert Scrub Ecological System)

Montane Mass-wasted Slopes Habitat

(= Inter-Mountain Basins Cliff and Canyon Ecological System, rarely North American Warm Desert Bedrock Cliff and Outcrop Ecological System)

Cercocarpus intricatus Series

Cercocarpus intricatus/Ivesia jaegeri Association
(= Inter-Mountain Basins Cliff and Canyon Ecological System)
Jamesia americana/Petrophytum caespitosum-Ivesia jaegeri Association
(= Inter-Mountain Basins Cliff and Canyon Ecological System)

Table 3-10 provides a reference for comparison between the SWReGAP vegetation community type and the corresponding vegetation series within the Steep Slopes and Cliffs plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-10 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series within the Steep Slopes and Cliffs Plant Community Zone on the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
North American Warm Desert Bedrock Cliff and Outcrop	Desert Mass-wasted Slopes Habitat
	Montane Mass-wasted Slopes Habitat
	Dwarf Mountain Mahogany

INTER-MOUNTAIN BASINS CLIFF AND CANYON ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as being "found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included is vegetation of unstable scree and talus slopes that typically occurs below cliff faces. Widely scattered trees and shrubs may include *Abies concolor, Pinus edulis, Pinus flexilis, Pinus monophylla, Juniperus* spp., *Artemisia tridentata, Purshia tridentata, Cercocarpus ledifolius, Ephedra* spp., *Holodiscus discolor*, and other species often common in adjacent plant communities."

The Inter-Mountain Basins Cliff and Canyon Ecological System is mapping unit 17 on the Ecological Systems of the Spring Mountains NRA map. It comprises 2.58 percent of the surface area of the Spring Mountains NRA.[21] An additional 0.04 percent was mapped as transitional to other ecological systems.

NORTH AMERICAN WARM DESERT BEDROCK CLIFF AND OUTCROP ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as being "found from subalpine to foothill elevations and includes barren and sparsely vegetated landscapes (generally <10 % plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur below cliff faces. Species present are diverse and may include *Bursera microphylla, Fouquieria splendens, Nolina bigelovii, Opuntia bigelovii*, and other desert species, especially succulents. Lichens are predominant lifeforms in some areas. They may include a variety of desert shrublands less than 2 hectares (5 acres) in size from adjacent areas."

The North American Warm Desert Bedrock Cliff and Outcrop Ecological System is mapping unit 16 on the Ecological Systems of the Spring Mountains National Recreation Area map. It comprises 1.4 percent of the surface area of the Spring Mountains NRA. An additional 0.15 percent was mapped as transitional to other ecological systems.

[21] This measure does not reflect the area of total cliff-face.

3.1.6 Riparian and Springs Plant Community Zone

Current Conditions

The Riparian and Springs Zone is defined by the presence of moisture in drainages or at spring sources, resulting in high species diversity often dominated by deciduous trees, with more lush and dense vegetation growth. Since streams run through the mountains at all altitudes, riparian ecosystems form continuous strands that cross from the subalpine and montane forests into desert systems. Spring diversion, impoundment, and dredging directly affect these riparian habitats.

Reference Conditions

Spring and riparian areas have undergone major changes as a result of European settlement in the Spring Mountains NRA. These ecosystems contain a valuable and limited resource, water. As such, the introduction of exotic, large mammals, such as wild horses, burros, and elk, in addition to the impacts by humans, have decreased native plant and animal biodiversity, increased soil compaction, reduced soil/site productivity, altered water flow, and introduced exotic plant species. The effects of recreation on riparian areas and springs include removal or reduction of vegetation through trail proliferation and trampling, soil compaction from repeated use, and introduction of exotic species. Roads and trails lead directly to some sites increasing visitation to these areas.

Historically, low elevation riparian ecosystems were found along banks of washes and streams. They were narrow, transitional zones with distinct vegetation and soils. Trees and other vegetation helped to moderate intense winds and sunlight in this ecosystem. Soils were young and moist, with a high water table and poor drainage due to continuous changes in water flow (drought or flood) or erosion (Brady and Weil 2002). Low-elevation riparian zones likely offered a refuge to animals that live in adjacent desert ecosystems.

Since streams run through the mountains at all altitudes, riparian ecosystems form continuous strands that cross the subalpine and montane forests and woodlands. At their upper edges, drainages start at avalanche chutes, and then become lower elevation riparian ecosystems as they cut through water bearing geological substrates. Mountain riparian ecosystems are present along perennial and intermittent streams, as well as seeps and fens. Mesic shrubs are the most prevalent lifeform of plants in this ecosystem, although some riparian areas have high cover of trees or herbaceous vegetation. Subalpine wetlands supported the most diverse plant communities.

Meridith (1975) observed that Trough and Buck Springs in the Spring Mountains NRA were very poor big game habitat at the time. Meridith noted that the little forage that may exist there was rapidly devoured by the many cows in the area. Both of those springs were *Rosa woodsii* var. *ultramontana* dominated when studied 20 years later by Nachlinger and Reese (1996). Throughout the Wheeler Wash and Wheeler Pass area, competition with livestock and horses was very heavy at the time of Meridith's wildlife survey. Some areas, especially those near water sources, were trampled and over grazed. Meridith concluded that the most significant wildlife management problems were (in order of importance): 1) lack of palatable forage, 2) pinyon and juniper encroachment, 3) lack of perennial water sources, 4) interspecific competition (livestock versus wildlife), and 5) human disturbances, especially activity around water sources and OHV use.

Grazing and tapping spring sources are the most profound disturbances on springs within the Spring Mountains NRA. Grazing eliminates palatable forage and compact soils. Tapping reduces the water available to wetland vegetation and changes species composition over time to facultative and upland taxa. Manning and Padgett (1995) reported on the condition of riparian communities in Nevada's National Forests. They found, during their studies in the late 1980s, that many riparian ecosystems had been heavily impacted by various land uses, including livestock grazing, mining and recreation. Overgrazing indicators include *Poa pratensis*, *Taraxacum officinale*, and *Trifolium longipes*. They encountered few riparian ecosystems that we considered in good ecological condition. On the Spring Mountains NRA, they observed comparatively very dry conditions with riparian areas having likely been impacted by livestock, feral mules, and wild ungulates. They emphasized the importance of all spring and seep areas for thermal and hiding cover and conclude that all these areas should be protected from excessive use because of their scarcity and value to wildlife.

Exotic plant species establishment is exacerbated by anthropogenic factors that physically disrupt the soil surface (Brooks 1999). Of the 63 springs surveyed by Sada and Nachlinger (1998), 84 percent had at least one exotic plant species. They found on average each spring had 2 to 3 exotic plant species, with Red, Lone Grapevine, Kiup, Coal, Willow Creek, and Cold Creek springs having 8 or more. Research and monitoring of disturbance is ongoing, and has provided many useful management indicators. To combat these exotic species, the chemical treatment of tamarisk with Tardon at Younts and Santa Cruz springs in 2000 has been effective (Sada 2004).

Diversion of water sources by piping it away from their natural channels appears to have the greatest detrimental effect on native spring biota (Sada and Nachlinger 1998). Diversion may adversely affect various plant species of concern occurring in spring and riparian areas, and may also affect endemic butterflies and their habitats, including larval host plants, nectar sources, and mud resources. Diversion also reduces availability of water for bats. Bats require persistent, good quality, and accessible water sources, typically in proximity to hibernacula and maternity roosts (Ramsey 1997).

Fire in the surrounding forested ecosystems may have resulted in changes to vegetation cover and subsequently shading and temperature regimes in riparian areas. However, because riparian areas have characteristics that reduce the frequency and severity of fire relative to their surrounding uplands, the consequences of individual fires cannot be predicted. These characteristics include less steep slopes, surface water, saturated soils, shade, fewer lightning ignitions, cooler air temperatures, lower daily maximum temperatures, higher relative humidity, higher fuel moisture content, and lower wind speeds (Schlisky 2003).

Nachlinger & Reese (1996) provided 1994-95 reference conditions for the **Disturbed Spring Habitats**, characterizing it as occurring throughout the Spring Mountains NRA at lower elevations. Elevation averaged 1,773 meters and ranged from 1,285 to 2,065 meters; aspects averaged 205 degrees and ranged from 18 to 348 degrees; slopes averaged 12 degrees and ranged from 4 to 25 degrees. These typically disturbed habitats had significant cover of exotic vegetation, often early seral from water diversion and overgrazing; transitional on drier soils to various upland types of the Desert Shrublands and Low Conifer Woodland, Montane Shrubland and Chaparral Zones.

Parent materials were commonly quartzite or limestone, or rarely mixed sedimentary. Landform types were commonly rolling uplands with dissected, low relief, and dense drainage, occasionally residual mountain dissected straight slopes, or rarely alluvial fans or mountain

slopes with dipping layered rocks. Plot positions were common in narrow valley stream channels, occasionally on mid slopes, or rarely in wide valley stream channels or in moderate valley bottoms.

Prevalent vegetation was a shrubland dominated by various deciduous or evergreen shrubs; comprised of 0.5 percent tree cover averaging 1.2 meters high, with 0.5 percent tall, 0.2 percent medium and 0.1 percent low cover; 38.7 percent shrub cover averaging 1.1 meters, with 11.6 percent tall, 25.4 percent medium, and 2.8 percent low cover; 30.6 percent graminoid cover averaging 0.68 meters, with 12 percent medium, 12 percent low and 6.4 percent ground cover; 8.7 percent forb cover averaging 0.57 meters, with 5.1 percent medium and 3.2 percent low cover; no fern cover; and 0.8 percent bryophyte and lichen cover. Ground cover was comprised of 16 percent soil, 6 percent gravel, 6 percent rock fragments and bedrock, 24 percent litter, 1 percent wood, and 36 percent basal vegetation.

There were no plants that were consistently dominant throughout this habitat. Common associates were *Baccharis sergiloides* and *Elymus cinereus*. Average number of taxa was 11 and ranged from 2 to 22. There were no plant species of concern in this habitat. Animal species of concern were *Euphilotes ancilla purpura*, *Myotis volans,* and *Pyrgulopsis* sp.

Natural disturbances included rare colluvial deposition and native animal grazing. Artificial disturbances included frequent water diversion and source tapping, occasional wild horse and burro grazing and trampling, recreational use, and on-going and presumably historic cattle grazing. Exotic plants frequently occurred in the habitats and included *Agropyron desertorum, Agrostis semiverticillata, Bromus madritensis* ssp. *rubens, Centaurea repens, Cynodon dactylon, Festuca arundinacea, Marrubium vulgare, Medicago sativa, Plantago major, Poa pratensis, Polypogon monspeliensis, Rumex crispus, Tamarix ramosissima* and *Veronica anagallis-aquatica*. Apparent trend parameters had eight indicating a stable or upward trend and three indicating a downward trend. Conservation status averaged poor quality, poor condition, good viability, and fair defensibility. Average biodiversity rank was 2.9.

Nachlinger & Reese (1996) provided 1994-95 reference conditions for the ***Rosa woodsii* var. *ultramontana* (Wood wild rose) Series**, characterizing it as occurring throughout the Spring Mountains NRA in montane areas. Elevation averaged 2,140 meters and ranged from 1,740 to 2,560 meters; aspects averaged 162° and ranged from 10 to 353°; slopes averaged 7° and ranged from 1 to 24°. A mid to late seral series presumably due to grazing, water diversion, and high disturbance levels; transitional to disturbed springs habitats at low elevations and under higher artificial disturbance levels; transitional to the *Dodecatheon redolens-Aquilegia formosa* series at higher elevations under generally lower artificial disturbance levels; transitional along riparian borders to a variety of types within the Low Conifer Woodland, Montane Shrubland and Chaparral, such as the *Artemisia tridentata* series and the *Pinus monophylla-Juniperus osteosperma/Artemisia tridentata* association, and to types within the High Conifer Forest and Woodland Zones.

Parent materials were commonly limestone, occasionally silty alluvium, quartzite, or mixed alluvium, or rarely calcareous conglomerate or gravelly alluvium. Landform types were commonly residual mountain undissected convex slopes, rolling uplands of moderate or low relief or dissected uplands, or alluvial fans, floodplains, and undifferentiated alluvial or colluvial features. Plot positions were primarily in valleys, including wide valley stream channels and undifferentiated features, moderate valley floodplains and stream channels, or narrow valley stream bars, stream channels, and undifferentiated features, occasionally on mid slopes, or rarely on benches.

Prevalent vegetation was a shrubland, or occasionally a forest, woodland, or grassland, dominated by deciduous shrubs and trees; comprised of 10.7 percent tree cover averaging 3.0 meters high, with 6.9 percent tall, and 3.5 percent medium cover; 43.6 percent shrub cover averaging 1.6 meters, with 15.9 percent tall, 29 percent medium and 2.4 percent low cover; 14.8 percent graminoid cover averaging 0.4 meter, with 2.2 percent medium, 10 percent low, and 2.3 percent ground cover; 10.6 percent forb cover averaging 0.55 meter, with 3.1 percent medium, 6.4 percent low, and 1.4 percent ground cover; 0.05 percent fern cover, averaging 0.03 meter, with 0.05 percent medium cover and 0.05 percent low cover; and 2.1 percent bryophyte and lichen cover.

The dominant plant was *Rosa woodsii* var. *ultramontana*. *Salix lasiolepis* was sometimes locally dominant. Common associates were *Aquilegia formosa, Mimulus gutattus*, and *Ribes cereum*. Average number of taxa was 13 and ranged from 5 to 21. Plant species of concern included *Astragalus aequalis* and *Phacelia hastata* var. *charlestonensis*. Animal species of concern included *Chlosyne acastus robusta, Euphilotes ancilla purpura*, *Hesperia colorado mojavensis*, *Icaricia icarioides austinorum*, *Limenitis weidemeyerii nevadae*, *Myotis volans, Pyrgylopsis micrococcus,* and *Neotamias palmeri*.

Natural disturbances included common native animal grazing, common water erosion, occasional fire, rare gullying, and rarely noted but presumably common flash flooding. Artificial disturbances included frequent wild horse and burro grazing, occasional spring diversions and impoundment, fire, rare vehicle disturbance, logging, trampling, and historic cattle grazing. Exotic plants rarely to frequently occurred and included *Agropyron desertorum, Agropyron intermedium*, *Agrostis semiverticillata*, *Bromus inermis, Festuca pratensis*, *Lolium perenne*, *Marrubium vulgare*, *Medicago sativa*, *Melilotus officinalis, Poa pratensis*, *Rumex crispus*, *Taraxacum officinale*, and *Veronica anagallis-aquatica*. Apparent trend parameters have seven indicating a stable or upward trend and two indicating a downward trend. Conservation status is undetermined; needs additional study. Average biodiversity rank is 3.3.

Nachlinger and Reese (1996) provided 1994-95 reference conditions for the ***Dodecatheon redolens-Aquilegia formosa* (Shooting star-western columbine) Series**, characterizing it as limited to the eastern slopes and canyons, and highest elevations of the Spring Mountains NRA. Elevation averaged 2,587 meters and ranged from 2,015 to 3,160 meters; aspects averaged 142 degrees and ranged from 5 to 358 degrees; slopes averaged 18 degrees and ranged from 2 to 54 degrees. It consists of both seral and stable associations and habitats; transitional to various High Conifer and Woodland Zone types along the riparian interface, notably the *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* association; transitional to the *Rosa woodsii* var. *ultramontana* series at generally lower elevations where flash floods or grazing have disturbed the vegetation.

Parent materials were commonly limestone, occasionally silty alluvium, calcareous conglomerate, or mixed sedimentary, or rarely conglomerate or mixed rock type. Landform types were commonly residual mountain clifflands and dissected convex slopes, or occasionally moderate relief rolling uplands or alluvial flood plains and terraces; plot positions were primarily in valleys, including narrow valley levees and stream channels, and moderate valley flood plains and stream channels, or occasionally on mid slopes, or rarely on lower slopes or wide valley stream channels.

Prevalent vegetation was a forbland, or rarely a woodland, dominated by herbaceous perennials, and infrequently by conifers; comprised of 10.7 percent tree cover averaging 4.5 meters high, with 7 percent tall and 3.7 percent medium; 9.6 percent shrub cover averaging

1 meter, with 2.9 percent tall, 4.9 percent medium and 1.8 percent low cover; 17.8 percent graminoid cover averaging 0.45 meter, with 6.8 percent medium, 7.5 percent low and 4.3 percent ground cover; 48.6 percent forb cover averaging 0.44 meters, with 8.9 percent medium, 35.7 percent low and 4.2 percent ground cover; 0.4 percent fern cover, averaging 0.03 meters, with 0.1 percent low cover and 0.2 percent ground cover; and 10 percent bryophyte and lichen cover.

The dominant plants were *Aquilegia formosa* and *Dodecatheon redolens.* Common associates were *Carex aurea*, *Cirsium eatonii* var. *clokeyi*, and *Platanthera sparsiflora*. The average number of taxa was 13 and ranged from 7 to 26. Plant species of concern included: *Angelica scabrida*, *Antennaria soliceps, Botrychium crenulatum, Cirsium eatonii* var. *clokeyi, Draba jaegeri, Draba paucifructa, Haplopappus compactus, Physaria hitchcockii* var. *hitchcockii, Penstemon leiophyllus* var. *keckii, Phacelia hastata* var. *charlestonensis, Potentilla concinna, Synthris ranunculina,* and *Viola charlestonensis.* There were no animal species of concern.

Natural disturbances included common native animal grazing, rarely noted, but probably common water erosion and flash flooding, rare mass-wasting, windthrow, fire, avalanche, and colluvial deposition. Artificial disturbances included frequent recreational use, common spring source diversion and impoundment, occasional woodcutting, trampling, wild horse and burro grazing, rare litter, fire, and historic cattle grazing. Spring plots typically were in functioning-at-risk to functioning condition, rarely non-functioning condition.

Exotic plants infrequently occurred and included *Lolium perenne, Poa pratensis, Taraxacum officinale, and Veronica anagallis-aquatica*. Apparent trend parameters had eight indicating a stable or upward trend and one indicating a downward trend. Conservation status averaged good quality, good to excellent condition, excellent viability, and good defensibility. Average biodiversity rank was 5.2.

Impacts, Activities, and Features

Table 3-11 identifies the various activities and features that occur in riparian and spring communities on the Spring Mountains NRA and presents the acreage, number, or mileage of overlap associated with each activity or feature, as derived by GIS analysis of the SWReGAP maps.

Table 3-11 Activities and Features that Occur in Riparian and Spring Communities on the Spring Mountains NRA

Activity	Unit of Measure	Riparian and Springs
Campgrounds	Acres	0.1
Picnic Areas	Acres	1.5
Concentrated Dispersed Use Areas	Acres	0.8
Ski Area Runs	Acres	0
Private Land	Acres	50
Fire Burns since 1953	Acres	160
Designated Horses/Burros Area	Acres	366
Firewood Cutting	Acres	11
Insect Damage (2003 and 2004)	Acres	134
Climbing Routes	Number	0

Table 3-11 Activities and Features that Occur in Riparian and Spring Communities on the Spring Mountains NRA

Activity	Unit of Measure	Riparian and Springs
Trailheads	Number	0
Springs	Number	7
Invasive Species	Number	1
Mines/Caves	Number	0
Buildings	Number	14
Utilities	Miles	0
Paved Roads	Miles	6
Unpaved Roads	Miles	19
Open Motorized Trails	Miles	0.01
Closed Motorized	Miles	0.2
System Trails	Miles	0.01
Non - System Trail	Miles	0.5
Perennial Streams	Miles	0.6

Ecological System Types

Disturbed Spring Habitats

Tamarix ramosissima Association
(= North American Warm Desert Riparian Woodland and Shrubland Ecological System)
Baccharis sergiloides Association
(= North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System)
Salix exigua-Peraphyllum ramosissimum Habitat
(= Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System)
Artemisia tridentata/Elymus cinereus Association
(= Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System and Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System)

Rosa woodsii var. *ultramontana* Series

Betula occidentalis/Smilacina stellata Association
(= Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System)
Rosa woodsii var. *ultramontana* Association
(= Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System, rarely Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System)
Bromus inermis-Potentilla hippiana var. *diffusa* Association
(= Inter-Mountain Basins Semi-Desert Grassland Ecological System [mis-applied, sensu Southern Rocky Mountains Montane-Subalpine Grassland Ecological System])

Dodecatheon redolens-Aquilegia formosa Series

Aquilegia formosa-Smilacina stellata/Rosa woodsii var. *ultramontana* Association
(= North American Warm Desert Cienega Ecological System, Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System and Rocky Mountain Subalpine-Montane Fen Ecological System)
Dodecatheon redolens-Angelica kingii Association

(= Rocky Mountain Subalpine-Montane Fen Ecological System)
Juniperus scopulorum/Epilobium ciliatum Habitat
(= Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System)
Cirsium clokeyi/Juniperus communis var. *depressa* Association
(= Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System)

SWReGAP mapped one ecological system which is not considered here for the following reasons.

ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW

The small, semi-natural vegetation and highly disturbed nature of the few springs and riparian areas of the Spring Mountains NRA prevents their sensible classification. The species which are often used to define a particular alliance elsewhere in their range are typically absent or barely present in Spring Mountains NRA wetlands.

There are few low gradient/slope wetlands in the Spring Mountains NRA and even fewer which aren't fens. The fens are clearly best classified as the Mountain Subalpine-Montane Fen Ecological System. It is likely that any wetlands mapped as Rocky Mountain Alpine-Montane Wet Meadow by SWReGAP have been mapped in the Spring Mountains NRA Ecological Systems map as a diverse mix of ecological systems. These include Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System, Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System, North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System, and more often either the North American Warm Desert Cienega Ecological System, and the Rocky Mountain Subalpine-Montane Fen Ecological System. Without the benefit of 0.6 and 1m resolution imagery we used, it is highly unlikely that the 30m LANDSAT imagery used by SWReGAP could have properly classified any of the springs and narrow riparian wetlands on the Spring Mountains NRA. Most of those wetlands are small enough that a 30m LANDSAT pixel would extend into the adjacent upland vegetation. This confounded proper classification of that pixel into any vegetation type, or missed identifying a wetland, despite the ambitious minimum mapping unit specified as a SWReGAP standard.

Table 3-12 provides a reference for comparison between the SWReGAP vegetation community type and the corresponding vegetation series within the Riparian and Springs plant community zone from the Nachlinger and Reese (1996) vegetation classification system.

Table 3-12 SWReGAP Vegetation Community Types and the Corresponding Vegetation Series within the Riparian and Springs Plant Community Zone of the Spring Mountains NRA

SWReGAP Vegetation Types (Lowry et al. 2005)	Vegetation Series (Nachlinger and Reese 1996)
North American Warm Desert Wash	Disturbed Spring Habitat
North American Warm Desert Lower Montane Riparian Woodland and Shrubland	Wood Wild Rose Habitat
Rocky Mountain Alpine-Montane Wet Meadow	Scented Shooting Star/Western Columbine

These SWReGAP ecological systems are considered here.

NORTH AMERICAN WARM DESERT CIENEGA ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as occurring "at low elevations (<1,000 meters) across the warm deserts of western North America. "Cienegas" are freshwater spring-fed wetlands. The system also includes mid-elevation (1,000 to 2,000 meters) wetlands found in semi-desert grasslands and Madrean evergreen woodlands. Evaporation often creates saline conditions especially on the margins as evidenced by salt-tolerant species such as *Distichlis spicata* and *Sporobolus airoides*. Typically, low-elevation examples are too warm to accumulate a deep organic layer. The type of vegetation depends on depth of water. In shallow margins, emergent plants typical of riparian vegetation are present including species of *Carex, Juncus*, and *Schoenoplectus*. In adjacent deeper waters, emergent marsh can be characteristic."

The North American Warm Desert Cienega Ecological System is mapping unit 12 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.06 percent of the area of the Spring Mountains NRA. An additional 0.03 percent was mapped as transitional to other ecological systems.

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN SHRUBLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as "found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1,700 to 3,475 meters. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana, Betula nana, Betula occidentalis, Cornus sericea, Salix bebbiana, Salix boothii, Salix brachycarpa, Salix drummondiana, Salix eriocephala, Salix geyeriana, Salix monticola, Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems is of either conifer or aspen forests."

The Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System is mapping unit 19 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.61 percent of the area of the Spring Mountains NRA

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as being "comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1,500 and 3,300 meters (4,920 and 10,830 feet), farther north elevation ranges between 900 and 2,000 meters. This is

confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii, Picea pungens, Picea engelmannii X glauca, Populus tremuloides*, and *Juniperus scopulorum*. Other trees possibly present but not usually dominant include *Alnus incana, Abies concolor, Abies grandis, Pinus contorta, Populus angustifolia, Populus balsamifera ssp. trichocarpa*, and *Juniperus osteosperma*."

The Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System is mapping unit 20 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.02 percent of the area of the Spring Mountains NRA.

NORTH AMERICAN WARM DESERT LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as occurring "in mountain canyons and valleys of southern Arizona, New Mexico, and adjacent Mexico and consists of mid- to low-elevation (1,100 to 1,800 meters) riparian corridors along perennial and seasonally intermittent streams.[22] The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Populus angustifolia, Populus deltoides ssp. wislizeni, Populus fremontii, Platanus wrightii, Juglans major, Fraxinus velutina*, and *Sapindus saponaria*. Shrub dominants include *Salix exigua, Prunus* spp., *Alnus oblongifolia*, and *Baccharis salicifolia*. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction."

The North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System is mapping unit 21 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.17 percent of the area of the Spring Mountains NRA.

NORTH AMERICAN WARM DESERT RIPARIAN WOODLAND AND SHRUBLAND ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as "low-elevation (<1,200 meters) riparian corridors along medium to large perennial streams throughout canyons and the desert valleys of the southwestern United States and adjacent Mexico. The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Acer negundo, Fraxinus velutina, Populus fremontii, Salix gooddingii, Salix lasiolepis, Celtis laevigata var. reticulata*, and *Juglans major*. Shrub dominants include *Salix geyeriana, Shepherdia argentea*, and *Salix exigua*. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction."

[22] Despite the description which describes this from the Sonoran Desert, the occurrence map on NatureServe Explorer indicates Nevada as within the range of this Ecological System.

The North American Warm Desert Riparian Woodland and Shrubland Ecological System is mapping unit 22 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.05 percent of the area of the Spring Mountains NRA. An additional 0.06 percent was mapped as transitional to other ecological systems.

ROCKY MOUNTAIN SUBALPINE-MONTANE FEN ECOLOGICAL SYSTEM

NatureServe regionally defines this ecological system as occurring "infrequently throughout the Rocky Mountains from Colorado north into Canada. It is confined to specific environments defined by ground water discharge, soil chemistry, and peat accumulation of at least 40 cm. This system includes extreme rich fens and iron fens, both being quite rare. Fens form at low points in the landscape or near slopes where ground water intercepts the soil surface. Ground water inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time. Constant high water levels lead to accumulation of organic material. In addition to peat accumulation and perennially saturated soils, the extreme rich and iron fens have distinct soil and water chemistry, with high levels of one or more minerals such as calcium, magnesium, or iron. These fens usually occur as a mosaic of several plant associations dominated by *Carex aquatilis, Carex limosa, Carex lasiocarpa, Betula nana, Kobresia myosuroides, Kobresia simpliciuscula*, and *Trichophorum pumilum (= Scirpus pumilus)*. *Sphagnum* spp. (peatmoss) is indicative of iron fens. The surrounding landscape may be ringed with other wetland systems, e.g., riparian shrublands, or a variety of upland systems from grasslands to forests."

The Nachlinger and Reese (1996) *Bromus inermis-Potentilla hippiana* var. *diffusa* Association has a single Spring Mountains NRA occurrence in Lee Meadow (Lee Canyon). NatureServe places this within the Inter-Mountain Basins Semi-Desert Grassland Ecological System. It is a semi-natural type which had subtle wetland affinities in their TWINSPAN analysis. For purposes of mapping, it was placed in mapping unit 9, which is Inter-Mountain Basins Semi-Desert Grassland Ecological System [sensu Southern Rocky Mountain Montane-Subalpine Grassland Ecological System]. The best current fit in the U.S. National Vegetation Classification is a *Bromus inermis* Semi-natural Herbaceous Alliance, with a single included association of *Bromus inermis* Semi-natural Herbaceous Vegetation.

The Rocky Mountain Subalpine-Montane Fen Ecological System is mapping unit 25 on the Ecological Systems of the Spring Mountains NRA map. It comprises 0.08 percent of the area of the Spring Mountains NRA.

3.2 EXOTIC PLANTS

Exotic plants can affect rare species and their habitats. Exotic plants include non-native species, invasive species, and noxious weeds. Noxious weeds are limited on the Spring Mountains; however, invasive and non-native species have been introduced both intentionally and unintentionally. Not all non-native species are invasive. The most significant changes and impacts from invasive, non-native species have occurred in riparian areas including springs and low elevation habitats.

3.2.1 Reference Conditions

Clokey (1951) commented on the weed status as of 1935 when he first visited the Spring Mountains: "At the time of the early settlement of the surrounding valleys, three sawmills (long

since abandoned) supplied local needs. Because of their elevation, the ecological conditions surrounding these mills did not afford a favorable area for the establishment of such weeds as might otherwise have been introduced, so that the native flora has remained almost completely uncontaminated by foreign elements. It was clear, however, that this condition would not prevail for long. A few years before 1935, automobile roads had been built into the mountains, and the Forest Service had installed a playground on Deer Creek and laid out several hundred campsites. Increasing numbers of visitors would inevitably introduce weeds." Bair and Tiehm noted in the Introduction of A Flora of the Desert National Wildlife Range, Nevada (Ackerman 2003) that Clokey identified 48 introduced species in his Spring Mountains flora. However, those floras extended into elevations lower than the Spring Mountains NRA, as well as into lands presently in Red Rock Canyon NCA.

Nachlinger and Reese (1996) compiled a vascular plant checklist list for the Spring Mountains NRA. A total of 459 plant taxa were identified within or immediately adjacent to their 599 plots and validation points. Thirty-one exotic species were identified. They identified a number of taxa that were thought to be especially invasive. These included *Arundo donax* (giant reed), *Bromus madritensis* ssp. *rubens* (foxtail chess; red brome), *Bromus tectorum* (downy-chess; junegrass; cheatgrass; broncograss), and *Tamarix ramosissima* (salt cedar; tamarisk).

3.2.2 Current Occurrences

The Ecological Systems of the Spring Mountains map identifies three major areas of semi-natural and cultural vegetation, totaling 6.45 percent of the area of the Spring Mountains NRA. Mapping unit 0 mostly includes areas seeded to exotic *Agropyron cristatum* (crested wheatgrass), representing 0.74 percent of the Spring Mountains NRA. Mapping unit 1 are recently burned areas which can be expected to have a dominance of *Bromus madritensis* ssp. *rubens*. It encompasses 3.66 percent of the Spring Mountains NRA. Mapping unit 1.4 are areas where chaparral appears to be rapidly following a flush in growth of post-fire herbaceous species, including *Bromus madritensis* ssp. *rubens*. It encompasses 1.55 percent of the Spring Mountains NRA.

Glenne (2003) compiled a list of 120 non-native plants either in or with the potential to be in the Spring Mountains (including lower elevations outside of the Spring Mountains NRA in Red Rock Canyon NCA) with locations and personal comments on infestations in an unpublished report on file with US Fish and Wildlife Service and Spring Mountains NRA. Important species included: *Bromus madritensis* var. *rubens* and *Bromus tectorum* were both assessed as "so widespread it is impossible to control. *Lolium perenne* (perennial ryegrass) "covers large tracts of disturbed areas. Cold Creek fire was reseeded with this grass.[23] Probably covers thousands of acres making this plant impossible to control." *Tamarix ramosissima* "occurs in limited populations on Spring Mountains NRA…A high priority for control and inventory."[24]

Weed Sentry surveys in 2004, 2005, and 2006 recorded and mapped invasive species along roads, mainly *Bromus tectorum* along Lovell Wash Road and Wheeler Pass road in the Cold and Willow Creek areas and *Sisymbrium altissimum* (tumble-mustard) along the low desert roads in the Mt. Potosi area.

[23] Primarily Agropyron desertorum (crested wheatgrass) based on Nachlinger and Reese (1996) and Draper et al (2005) plot data.
[24] It had already been removed from Younts Spring by the date of the report.

Bromus diandrus (Ripgut brome) was found in numerous areas during the 2006 survey, including four trails, five roads, and three campgrounds. *Bromus tectorum* was also found in numerous areas during the 2006 survey including 11 roads, 9 trails; 2 springs; and 3 campgrounds.

Tamarisk ramosissima was the most important invasive species at a number of low elevation springs, and it was removed from these areas by the interagency Southern Nevada Restoration Team in early 2000 (Bruce Lund, pers. comm.)

Non-native species including *Agropyrum cristatum* (crested wheatgrass), *Melilotus alba* (Sweet white clover), and *Medicago sativa* (alfafa), have been sown for soil stabilization at the Las Vegas Ski and Snowboard Resort for at least a couple of decades. Concerns have been expressed (Smith 2001) that these would spread into adjacent natural habitats and impact sensitive species such as *Astragalus oophorus* var. *clokeyanus* (Clokey eggvetch); however this has not occurred.

Taraxacum officinale (dandelion) was absent from high elevation meadows in the late 1990s but started appearing in avalanche chutes and meadows in the late 1990s (Beyer 2003a). Handpulling and herbicides eradication efforts were initiated in 2003. However, treatments were halted in 2006 to monitor the area and assess whether this species is actually a threat to sensitive species and high elevation meadows or is only a nuisance that would not require annual expensive and difficult eradication efforts.

Ranunulus testiculatus (Bur buttercup) was recognized in 2005 in the Cold Creek area. In 2006, patches were GPSed and hand-pulling was done in outlying patches to attempt to slow its spread. A plan for more complete control efforts using herbicides is being planned for 2007.

Other species found in a limited number of sites during the 2006 Weed Sentry surveys include *Brassica tournefortii* (Sahara mustard), Descurania sophia (flixweed), *Hordeum murinum* (hare barley), *Malcomia africana* (African mustard), *Sisymbrium irio* (London rocket), *Sisymbrium orientale* (oriental mustard), *Acroptilon repens* (Russian knapweed), *Chorispora tenella* (blue mustard), *Verbascum thapsus* (mullein), *Tragopogon dubius* (yellow salsify), *Arundo donax* (giant reed), *Ranunculus testiculatus* (Bur buttercup), *Melilotus officinale* (yellow sweetclover), *Melilotus alba* (white sweetclover), *Marrubium vulgare* (horehound), *Salsola tragus* (Russian thistle), and *Ulmus pumila* (Siberian elm).

3.3 SURFACE WATER SOURCES

Surface water sources are critical wildlife habitat in the Spring Mountains NRA. These sources currently include tanks, springs, seeps, wells, and waterfalls. The following discussion summarizes current knowledge on sources which are known. Additional sources identified on the ecological systems map will require field verification and inventory.

3.3.1 Springs and Seeps

Springs and seeps are scattered throughout the Spring Mountains in both Clark and Nye counties, Nevada. Springs and seeps are important resources in this arid region since they frequently provide the only water available over wide expanses of desert. Most of the spring and seep locations within the Spring Mountains discharge at impermeable fault contacts or exposure to caverns in the limestone as a result of faulting or erosion. Discharge is primarily from perched or elevated water tables within the local aquifers (mountain-bedrock, alluvial apron, and valley-

fill). These springbrooks are characteristically short because the water quickly infiltrates the alluvium (Sada and Nachlinger 1996). It is believed that the seasonal precipitation from snow and thunderstorms provide the Spring Mountains' springs/aquifers with most of their water (Sada and Nachlinger 1996).

Most of the springs within the range have been developed for livestock and/or domestic use. Many have been excavated by machinery, or had diversion structures in place, including springboxes and pipes for water transport. Springs are also impacted by natural events, such as fires, avalanches, and floods.

Water sources in the Spring Mountains NRA

In 2006, water sources in the Spring Mountains NRA were compiled (SWCA2005a). Only the springs that are managed by the Forest Service are included in Table 3-13 below. The data includes 100 springs, 16 of which are unnamed and have no data identified. Therefore, only 83 named springs are included in Table 3-13. For each of the springs the following information is provided, when available: status (i.e., perennial/ephemeral, fenced/unfenced), disturbances, and recommendations. Recommendations were identified from this data, which included citations from USFS (2003), Johnson and Mandril (1999), Purser (2002), and RECON (2000), as well as reports by Sada and Nachlinger (1996, 1998) and the USFS Conservation Agreement (1998).

Status

There is a dearth of data for many of the water sources. This reflects the field research priorities of the last 12 years, which have focused on sources with higher biodiversity significance. The following statements summarize the status of the springs in the Spring Mountains:

- Eight springs have been identified as perennial. This was determined either by assumption (i.e., pyrgs/springsnails have been identified there) or the spring was identified as perennial by the data included in the above document.

- Springsnails have been documented at six springs. These include Horse Springs (#1 and #2), Kiup Spring, Horseshutem Springs (main spring and middle spring), Wood Canyon Spring, Cold Creek and Willow Creek (Sada 2002).

- Eleven springs within the Spring Mountains NRA have been fenced to exclude recreational activities that would compromise the sensitive and diverse riparian habitat.

Disturbance

According to Sada and Nachlinger (1998), the conditions of the springs within the Spring Mountains differ little from the conditions observed by Sada et al (1992) during their survey of approximately 500 springs in northern Nevada in 1991. Studies indicate that diversions, ungulate trampling, and recreation degrade spring systems and influence the biotic characteristics of these habitats. It has also been suggested that these elements may have a greater influence on spring biota than natural characteristics of landscape and habitats (Sada and Nachlinger 1998).

- There are 36 springs that are known to have been influenced by some type of disturbance.

- For example, 21 of the listed springs are known to have been disturbed by either ungulate use or recreational activities. Other springs have been affected by soil erosion from diversions and/or ungulates, or removal and treatment of salt cedar within the spring system.

Recommendations

In the current situation, most springs and spring-fed riparian and aquatic habitats in the Spring Mountains are degraded or not protected properly to avoid future degradation of the habitat. Conservation programs to protect spring habitats frequently require small amounts of land and comparatively minor changes in management (Sada and Nachlinger 1998). Since springs are most affected by two types of use (diversions and trampling) it is important that management strategies deal with and resolve these two issues, which would improve conditions at most springs.

Specific recommendations have been made for some of the springs within the Spring Mountains, and are listed below in Table 3-13. However, Sada and Nachlinger (1998) list some general recommendations that should be applied to the management of all springs:

- Manage springs and their riparian systems as wetlands. Use guidelines that are currently implemented to protect similar wetland systems, such as riparian zones. Good standards and guidelines for use of these biological systems are stated in the Toiyabe National Forest Land and Resource Management Plan.

- Springs and a portion of their springbrooks should always be protected from activities that decrease biodiversity and cause functional changes in aquatic and riparian communities. Modifications (i.e., diversions, recreation, and ungulate use) should not impact the natural character of a spring source and at least 50 meters of its uppermost springbrook. Greater lengths of large springbrooks (e.g., Willow Creek and Cold Creek) should be protected, possibly extending downstream for several hundred meters. For these springs, the length of the springbrook needing protection should be determined by surveys to identify areas with highest biodiversity.

- If diversion is necessary, all structures should be placed at least 50 meters downstream from the spring. Spring sources should be maintained in a natural condition. Environmental damage by springbox construction and operation can be minimized by collecting water from a dry well placed in the springbrook bed (at least 50 meters downstream from the source). Diversions should also be limited to only the amount of water needed for the intended use and at least 25 percent of a spring's total discharge should always remain in the springbrook. Unnecessary diversion should not occur; for instance, diversions should be limited to periods when water is needed at a specified destination. They should not continue throughout the year when diversion is unnecessary. All water should remain in a springbrook when not being used for other purposes.

- Management of ungulates and recreation within spring-fed riparian zones should follow standards and guidelines for these uses described in Forest and Management Plans. If disturbance cannot be managed without excluding use, exclosures should then be constructed and maintained to protect the spring, at least 50 meters of the springbrook, and an area extending at least 20 meters beyond the outermost limits of all riparian vegetation.

- Vegetation monitoring should be conducted to determine if existing uses are excessive and adversely impacting springs. This monitoring should follow Forest Service and BLM guidelines developed to determine livestock and recreation utilization that is compatible with maintaining healthy aquatic habitats and riparian zones.

- Eliminate exotic species from spring-fed riparian and aquatic habitats. Prioritize these programs so species that change the functional characteristics of riparian and aquatic communities are eradicated as soon as they are located. High-priority exotic species in the Spring Mountains include goldfish, salt cedar, and giant reed.

- Al1 water sources in the Spring Mountains should be surveyed to accumulate biotic and abiotic information and document current conditions. This information should be used to prioritize management programs beyond those described in the vulnerability assessment. Sites with rare species should be acquired and managed to protect these resources. Sites adjacent to federal or State lands should be given highest acquisition priority.

- Historical and current human use of desert springs indicates that the public recognizes these resources as unique environments. Continuation of this use provides an excellent forum for interpretive presentations to explain the historical and biological importance of springs. Interpretative programs should be developed to educate the public about springs and the effects of excessive resource utilization on their biota.

Table 3-13 Springs of the Spring Mountains NRA

Springs	Status		Disturbance	Recommendations
	Spring Type	Enclosure		
Aztec Tank	Unknown	Unknown	2004 wildfire	2002-2004 wildfires burned the existing vegetation at nine springs, seeps, and tanks. These water sources need an inventory of their present vegetation condition to see if revegetation efforts are needed to maintain wildlife values.
Big Falls	Unknown	Unknown	[d] In good condition	Unknown
Big Timber Spring	Ephemeral	Unfenced	[a] Highly disturbed by past livestock grazing	[e] Construct horse and burro exclusion fence, move existing headbox, trough, pipeline, and impoundment downstream
Bill Smith Springs	Ephemeral	Unknown	Horse grazing	Unknown
Bonanza	Unknown	Fenced	Unknown	Unknown
Bootleg Spring	Unknown	Unknown	Unknown	Unknown
Buck Spring	Perennial	[a] Fenced	Unknown	[a] Repair and expand horse exclusion fence, remove trough, headbox, and pipeline
Cane Spring	Unknown	Unknown	Unknown	Unknown
Carpenter Canyon 2	[xx] Perennial	Unknown	[h] Recreation	Unknown
Cave Spring	Unknown	Unfenced	[a] Road blocked. [i] Affected by floods and recreational use	[f] Post signage about sensitive species and habitat
Caybank Spring	Unknown	Unknown	Unknown	Unknown

Table 3-13 Springs of the Spring Mountains NRA

Springs	Status		Disturbance	Recommendations
	Spring Type	Enclosure		
CC Spring	Ephemeral	Unfenced	2002 wildfire	[f] Post signs about sensitive species and habitat. [a] Move diversion and rehabilitate riparian vegetation
Center Spring	Unknown	Unknown	Unknown	
Cougar Spring	Ephemeral	Unfenced	[e] Appears to be used by horses	[e] Construct exclusion fence, drywell, and pipeline and move impoundment downstream
Crystal Springs	Unknown	Unfenced	Horse and burro grazing	Unknown
E. Mud Spring	Unknown	[a] Fenced	[a] Soil unstable from diversions	[c] Repair ungulate exclusion fence, Remove headbox and pipeline
E. of Harris	Unknown	Unknown	Unknown	Unknown
E. of Horse	Unknown	Unknown	Unknown	Unknown
Edna Grey Spring	Unknown	[d] Fenced	Unknown	[d] Replace exclusion fence and remove invasion of Russian thistle
ENE. of Lost Cabin	Unknown	Unknown	2002 wildfire	
Fletcher Spring	Unknown	Unfenced	[a] Floods and high recreation	[a] Control hiker use and recreational horses
Gallon Tank Spring	Unknown	Unknown		
Gold Spring	[i] Perennial	Unfenced	[a] Spring is now dry. Ungulates use the area.	[e] Remove stocktank, headbox, and pipeline and construct fence
Goodwater Spring	Unknown	Unfenced	Unknown	Probably not extant due to GNIS identification error
Half Barrel	Unknown	Unknown	Unknown	Unknown
Hampton Spring	Unknown	Unknown	Unknown	Unknown
Horse Springs	[xx] Perennial	Unknown	Horse grazing	Complex of multiple sources and vegetation
Horseshutem Spring	[xx] Perennial	Unfenced	[a] Ungulate grazing	Unknown
Jaybird Spring	Ephemeral	Unfenced	Unknown	Excavated, now a seep
Kiup Spring	[xx] Perennial	[a] Fenced	[a] Slightly disturbed by ungulates (erosion)	[a] Maintain fence and monitor ungulate use and erosion outside of fence (i.e., just outside the NRA boundary)
Lee Spring	Unknown	Unknown	Unknown	Unknown
Lees Spring	Unknown	Unknown	Unknown	Unknown
Little Falls	Unknown	Unknown	[d] Garbage and trash, 2005 avalanche	[e] Remove headbox and pipeline, if still present
Lost Cabin Spring	Unknown	Unknown	[c] Road closed but not replanted, 2004 wildfire	[c] Obliterate road and reveg.[e] Mechanically reshape contour of channel
Lower Deer Creek Spring	Unknown	Unfenced	Horse grazing	Control horse population
Lower Wood Canyon	Unknown	Unknown	Unknown	Unknown
Macks Canyon	Perennial	[a] Some areas fenced	[a] Heavy recreational use by campers	[f] Post signage about sensitive species and habitat and extend exclusion

Table 3-13 Springs of the Spring Mountains NRA

Springs	Status		Disturbance	Recommendations
	Spring Type	Enclosure		
Mary Jane Falls	Perennial	Unfenced	[a] Floods or avalanches	Unknown
Mazie Spring	Unknown	Unknown	[d] Informal hiking trails run through riparian area	[d] Remove non-designated hiking trails and invasive dandelion
McFarland Spring	Unknown	[a] Fenced	[a] Ungulates	[f] Improve soil stability, construct drywell, and improve exclusion fence
Mexican Spring	Unknown	Unknown	[a] Ungulates and dredging, 2004 wildfire	[e] Discontinue dredging, construct exclusion, drywell, and pipeline
Middle Mud	Unknown	[a] Fenced	[a] Soil unstable from diversions, horse grazing	Unknown
Mountain Spring	Unknown	Unfenced	Unknown	Complex of multiple springs
Mud Hole Spring	Unknown	Unknown	Unknown	Unknown
Mud Springs	Unknown	[i] Fenced	[b] Ungulate trampling	[c] Remove headbox and pipeline. [a] maintain fence and rehabilitate soil
N. of Horse	Unknown	Unknown	Unknown	Unknown
Near Horse Spring	Unknown	Unknown	Unknown	Unknown
Ninety-nine Spring	Unknown	Unknown	[a] Ungulates, 2004 wildfire	[e] Discontinue dredging, construct exclusion, drywell, and pipeline
NNW. Of Lost Cabin	Unknown	Unknown	2004 wildfire	Unknown
Oak Spring	Unknown	Unknown	Unknown	Unknown
Pahrump Spring	Unknown	Unknown	Unknown	Unknown
Peak Spring	Unknown	Unknown	[i] Floods affect area during runoff	Unknown
Potosi Spring	Unknown	Unknown	Unknown	Unknown
Rainbow Spring	[i] Perennial	Unknown	[b] Comparatively good condition: OHV and equestrians	Unknown
Rock Spring	Perennial	Unfenced	[a] High use by ungulates	[a] Monitor ungulate use
Rosebud Spring	Dry	Unfenced	None	Quercus gambelli grove
Roses Spring	Unknown	Unknown	[a] Ungulates, 2004 wildfire	[a] Monitor ungulate use
S. of Horse	Unknown	Unknown	Unknown	Unknown
Santa Cruz Spring	Unknown	Unknown	[c] Removal of salt cedar, horse grazing	[e] Construct exclusion fence, drywell, and pipeline
Sawmill	Unknown	Unfenced	[a] Good condition, hiking present	[c] Post signage about sensitive species and habitat. [a] manage recreation
Scout Canyon Spring	Unknown	Unknown	Unknown	Unknown
Sheep Spring	Unknown	Unknown	[b] Generally good condition. Erosion vulnerability	Unknown
Sidehill Spring	Unknown	Unknown	Unknown	Unknown
South	Unknown	Unknown	Unknown	Source location ambiguous
Spring	Unknown	Unknown	Unknown	Unknown
Stanley B # 1	Unknown	Unfenced	[a] Good condition. Hiking trails present	Unknown
Stanley B # 2	Unknown	Unfenced	Unknown	Unknown

Table 3-13 Springs of the Spring Mountains NRA

Springs	Status		Disturbance	Recommendations
	Spring Type	Enclosure		
Stanley B # 3	Unknown	Unfenced	Unknown	Unknown
SW. SR160/BSA	Unknown	Unfenced	Unknown	Unknown
Three Springs	Unknown	Unfenced	[a] Affected by floods and avalanches	Unknown
Trough Spring	Unknown	[a] Poorly maintained fence	[a] Ungulates/Erosion	[f] Post signage about sensitive species and habitat. [a] Move diversion structure downstream 50 m and maintain exclusion fence
Trout Springs	Unknown	Unknown	Unknown	Unknown
Two Springs	Unknown	Unknown	Unknown	Unknown
Upper Wood Canyon	Unknown	Unknown	Horse grazing	Unknown
W. Mud Spring	Unknown	Unknown	Horse grazing	Unknown
W. of Horse	Unknown	Unknown	Unknown	Unknown
Whisky Spring	Unknown	Unknown	[a] Heavily used by hikers: trampled vegetation	[a] Eliminate or move diversion downstream. [d] Remove non-designated hiking trails and restore eroded stream bank
White Point Spring Narrows	Unknown	Unknown	Unknown	Unknown
Wild Rose Spring	Unknown	Unknown	Unknown	Unknown
Willow Creek Spring	[xx] Perennial	Fenced	[a] Heavy recreation, elimination of riparian vegetation and horse grazing	[a] Relocate camping areas and revegetate
Wood Canyon Spring	[xx] Perennial	Unknown	Horse grazing	Unknown
Wood Spring	Unknown	Unknown	[a] Hiking, 2004 wildfire	Unknown
Younts	Perennial	Unfenced	[c] Salt cedar removed. [e] Very disturbed	[e] Remove water impoundment

Key References and Sources:
[a]Sada and Nachlinger 1996
[b]Sada and Nachlinger 1998
[c]USFS 2003
[d]Johnson and Mandril 1999
[e]Purser 2002
[f]RECON 2000
[g]Sada 2002
[h]Conservation Agreement
[i]Springs Database
[xx]Assumed perennial because of the presence of pyrgs/springsnails

3.3.2 Guzzlers

Within the whole Spring Mountains Range, there are 34 guzzlers for both big and small game. The Nevada Department of Wildlife owns all but 2 of those 34 guzzlers. The remaining two are owned by BLM and the Forest Service. There are 10 guzzlers located within the Spring Mountains NRA (Table 3-14). Of those ten guzzlers, nine are owned by NDOW and the remaining one is owned by USFS. All of the NDOW guzzlers were built in 1988 and have been checked within recent years. Access is not easy and requires a 4-wheel-drive vehicle. The NDOW guzzlers were built for small game, while the one owned by the Forest Service is meant

for big game, such as elk. These guzzlers collect rainwater, which can be accessed year-round by wildlife and game birds, such as quail and chukar. Humans, as well as feral horses, can impact the guzzlers; therefore, maintenance activities include apron and/or gutter repairs at times.

Because construction of artificial water catchments is a relatively recent activity resulting primarily from human development and habitat fragmentation, the effects of water catchments on wildlife have not been well documented. However, studies have shown that bighorn sheep and mule deer populations have increased as a result of the development of water catchments (AGFD 2003).

Table 3-14 Guzzlers of the Spring Mountains NRA

ID	Owner	Built	Checked	Maintenance Activities
286	Forest Service			
1413	NDOW	1988	2003	Human impacts to site
1414	NDOW	1988	1990	
1415	NDOW	1988	2002	Needs repairs to apron and gutter
1416	NDOW	1988	2002	Rebuilt in March 2004
1417	NDOW	1988	2002	
1418	NDOW	1988	2002	
1420	NDOW	1988	2004	Impacted by feral horses
1422	NDOW	1988	2004	
1433	NDOW	1988	2002	Washed gutter

3.3.3 Additional Water Sources

There are twenty-one additional water sources/points located within the Spring Mountains NRA. These water sources include a well, water tanks, and waterfalls. There is only one well (Wheeler Well) in the Spring Mountains NRA. There are 14 unnamed water tanks located throughout the Spring Mountains Range whether or not they are functional or supply water available to wildlife is unknown. There are six waterfalls located in the Spring Mountains NRA: Big Falls, Little Falls, Mary Jane Falls, and three that are unnamed.

3.4 SOILS

The Spring Mountains NRA plays host to a wide range of soil types. As stated previously, an array of physical and environmental attributes play a role in the development of the vegetation communities. These same variables also influence soil development. The most important of these are surficial geology, landform, morphometry, and local climate (Winthers et al. 2005). In the Spring Mountains, elevations range from 1,150 meters (3,773 ft) to over 3,632 meters (11,913 ft) (Nachlinger and Reese 1996). Precipitation increases from 7 inches per year to over 23 inches per year corresponding to a decrease in temperature (SWCA 2005b). Soils reflect these changes in these physical and environmental attributes.

Soils in the arid lower elevations of the Spring Mountains, which are composed of primarily limestone, dolomite, and to a lesser extent, sandstone and quartzite parent materials, are

generally found on alluvial fans and fan remnants which have developed calcium carbonate and silica indurated hardpans (caliche) close to the soil surface. These older, dry soils do not have plant available water for more than 50% of the year. At higher elevations, slope, aspect, landform, and higher precipitation form younger soils and soils higher in organic content (SWCA 2005b).

The Natural Resources Conservation Service (NRCS) mapped the Spring Mountains as part of their Clark County Soil Survey. Table 3.15 lists the soils found on the Spring Mountains NRA as part of the Clark County Soil Survey, their acreage extent, and a brief description of their setting (NRCS 2006). Soils mapped in the Spring Mountains NRA as part of the Nye County Soil Survey are also included in this table (NRCS 2004).

Table 3-15 lists the soils found on the Spring Mountains NRA and provides the number of acres and a description for each association or complex (NRCS 2004, 2006).

Table 3-15 Soils Found on the Spring Mountains NRA Listed in Descending Order by Number of Acres Occurring

Soil Series	Acres	Description
Buckspring-Fletcherpeak-Seralin association	66,677	These soils consist of residuum weathered limestone and dolomite and are found on 15 to 75 % slopes on mountains. Its natural drainage is classified as well to somewhat excessively drained.
Mountmummy-Thesisters-Maryjane association	25,504	These soils consist of residuum weathered limestone and are found on 15 to 75 % slopes on mountains. Its natural drainage is classified as well to somewhat excessively drained.
Boxspring-Scrapy-Rock outcrop association	21,274	These soils consist of residuum weathered limestone and dolomite and are found on 30 to 75 % slopes on mountains. Its natural drainage is classified as well drained.
Maryjane-Robbersfire-Kitgram complex, 30 to 75 % slopes	15,064	These soils consist of residuum weathered limestone and dolomite and are found on 30 to 75 % slopes on mountains. It natural drainage is classified as well drained.
Moentria-Purob Association	14,978	These soils consist of residuum weathered sandstone, siltstone, and alluvium derived from limestone. It is found on 4 to 30 % slopes on mountains and fan remnants. Its natural drainage is classified as well drained.
Boxspring-Potosi-Rock outcrop association	14,334	These soils consist of residuum weathered limestone and dolomite and are found on 15 to 50 % slopes on mountains. Its natural drainage is classified as well drained.
Lastone association	13,122	These soils consist of residuum weathered sandstone and siltstone and are found on mountains slopes at 15 to 75 % slopes. Its natural drainage is classified as somewhat excessively drained.
Seralin-Traley-Rock outcrop association	11,910	These soils consist of residuum weathered limestone and dolomite and are found on 30 to 75 % slopes on mountains. Its natural drainage is classified as well drained.
Purob-Irongold association	11,452	These soils consist of residuum weathered limestone and are found on 2 to 8 % slopes on fan remnants and piedmonts. Its natural drainage is classified as well drained.
Purob extremely gravelly loam, 8 to 30 % slopes	10,875	These soils consist of residuum weathered limestone and are found on 8 to 30 % slopes on fan remnants and piedmonts. Its natural drainage is classified as well drained.
Goodwater-Doespring association, 15 to 50 % slopes	10,108	These soils consist of alluvium derived from limestone over fanglomerate and are found on 15 to 50 % slopes on ballenas, fan piedmonts, and rock piedmonts. Its natural drainage is classified as well to somewhat excessively drained.
Schader-Sed-Cruzspring association	9,374	These soils consist of colluvium and/or residuum weathered from quartzite and are found on 15-50 % slopes on mountains. Its natural drainage is classified as well drained.

Table 3-15 Soils Found on the Spring Mountains NRA Listed in Descending Order by Number of Acres Occurring

Soil Series	Acres	Description
Ladyofsnow-Robbersfire-Maryjane association	9,313	These soils consist of colluvium and alluvium derived from limestone and dolomite and are found on 15 to 75 % slopes on mountains. Its natural drainage is classified as well drained.
Mackscanyon very gravelly silt loam, 15 to 50 % slopes	8,148	These soils consist of alluvium derived from limestone and are found on 15 to 50 % slopes on fan remnants. Its natural drainage is classified as well drained.
Cruzspring-Schader-Rock outcrop association	7,907	These soils consist of colluvium and/or residuum weathered from quartzite and are found on 15 to 50 % slopes on mountains. Its natural drainage is classified as well drained.
Buckspring-Scrapy association	6,376	These soils consist of colluvium over residuum weathered limestone and alluvium derived from limestone and dolomite and are found on 15 to 50 % slopes on mountains and mountain slopes. Its natural drainage is classified as well drained.
Wheelerwell-Wheelerpass association	6,019	These soils consist of colluvium derived from quartzite over dolomite and colluvium and/or residuum weathered from quartzite. It is found on 15 to 75 % slopes on hills and mountains. Its natural drainage is classified as well to somewhat excessively drained.
Leecanyon-Goodwater association	5,507	These soils consist of alluvium derived from limestone and dolomite and are found on 4 to 15 % slopes on fan remnants and piedmonts as well as on ballenas. Its natural drainage is classified as well drained.
Purob extremely gravelly loam, 2 to 8 % slopes	4,592	These soils consist of alluvium derived from limestone and are found on 2 to 8 % slopes on fan remnants and piedmonts. Its natural drainage is classified as well drained.
Seralin extremely gravelly loam, 30 to 75 % slopes	4,565	These soils consist of colluvium and/or residuum weathered from limestone and dolomite and are found on 30 to 75 % slopes on mountains. Its natural drainage is classified as well drained.
Zibate-Rock outcrop complex, 15 to 50 % slopes	4,443	These soils consist of residuum weathered from volcanic rocks and are found on 15-50 % slopes on hills. Its natural drainage is classified as well drained.
Seralin-Devilsthumb-Ednagrey association	4,324	These soils consist of colluvium and/or residuum weathered from limestone, dolomite, and sandstone and are found on 30 to 75 % slopes on mountains. Its natural drainage is classified as well to somewhat excessively drained.
Potosi-Zeheme-Rock outcrop association	4,003	These soils consist of colluvium and/or residuum weathered from limestone and are found on 15 to 50 % slopes on mountains. Its natural drainage is classified as well drained.
Purob-Niavi association	2,847	These soils consist of alluvium derived from limestone, dolomite, and quartzite and are found on 2 to 50 % slopes on fan remnants and piedmonts as well as stream terraces. Its natural drainage is classified as well to somewhat excessively drained.
Boxspring-Zeheme-Rock outcrop association	2,760	These soils consist of colluvium and/or residuum weathered from limestone and dolomite and are found on 15 to 50 % slopes on mountains. Its natural drainage is classified as well drained.
Mackscanyon-Goodwater association	2,303	These soils consist of alluvium derived from limestone and are found on 8 to 15 % slopes on fan remnants and ballenas. Its natural drainage is classified as well drained.
Troughspring-Charkiln-Buckspring association	2,291	These soils consist of alluvium derived from limestone and quartzite as well as colluvium over residuum weathered from limestone and are found on 4 to 50 % slopes on mountains, mountains valleys, and fan remnants. Its natural drainage is classified as well drained.
Maryjane extremely gravelly loam, 8 to 30 % slopes	2,252	These soils consist of alluvium derived from limestone and are found on 8 to 30 % slopes on alluvial fans. Its natural drainage is classified as well drained.
Luckystrike gravelly loam, 8 to 30 % slopes	2,165	These soils consist of alluvium derived from limestone and are found on 8 to 30 % slopes on alluvial fans. Its natural drainage is classified as well drained.
Irongold extremely gravelly loam, 2 to 8 % slopes	2,088	These soils consist of alluvium derived from limestone and are found on 2 to 8 % slopes on fan remnants. Its natural drainage is classified as well drained.

Table 3-15 Soils Found on the Spring Mountains NRA Listed in Descending Order by Number of Acres Occurring

Soil Series	Acres	Description
Charkiln-Woodspring-Buckspring association	1,981	These soils consist of colluvium and/or residuum weathered from limestone as well as alluvium derived from limestone, dolomite and quartzite. It is found on 4 to 50 % slopes on fan remnants and mountains. Its natural drainage is classified as well drained.
Goodwater very gravelly sandy loam, 15 to 50 % slopes	1,847	These soils consist of alluvium derived from limestone and are found on 15 to 50 % slopes on ballenas and fan piedmonts. Its natural drainage is classified as well drained.
Mackscanyon-Purob association	1,818	These soils consist of alluvium derived from limestone and are found on 15 to 50 and 2 to 8 % slopes on fan remnants. Its natural drainage is classified as well drained.
Moentria extremely gravelly loam, 15 to 50 % slopes	1,806	These soils consist of colluvium and/or calcareous residuum weathered from sandstone and siltstone, and are found on 15 to 50 % slopes on mountains. Its natural drainage is classified as well drained.
Lamadre-Robbersfire association	1,602	These soils consist of colluvium and/or residuum weathered from limestone and dolomite and are found on 30 to 75 % slopes on mountains. Its natural drainage is classified as well drained.
Cruzspring-Rock outcrop complex, 15 to 50 % slopes	1,565	These soils consist of colluvium and/or residuum weathered from quartzite and are found on 15-50 % slopes on mountains. Its natural drainage is classified as well drained.
Irongold-Weiser association	1,171	These soils consist of alluvium derived from limestone and dolomite and are found on 2 to 15 % slopes on fan remnants and piedmonts. Its natural drainage is classified as well drained.
Kylecanyon-Goodwater association	1,018	These soils consist of alluvium derived from limestone and dolomite and are found on 4 to 15 % slopes on fan remnants and ballenas. Its natural drainage is classified as well drained.
Rubble land-Charpeak-Rock outcrop complex	909	These soils consist of colluvium and/or residuum weathered from limestone and are found on 15-50 % slopes on mountains. Its natural drainage is classified as well drained.
Lastchance-Ferrogold-Commski association	724	These soils consist of alluvium derived from limestone and dolomite and are found on 2-15 % slopes on fan remnants. Its natural drainage is classified as well drained.
Jonnic-Niavi association	574	These soils consist of alluvium derived from quartzite and mixed rock sources and are found on 2-8 % slopes on stream terraces and fan piedmonts and remnants. Its natural drainage is classifies as well drained to somewhat excessively drained.
Zeheme-Potosi-Rock outcrop association	406	These soils consist of colluvium residuum weather from limestone and are found on 15-50 % slopes on mountains. Its natural drainage is classified as well drained.
Troughspring very gravelly loam, 4 to 15 % slopes	277	These soils consist of alluvium derived from limestone and are found on 4-15 % slopes on fan remnants and fan piedmonts. Its natural drainage is classified as well drained.
Longjim-Yurm association	178	These soils consist of alluvium derived from limestone, dolomite, and mixed rocks and are found on 4-15 % slopes on fan piedmonts and fan remnants. Its natural drainage is classified as well drained to somewhat excessively drained.
Longjim-Purob-Niavi association	162	These soils consist of alluvium derived from limestone, dolomite, quartzite, and mixed rock sources and are found on 2-15 % slopes on fan piedmonts, fan remnants, and stream terraces. Its natural drainage is classified as well drained to somewhat excessively drained.
Tecopa-Zibate-Rock outcrop association	101	These soils consist of residuum weathered from mixed rocks over residuum weathered from mixed and volcanic rocks and are found on 15-50 % slopes on hills. Its natural drainage is classified as well drained.
Niavi-Jonnic association	70	These soils consist of alluvium derived from quartzite and mixed rock sources and are found on 2-8 % slopes on stream terraces and fan remnants and fan piedmonts. Its natural drainage is classified as well drained to somewhat excessively drained.

Table 3-15 Soils Found on the Spring Mountains NRA Listed in Descending Order by Number of Acres Occurring

Soil Series	Acres	Description
Canoto-Arizo complex, 2 to 4 % slopes	39	These soils consist of alluvium derived from mixed rock sources and are found on 2-4 % slopes on alluvial and inset fans. Its natural drainage is classified as well drained to excessively drained.
Longjim-Niavi association	26	These soils consist of alluvium derived from quartzite and mixed rock sources and are found on 2-15 % slopes on stream terraces and fan piedmonts and remnants. It natural drainage class is well drained to somewhat excessively drained.

3.5 FIRE

3.5.1 Reference Conditions

In 1910, the Forest Service began suppressing all fires on the Spring Mountains NRA because at that time fires were considered unfavorable. The occurrence of wildfire prior to 1954 is not well known. Some documentation began in 1924; however, data are likely incomplete prior to 1954. Old fire scars have been found in the developed canyons, and old stumps exist in other areas where there is no record of fire. In some areas, there are live pines with fire scars, which indicate that a low intensity fire passed through the area. Tree ring samples are needed in order to obtain a more thorough understanding of past fire occurrences in the Spring Mountains NRA. It is known that post-1954 many large fires have occurred, especially the 1981 fire in the northernmost part in the Cold Creek area (Jim Hurja, pers. comm. 2006) and on Bonanza Peak plus both sides of Wheeler Pass (Gary Reese, pers. comm.). Other areas included a late 1940s human caused wildfire in Trail Canyon, the 1982 “sky” burn in Lovell Canyon which reached Harris and Griffith Peaks, a 1923 fire at the present site of the Mount Charleston Hotel which extended up to Fletcher Peak, a fire at and north of Coal Spring, and fires in Wallace and Carpenter Canyons (Gary Reese, pers. comm.).

3.5.2 Current Conditions

There has been repeated burning in the same locations, as shown on the map of known fire occurrences (Figure 3-2). These areas are now dominated by shrubland or chaparral habitat. In the past, much of this was a pinyon-juniper community; however, pinyon-juniper seeds are often lost with catastrophic fires and it takes a long time for pinyon-juniper to reestablish. Shrub species take over because they are more fire-adapted. In dry years, shrub species are more susceptible to fire, making shrublands subject to repeated burning. One example is the Robber’s Fire, which recently burned a portion of the Spring Mountains NRA, converting a pinyon-juniper-mountain mahogany community to chaparral. This area, post-fire, became typically dryer and warmer, with less moisture in the soil (Jim Hurja, pers. comm. 2006).

When wildfires occur, pinyon-juniper communities are most affected. Past wildfires have caused pinyon-juniper communities to shift species composition, gradually becoming shrubland or chaparral communities. However, for other communities, such as ponderosa pine, periodic fires are important. A shift in vegetation species may occur in some of these areas that have not burned in a long time, such that shade-tolerant species may begin to dominate. For example, a ponderosa pine community, which needs sunlight, might transition to a white fir community, which needs more canopy cover. Heavier fuels build up in these shade-tolerant communities, increasing the risk of stand replacement fires (Jim Hurja, pers. comm. 2006).

3.6 ELK

3.6.1 Reference Conditions

Twenty-one elk (*Cervus elaphus*) were introduced into the Spring Mountains in 1935 and the population was augmented with releases in the 1980s. In 1964 the population size was estimated to be between 100 – 200 animals (Deacon et al. 1964). Elk in the Spring Mountains are now either descendants of those that were transplanted from Yellowstone National Park more than six decades ago, or a few generations removed from elk that were released in 1984 in Lovell Canyon, 20 miles southwest of Cold Creek. Elk typically utilize the herbaceous understory in forested, shrub, and grassland systems (Nowak 1991). Their vegetation use typically changes by season with grasses in the spring; forbs and wood species in the summer; and dry grasses, woody species, and conifers in the fall and winter.

In 1996, the elk population had 246 elk. This was when the current Forest Plan was written and management guidelines were set based on the then-current population size (Brad Hardenbrook, pers. comm. 2006).

3.6.2 Current Conditions

The elk population on the Spring Mountains NRA is currently managed for the number of elk that existed 10 years ago; however, numbers have been declining since that time. In recent years, three tags have been issued annually for hunting elk in hunt unit 262, the unit that includes the Spring Mountains. NDOW conducts fly-overs every other year to gather data on the elk population. While the elk are usually found near Cold Creek, McFarland Burn, or McFarland Spring, NDOW has observed some seasonal movement by elk. Antlers were found that had been shed from a bull elk in Lucky Strike Canyon (Brad Hardenbrook, pers. comm. 2006); sign is still seen occasionally in Lovell Canyon and sightings are reported from Trout Canyon (Karen Harville, pers. comm. 2007).

Elk, have declined from 243 in 1996 to 120 in 2006 after years of drought and additional pressures from human encroachment on their “safe-secure space” (Brad Hardenbrook, pers. comm. 2006).

Figure 3-2 Fire History Spring Mountains National Recreation Area

Figure 3-2 BACK

3.7 HORSES AND BURROS

3.7.1 Reference conditions

According to NDOW, wild horses in the Spring Mountains are the descendants of stock animals that were abandoned or escaped from ranches in the 1950s and 1960s (Brad Hardenbrook, pers. comm. 2006). In the past, Appropriate Management Level (AML) for wild horse and burro populations were based on available water, with 25 percent of water resources allocated to wild horses and burros (USFS 1996). Formal data prior to 2000 is not available to determine population numbers for the species, but the AML for each area would be considered to be the preferred number on the landscape. The AML was set in 1996 with the adoption of the GMP (1996). At that time the GMP stated that the current population size was determined to be 278 horses and 225 burros. In 1995, moderate to high levels of disturbance from wild horses and burros were documented at six springs surveyed in the Spring Mountains NRA (USFS 1998).

3.7.2 Current Conditions

The Spring Mountains Herd Management Area Complex (HMA) covers a total of 671,625 acres and includes both BLM and Forest Service land and is jointly managed by both agencies. There are 163,804 acres designated by the Forest Service as wild horse territories (WHT) on the Spring Mountains (BLM 2006), including Red Rock, Spring Mountains, and Johnnie. The Red Rock WHT is separated from the remainder of the HMA by either physical or geographical boundaries (BLM 2006). The remaining portions of the HMA have no physical or geographical boundaries to restrict movement, and are, therefore, managed as a complex.

The Red Rock territory (managed by the Forest Service) / management area (managed by BLM) is located at the southern end of the Red Rock Canyon NCA. The territory/management area known as Johnnie is located near Pahrump. The Forest Service Spring Mountains territory and the BLM Wheeler Pass management area are located near Cold Creek.

The AML for the jointly managed HMAs is still presently 147 wild horses and 146 burros. The AML represents the maximum number that can graze without damaging the range. Aerial census and distribution flights were completed in March 2004, December 2005, May 2006, October 2006, and December 2006. The December 2006 census data estimated the current horse and burro population within the HMA to be 374 horses and 900 burros, 2.54 and 6.16 times the AML for horses and burros (BLM 2006). The data that have been collected suggest that there is an annual population increase of 17 to 20 percent for wild horses and 20 percent for burros. The resource monitoring data for these herds indicates the current overpopulation of wild horses and burros is resulting in excessive utilization of key forage and browse species within the HMA. In 2007, wild horses and burros were gathered in the HMA to reduce the number of animals to the AML.

Table 3-16 AML and Population Summary for the Spring Mountains Complex

HMA/WHT	AML		Population Estimate	
	Horses	Burros	Horses	Burros
Red Rock	50	50	21	201
Johnnie	47	21	85	573
Wheeler / Spring Mountains	50	75	268	126
Total	147	146	374	900
BLM 2006				

Current management limits for wild horse and burro numbers are based on seven percent of available water and forage resources. This change in management reduces, but does not eliminate, the potential for overgrazing and soil compaction in some areas.

4.0 SPECIES ACCOUNTS

In Chapter 4, the following sections include individual species narratives for the 85 key species to be addressed as part of the landscape analysis for the Spring Mountains NRA. These narratives provide basic information that reflects the current state of knowledge on the distribution, ecology, and threats for each species using a consistent format, as described below.

In Chapter 5, the Landscape Assessment will evaluate the conservation status and trend of plant and animal species and ecological communities and systems utilizing NatureServe Conservation Status Factors, ENTRIX analytical approach, NNHP data and SWCA species summaries. From these resources, a list of measures has been developed that will be used as “indicators” for comparing how existing and reference conditions are meeting key conservation and management objectives. These key measures include:

- Species Characteristics (vulnerability, endemicity, specificity)
- Distribution and Numbers of species (occurrences, size, extent)
- Population Trends
- Threats

The information contained in Chapter 4 will be used for the synthesis of all species analyses in Chapter 5.

The following format will be used for all species descriptions:

Species

This identifies the common and scientific names of the taxonomic entity that is being addressed. The term “species” or “element” is often applied to that entity regardless of its taxonomic hierarchy as a subspecies or variety. A floristic checklist for plants found by Nachlinger and Reese (1996) on and near vegetation plots in the Spring Mountains NRA is given in Appendix B.

The current scientific and common names for all wildlife and plant species were confirmed using a combination of on-line sources (USDA, NRCS 2008; NatureServe 2007; ITIS 2008; Bisby et al. 2008). Taxonomic references and rationale to support the current scientific and common names are provided for each species within the on-line source utilized. For those species whose taxonomic uncertainty is currently or was recently in question, specific literature is provided in this chapter under the appropriate species account to document any changes.

Status Designations

This section identifies the special status designations that have been assigned to each species by the various state or federal resource management agencies, or special management commitments carried forward in planning and management documents such as the MSHCP (RECON 2000) or CA (USFS 1998), relative to the management of the species. Forest Service sensitive species or species of concern and interest status are designated by the Regional Forester of the Intermountain Region (USFS Region 4) as established in 1995 and amended in 2003 and again in 2006 to include 4 of the 8 endemic Spring Mountains NRA butterflies. The BLM designates species as sensitive at the state level; the list was last updated in 2003. Though BLM status has no direct application to Forest Service lands, it does reflect additional management responsibilities for those species on BLM lands adjacent to the Spring Mountains NRA (i.e., on the Red Rock Canyon NCA).

The NatureServe conservation status rank is provided for each species (XXX). This ranking follows standardized NatureServe methodology based on the relative rarity of the species. The ranking includes two components, the Global Rank (“G” rank) and the State Rank (“S” rank). The global rank addresses the rarity or abundance of a taxonomic entity across its full distribution, regardless of any political boundaries. The state rank addresses the rarity or abundance of a species only within the designated state. If an organism is only found in one state, the global and state ranking would be identical. The rankings are given on a scale of 1 to 5, with “1” being the rarest (those species with 5 or fewer documented occurrences) and “5” being assigned to those species that are demonstrably secure. Rankings for subspecies or varieties are identified as part of the global ranks and are referred to as the “T” rank. The “G” rank is applied to the species overall, and the “T” rank applies only to the lower taxonomic unit. When the global rank is listed with a “Q,” it reflects that there is some uncertainty with the taxonomic validity of that element.

Range-wide Distribution

This section provides information regarding the species’ geographic distribution throughout its range, describing generally where it is located outside of the Spring Mountains NRA. Increasingly more information is often provided at the state, regional, and county level. This information is to provide a perspective on the relative importance of the Spring Mountains NRA to the management and conservation of the species overall.

Distribution in the Spring Mountains NRA

Specific information on the species’ distribution is provided. This may include a listing of individual sites or a general description of its occurrence in the Spring Mountains NRA. Occasionally, reference is made to the species on adjacent lands when it appears to be relevant to management on the Spring Mountains NRA.

A distinction is made regarding the site specificity of the occurrence data. Some occurrence records are based on the reporting of the species in a general area, as is often the case for older records. However, for occurrence records to be used in the GIS analysis, they must reflect

a high level of precision in the mapping of the site. Occurrence records are based on either a point location or a mapped polygon that circumscribes the aerial extent of the habitat as occupied by the species (polygons are only available for certain species of plants). Using GIS-mapped sites and polygons, an overview map is provided of the species' distribution in the Spring Mountains NRA followed by more detailed mapping of each occurrence record for the species (at a scale not less resolved than 1:50,000). The NNHP provided most of the species occurrence data; however, additional data was included from a variety of recent species survey reports. The elevation range provided for each species is derived from the mapped occurrences with a resolution of 25 feet (8 meters).

Habitat

A description of the species' habitat is provided. This is generally focused on habitat types that occur, but may reference suitable habitat range-wide, within Nevada, or in Clark County depending on the type of information that is available.

Measures

This section identifies the type of information that will be used to establish the status, trend, and management recommendations for a species. Polygons translate into acres of occupied habitat; no aerial extent has been assigned to sites. The number of sites is often used to express abundance. However, to apply some level of consistency in tallying the number of sites over time (e.g., avoid double counting or undercounting sites) NNHP methodology is used to define an element occurrence (EO). For botanical species, element occurrence records meet specific criteria based on the separation distance between sites. If two sites are within the specified distance they are tallied as one EO. For most plants, the required site-separation distance is 1 kilometer. As new occurrence information is obtained, what was once two EOs spaced 1.5 kilometers apart would be tallied as one EO if a new occurrence of that species is discovered between the previous two known sites, (i.e., what would now be three sites is tallied as one EO). It is important to note that with the addition of information on known site occurrences there may be a reduction in the number of tallied EOs. To help account for this situation in the landscape analysis, the total number of sites is also reported with the number of EOs.

Reference Status in the Spring Mountains NRA as of 1998 or Earlier

The year 1998 was chosen as the cut-off for reference status because that was the date in which the Forest Service entered into a conservation agreement with the USFWS and the State regarding the management of certain species in the Spring Mountains NRA. Therefore, 1998 establishes the "baseline status" for most of the species. This section attempts to provide information that is available on the historic status (e.g., distribution and abundance of the species and the quality of its habitat) of a species prior to 1998. Site-specific information is often very limited. By analyzing the GIS occurrence data by date, a tally of sites and element occurrence records documented prior to 1998 are provided using the same standards as those established in the *Measures* section.

Current Status in the Spring Mountains NRA

This section provides information on the results of recent surveys and other new data accumulated since 1998 to fall, 2006. Trend in status (e.g., stable, increasing, declining) is identified when possible. In some cases a species' range-wide and/or regional trend information is discussed. The current tally of the various identified measures (i.e., sites, polygons, acres, and EOs) for each species is provided, comparing measures from the current status to the

reference status may reflect actual changes in a species status (i.e., abundance and distribution) or more often reflects the status of information on that species (e.g., more surveys have been conducted recently providing more data but the species' status has not changed.

Threats

This section discusses known threats, if available, plus any known or suspected threats within Clark County or range-wide that is applicable to the Spring Mountains NRA. Impacts and losses that have occurred are reported. Using the GIS mapped species occurrence information, the known locations of a species is compared to the mapped locations of existing human uses in the Spring Mountains NRA. The number of sites, polygons, and polygon acres for a species that overlap with a particular human use is reported. Note: an overlapping species occurrence and human activity does not necessarily reflect an impact to the species.

Level of Analysis

Based on the type and extent of information presented in the species account, a determination is made regarding how that species will subsequently be evaluated in the landscape analysis. Where only general information is available on the status (e.g., distribution, abundance, and trends) of a species on the Spring Mountains NRA, a "descriptive" evaluation will be completed to describe the potential presence of the species based on general habitat as described in the literature, and other regional distribution information. For species that have limited site-specific data that are based only on incidental sightings and casual surveys, a qualitative site-based analysis will be conducted. A site analysis includes the identification of potential management conflicts at species occurrence sites. A quantitative habitat-based evaluation will be completed for those species where sufficient information is available to reflect accurately the known and suspected distribution of the species through the development of a GIS-derived map of predicted potentially suitable habitat throughout the Spring Mountains NRA.

4.1 MAMMALS

4.1.1 Western Small-footed Myotis (*Myotis ciliolabrum*)

Status Designations

The western small-footed myotis (*Myotis ciliolabrum =M. subulatus melanorhinus*; *M. subulatus subulatus*) is designated in the CA (USFS 1998) as a species of greatest management concern, and as a medium priority evaluation species in the MSHCP (RECON 2000). It is a BLM Nevada sensitive species (BLM 2003) and has a NatureServe conservation status rank of G5 S3 (NatureServe 2007).

Range-wide Distribution

The western small-footed myotis is found in western North America from southern Canada south into central Mexico (NatureServe 2007). This species is located throughout the western United States east to western North and South Dakota and south to western Texas. It occurs throughout Nevada (Bradley et al. 2006). Range-wide the western small-footed myotis is found over an elevation range of 975–10,825 feet (300–3,300 meters) (Holloway and Barclay 2001).

Distribution in the Spring Mountains NRA

Multiple surveys for bat species conducted since 1996 recorded this species throughout the range, from the extreme northwest (e.g., north and west of Mt. Stirling) to as far south ending at Mt. Potosi, and on both the west (e.g., Carpenter Canyon and Wheeler Pass area) and east

slopes (e.g., Cold Creek area, Lee Canyon, Kyle Canyon and southeast from there) of the Spring Mountains (SWCA 2005a; extrapolated from maps). It was netted at Big Timber Springs and Wheeler Well in the north; Deer Creek picnic area and Middle Mud Springs in the eastside; and CC Springs at Lovell Canyon in the south part of the range (Ramsey 1997; O'Farrell 2002a, b; all other recent detections are acoustical). Locations of known occurrences all occur between 4,976 and 9,594 feet (1,516 and 2,924 meters) elevation (Figure 4-1).

Habitat

The western small-footed myotis generally inhabits arid and semi-arid habitats (Holloway and Barclay 2001) such as desert scrub, sagebrush steppe, blackbrush, greasewood, and pinyon-juniper woodlands (Bradley et al. 2006), though it is also found in coniferous (pine and fir) forest areas (Hiatt and Boone 2004). This pattern is noted in the Spring Mountains, where all detections as noted above ranged from high elevation chaparral, to Ponderosa pine, and pinyon-juniper.

The species primarily roosts in rock crevices, caves, and mines, though it will also roost under tree bark, in buildings, and under bridges. They hibernate throughout most of their summer range (Holloway and Barclay 2001). Important ecological factors are caves, mines, and rock crevices that provide roost sites, especially for winter hibernacula, as well as standing snags and hollow trees used as roosts (Ramsey 1997; Bradley et al. 2006; NatureServe 2007), and open water for foraging (Holloway and Barclay 2001).

Life History

The western small-footed myotis is a year-round resident in the Spring Mountains NRA (Bradley et al. 2006), although most detections have occurred in the summer months. Females give birth to one young per year from May to July (Bradley et al. 2006) and may be solitary or roost in small groups, with an average of about 4 reproductive females, though groups of 19 or more have been recorded (Holloway and Barclay 2001). Adult males do not roost with nursing females though they may use the same foraging areas (Holloway and Barclay 2001). Individuals of both sexes usually hibernate solitarily in caves, mines, and rock crevices (Holloway and Barclay 2001). This bat has a slow, maneuverable flight, foraging for aerial insects from 1 meter above ground to treetop height (Holloway and Barclay 2001), often along cliffs and rocky slopes, such as talus, scree, and bare rock (NatureServe 2007), in open areas (Bradley et al. 2006), and along water courses and over water (Holloway and Barclay 2001).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites.

Figure 4-1 Western Small-footed Myotis Species Distribution

Figure 4-1 BACK

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The first record was at Potosi Mountain in 1939 or 1940 (SWCA 2005a). The general distribution of the western small-footed myotis prior to 1999 is thought to be similar to its current range. Prior to 1999, it was known to occur at Mount Potosi (a roost site), Deer Creek, and Wheeler Well (SWCA 2005a). In the Spring Mountains NRA, the western small-footed myotis most likely relied on caves, crevices, and tree snags for roosting sites prior to 1900. The addition of mines and buildings as European settlers entered the area may have increased potential roost sites (SWCA 2005a). Spring diversions may have altered potential foraging sites; and loss of large trees and snags to timber harvest may have reduced some potential roost sites. Based on available, data there are 5 sites documented prior to 1998, which were observations of bats foraging, flying through the area, or data describing the type of use was not available.

Current Conditions in the Spring Mountains NRA

The status is presumed stable (SWCA 2005a) though no hibernacula or maternity roost sites are known on the Spring Mountains NRA. In a 2002 survey, the western small-footed myotis was detected at all sampled locations and was a dominant species at all but 2 locations, showing a widespread distribution (O'Farrell 2002a). Similarly, in surveys conducted from spring 2004 through January 2006, this species was dominant at most of the locations sampled (O'Farrell 2006).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 53 sites where the western small-footed myotis have been detected in the Spring Mountains NRA. Of these 53 sites, one is a reported roost location at Potosi Mine that has not been re-verified for over 40 years, and 52 are observations as the bat was foraging, flying through the area, or data describing the type of use was not available (Ramsey 1996, 1997; Sherwin 2005; SWCA 2005a; O'Farrell 2002a, 2002b, 2006).

Threats

Potential threats to the western small-footed myotis in the Spring Mountains NRA include disturbance at potential hibernacula and breeding colony sites by spelunking and rock climbing, projects that remove large trees or snags, and spring diversions resulting in a reduction of water sources (SWCA 2005a; NatureServe 2007).

Based on mapping as of 2006 of western small-footed myotis occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-1. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-1 Estimated Overlap Between Western Small-Footed Myotis and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	3
Designated Horses/Burros Area	3
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	3
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	10
Fires 1971-1988	1
Fires 1989-2005	3
Invasive Species	2
Motorized Trails (closed)	1
Private Land	4
System Trail (high mileage)	1
Roads (paved)	1
Roads (unpaved)	4
Wildland Urban Interface	6

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the western small-footed myotis as part of the landscape analysis.

4.1.2 Long-eared Myotis (*Myotis evotis*)

Status Designations

The long-eared myotis (*Myotis evotis*) is designated in the CA (USFS 1998) as a species of greatest management concern, and as a covered species in the MSHCP (RECON 2000). It is a BLM Nevada sensitive species (BLM 2003) and has an NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The long-eared myotis is found in western North America from southwestern Canada south through the western United States to Baja California, though they are not present in the southwest deserts (Manning and Jones 1989; NatureServe 2007). It is found throughout Nevada where it is more common in the northern half of the state (Bradley et al. 2006). Range-wide the long-eared myotis is found over an elevation range from sea level to 9,300 feet (sea level to 2,830 meters) (Manning and Jones 1989).

Distribution in the Spring Mountains NRA

Multiple surveys of bat species since 1996 indicate that this species is found across the Spring Mountains NRA, from the extreme northwestern part (north and west of Mt. Stirling) to as far south as Mt. Potosi. The species is also found on both the west (e.g., Carpenter Canyon and Wheeler Pass area) and east slopes of the Spring Mountains (e.g., Cold Creek area, Lee

Canyon, Kyle Canyon and southeast from there) (SWCA 2005a; extrapolated from maps). The species was netted in 1997 and 2002 (Ramsey 1997; O'Farrell 2002a, b) at water sources throughout the Spring Mountains NRA and was found to be common at most sites both on the west and east sides of the Spring Mountains range from north to south. All other recent detections are acoustical. See Figure 4-2 for locations of known occurrences of this species, all of which occur between 5,395 and 9,594 feet (1,644 and 2,924 meters) elevation.

Habitat

It is found primarily at higher elevations within coniferous forest (Bradley et al. 2006). The long-eared myotis is associated with mines, caves, springs, and streams (USFS 2003; Clark County 2006). In Clark County and the Spring Mountains NRA, this species primarily occurs in mixed conifer, pinyon-juniper, and sagebrush habitats (Hiatt and Boone 2004; Clark County 2006), especially those areas with broken rock outcrops (NatureServe 2007). Day roosts include buildings, snags, hollow trees, mines, caves, crevices, and underneath bark; night roosts are usually caves, mines, or under bridges (Hiatt and Boone 2004; Clark County 2006). Maternity colonies are formed in trees and rock outcrops (O'Farrell 2006), in buildings, or under bridges (Ramsey 1997). Important ecological factors for the long-eared myotis include standing snags, hollow trees, caves, and mines for roosting, and open water for foraging (NatureServe 2007).

Life History

The long-eared myotis forms small to moderate-sized maternity colonies (O'Farrell 2006). One young per year is born June to July (Bradley et al. 2006). Males roost singly or in small groups, occasionally at the same site as a maternity colony but roosting apart from it (Manning and Jones 1989). This species is insectivorous, often picking their prey from foliage, trees, rocks, or the ground while hovering (Manning and Jones 1989). Moths and small beetles are preferred as prey, and which are captured as the bat forages over water or in forested areas (Bradley et al. 2002; Hiatt and Boone 2004; Clark County 2006).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded in Clark Canyon during June of 1929 (SWCA 2005a). The general distribution of this bat prior to 1999 is thought to be similar to its current range (SWCA 2005a). The long-eared myotis most likely relied on caves, crevices, and snags for roosting sites prior to European settlement (SWCA 2005a). The addition of mines and buildings to the Spring Mountains, with the arrival of European settlers, may have increased potential roost sites for this species (SWCA 2005a); spring diversions may have altered potential foraging sites.

Current Conditions in the Spring Mountains NRA

The status of the long-eared myotis in the Spring Mountains NRA appears to be secure, though caution may be warranted due to reported regional population declines (see below). Populations of the long-eared myotis are thought to be stable throughout its range, including in Nevada (NatureServe 2007); though its status in Nevada is not well understood (Bradley et al. 2006). It has been reported that this species is uncommon almost everywhere in Nevada and that severe population declines have occurred in the Spring Mountains (Bradley et al. 2006). This species was found to be an important contributor to total bat activity (i.e., high numbers at most sites) at

higher elevation sites (O'Farrell 2002a, 2006). Known maternity roosts are located at the Deer Creek Picnic Area and Wheeler Well (Ramsey 1997).

The combined available data sources as of 2006 indicate that there are currently 56 sites where the long-eared myotis has been documented in the Spring Mountains NRA. Of these 56 sites, 8 are roosts (including 2 maternity roosts) and 48 are observations as the bat was foraging, flying through the area, or data describing the type of use was not available (Ramsey 1997; Sherwin 2005; O'Farrell 2002b, 2006).

Threats

Potential threats to the long-eared myotis may include disturbance to roosts by spelunking and rock climbing; bridge replacement; and loss of roosts due to mine closures, building demolition, and projects that remove large trees or snags (RECON 2000; Clark County 2006). Additional threats to habitat include degradation of springs due to diversions, modifications, or reductions of flows from ground water pumping resulting in a reduction of foraging sites and access to water (Clark County 2006).

Based on mapping as of 2006 of long-eared myotis occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-2. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-2 Estimated Overlap Between Long-Eared Myotis and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites
Caves/tunnels	1
Concentrated Use Areas	4
Designated Horses/Burros Area	4
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	3
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	11
Fires 1971-1988	1
Fires 1989-2005	5
Firewood Gathering	2
Invasive Species	2
Motorized Trails (closed)	1
Motorized Trails (open)	1
Private Land	3
System Trail (high mileage)	1
System Trail (low mileage)	1
Roads (paved)	2
Roads (unpaved)	2
Wildland Urban Interface	6

Figure 4-2 Long-eared Myotis Species Distribution

Figure 4-2 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the long-eared myotis as part of the landscape analysis.

4.1.3 Fringed Myotis (*Myotis thysanodes*)

Status Designations

The fringed myotis (*Myotis thysanodes*) is listed in the CA (USFS 1998) as a species of greatest management concern, is designated as a medium priority evaluation species in the MSHCP (RECON 2000), and is a BLM Nevada sensitive species (BLM 2003). The fringed myotis is state protected in Nevada (Bradley et al. 2006) and has a NatureServe conservation status rank of G4G5 S2 (NatureServe 2007).

Range-wide Distribution

The fringed myotis is distributed in western North America from south-central British Columbia south through the western United States to southern Mexico (NatureServe 2007). Range-wide, this species is primarily found at an elevation range of approximately 3,925–6,900 feet (1,200–2,100 meters) but has been recorded at approximately 9,350 feet (2,850 meters) in New Mexico (O'Farrell and Studier 1980).

Distribution in the Spring Mountains NRA

Multiple surveys of bat species since 1996 record this species throughout the Spring Mountains NRA in limited numbers. Isolated foraging occurrences have been documented (Ramsey 1997; USFS 2003; O'Farrell 2002a, 2002b, 2006). The species was netted by Ramsey (1997) on the west side of the Spring Mountains in transitional habitat (pinyon-juniper/ponderosa pine); all other detections are acoustic. See Figure 4-3 for locations of known occurrences of this species, all of which occur between 5,395 and 8,565 feet (1,644 and 2,611 meters) elevation.***

Habitat

In Clark County, the fringed myotis occupies an elevation range of approximately 4,000 to 7,000 feet (1,200–2,100 meters) but can occur at the lower elevations during spring and fall migration (Hiatt and Boone 2004). The fringed myotis is found in desert and woodland habitats (NatureServe 2007). Oak and pinyon woodlands appear to be the most commonly used vegetation associations (O'Farrell and Studier 1980); in the Spring Mountains, oak habitat is replaced by chaparral and sagebrush. It roosts in caves, mines, rock crevices, buildings, and other protected sites (Hiatt and Boone 2004; NatureServe 2007). Colonial maternity roosts occur in caves, mines, and sometimes buildings; they can also occur in rock crevices cliffs, trees, or snags (Ramsey 1997). Important ecological factors are caves, mines, and rock crevices for roosting (NatureServe 2007).

Life History

The fringed myotis is a year-round resident in the Spring Mountains NRA (Bradley et al. 2006). Adult females give birth to one young per year, usually in May or June (Bradley et al. 2006). Maternity roosts are usually comprised of several hundred adult females; males roost singly or in small groups (Bradley et al. 2006). Migration is over short distances to lower elevations where they are occasionally active during the winter (O'Farrell and Studier 1980). They hibernate in mixed-sex groups (Bradley et al. 2006), generally in tightly packed clusters (O'Farrell and Studier 1980). This species is insectivorous with a preference for beetles but it also feeds on a

variety of other species, including moths (Bradley et al. 2006). It forages along forest edges and over the forest canopy using a slow, highly maneuverable flight, gleaning insects from the ground or the canopy of thick and thorny vegetation (O'Farrell and Studier 1980; Bradley et al. 2006; NatureServe 2007).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites, and the total number of caves (potential roost sites) in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded along the creek in Clark Canyon in 1964 or earlier (Deacon et al. 1964 as cited in Ramsey 1997). Ramsey (1997) reported netting the fringed myotis in the Potosi area in 1996; also in 1996, a maternity roost was located near the Spring Mountains NRA at White Rock Spring in the Red Rock Canyon NCA. Based on available data, there are 4 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The current status of the fringed myotis is uncertain; it is known to forage at widely scattered locations in limited numbers but maternity roosts, bachelor roosts, or hibernacula on the Spring Mountains NRA have not been located. The fringed myotis is presumed to be rare range-wide, and the species is thought to be stable or possibly declining (NatureServe 2007). Throughout most of its range the fringed myotis is considered moderately threatened but is regarded as very threatened in Nevada by the NNHP (NatureServe 2007).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 14 foraging sites and no known roosts where the fringed myotis has been known to occur in the Spring Mountains NRA.

Threats

The fringed myotis is very sensitive to roost disturbance (Bradley et al. 2006), especially during parturition (O'Farrell and Studier 1980). The greatest threat to the fringed myotis is human disturbance at roost sites (especially maternity colonies), if present, by spelunking and rock climbing (NatureServe 2007), and projects that remove large trees or snags. Additional threats to habitat include degradation of springs due to diversions, modifications, or reductions of flows from ground water pumping resulting in a reduction of foraging sites and access to water (Clark County 2006).

Figure 4-3 Fringed Myotis Species Distribution

Figure 4-3 BACK

Based on mapping as of 2006 of fringed myotis occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-3. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-3 Estimated Overlap Between Fringed Myotis and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	2
Designated Horses/Burros Area	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	6
Fires 1989-2005	1
Firewood Gathering	1
Invasive Species	1
Non-System Trail	1
Motorized Trails (open)	1
Private Land	1
Roads (unpaved)	2
Wildland Urban Interface	1

Level of Analysis

The data available, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the fringed myotis as part of the landscape analysis.

4.1.4 Long-legged Myotis (*Myotis volans*)

Status Designations

The long-legged myotis (*Myotis volans*) is listed in the CA as a species of greatest management concern (USFS 1998), a designated covered species in the MSHCP (RECON 2000), a BLM Nevada sensitive species (BLM 2003) and has a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The long-legged myotis is found throughout western North America from Alaska to central Mexico (Warner and Czaplewski 1984) and throughout Nevada with the exception of the low desert in the southeast corner of the state (Clark County 2006). Range-wide, the long-legged myotis is found over an elevation range from 200–12,375 feet (60–3,770 meters) (Warner and Czaplewski 1984).

Distribution in the Spring Mountains NRA

Multiple surveys of bat species since 1996 indicate that the long-legged myotis is found throughout the Spring Mountains NRA, often detected in association with the long-eared myotis (*M. evotis*), from the extreme northwestern part (north and west of Mt. Stirling) to as far south as Mt. Potosi. The species was also recorded on both the west (e.g., Carpenter Canyon and Wheeler Pass area) and east slopes of the Spring Mountains (e.g., Cold Creek area, Lee

Canyon, Kyle Canyon and southeast from there) (SWCA 2005a; extrapolated from maps). The species was mist-netted in 1997 at 8 sites, from Big Timber Springs in the north to Potosi Springs in the south (Ramsey 1997) and was also netted at CC Springs and Buck Springs on the west side and the Mud Springs complex on the east side in 2002 (O'Farrell 2002a, b); all other detections since then are acoustic. See Figure 4-4 for locations of known occurrences of this species, all of which occur between 5,395 and 10,126 feet (1,644 and 3,086 meters) elevation.

Habitat

Primarily a coniferous forest bat, habitat for the long-legged myotis includes mixed conifer and pinyon-juniper vegetation communities above approximately 4,000 feet (1,220 meters) elevation, but it also uses ponderosa pine/mountain shrub, juniper, sagebrush, and occasionally desert habitats (Bradley et al. 2006; Clark County 2006). Roost sites include hollow trees, large-diameter snags, under bark, in live trees with lightning scars, or in rock crevices, mines, and buildings (Clark County 2006). It forms substantial colonies in mines, and caves which serve as hibernacula (Warner and Czaplewski 1984; O'Farrell 2002a). Maternity roosts are colonial and are formed in buildings, under bridges, in rock crevices, cliffs, in trees, or in snags (Ramsey 1997). This species is dependent upon the presence of a consistent source of water and is associated with rivers and springs (Clark County 2006). Important ecological factors are hollow trees, caves, and mines for roosting and open water for foraging (Clark County 2006).

Life History

The long-legged myotis is a year-round resident in the Spring Mountains NRA (Bradley et al. 2006). Maternity colonies consist of approximately 200–500 individuals, and females give birth to one young per year in June or July (Bradley et al. 2006). This species is insectivorous and feeds primarily on moths (Warner and Czaplewski 1984) and small beetles, flies, and termites (Hiatt and Boone 2004; Bradley et al. 2006). It forages within the forest canopy (Warner and Czaplewski 1984) and in open areas (Bradley et al. 2006), often pursuing prey with a rapid, direct flight over relatively long distances (Warner and Czaplewski 1984).

Measures

A measure that will be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded in the Spring Mountains NRA in Kyle and Clark Canyons in 1929 (SWCA 2005a). The general distribution of this bat prior to 1999 is thought to be similar to its current range (SWCA 2005a). In a survey conducted from 1992–1994, this species was captured at 5 sites in the Spring Mountains NRA, and in 1995 it was found primarily at Wheeler Well and Deer Creek (SWCA 2005a). As of 1997, Ramsey (1997) had documented at least 6 sites. Two maternity roosts were located in 1995–1996 (Ramsey 1997). In the Spring Mountains NRA, the long-legged myotis most likely relied on caves, crevices, and tree snags for roosting sites prior to 1900. The addition of mines and buildings to the Spring Mountains as European settlers entered the area may have increased potential roost sites (SWCA 2005a); spring diversions may have altered potential foraging sites.

Figure 4-4 Long-legged Myotis Species Distribution

Figure 4-4 BACK

Current Conditions in the Spring Mountains NRA

The status of the long-legged myotis in the Spring Mountains NRA appears to be stable. Although this species was thought to be declining in numbers prior to 1999, the most recent documents suggest that its populations are in fact stable (SWCA 2005a). O'Farrell (2002a, b) has also added many previously unrecorded locations for this species. In a 2002 survey, this bat was one of the primary species found at most examined locations (O'Farrell 2002a). It has been found using Potosi, 99, and Dawn mines as hibernacula (Rahn 2000 in SWCA 2005a). Two maternity roosts have been located, one at the Deer Creek Picnic Area and the other at Potosi Spring (Ramsey 1997).

Data collected through 2006 was converted to site-specific GIS mapping, indicate that there are 59 sites where the long-legged myotis have been documented in the Spring Mountains NRA. Of these 59 sites, 6 are roosts and 53 are observations as the bat was foraging, flying through the area, or data describing type of use was not available (Ramsey 1996, 1997; O'Farrell 2002a, 2002b, 2006).

Threats

Potential threats to the long-legged myotis in the Spring Mountains NRA include disturbance to roosts and hibernacula by spelunking and rock climbing (NatureServe 2007) and projects that remove large trees or snags. Other threats may include degradation of springs due to diversion, modification, or reduction from ground water pumping resulting in a reduction of foraging sites over water (Clark County 2006).

Based on mapping as of 2006 of long-legged myotis occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-4. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-4 Estimated Overlap Between Long-Legged Myotis and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Caves/tunnels	1
Concentrated Use Areas	4
Designated Horses/Burros Area	4
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	13
Fires 1971-1988	1
Fires 1989-2005	4
Firewood Gathering	3
Invasive Species	3
Non-System Trail	1
Motorized Trails (closed)	2
Private Land	4
System Trail (high mileage)	1
System Trail (low mileage)	1

Table 4-4 Estimated Overlap Between Long-Legged Myotis and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Roads (paved)	1
Roads (unpaved)	3
Wildland Urban Interface	6

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the long-legged myotis as part of the landscape analysis.

4.1.5 Yuma myotis (*Myotis yumanensis*)

Status Designations

The Yuma myotis (*Myotis yumanensis*) is designated in the CA as a species of greatest management concern (USFS 1998) and is a listed watch list species in the MSHCP (RECON 2000). It is a BLM Nevada sensitive species (BLM 2003) and has an NatureServe conservation status rank of G5 S3S4 (NatureServe 2007).

Range-wide Distribution

Yuma myotis is distributed throughout western North America from southwestern Canada south into Mexico (NatureServe 2007), occurring east from Montana and western Texas (NatureServe 2007). It is found in Nevada in the southern tip to the southeast corner and western half of the state (Bradley et al. 2006).

Distribution in the Spring Mountains NRA

Since 1996 when this species was netted in the extreme south area of the Spring Mountains, the Yuma myotis was not detected in any surveys until spring 2006. In the summer of 2006 detection of this species was confirmed acoustically at 3 sites at the Middle Kyle Canyon Complex in the Spring Mountains NRA, all below 7,000 feet elevation. It is likely that the sightings are associated with the presence of ponds at lower Kyle Canyon.

Habitat

This species is found in a wide variety of upland and lowland habitats including riparian, desert scrub, sagebrush, playa, and in its northern portion of the range within forested habitats. It requires large tracts of open water to forage and drink (NatureServe 2007). Maternity roosts usually occur in buildings, under bridges, or in caves and mines (Ramsey 1997). Potential habitat on the Spring Mountains is limited because the species usually lives at lower elevations (less than 7,000 feet) and requires larger bodies of water.

Life History

Maternity colonies can be quite large (i.e., 200 up to several thousand individuals), and females give birth to one young per year in June or July (Bradley et al. 2006). It aggregates in large colonies in winter, but no large hibernacula have been found in Nevada. Foraging occurs on a

variety of emergent aquatic insects (e.g., midges, caddisflies) over ponds and streams, where the bat flies just above the surface of the water (Bradley et al. 2006; NatureServe 2007).

Measures

There is little specific data available to define measures of distribution and abundance for the Yuma myotis.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The species was detected in 1996 (Ramsey 1997) in the extreme south area of the Spring Mountains; there is little information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine this bat's current status. Recent survey detections are likely incidental, with the species utilizing the Kyle Canyon ponds in years when water is available for foraging. In a memo to the Forest Service in 2004, O'Farrell stated that the Yuma myotis has only recently been found in the Las Vegas Valley, but farther east than the Spring Mountains NRA; and this bat requires larger water bodies than are available on the Spring Mountains NRA (O'Farrell 2002a).

Threats

Specific threats for the Spring Mountains have not been identified due to the limited information on the species' distribution. Range-wide, the Yuma myotis is threatened by human disturbance of maternity colonies in caves and buildings (NatureServe 2007). This bat is more closely associated with water than most bats and some riparian management practices may be detrimental, resulting in the loss of potential roost sites (NatureServe 2007).

Level of Analysis

Since only three detections of this species in lower Kyle Canyon have been made in studies conducted on the Spring Mountains NRA, there is little data associated with the Yuma myotis. As it requires large bodies of water for foraging purposes, its presence is likely incidental, and its viability is not dependent upon habitat within the Spring Mountains NRA. No further analysis will be conducted as part of this landscape assessment.

4.1.6 Silver-haired Bat (*Lasionycteris noctivagans*)

Status Designations

The silver-haired bat (*Lasionycteris noctivagans*) is a covered species listed in the MSHCP (RECON 2000) and is a BLM Nevada sensitive species (BLM 2003). It has an NatureServe conservation status rank of G5 S3 (NatureServe 2007).

Range-wide Distribution

The silver-haired bat occurs throughout the United States with the exception of the southwestern deserts, from northern Mexico into southern Canada (Kunz 1982), and is widely distributed in Nevada at elevations below 9,000 feet (2,740 meters) (Bradley et al. 2006; Clark County 2006).

Distribution in the Spring Mountains NRA

Multiple surveys conducted since 1996 record this species to have a limited and scattered distribution. Only 5 foraging locations have been documented, all through acoustic monitoring, though repeated use of some sites has been recorded; and two sites represent winter records (the Nell property and "Echo 3 site") (O'Farrell 2006). See Figure 4-5 for locations of known occurrences of this species, all of which occur between 6,369 and 8,258 feet (1,941 and 2,517 meters) elevation.

Habitat

The silver-haired bat is a forest associated species, generally associated with mature stands of mixed conifer, conifer/deciduous, and pinyon-juniper forests. It occurs either at higher latitudes or higher altitudes in the southwest; and may occur at lower elevations in riparian woodlands in southern Nevada (Bradley et al. 2006; Clark County 2006). It generally is solitary in roosting (Kunz 1982). Summer roosts are almost exclusively in trees and are located at least 45 feet (15 meters) above the ground (Bradley et al. 2006) including in hollow trees and snags, and under bark. Winter roost sites include rock crevices, caves, and buildings (Kunz 1982). Maternity roosts are generally woodpecker holes in trees (Bradley et al. 2006; Clark County 2006). Important ecological factors for the silver-haired bats include large hollow trees and snags for summer roosting, caves for winter roosting, and open water for foraging.

Life History

Silver-haired bat migration patterns are poorly understood though females apparently migrate farther than males; migration patterns in the mountainous west are less distinct than other parts of the species' range (Kunz 1982). They hibernate during the winter (Clark County 2006; O'Farrell 2006) but will emerge to forage. The activity of this species is unusual in the Spring Mountains in that it appears to be very active in the winter, and disappears during the summer months, returning in numbers in October (O'Farrell 2006). This species tends to use multiple roost sites and switches frequently (Bradley et al. 2006; Clark County 2006). It may form small maternity colonies in hollow trees. Females give birth to one or generally two young per year, in June or July (Bradley et al. 2006). This species is opportunistic in its food habits taking a variety of insects while foraging with a slow, erratic flight in or near coniferous or mixed deciduous forests, or adjacent to ponds and watercourses (Kunz 1982).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites and including the total number of known roost sites and foraging sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is little information to indicate a reference status within the Spring Mountains NRA. Some degradation of habitat may have occurred following European settlement of the Spring Mountains through the loss of large trees and snags, and alteration of water sources. Based on available data there is one site documented prior to 1998.

Figure 4-5 Silver-haired Bat, species Distribution

Figure 4-5 BACK

Current Conditions in the Spring Mountains NRA

The current status of this species is that it is present and apparently rare during both spring/summer and fall/winter periods. The presence of maternity roosts is uncertain. Southeastern Nevada is at the southern periphery of the species distribution (Kunz 1982) and it is considered locally common in Clark County (Hiatt and Boone 2004; Clark County 2006). Winter records of foraging bats suggest this may be a migratory destination for hibernation. Only limited wintertime bat surveys have been conducted.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate there are currently 5 sites where the silver-haired bat has been documented foraging in the Spring Mountains NRA.

Threats

Potential threats to the silver-haired bat include: mature forest habitat degradation and modification due to fire suppression and fuels management; snag and large tree removal resulting in the loss of potential roost locations; and degradation of springs due to diversions, modifications, or reductions of flows from ground water pumping resulting in a reduction of foraging sites and access to water (RECON 2000; Clark County 2006).

Based on mapping as of 2006 of the silver-haired bat's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-5. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-5 Estimated Overlap Between Silver-Haired Bat and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites
Firewood Gathering	1
Wildland Urban Interface	1

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the silver-haired bat as part of the landscape analysis.

4.1.7 Spotted Bat (*Euderma maculatum*)

Status Designations

The spotted bat (*Euderma maculatum*) is a Forest Service sensitive species (USFS 2003). This species is designated in the CA as a species of greatest management concern (USFS 1998) and is a watch list species in the MSHCP (RECON 2000). The spotted bat is a BLM Nevada sensitive species (BLM 2003) and is listed as threatened by the State of Nevada (Bradley et al. 2006). It has an NatureServe conservation status rank of G4 S2 (NatureServe 2007).

Range-wide Distribution

The spotted bat is widespread in western North America, but its distribution is patchy and it is rarely abundant throughout its range (Bradley et al. 2006; NatureServe 2007). This species is

found from southern British Columbia south through a portion of the western United States and into central Mexico (NatureServe 2007). The spotted bat has been found at scattered locations throughout Nevada, with about half of the known Nevada occurrences in Clark County (Bradley et al. 2006).

Distribution in the Spring Mountains NRA

This species has never been detected however suitable habitat is present in the Spring Mountains NRA. Although the spotted bat has not been documented during extensive bat surveys, including use of acoustical recordings, conducted from 1997 to the present (Ramsey 1997; O'Farrell 2002, 2004), O'Farrell (2006) suspects that it may be present.

Habitat

The spotted bat is found in various habitats from desert to montane coniferous stands, including open ponderosa pine forest, and pinyon-juniper woodland (Bradley et al. 2006; NatureServe 2007). It consistently roosts in caves and in cracks and crevices in cliffs and canyons (Bradley et al. 2006; NatureServe 2007). Rock crevices in cliffs, and occasionally mines and caves are used as maternity roosts (Bradley et al. 2006; Ramsey 1997). Its distribution appears to be linked to the availability of cliff-roosting habitat (NatureServe 2007). Key habitat attributes for the spotted bat are caves and rock crevices for roosting and open water for foraging.

Life History

Maternity roosts may be solitary (Ramsey 1997), and females give birth to one young per year in June or July (Bradley et al. 2006). The spotted bat hibernates but periodically arouses to forage and drink in the winter; however, winter habits are poorly known (Bradley et al. 2006). This species is insectivorous, feeding primarily on moths but taking a variety of insects (Bradley et al. 2006; NatureServe 2007). It is known to travel long distances between roosting and foraging sites.

Measures

There are no specific data available to define measures of distribution and abundance for the spotted bat.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine this bat's current status with, or even throughout the species' range (NatureServe 2007). In a memo to the USFS in 2004, O'Farrell stated that the spotted bat would be "expected" to occur on the Spring Mountains NRA (Karen Harville, pers. comm.). However, it has not been documented during extensive surveys conducted from 1997 to the present (Ramsey 1997; O'Farrell 2002a, O'Farrell 2002b, O'Farrell 2006). Although its presence is not documented, this bat is still considered "potentially present" on the Spring Mountains. Because no detections have been made in the last 7 years of survey, the likelihood of a population of the species occurring the Spring Mountains NRA seems remote.

Threats

Little is known about this bat and its life history, and threats are therefore speculations. Potential threats include habitat destruction or disturbance of high cliffs and canyon walls.

Level of Analysis

Since there are no documented occurrences of the spotted bat, and its viability is not likely dependent upon habitat within the Spring Mountains NRA, no further analysis will be conducted within this landscape assessment.

4.1.8 Allen's Lappet-browed Bat (*Idionycteris phyllotis*)

Status Designations

The Allen's lappet-browed bat (currently known as Allen's big-eared bat) (*Idionycteris phyllotis* =*Corynorhinus phyllotis*; *Plecotus phyllotis*) is designated as a species of greatest management concern, managed under the CA (USFS 1998) and is listed as a watch list species under the MSHCP (RECON 2000). This species is a BLM Nevada sensitive species (BLM 2003) and has an NatureServe conservation status rank of G3G4 S1 (NatureServe 2007).

Range-wide Distribution

Records for the Allen's lappet-browed bat are from locations in mountainous regions of the southwestern United States (western New Mexico to southeastern California, southern Nevada, and southern Utah) and Mexico, from Mojave Desert scrub to fir forest in the vicinity of rocks (Czaplewski 1983). In Nevada, records are limited to Clark County; however, this species may also occur in southern Lincoln and Nye Counties (Bradley et al. 2006). Range-wide the Allen's lappet-browed bat is found over an elevation range from 2,600 to 9,800 feet (855 to 3,225 meters); however, this species is usually found between 3,500 and 7,500 feet (1,100 and 2,500 meters) (Czaplewski 1983).

Distribution in the Spring Mountains NRA

Multiple surveys of bat species conducted in the Spring Mountains NRA since 1996 record that the Allen's lappet-browed bat is not often encountered (SWCA 2005a; extrapolated from maps). Seven foraging occurrences have been documented (Ramsey 1997; SWCA 2005a; O'Farrell 2006), almost all below 7,000 feet. The Ramsey sites were netting sites accomplished in 1992-1996; all other observations are acoustic. Sites it has been recorded foraging or drinking at include Lower Kyle Canyon, CC Spring (O'Farrell 2006), Potosi Spring (Ramsey 1997), Middle Kyle Canyon, and Pine Creek (SWCA 2005a). See Figure 4-6 for locations of known occurrences of this species, all of which occur between 5,694 and 7,546 feet (1,736 and 2,300 meters) elevation.

Habitat

The Allen's lappet-browed bat is typically found in mountainous areas near rocks such as cliffs, boulders, talus, scree, bare rock, or lava flows (NatureServe 2007). This species occupies high elevation forests and pine and oak woodlands, but also uses a variety of riparian woodlands across a wide elevation gradient. Occasionally they are found at lower elevations and in more arid habitats (Czaplewski 1983), such as within the Spring Mountains, where they are recorded primarily around springs within pinyon-juniper, chaparral, sagebrush and blackbrush habitats. This species roosts in large dead snags, rock crevices, mines, or caves (SWCA 2005a). Maternity roosts usually occur in mines and caves (Ramsey 1997) but have also been found in boulder piles (NatureServe 2007). Important ecological factors are large dead trees, caves, or mines for roosting and open water for foraging.

Life History

The Allen's lappet-browed bat is probably a year-round resident in southern Nevada, shifting to lower elevations during the winter (Bradley et al. 2006). This species hibernates but periodically arouses to forage and drink in the winter (Bradley et al. 2006). The sexes segregate geographically during the summer months with females gathering into maternity colonies and males possibly remaining solitary, roosting elsewhere (Czaplewski 1983). Maternity roosts are colonial (Ramsey 1997) with females giving birth to one young per year in June or July (Bradley et al. 2006). The Allen's lappet-browed bat is insectivorous and primarily feeds on moths captured in flight or gleaned from vegetation along streams or over ponds (NatureServe 2007). This bat is highly maneuverable in flight with variable modes of echolocation as an adaptation to foraging between, within, and below the forest canopy (Czaplewski 1983). It is known to travel long distances between roosting and foraging locations (Bradley et al. 2006).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Allen's lappet-browed bat was first recorded in the Spring Mountains NRA at the Nel property before 1979 (O'Farrell 2002a). This species most likely relied on caves, crevices, and snags for roosting sites prior to European settlement (SWCA 2005a). The addition of mines and buildings in the Spring Mountains as European settlers entered the area may have increased potential roost sites (SWCA 2005a); spring diversions may have altered potential foraging sites. Based on available data there is 1 element occurrence record that includes one site documented prior to 1998.

Current Conditions in the Spring Mountains NRA

Very little is known about the current status of this species (SWCA 2005a); it is rare and apparently unknown if the bat is a resident species or if there are even any occupied roost sites in the Spring Mountains NRA. It is thought that populations range-wide have been relatively stable over the long term (+/- 25% change), but have apparently been declining to stable over the short term (+/-10% fluctuation to 30% decline) (NatureServe 2007). Insufficient data is available to extrapolate this trend for the Spring Mountains NRA.

Combined available data sources as of 2006, converted to site-specific GIS mapping, indicate there are currently 3 element occurrence records that include 7 sites where the lappet-browed bat have been documented foraging.

Figure 4-6 Allen's Lappet-browed Bat Species Distribution

Figure 4-6 BACK

Threats

Potential threats to the Allen's lappet-browed bat in the Spring Mountains NRA include vandalism or closure of abandoned mines used as roosts; disturbance of potential hibernacula and breeding colonies by spelunking and rock climbing, which may result in abandonment of the roost (SWCA 2005a); projects that remove large trees or snags (NatureServe 2007); and spring diversions, which could result in a reduction of foraging sites over water (Bradley et al. 2006).

Based on mapping as of 2006 of the Allen's lappet-browed bat occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-6. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-6 Estimated Overlap Between Allen's Lappet-Browed Bat and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	2
Fires 1989-2005	2
Invasive Species	1
Private Land	2
Roads (paved)	1
Wildland Urban Interface	2

Level of Analysis

The data available, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the Allen's lappet-browed bat as part of the landscape analysis.

4.1.9 Pale Townsend's Big-eared Bat (*Corynorhinus townsendii pallescens*)

Status Designations

The pale Townsend's big-eared bat (currently known as the Pale lump-nosed bat) (*Corynorhinus townsendii pallescens =Plecotus townsendii pallescens*) is a Forest Service sensitive species (USFS 2003).and designated in the CA (USFS 1998) as a species of greatest management concern, and as a high priority evaluation species in the MSHCP (RECON 2000). It is a BLM Nevada sensitive species (BLM 2003) and has an NatureServe conservation status rank of G4T4 S4 (NatureServe 2007).

Range-wide Distribution

The pale Townsend's big-eared bat is found in western North America from southern British Columbia south to northwestern Mexico. Its western limits include central Washington and Oregon and eastern and southern California, and it spans to the east into South Dakota, Kansas, western Oklahoma, and Texas (NatureServe 2007). This bat is found throughout Nevada (Clark County 2006). Range-wide, the pale Townsend's big-eared bat is found at elevations below 10,375 feet (3,160 meters) (Kunz and Martin 1982).

Distribution in the Spring Mountains NRA

Multiple surveys of bat species since 1996 indicate that the pale Townsend's big-eared bat is found scattered from the Wheeler Well in the north to Mt. Potosi in the south, as well as on both the west (e.g., Carpenter Canyon and Wheeler Pass area) and east slopes (e.g., Lee Canyon, Kyle Canyon and southeast from there) of the Spring Mountains (SWCA 2005a; extrapolated from maps). It was netted at Potosi Spring (Ramsey 1997), and in 2001 at the Lucky Strike Canyon, and Middle Mud Springs (O'Farrell 2002a, b). All other detections since then have been accomplished through acoustic survey. See Figure 4-7 for locations of known occurrences of this species, all of which occur between 5,541 and 9,699 feet (1,689 and 2,956 meters) elevation.

Habitat

The presence of the pale Townsend's big-eared bat in the Spring Mountains NRA is highly associated with caves and mines (SWCA 2005a). It is often found associated with mesic habitats in coniferous and deciduous forests (Kunz and Martin 1982) but it also occurs in sagebrush, blackbrush, Mojave mixed scrub, creosote-bursage, mesquite, and lowland riparian habitats (Hiatt and Boone 2004; Clark County 2006). Daytime roosts are principally mine tunnels and caves and occasionally cliffs, cracks, crevices, and trees that must have cave-like spaces, while nighttime roosts are often buildings or bridges (Bradley et al. 2006; Clark County 2006). Maternity roosts are colonial and occur in mines or caves (Ramsey 1997). Important ecological factors for the pale Townsend's big-eared bat are caves and mines for roosting, and open water for foraging.

Life History

The pale Townsend's big-eared bat is a year-round resident in the Spring Mountains (Clark County 2006). Females form maternity colonies while males roost individually (Bradley et al. 2006). Females give birth to one young per year from May to July (Bradley et al. 2006). This species is insectivorous, feeding primarily on small moths (Clark County 2006) and mostly forages over water in open forest habitat (SWCA 2005a).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites including the total number of known roost sites and foraging sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The first record for this species was in Clark Canyon in 1891 (SWCA 2005a). In 1963, a large number of pale Townsend's big-eared bats were reported using the Potosi Mine as a hibernaculum (SWCA 2005a). In surveys performed from 1992 to 1995, the pale Townsend's big-eared bat was found at 8 sites (SWCA 2005a; Clark County 2006). In 1997, this species was reported roosting at Wounded Knee, Desert, Column, and Tea Kettle Caves (SWCA 2005a). Prior to European settlement, the pale Townsend's big-eared bat likely roosted in caves and visited the springs from the desert up through the mid-elevations. SWCA (2005a) reported that the habitat for pale Townsend's big-eared bat has remained relatively stable since 1900. However, the addition of mines to the Spring Mountains as European settlers entered the area may have increased potential roost sites used as hibernacula and for breeding (SWCA 2005a), although spring diversions may have negatively impacted potential foraging sites. Based on available data there are 6 sites documented prior to 1998 in the Spring Mountains NRA.

Figure 4-7 Pale Townsend's Big–eared Bat Species Distribution

Figure 4-7 BACK

Current Conditions in the Spring Mountains NRA

Status of the pale Townsend's big-eared bat is uncertain but may be declining. Range-wide, populations may be decreasing and the population in the Spring Mountains may already be low (USFS 2003). Though past surveys have documented this bat at various sites throughout the Spring Mountains NRA, a 2002 survey found this species at only a few locations and in small numbers (O'Farrell 2002b). Surveys conducted during the summer of 1999 and winter of 2000 found that pale Townsend's big-eared bats are still roosting in the Potosi Mine; however, the number of individuals was not given (USFS 2003). Other known or suspected hibernacula sites include Lucky Strike Mine, 99 Mine, Pinnacle Mine, "What Cave?", Williams Hole, and Column Cave (USFS 2003; Sherwin 2005). The only reported potential maternity roost is "What Cave?" (Sherwin 2005). In surveys conducted from spring 2004 through January 2006, this species was found at only 5 of the 21 locations sampled (O'Farrell 2006).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate there are currently 37 sites where pale Townsend's bats have been documented in the Spring Mountains NRA. Of these 37 sites, 11 are roosts and 26 are observations as the bat was foraging, flying through the area, or data describing type of use was not available (K. Harville, pers. comm.; O'Farrell 2002a, 2002b, 2006; Ramsey 1996, 1997; Sherwin 2005).

Threats

The pale Townsend's big-eared bat is highly susceptible to human disturbance at roost sites (O'Farrell 2006). This bat has been found hibernating at the Lucky Strike Mine complex where the Nevada Division of Mines has placed metal posts and barbed wire in the portal to the adit to inhibit human use; however, this fencing may have a serious impact on bat use (O'Farrell 2002a).

Other potential threats to the pale Townsend's big-eared bat in the Spring Mountains NRA include disturbance of hibernacula and breeding colonies by spelunking and rock climbing, projects that remove large trees or snags and spring diversions resulting in reduction of foraging sites over water (Clark County 2006).

Based on mapping as of 2006 of the pale Townsend's big-eared bat's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-7. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-7 Estimated Overlap Between Pale Townsend's Big-eared Bat and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping sites
Caves/tunnels	1
Concentrated Use Areas	1
Designated Horses/Burros Area	3
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	4
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	6
Fires 1989-2005	5
Firewood Gathering	2

Table 4-7 Estimated Overlap Between Pale Townsend's Big-eared Bat and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping sites
Invasive Species	2
Private Land	4
Roads (paved)	1
Roads (unpaved)	2
Wildland Urban Interface	4

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the pale Townsend's big-eared bat as part of the landscape analysis.

4.1.10 Palmer's Chipmunk (*Neotamias palmeri*)

Status Designations

The Palmer's chipmunk (*Neotamias palmeri =Eutamias palmeri*; *Tamias palmeri*) is listed as a species of greatest management concern in the CA (USFS 1998) and is a designated covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Palmer's chipmunk is endemic to the Spring Mountains, found only in Clark and Nye Counties, Nevada (Clark County 2006).

Distribution in the Spring Mountains NRA

Multiple surveys conducted since 1994 record this species distribution in an area loosely bounded by Willow Creek to the northwest, the North Fork of Deer Creek to the northeast, Kyle Canyon to the southeast, and Carpenter Canyon to the southwest (SWCA 2005a; extrapolated from maps). Palmer's chipmunk is widely distributed at elevations of approximately 6,800 to 11,900 feet (2,100 to 3,600 meters); however, it is most abundant in a narrower elevation band of 8,000 to 8,400 feet (2,440 to 2,550 meters) (Best 1993, Clark County 2006). See Figure 4-8 for locations of known occurrences of this species, all of which occur between 6,831 and 11,360 feet (2,082 and 3,462 meters).

Habitat

This species is found in bristlecone pine, white fir-ponderosa pine, pinyon-juniper, and mountain mahogany-manzanita habitat types (Clark County 2006). Palmer's chipmunk is typically found on canyon floors or lower slopes of mesic canyons where shelter is available in the form of fallen trees, large rocks, small caves, or cliff sides (Clark County 2006; Tomlinson 2001). It requires access to water for at least some part of the year for both thermoregulation and reproductive success (Clark County 2006). Important ecological factors are shrub cover, lower slopes of mesic canyons (e.g., generally north facing slopes), and access to water (Tomlinson 2001).

Figure 4-8 Palmer's Chipmunk Species Distribution

Figure 4-8 BACK

Life History

Palmer's chipmunk is seasonally active, spending colder months torpid in underground burrows, which it digs deep into the ground (Clark County 2006). Activity almost ceases during cold winter months, but chipmunks may be active in winter when temperatures are well above normal (Tomlinson 2001). The active season is generally March through October, with females emerging later and becoming most active midsummer (Clark County 2006). This species is a granivore whose primary food source is conifer seeds, but its diet also includes berries and grasses (Ambos and Tomlinson 1996; Tomlinson 2001).

Measures

A measure that will be used to determine the status, trends, and management recommendations for this species include the total number of known occupied sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The first record for this species was in Clark Canyon in 1891 (SWCA 2005a). After the arrival of European settlers, potential foraging habitat and nesting sites were altered through timber harvest, fire suppression activities, developments such as buildings and campgrounds, water diversions, pesticide and insecticide use, and road building (SWCA 2005a). During surveys conducted from June 1994 to November 1995, the highest concentrations of Palmer's chipmunk were found in the North Fork of Deer Creek (Ambos and Tomlinson 1996). Based on available data there are 11 sites documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

Status of the Palmer's chipmunk is probably stable though numbers may fluctuate from year to year, as abundance appears to increase at some sites and decrease at others (SWCA 2005a). Extensive surveys have been completed for this species by Ambos and Tomlinson (1996), Tomlinson (2001), and Lowrey (2002), identifying areas of high quality habitat. The highest known densities occur on the east side of the mountain complex at the main and north forks of Deer Creek, as well as in Lee and Kyle Canyons (Tomlinson 2001; SWCA 2005a). High densities have also been found at Mary Jane Falls trailhead and Old Mill picnic area (Tomlinson 2001). For all sites sampled by Tomlinson (2001), population estimates indicated that the highest density of animals was 31 chipmunks per hectare during the 1994 season; the lowest density was in 1999 at 20.5 chipmunks per hectare. This species generally has a low population density compared to other chipmunks, which is likely a function of several factors, including high mobility, large home range size, and low density of vegetation in the Spring Mountains (Clark County 2006). Sudden changes in available habitat and severe natural weather events both have the potential to affect overall population density and distribution significantly (Clark County 2006).

The Combined available data sources as of 2006, converted to site-specific GIS mapping, indicate there are currently 96 sites where the Palmer's chipmunk has been documented in the Spring Mountains NRA. There is an estimated total of 32,612 acres of occupied habitat.

Threats

One threat is predation by feral dogs and cats near Kyle Canyon; in 2000, feral cats were removed from this area, which may have contributed to the increase in numbers of chipmunks from the previous year (Tomlinson 2001). Feral animals have also been documented in Deer Creek, Old Mill picnic and camping area, Macks Canyon, Lee Canyon, and Whiskey Spring

(Ambos and Tomlinson 1996). Another threat is woodcutting in high chipmunk density areas. The control of woodcutting and maintenance of dead snags, fallen trees, and rock cover sites and undergrowth on slopes and canyon bottoms is reported to be important for the species (Tomlinson 2001). Woodcutting activities in heavily used campgrounds and group use areas where downed logs, snags, and trees have been removed are detrimental to chipmunks, especially at Deer Creek, Carpenter Canyon, Old Mill picnic and camping area, and Macks, Lee, and Kyle Canyons (Ambos and Tomlinson 1996). Water diversions in riparian areas and from springs that are important for breeding can reduce habitat quality and limit access to water for chipmunks. Water diversions within chipmunk habitat have occurred in Deer Creek, Old Mill picnic and camping area, and near Macks, Clark, Lee, and Trout canyons (Ambos and Tomlinson 1996). Mortality (road kill) due to paved access roads has been reported for Carpenter, Macks, Clark, Wallace, and Trout canyons (Ambos and Tomlinson 1996). Another threat to the Palmer's chipmunk is development of recreation facilities in suitable habitat (i.e., existing, expansion of, and future facilities). Other threats include land development at Rainbow Canyon, OHV use at Clark Canyon, and the expanded parking area near Mary Jane Falls trailhead (Ambos and Tomlinson 1996).

Based on mapping as of 2006 of the Palmer's chipmunk's occurrence localities within the Spring Mountains NRA, this species' habitat overlaps with existing human activities on the landscape as indicated in Table 4-8. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-8 Estimated Overlap Between Palmer's Chipmunk and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping sites
Campgrounds	15
Firewood Gathering	1
Picnic Areas	11
Private Land	14
Snow Play Areas	2
Structures on FS Land	2
System Trail (high mileage)	1
Roads (paved)	20
Roads (unpaved)	9
Wildland Urban Interface	48

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Palmer's chipmunk as part of the landscape analysis.

4.2 BIRDS

4.2.1 Northern Goshawk (*Accipiter gentilis*)

Status Designations

The northern goshawk (*Accipiter gentilis*) is a Forest Service sensitive species, designated as a species of concern in the CA (USFS 1998), and is a watch list species for the MSHCP (RECON 2000). This species has an NatureServe conservation status rank of G5 S2 (NatureServe 2007).

Range-wide Distribution

The northern goshawk is found from western and central Alaska south through Canada to central California, and southern Arizona. They are also found to the east from the eastern foothills of the Rockies, to central Michigan, Pennsylvania, northwestern Connecticut, and the Appalachians south to West Virginia and Maryland (NatureServe 2007).

Distribution and Abundance in the Spring Mountains NRA

In the Spring Mountains NRA, northern goshawks have been recorded nesting at Buck Springs and Middle Mud Springs in 2005 – 2007. It has been observed near the Scout Camp in the Foxtail area and at McWilliams Canyon near Dolomite Campground in Lee Canyon; within Kyle Canyon between Mary Jane and Cathedral Rock (where reproduction was confirmed); and in the middle drainage of Wallace Canyon (Morrison 2005). See Figure 4-9 for locations of known occurrences of this species, all of which occur between 7,178 and 7,786 feet (2,188 and 2,373 meters) elevation.

Habitat

Range-wide, the northern goshawk occurs in nearctic forested habitats including true fir, mixed conifer, lodgepole pine, ponderosa pine, Jeffrey pine, montane riparian deciduous forest, and Douglas-fir (Morrison 2005). Home ranges often consist of a wide range of forest age classes and conditions, but nest sites are associated with patches of relatively larger, denser forest than the surrounding landscape (Morrison 2005). Nests are constructed in very large trees with sturdy branches in the lower part of the canopy and typically occur in mature or old-growth forests with high canopy closure and sparse groundcover, near water, meadow habitat, or forest openings (GBBO 2005; NatureServe 2007). Nest heights range from approximately 8 to 140 feet (2 to 40 meters) above the ground (NatureServe 2007). The goshawk is distributed throughout the Great Basin in Nevada and primary habitats used are aspen and montane riparian forests (GBBO 2005). An important ecological feature is a wide range of forest age classes, with old-growth forests for nesting and younger forests for hunting.

Life History

The goshawk is present in Nevada year-round and the breeding season is from April to July (GBBO 2005). The northern goshawk preys on birds such as American robin, mourning dove, woodpeckers, sapsuckers, and jays, as well as small to medium-sized mammals (e.g., squirrels, chipmunks, cottontails) (GBBO 2005).

Measures

A measure that will be used to determine the status, trends, and management recommendations for this species include the total number of confirmed reproductive territories in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There are very few historic records of goshawks in the Spring Mountains (Morrison 2005). Van Rossem reported a pair of adults in Cold Creek in 1931 and another pair in ponderosa pines in Lee Canyon in 1932 (Morrison 2005). From the time of the first European settlement in the Spring Mountains, there have been substantial impacts within the conifer zone due to human activities such as timber harvest, livestock grazing, road construction, and development.

Current Conditions in the Spring Mountains NRA

The northern goshawk is a resident nesting bird, though its population status and extent of occupied habitat is uncertain. Range-wide, populations appear to be stable (NatureServe 2007). Data indicate there are likely 4 or 5 goshawk territories that currently exist in the Spring Mountains NRA based on observation of birds during the breeding season but without known nest site locations for 2 of them (Morrison 2005). Three of these territories (Kyle, Buck Springs and Mud Springs) were occupied by breeding goshawks in 2005 (Morrison 2005); one young was fledged from the Mud Springs nest, 2 young were fledged from the Buck Springs nest and one fledgling and adult were seen at Kyle Canyon.

Threats

Threats to breeding populations include timber harvest; the deterioration or loss of nesting habitat due to fire suppression, grazing, and insect and tree disease outbreaks; the presence of great horned owls as a predator of both nestlings and adults; and disturbances at nest sites (NatureServe 2007).

Based on mapping as of 2006 of the northern goshawk's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-9. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-9 Estimated Overlap Between the Northern Goshawk and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	1
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1
Invasive Species	1
Private land	1
Structures on FS land	1
Roads (paved)	1
Roads (unpaved)	1
Wildland Urban Interface	1

Figure 4-9 Northern Goshawk Species Distribution

Figure 4-9 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the northern goshawk as part of the landscape analysis.

4.2.2 American Peregrine Falcon (*Falco peregrinus anatum*)

Status Designations

The American peregrine falcon (*Falco peregrinus anatum*) is a Forest Service sensitive species, listed as a species of concern in the CA (USFS 1998), and is a designated covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G4 S2 (NatureServe 2007).

Range-wide Distribution

The peregrine falcon occurs throughout much of North America from the subarctic boreal forests of Alaska and Canada south into Mexico (64 FR 46542).

Distribution in the Spring Mountains NRA

There are no documented nesting occurrences of this species within the Spring Mountains NRA, though there were five incidental observations of peregrine falcons recorded during the 2005 Great Basin Bird Observatory (GBBO) bird surveys of the Spring Mountains NRA. Intensive surveys for the peregrine falcon were conducted during the spring of 2004 at 13 cliff-faces that included apparently suitable nesting habitat. In addition NDOW conducts occasional inventories in these areas. No observation of nesting peregrines where made during any surveys. See Figure 4-10 for locations of known occurrences of this species, all of which occur between 6,809 and 10,761 feet (2,075 and 3,280 meters).

Habitat

Range-wide, this species inhabits many different terrestrial biomes. Most commonly occupied habitats contain cliffs for nesting, with open gulfs of air, and generally open landscapes for foraging (White et al. 2002). In Clark County, this species can be found in mixed conifer, pinyon-juniper, sagebrush, lowland riparian, grassland habitats, as well as agricultural and urban areas (Clark County 2006).

Life History

The peregrine falcon has an average clutch size of 4 eggs which are incubated for 32 to 35 days. Male and female usually form a lifelong pair bond and will replace lost clutches during the breeding season (NatureServe 2006). Peregrine falcons most often prey on birds.

Measures

There is no specific data available to define measures of distribution and abundance for the peregrine falcon.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is inadequate information to indicate a reference status within the Spring Mountains NRA. However, range-wide the species' populations were in serious decline in the 1960s and 1970s which was attributed primarily to pesticide contamination (from DDT and its derivatives) causing

eggshell thinning and nest failure (RECON 2000). Populations made substantial recovery through the 1990s and the bird was removed from listing under the Endangered Species Act in 1999 (64 FR 46541-46558).

Current Conditions in the Spring Mountains NRA

The peregrine falcon has only been incidentally documented; there are no known nesting records (though it has been observed during the nesting period) in the Spring Mountains NRA. Nesting peregrines have been documented in the Lake Mead area, at Hoover Dam in both Nevada and Arizona, and the Las Vegas Valley (Clark County 2006; Hiatt and Boone 2004). Throughout its range, the status of peregrine falcon populations is reported to continue to improve (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited occurrence of the species. However, threats to the peregrine falcon within Clark County that may apply to the Spring Mountains NRA include disturbance due to rock climbing; mortality through collisions and electrocution with power lines; and, illegal take (Clark County 2006).

Based on mapping as of 2006 of the peregrine falcon's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-10. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-10 Estimated Overlap Between the American Peregrine Falcon and Human Activities Occurring Within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Designated Horses/Burros Area	2
Fires 1971-1988	1

Level of Analysis

Since there are limited documented occurrences, all of which are incidental sightings and no nesting of peregrine falcons noted in surveys conducted on the Spring Mountains NRA, and management actions will not likely impact this species, no further analysis will occur as part of this landscape assessment.

4.2.3 Flammulated Owl (*Otus flammeolus*)

Status Designations

The flammulated owl (*Otus flammeolus*) is a Forest Service sensitive species, designated a species of concern in the CA (USFS 1998), and a watch list species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G4 S4B (NatureServe 2007).

Figure 4-10 American Peregrine Falcon Species Distribution

Figure 4-10 BACK

Range-wide Distribution

The flammulated owl can be found throughout a broad geographic range in western North America, extending from southern British Columbia south to the mountains of central Mexico (Arsenault 2002) and east to the western edge of the Great Plains. In Nevada, this species is both a migrant and a breeder. Breeding is confirmed from only the Carson Range in the west and a series of ranges along eastern Nevada from the Spring Mountains and Sheep Range in the south up to the Schell Creek and Snake ranges. In addition, this species occurs as a breeder in the Santa Rosa Range in north-central Nevada and the Jarbridge Mountains in northeastern Nevada (Dunham et al. 1996; Neel 2002).

Distribution in the Spring Mountains NRA

Flammulated owls are distributed on the east and west sides of the Spring Mountains where suitable habitat is present. They have been documented in the Spring Mountains NRA from Bristlecone Trail, Kyle Ranger Station, Macks Canyon, Mary Jane Falls Trail, McFarland Canyon, Mud Springs, Scout Camp, and Wallace Canyon (Arsenault 2002). See Figure 4-11 for locations of known occurrences of this species, all of which occur between 7,682 and 9,396 feet (2,341 and 2,864 meters) elevation.

Habitat

This species is a neotropical migrant that is present in Nevada in summer (Arsenault 2002; GBBO 2005). Flammulated owls prefer nest cavities excavated by the northern flicker, or other woodpeckers that excavate similarly large cavities in large snags (Arsenault 2002; GBBO 2005). Roost sites are found in dense tree canopies or thickets that provide shade and protection from predators (GBBO 2005; NatureServe 2007). Important ecological factors include existing nest cavities, dense forested areas, and an abundance of large nocturnal insects.

Life History

The breeding season for the flammulated owl is April through July (Arsenault 2002; GBBO 2005), with breeding most common in the mid to high coniferous forest areas that are comprised of ponderosa pine, white fir, and sometimes limber pine, in forest patches as small as 40 hectares (Arsenault 2002). Breeding often occurs in loose clusters of multiple pairs (GBBO 2005).

Measures

A measure to be used to determine the final status, trends, and management recommendations for this species is the total number of known occupied breeding sites and occurrences in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Previous records of flammulated owls in the Spring Mountains NRA include one in Macks Canyon (1963), four in Scout Canyon (1963), and one in Clark Canyon (1961) (Arsenault 2002). From the time of the first European settlement in the Spring Mountains, there have been substantial impacts within the conifer zone due to human activities such as timber harvest, livestock grazing, road construction, and development.

Current Conditions in the Spring Mountains NRA

The status of the flammulated owl appears to be stable. Flammulated owls have a widespread distribution in western North America, but loss and fragmentation of mature forest habitat

suggests that populations are declining on a widespread scale. This may or may not be true within the boundaries of the Spring Mountains NRA (NatureServe 2007). In May through July of 2002, a preliminary inventory was conducted in potentially suitable flammulated owl habitat; 15 territories were occupied by calling males and one nest was located in the Bristlecone Trail territory (Arsenault 2002). In 2004, one fledged young was documented at Bristlecone Trail (Mika and Riddle 2006). In 2005, three owls were encountered in Macks Canyon defending territories, indicating high activity rates (Mika and Riddle 2006).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there 16 sites where flammulated owls have been located in the Spring Mountains NRA. Each of these records represents birds suspected of being within a breeding territory.

Threats

Threats include loss of snags and trees for nest cavities because of fuel reduction projects and safety considerations resulting in the removal of snags within a certain distance of camping areas, picnic sites, trailheads, and alongside trails. This species is most susceptible to disturbance during peak breeding season in June and July (NatureServe 2007), when recreation (dispersed camping, hiking, and access to rock climbing sites) is most popular. Range-wide, populations are apparently most sensitive to variation in adult survival; this life history strategy makes populations vulnerable to environmental perturbation such as habitat loss and fragmentation, and slow to recover from population declines (NatureServe 2007). Reductions of any large primary cavity nesters on which the owl depends to create nesting cavities, such as flickers and other woodpeckers, within the forest community could result in reduced availability of nesting sites (NatureServe 2007).

Based on mapping as of 2006 of the flammulated owl's occurrence localities within the Spring Mountains NRA, with each site mapped as a 2.5-acre area, this species overlaps with existing human activities on the landscape as indicated in Table 4.11. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4.11 Estimated Overlap Between the Flammulated Owl and Human Activities Occurring Within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Buildings on private land	1
Campgrounds	1
Concentrated Use Areas	2
Firewood Gathering	2
Non-System Trail	6
Private Land	1
Snow Play Areas	1
Structures on FS Land	1
System Trail (high mileage)	2
System Trail (low mileage)	5
Trailheads in Developed Canyons	1
Roads (paved)	4
Roads (unpaved)	3
Wildland Urban Interface	6

Figure 4-11 Flammulated Owl Species Distribution

Figure 4-11 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the flammulated owl as part of the landscape analysis.

4.2.4 Western Burrowing Owl (*Athene cunicularia hypugaea*)

Status Designations

The western burrowing owl (*Athene cunicularia hypugaea =Speotyto cunicularia hypogea*) is a species of concern listed in the CA (USFS 1998) and is ranked as a high priority species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G4T4 S3B (NatureServe 2007).

Range-wide Distribution

The burrowing owl occurs in the grasslands and deserts of north and Central America west of the eastern edge of the Great Plains and south to Panama, as well as throughout Florida (Haug et al. 1993). The western burrowing owl is a year-long resident in Clark County (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

There have been two incidental observations of the western burrowing owl within the Spring Mountains NRA (Karen Harville, pers. comm.). The first sighting occurred in 2004 along the Wheeler Pass/Clark Canyon road at the Spring Mountains NRA border adjacent to BLM land. The second sighting was in 2006 alongside SR 156 within 0.2 mile of the Red Rock Canyon NCA (Karen Harville, pers. comm.). There have been no species-specific surveys for the burrowing owl and it was not recorded during the general bird surveys conducted by the GBBO in 2005. The second sighting occurred during GBBO protocol surveys conducted for the proposed Wildland Urban Interface Fuels project. See Figure 4-12 for locations of known occurrences of this species, all of which occur between 5,014 and 5,541 feet (1,528 and 1,689 meters) elevation.

Habitat

Range-wide this species is found in open grasslands and deserts habitats, often associated with burrowing mammals (Haug et al. 1993). In Clark County, the western burrowing owl lives year-round in open, dry grassland, Mojave Desert scrub, sagebrush/perennial grassland, and open shrub stages of pinyon-juniper, (Clark County 2006; Hiatt and Boone 2004). Important ecological features for the burrowing owl are the presence of burrows for nesting (Haug et al. 1993).

Life History

Burrowing owls select their burrows where there is a clear view of the surrounding area.

Measures

The data is not adequate to determine measures for this species.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA prior to 1998. However, the southwestern region showed significant population increases according to the breeding bird survey from 1980 to 1989, with the same data showing a significant decrease in populations in the central plains (Haug et al. 1993).

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the current status of the burrowing owl in the Spring Mountains NRA. However, throughout the species' range it is declining due to habitat loss due to agricultural and urban development, and loss of prairie dog habitat in some states (NatureServe 2007).

The combined available data sources for the Spring Mountains NRA as of 2006, converted to site-specific GIS mapping, indicate that there are currently two observations of this species where the breeding status had not been specified.

Threats

Specific threats have not been identified due to the limited information on the species' distribution. However, threats to the burrowing owl that have been identified within Clark County and may apply to the Spring Mountains NRA include loss and fragmentation of habitat due to land development, mortality on highways, and habitat degradation due to control and extermination of colonial burrowing mammals (RECON 2000; GBBO 2005). Burrowing owls are sensitive to disturbance by dogs, motorized vehicles, and people. The bird's reproductive success has been shown to be compromised where there are high levels of disturbance (GBBO 2005). A minimum 600-meter buffer has been recommended around active burrows (GBBO 2005).

Based on mapping as of 2006 of the burrowing owl's occurrence localities within the Spring Mountains NRA, this species' habitat overlaps with existing human activities on the landscape as indicated in Table 4-12. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-12 Estimated Overlap Between the Western Burrowing Owl and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Designated Horses/Burros Area	2

Level of Analysis

The Spring Mountains NRA is likely at the extreme edge of this species range, and management actions are not likely to impact the western burrowing owl and its viability. Since there are limited occurrences (and no breeding records) of western burrowing owls, and these sightings are likely incidental or at the very edge of the range of this species, no further analysis will be conducted as part of this landscape assessment.

Figure 4-12 Western Burrowing Owl Species Distribution

Figure 4-12 BACK

4.2.5 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Status Designations

The southwestern willow flycatcher (*Empidonax traillii extimus*) is currently listed as endangered under the Endangered Species Act (60 Federal Register 10694; February 27, 1995) as well as a sensitive species by the Forest Service (USFS 2003). It is a species of concern listed in the CA (USFS 1998), and is designated as a covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G5T1T2 S1B (NatureServe 2007).

Range-wide Distribution

The southwestern willow flycatcher's breeding range includes southern Nevada, southern California, Arizona, New Mexico, southern Utah, western Texas, northwestern Mexico, and possibly southwestern Colorado (Neel 2002). In Nevada, it occurs below 4,000 feet (1,220 meters) elevation (Neel 2002), and in Clark and Nye County it is a summer resident where it is known to nest at Pahranagat National Wildlife Refuge and along the Virgin and Muddy rivers (Hiatt and Boone 2004). Other riverine areas in Clark County with potential habitat include Meadow Valley Wash, Las Vegas Wash, and the Colorado River mainstem (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

One willow flycatcher was heard singing at Willow Spring Creek, where it is considered a summer resident (Karen Harville, pers. comm.). However, there have been no species-specific surveys for the southwestern willow flycatcher. The presence of suitable nesting habitat is uncertain and, if present, of very limited extent.

Habitat

Range-wide, the southwestern willow flycatcher is restricted to riparian habitats along rivers, streams, or other wetlands (Sedgwick 2000; Hiatt and Boone 2004). It prefers areas where intermediate-sized stands of willows (*Salix* spp.), cottonwood (*Populus* spp.), Baccharis spp., tamarisk (*Tamarix* spp.), or other riparian vegetation form a canopy of dense foliage, near or adjacent to surface water (Hiatt and Boone 2004; Neel 1999; Sedgwick 2000; Neel 2002; Hiatt and Boone 2004).

Life History

The southwestern willow flycatcher usually breeds from early June through the end of July, with a peak in mid-June. The clutch size is usually 3 to 4 eggs which are incubated by the female for 12 to 15 days before hatching. Breeding territories are usually about 1.5 acres (NatureServe 2007). The bird is insectivorous.

Measures

There is no specific data available to define measures of distribution and abundance for the southwestern willow flycatcher in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA. However, this species was listed as endangered under the Endangered Species Act in 1995 because of population declines throughout its range (USFWS 1995).

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the current status of the southwestern willow flycatcher in the Spring Mountains NRA. However, throughout its range this species has declined greatly in range and abundance in riparian areas of the southwest, primarily because of habitat loss and degradation, including nest parasitism by brown-headed cowbirds (NatureServe 2007).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on the species' distribution. However, threats to the southwestern willow flycatcher that have been cited within Clark County and may apply to the Spring Mountains NRA include habitat degradation, and loss of habitat quality due to the introduction, competition, and encroachment of exotic species. In addition, increased irrigated agriculture and livestock grazing have increased the range and abundance of brown-headed cowbirds, thereby increasing brood parasitism in some areas (Clark County 2006).

Level of Analysis

The Spring Mountains NRA is likely at the extreme edge of this species range, and management actions are not likely to impact the southwestern willow flycatcher and its viability. Since there are limited occurrences (and no breeding records) of the southwestern willow flycatcher in the Spring Mountains NRA, and these sightings are likely incidental, migration records, or at the very edge of the range of this species, no further analysis will be conducted as part of this landscape assessment.

4.2.6 Phainopepla (*Phainopepla nitens*)

Status Designations

The phainopepla (*Phainopepla nitens*) is designated as a covered species under the MSHCP (RECON 2000) and is classified as a BLM Nevada sensitive species (BLM 2003). It has a NatureServe conservation status rank of G5 S2B (NatureServe 2007).

Range-wide Distribution

This species inhabits arid woodland and desert habitats of the southwestern United States and Mexico. In the United States, its range encompasses southern California, extreme southern Nevada, extreme southwestern Utah, southern New Mexico, southwestern Texas, and most of Arizona (Chu and Walsberg 1999). In southern Nevada, the phainopepla occurs in the Spring Mountains, the Lake Mead National Recreation Area, the Las Vegas Valley, along the Virgin and Muddy Rivers, and along the Meadow Valley Wash (Hiatt and Boone 2004). It breeds throughout Piute and Eldorado valleys in extreme southern Clark County (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

It is known to occur in Trout Canyon and Pine Creek (Hiatt and Boone 2004) in the Spring Mountains NRA. The phainopepla has been observed in the northeast part of the Spring Mountains NRA around Willow and Cold creeks (Karen Harville, pers. comm.). However, there have been no species-specific surveys for the phainopepla. The presumed distribution of suitable habitat is of very limited extent, especially in comparison to its potential distribution within Clark County and throughout the rest of its range.

Habitat

Range-wide, the phainopepla is found within two types of habitat based on season (Chu and Walsberg 1999). During most of the year, it is typically restricted to the Sonoran Desert and portions of the Mojave Desert in desert riparian areas along washes where it is closely associated with mistletoe (Chu and Walsberg 1999). However, during late spring and summer it moves to semiarid woodlands, including riparian woodlands in chaparral habitats, live-oak woodlands, and Joshua-tree woodlands where there are mistletoe berries (Chu and Walsberg 1999). In Clark County, it is found in lowland riparian and mesquite/catclaw habitats where washes, riparian areas, and other habitats supporting brushy growth of mesquite, catclaw, ironwood, and paloverde that are infested with mistletoe (Clark County 2006). Little specific habitat information has been documented in the Spring Mountains NRA.

Life History

The phainopepla breeds March through July, laying 1 to 3 broods per year (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the phainopepla in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA. However, breeding bird surveys from 1969 to 1997 (Clark County 2006) indicated the species was present.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the phainopepla's current status in the Spring Mountains NRA. Throughout the species' range, it is suspected that the population is declining due to mesquite removal for agricultural and residential development (Chu and Walsberg 1999).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on the species' distribution. However, threats to the phainopepla that have been identified within Clark County and may apply to the Spring Mountains NRA, include habitat degradation and wildlife displacement from wood collection; and loss of habitat quality due to the introduction, competition, and encroachment of non-native vegetation (Clark County 2006).

Level of Analysis

Since there are few documented occurrences of phainopepla, the habitat on the Spring Mountains NRA is at the edge of this species occurrence and management activities are not likely to impact this species, no further analysis will be conducted as part of this landscape analysis.

4.2.7 Blue Grosbeak (*Passerina caerulea*)

Status Designations

The blue grosbeak (*Passerina caerulea =Guiraca caerulea*) is designated as a covered species under the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G5 S3B (NatureServe 2007).

Range-wide Distribution

The blue grosbeak breeds across the southern half of North America from New Jersey west to interior California, northern Baja California, and south into Mexico (Ingold 1993).

Distribution in the Spring Mountains NRA

There are no documented occurrences of this species in the Spring Mountains NRA. There have been no species-specific surveys for the blue grosbeak and it was not recorded during the general bird surveys conducted by the GBBO in 2005. The presumed distribution of suitable habitat in the Spring Mountains NRA is of very limited extent, especially in comparison to its potential distribution within Clark County and throughout the rest of its range.

Habitat

Range-wide, breeding habitat for this species includes old fields, forest edge, groves, riparian, fields, deserts, mesquite savanna, salt cedar, and pine forests (Ingold 1993). In Clark County, the blue grosbeak breeds in desert riparian and grassland habitats, as well as agricultural and urban areas with low canopy cover primarily associated with riparian thickets of willow, young cottonwood, arrow weed, or tamarisk along the Virgin, Muddy, and Colorado rivers and lower Las Vegas Wash. It forages in forest openings, grasslands, and croplands (Clark County 2006; Hiatt and Boone 2004). Specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The blue grosbeak may lay 2 to 5 eggs and produce 1 to 2 broods each year during the spring and summer (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the blue grosbeak in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA. However, breeding bird surveys from 1965 to 1979 showed numbers increasing over the entire continent (Ingold 1993).

Current Conditions in the Spring Mountains NRA

Based on the lack of occurrence data, the potential presence of the blue grosbeak is considered incidental in the Spring Mountains NRA. Within Clark County, blue grosbeak populations are thought to be declining due to loss of riparian habitat (Clark County 2006).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the lack of occurrence information. However, threats to the blue grosbeak that have been identified within Clark County and may apply to the Spring Mountains NRA include lowland riparian habitat degradation and modification associated with channelization, changes in habitat quality due to changes in water flows resulting from water diversion and ground water pumping, and changes in water quality from grazing and agriculture. Population decreases have also been attributed to the introduction, competition, and encroachment of non-native species, and increased populations of nest parasitic species (i.e., brown-headed cowbird) (Clark County 2006).

Level of Analysis

The Spring Mountains NRA is likely at the extreme edge of this species range, and management actions are not likely to impact the blue grosbeak and its viability. Since there are no sightings and the Spring Mountains are at the very edge of the range of this species, no further analysis will be conducted as part of this landscape assessment.

4.2.8 Summer Tanager (*Piranga rubra*)

Status Designations

The summer tanager (*Piranga rubra*) is a designated covered species under the MSHCP (RECON 2000), and has a NatureServe conservation status rank of G5 S2B (NatureServe 2007).

Range-wide Distribution

The summer tanager is found throughout the southern United States, from east to west, and into Mexico; with eastern populations ranging as far as 40° north latitude (Robinson 1996).

Distribution in the Spring Mountains NRA

The summer tanager reaches the northern edge of its range in the west in southern Nevada (Hiatt and Boone 2004). The summer tanager has been documented on the northeast part of the Spring Mountains NRA around Willow Creek and Cold Creek (Karen Harville, pers. comm.), though there are no available site-specific breeding records. There have been no species-specific surveys for the summer tanager and it was not recorded in general bird surveys conducted by the GBBO at set plots monitored yearly.

Habitat

The summer tanager occupies deciduous forest habitat throughout the eastern and northern portions of its range. The western populations inhabit riparian woodland habitat dominated by willows and cottonwoods at lower elevations, and mesquite and salt cedar at higher elevations (Robinson 1996). In Clark County the summer tanager can be found in desert riparian habitat with mature cottonwood-willow associations along streams (Clark County 2006). Specific habitat and distribution information in the Spring Mountains NRA has not been documented.

Life History

The summer tanager lays its eggs from May to June. The clutch size is usually 3 to 5 eggs that hatch after 12 days and fledge after 8 to 10 days (NatureServe 2007).

Measures

There are no specific data available to define measures of distribution and abundance for the summer tanager in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA. However, breeding bird surveys conducted throughout the range of the summer tanager indicate that continent-wide, long-term trends (1966-1991) have been stable. However, short-term (1982-1991) trends demonstrated a significant decrease in populations (Robinson 1996).

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the summer tanager's current status in the Spring Mountains NRA. Throughout the species' range its status is considered secure; although, populations along the Colorado River have declined due to habitat loss and degradation (NatureServe 2007).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on the species' distribution. However, threats to summer tanagers that have been cited within Clark County and may apply to the Spring Mountains NRA include lowland riparian habitat degradation and modification associated with stream channelization, water diversions, and ground water pumping; degradation of water and habitat quality due to ungulate grazing; and the introduction, competition, and encroachment of exotic species (Clark County 2006).

Level of Analysis

Since there are limited incidental documented occurrences of the summer tanager, habitat is minimal and limited on the Spring Mountains NRA, and management actions are not likely to impact this species, no further analysis will be conducted as part of this landscape assessment.

4.3 REPTILES

4.3.1 Desert Tortoise (*Gopherus agassizii*) – Mojave Population

Status Designations

The Mojave population of the desert tortoise (*Gopherus agassizii*) is listed as threatened under the Endangered Species Act (55 FR 12178-12191). It is a species of concern listed in the CA (USFS 1998), is a covered species under the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G4 S2S3 (NatureServe 2007).

Range-wide Distribution

The Mojave population of the desert tortoise occurs throughout the Mojave Desert region of the southwestern United States, north and west of the Colorado River, including southern California, southern Nevada, extreme southwest Utah, and extreme northwest Arizona, from near sea level to 5,240 feet (1,600 meters) elevation (Stebbins 2003).

Distribution in the Spring Mountains NRA

Given the lack of formal surveys or habitat mapping for this species in the Spring Mountains NRA, the presumed distribution of suitable desert tortoise habitat in the NRA is located along the lower elevation edges of the Spring Mountains NRA boundary. This habitat is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. See Figure 4-13 for locations of the only known occurrences of this species in the Spring Mountains NRA, all of which occur between 4,170 and 6,350 feet (1,271 and 1,935 meters). Note: mapped desert tortoise sites are derived from general descriptions of approximate observation locations.

Habitat

The desert tortoise occurs in primarily desert scrub and desert wash habitats (Stebbins 2003), inhabiting Mojave Desert scrub and blackbrush communities (Clark County 2006). It commonly uses shelter among rocks and exposed eroded caliche layers in walls of washes (Stebbins 2003).

Life History

The desert tortoise lays a clutch of 1 to 12 eggs from May to July (Stebbins 2003). Double clutching is common in the Mojave Desert in or following a wet year (NatureServe 2007).

Measures

There is not enough site information to determine measures for this species in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on available data there is one occurrence record for the desert tortoise documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

The desert tortoise in the Spring Mountains NRA is rare due to the limited amount of suitable habitat, which is only present at the periphery of the Spring Mountains NRA. There have only been five documented occurrences of the desert tortoise: one observation was west of Mexican Spring; live tortoises were found in the southeast portion of the Spring Mountains NRA near Potosi Spring and west of Lost Cabin Spring; one carcass was located near the Middle Kyle Canyon Complex just north of SR 157; and another carcass was found within the Lovell Canyon area near the Torino Ranch (Karen Harville, pers. comm.). There have been no species-specific surveys for the desert tortoise in the Spring Mountains NRA. As a result, the only information available is of incidental sightings.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 5 element occurrence records where the general locations of desert tortoise have been observed in the Spring Mountains NRA.

Threats

Areas that would be inhabited by the desert tortoise are at lower elevations and relatively flat areas of the Spring Mountains NRA. Therefore, portions of Forest Service roads, and user-defined OHV vehicle trails and horse trails are found within this species' potential habitat. Threats to the desert tortoise in the Spring Mountains NRA may include habitat modification and

degradation, mortality from concentrated recreation (e.g., OHV activities) or vehicular traffic on and off highways and unimproved roads, and habitat degradation from feral ungulate and domestic horse grazing and trampling (Clark County 2006). Wildfires in the area can result in direct mortality of desert tortoises as well as habitat alteration by furthering the expansion of cheatgrass. Another potential threat in the Spring Mountians NRA to the desert tortoise is the spread of an upper respiratory tract disease that can be caused by release of captive tortoises into the wild (RECON 2000).

Based on mapping as of 2006 of desert tortoise occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-13. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-13 Estimated Overlap Between the Desert Tortoise and Human Activities Occurring within the Spring Mountains NRA.

Activity	Number of Overlapping Sites
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1

Considering the reported elevation range of the desert tortoise, the presumed distribution of suitable habitat is very minimally restricted to the lower elevation edges of the Spring Mountains NRA (less than 5,000 feet in elevation) and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Incidental sightings of the desert tortoise has been noted only five times in the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA, no further analysis will be conducted as part of this landscape assessment.

4.3.2 Western banded Gecko (*Coleonyx variegatus*)

Status Designation

The western banded gecko (*Coleonyx variegatus*) is a designated covered species in the MSHCP and is considered a southwestern desert endemic (RECON 2000). This species has a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The banded gecko occurs from sea level to approximately 5,000 feet (1,580 meters) elevation throughout the deserts of the southwestern United States, northwest Mexico, and Baja California (Stebbins 2003). In the United States, its range encompasses southern California, extreme southern Nevada, southwestern Utah, western Arizona, and extreme southwestern New Mexico (NatureServe 2007; Stebbins 2003).

Figure 4-13 Desert Tortoise Species Distribution

Figure 4-13 BACK

Distribution in the Spring Mountains NRA

Numerous subspecies of the banded gecko have been described. The subspecies occurring in the vicinity of the Spring Mountains is expected to be *C. v. variegatus*, the most widespread of the banded gecko subspecies (Stebbins 2003). Suveys have been limited, but sighings of have been documented in the Cold Creek, mid-Kyle Canyon , Lee Canyon, Mountain Springs, and Potosi areas (Karen Harville, pers. comm..; Logan and Baker 2007; NDOW 2008, RECON 2000). The presumed distribution of suitable habitat is of very limited extent in the Spring Mountains NRA, especially in comparison to its distribution within Clark County and throughout the rest of its range.

Habitat

Range-wide, this species occurs in primarily desert habitats in both rocky areas and barren dunes (NatureServe 2007; Stebbins 2003). In Clark County, it is known to inhabit Mojave Desert scrub and mesquite/catclaw habitats, and less commonly in pinyon-juniper, blackbrush, sagebrush, and desert riparian habitats (Clark County 2006; Hiatt and Boone 2003). It seeks shelter under rocks, crevices, fallen logs (primarily yucca), and rubbish piles. It is nocturnal, feeding on arthropods (Clark County 2006), and is capable of surviving in very dry habitats (Stebbins 2003). Specific habitat and distribution information has not been documented, but its range would be expected to be along the lower reaches of the Spring Mountains NRA boundary and extremely limited.

Life History

The banded gecko lays 1 to 3 clutches of 2 eggs from May to September. Young hatch 45 days later, July to November (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the banded gecko in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the banded gecko, and there is insufficient information to determine its current status in the Spring Mountains NRA. Extensive general surveys for reptiles completed within this species' potential habitat were conducted for the Wildland Urban Interface Fuels project (along lower Lee Canyon Road to the Spring Mountains NRA boundary) and within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project (Jones & Stokes 2006; Logan and Baker 2007). The species was not recorded within either proposed project area (Karen Harville, pers. comm.). However, incidental sightings in the Spring Mountains NRA have been documented. The species' status is presumed stable throughout most of its range (NatureServe 2007).

Threats

Areas that would be inhabited by this species in the Spring Mountains NRA are lower elevation and relatively flat, compared to the higher mixed conifer zones. Portions of the Forest Service road system, and some user defined OHV trails and horse trails are found within this species' potential habitat. However, threats to the banded gecko that have been identified within Clark

County and may apply to the Spring Mountains NRA include habitat fragmentation from roads and trails; mortality from vehicular traffic on highways, unimproved roads, and cross-country activities; loss from collection by commercial collectors and hobbyists; and habitat degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, and parking for these activities) (Clark County 2006; NatureServe 2007).

Level of Analysis

The reported elevation range of the western banded gecko and the presumed distribution of suitable habitat are very minimally restricted to the lower elevation edges of the Spring Mountains NRA and are of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Only one site occurrence has been reported for this species. As the viability of the western banded gecko is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact the species, no further analysis will be conducted as part of this landscape assessment.

4.3.3 Western Chuckwalla (*Sauromalus ater*)

Status Designations

The western chuckwalla (currently known as the common chuckwalla) (*Sauromalus ater* = *Sauromalus obesus obesus*) is a southwestern endemic that is designated as a species of concern in the CA (USFS 1998), and as covered species under the MSHCP (RECON 2000). This species is classified as a BLM Nevada sensitive species (BLM 2003) and has a NatureServe conservation status rank of G5 S3 (NatureServe 2007).

Range-wide Distribution

The chuckwalla occurs throughout the deserts of the southwestern United States, western Mexico, and eastern Baja California (Stebbins 2003). In the southwestern United States, this species' range encompasses southeastern California, southern Nevada, western Arizona, and extreme southern Utah from sea level up to approximately 5,000 feet (1,530 meters) elevation (Hiatt and Boone 2004; Stebbins 2003).

Distribution in the Spring Mountains NRA

The only recording for this species was by Forest Service biologists on the lower west side of the Spring Mountains NRA while conducting bird surveys (Karen Harville, pers. comm.).

Habitat

Range-wide, chuckwallas are typically found on rocky slopes and open flats in the vicinity of rock outcrops where creosote bush is present (NatureServe 2007). In Clark County, this species is found within Mojave Desert scrub, salt desert scrub, and mesquite/catclaw in areas with rocky cover or boulder outcrops where individuals can seek shelter in rock crevices (Clark County 2006). Within the Spring Mountains NRA it would be expected to be found within the Sonoran Mojave Creosote bush-white Bursage Desert Scrub/Mixed Salt Desert Scrub and the Inter-Mountain Basins Semi-Desert Shrub Steppe, where it would be located specifically adjacent and within rocky areas. Specific habitat and distribution information has not been documented in the Spring Mountains NRA. Hiatt and Boone (2004) state, "In Clark County, Nevada, this species occurs on virtually all undisturbed rocky hillsides up to about 4,920 feet (1,500 meters) in elevation."

Life History

The chuckwalla lays a clutch of 5 to 16 eggs (clutch size increases with female body size) from June to August. Females may lay eggs only every second year (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the chuckwalla in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no site-specific surveys for the chuckwalla and there is insufficient information to determine its current status in the Spring Mountains NRA. Extensive general surveys for reptiles were completed within this species' potential habitat along rock faces within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded during those surveys. The chuckwalla's status is considered relatively stable throughout much of its range; however, populations may vary with environmental conditions and some populations may have declined (NatureServe 2007).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on the species' distribution. As the species is found primarily on rocky outcrops, it is vulnerable to habitat fragmentation and mortality caused by roads and trails. Other threats to the chuckwalla that have been identified within Clark County and may apply to the Spring Mountains NRA include indiscriminate recreational shooting, illegal collection (a major problem as this is a popular reptile for collection), and habitat degradation from OHV vehicle activities (Clark County 2006).

Level of Analysis

The reported elevation range of the species and the presumed distribution of suitable habitat are restricted to the lower elevation edges of the Spring Mountains NRA and are of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. In addition there is little likelihood of management activities within potential habitat (rocky outcrops). Since there are few sightings associated with the chuckwalla, its viability is not dependent upon habitat and management actions within the Spring Mountains NRA, no further analysis will be conducted as part of this landscape assessment.

4.3.4 Banded Gila Monster (*Heloderma suspectum cinctum*)

Status Designations

The banded Gila monster (*Heloderma suspectum cinctum*) is listed as a species of concern under the CA (USFS 1998), and as an evaluation species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G4T4 S2 (NatureServe 2007).

Range-wide Distribution

A subspecies of the Gila monster, the banded Gila monster occurs in the deserts of western Arizona, extreme southeastern California, extreme southwestern Utah, and extreme southern Nevada from near sea level to approximately 6,000 feet (1,830 meters) in elevation (Stebbins 2003; Hiatt and Boone 2004). The Gila monster is the only venomous lizard in the United States.

Distribution in the Spring Mountains NRA

There have been few surveys specifically for the species in the Spring Mountains NRA and there are no documented occurrences of Gila monsters within the Spring Mountains NRA, which is at the extreme limits of its range. Bradley and Deacon (1966) noted that the closest observation "…was taken in the Red Rock area at the base of the East slope of the range about 15 miles west of Las Vegas and is the first record from the west side of the Las Vegas Valley." While the Gila monster may be widespread in Clark County, few observation records exist to document distribution and abundance (Hiatt and Boone 2004). The presumed distribution of suitable habitat is of very limited extent in the Spring Mountains NRA, especially in comparison to its potential distribution within Clark County and throughout the rest of its range.

Habitat

In Clark County, it is known to inhabit shrubby, grassy, and succulent desert areas within Mojave Desert scrub, mesquite/catclaw, pinyon-juniper, desert riparian, and occasionally oak woodland (Clark County 2006). Therefore, within the Spring Mountains NRA boundary, it would be expected to be found within the Sonora Mojave Creosote Bush-White Bursage Desert Scrub/Mixed Salt Desert Scrub and the Inter-Mountain Basins Semi-Desert Shrub Steppe, where it would be located specifically on the lower slopes of rocky canyons, mesic flats, washes, and flats with grassland or succulents. The Gila monster uses rocks and burrows of other animals for cover during the day and searches for prey items primarily at night (Clark County 2006). Specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The banded Gila monster lays a clutch of 2 to 12 eggs from July to August. They tend to be generalists, feeding on small mammals, eggs and nestlings of birds as well as reptile eggs, insects, and carrion (Stebbins 2003).

Measures

There is no specific data available to define measures of distribution and abundance for the banded Gila monster in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the banded Gila monster and there is insufficient information to determine its current status in the Spring Mountains NRA. Throughout the species' range its status is apparently secure and it is protected from collection without special permit (NatureServe 2007). Extensive general surveys for reptiles completed within this species' potential habitat were conducted along and below rock faces within the lower Kyle

Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within this proposed project area, nor was it seen in lower elevation areas during Wildland Urban Interface Fuels project surveys conducted in 2006.

Threats

Specific threats in the Spring Mountains NRA to the banded Gila monster have not been identified due to the limited information on the species' distribution. However, threats to the banded Gila monster that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat modification and degradation, wildlife mortality from concentrated recreation, OHV use, mortality from uncontrolled pets and feral animals, and equestrian trail rides (Clark County 2006). Although it is a state protected species, it is still poached and sold to collectors (RECON 2000).

Level of Analysis

Considering the reported elevation range of the species, the presumed distribution of the majority of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. The species was not detected during reptile survey conducted for the Middle Kyle Canyon Complex and Wildland Urban Interface Fuels projects and the present status is that the species does not occur on the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities will not impact the species, no further analysis will be conducted as part of this landscape assessment.

4.3.5 Long-nosed Leopard Lizard (*Gambelia wislizenii*)

Status Designations

The long-nosed leopard lizard (formerly known as the large-spotted leopard lizard) (*Gambelia wislizenii =Gambelia wislizenii wislizenii*) is a designated covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G5 S4 (NatureServe 2007). It is considered a Great Basin and southwestern desert endemic species in the MSHCP (RECON 2000)

Range-wide Distribution

The long-nosed leopard lizard occurs throughout much of the southwest, from southeastern Oregon, southern Idaho, Nevada, southeastern California, Arizona, southern New Mexico, and western Texas from near sea level to approximately 6,000 feet (1,830 meters) elevation (Stebbins 2003).

Distribution in the Spring Mountains NRA

The long-nosed leopard lizard has been reported to be found in the Willow Creek, Cold Creek, Mountain Springs area of the NRA (Jones & Stokes 2006, Logan and Baker 2007, NDOW 2008). There have been no species-specific surveys for the long-nosed leopard lizard in the Spring Mountains NRA.

Habitat

Range-wide, this species occurs primarily in arid and semiarid plains with bunch grass, alkali bush, sagebrush, creosote bush, or other scattered low plants on hardpan, gravel, or sand

(Stebbins 2003). In Clark County, it is known to inhabit primarily Mojave Desert scrub and salt desert scrub, but also occurs in blackbrush, sagebrush and pinyon-juniper habitats (Clark County 2006; Hiatt and Boone 2004). Specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The long-nosed leopard lizard lays a clutch of 1 to 11 eggs in different areas between late May and early July. Eggs generally hatch within 5 to 7 weeks (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the long-nosed leopard lizard in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the current status of the long-nosed leopard lizard in the Spring Mountains NRA. Throughout this species' range, its status is considered secure (NatureServe 2007).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information about the species' distribution. Therefore, portions of the Forest Service road system, and user defined OHV vehicle trails and horse trails are found within this species potential habitat. Threats to the long-nosed leopard lizard that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat loss and degradation, loss from commercial collectors and hobbyists, mortality from vehicular traffic on highways and unimproved roads, and habitat fragmentation or destruction by roads and trails (Clark County 2006).

Level of Analysis

Areas that would be inhabited by the long-nosed leopard lizard are at lower elevations and relatively flat areas of the Spring Mountains NRA. Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Presence in the Spring Mountains NRA is likely to be incidental. Surveys conducted within the Middle Kyle area and along Lee Canyon Road within suitable habitat did not detect this species. As the viability of the long-nosed leopard lizard is not dependent upon habitat within the Spring Mountains NRA, no further analysis will be conducted as part of this landscape assessment.

4.3.6 Great Basin Collared Lizard (*Crotaphytus bicinctores*)

Status Designations

The Great Basin collard lizard (*Crotaphytus bicinctores*) (=*Crotaphytus insularis bicinctores*) is a designated covered species under the MSHCP and is considered a Great Basin and

southwestern desert endemic (RECON 2000). This species has a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

Previously considered a subspecies of the desert collared lizard, *C. insularis,* the Great Basin collared lizard is found within the deserts of western Arizona, western Utah, most of Nevada, and southern California (Stebbins 2003) from sea level to approximately 7,500 feet (2,290 meters) elevation (NatureServe 2007).

Distribution in the Spring Mountains NRA

The Great Basin collared lizard was reported in the Willow Creek area of the Spring Mountains NRA (Karen Harville, pers. comm.), though there are no available site-specific records. There have been no species-specific surveys for the Great Basin collard lizard, nor has it been recorded in general reptile surveys conducted in 2005–2007 on the Spring Mountains NRA.

Habitat

Range-wide, the Great Basin collared lizard occurs primarily within Great Basin, Sonoran, and Mojave deserts, and is found primarily in rocky areas that are sparsely vegetated (NatureServe 2007). In Clark County, it is known to inhabit Mojave Desert scrub, salt desert scrub, mesquite/catclaw, desert riparian, blackbrush, sagebrush, and pinyon-juniper habitats in rocky area such as arroyos, hill slopes, and washes where they can hide under rocks or in rodent holes (Clark County 2006). In the Spring Mountains NRA, the collared lizard would be found from the Sonora-Mojave Creosote Bush-White Bursage Desert Scrub/Mixed Salt Desert Scrub to the Great Basin Pinyon-Juniper Woodland.

Life History

The Great Basin collard lizard lays 1 to 2 clutches of 2 to 12 eggs a year, mainly in June and hatch around October (NatureServe 2007).

Measures

There is no specific data available to define measures of distribution and abundance for the Great Basin collard lizard in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the Great Basin collard lizard and there is insufficient information to determine its current status in the Spring Mountains NRA. Extensive general surveys for reptiles completed within this species' potential habitat were conducted for the Wildland Urban Interface Fuels project (along Lee Canyon Road) and within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within either proposed project area. Throughout the species' range, its status is considered secure (NatureServe 2007).

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on this species' distribution. Areas that would be inhabited by the Great Basin collared lizard in the Spring Mountains NRA are lower elevation and relatively flat, compared to the higher mixed conifer zones. As a result most of the Forest Service road system, user defined OHV vehicle trails, and horse trails are found within this species' potential habitat. Threats to the Great Basin collared lizard that have been identified within Clark County and may apply to the Spring Mountains NRA include loss from commercial collectors and hobbyists, mortality by vehicular traffic on highways and unimproved roads, mortality from feral animals and uncontrolled pets, and habitat fragmentation and destruction by roads and trails (Clark County 2006; RECON 2000).

Level of Analysis

The reported elevation range of the Great Basin collared lizard and the presumed distribution of suitable habitat are restricted to the lower elevation edges of the Spring Mountains NRA and are of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Surveys within potential habitat have not detected this species and only one sighting has been reported in the Spring Mountains NRA. No further analysis will be conducted as part of this landscape assessment.

4.3.7 Western Red-tailed Skink (*Eumeces gilberti rubricaudatus*)

Status Designations

The western red-tailed skink (currently known as the western redtail skink) (*Eumeces gilberti rubricaudatus*) is a designated covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G5T4 S2S3 (NatureServe 2007).

Range-wide Distribution

The western red-tailed skink is a subspecies of Gilbert's skink (Hiatt and Boone 2004) and is known from the southwestern United States and Baja California from sea level to approximately 7,300 feet (2,220 meters) elevation (Stebbins 2003). The western red-tailed skink occurs in two isolated populations; one in the mountain ranges in southwestern Nevada and southeastern California, and the second in central and southern California. In Clark County, Nevada it is known from the Spring, Sheep and Newberry mountains (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

A few occurrences are noted based on the MSHCP map, Appendix 2 for the species (RECON 2000) and a few incidental sightings have been made in the Spring Mountains NRA; however, specifics for those locations are not available.

Habitat

The western red-tailed skink is primarily found in Ponderosa pine woodland, pinyon-juniper woodland, closed and open chaparral, desert grassland, mixed broadleaf riparian, cottonwood-willow riparian, and juniper woodland habitat types (BISON-M 2004). It prefers rocky areas or areas with logs or leaf cover near permanent or intermittent streams (Hiatt and Boone 2004). In Clark County, it primarily inhabits pinyon-juniper and riparian habitats near water. It is less common in higher elevation habitats (Clark County 2006). Specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The western red-tailed skink lays a clutch of 3 to 9 eggs during the summer months (Stebbins 2003).

Measures

There are no specific data available to define measures of distribution and abundance for the western red-tailed skink in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the western red-tailed skink and there is insufficient information to determine its current status in the Spring Mountains NRA. Throughout the species' range its status appears secure, although little information is available (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. However, threats to the western red-tailed skink that have been identified in Clark County and apply to the Spring Mountains NRA include mortality from habitat degradation and loss from destructive collection methods; habitat degradation and modification due to fire suppression and fuels management; mortality from vehicles on paved and unpaved roads; and habitat degradation from wood collection and litter removal (Clark County 2006).

Level of Analysis

Since there are limited documented occurrences of the western red-tailed skink in the Spring Mountains NRA, a descriptive analysis will be conducted as part of this landscape assessment.

4.3.8 California Kingsnake (*Lampropeltis getula californiae*)

Status Designations

The California kingsnake (*Lampropeltis getula californiae*) is a designated covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G5T5 S4 (NatureServe 2007).

Range-wide Distribution

The California kingsnake, one of many subspecies of the common kingsnake, is widespread in the southwestern United States, occurring in the western half of Arizona, throughout California and Baja California, the southern half of Nevada, and extreme southern Utah from sea level to approximately 7,000 feet (2,130 meters) elevation (Stebbins 2003).

Distribution in the Spring Mountains NRA

One sighting of the California kingsnake was reported by a Forest Service wildlife biologist at Keyhole Canyon in Lower Middle Kyle Canyon (Karen Harville, pers. comm.). However, the

species might be present in the Spring Mountains NRA in vegetation communities up to the coniferous forest (7,000 feet [2,100 meters]) (Hiatt and Boone 2004).

Habitat

Range-wide, the California kingsnake is found in a variety of habitats, including coniferous forests, woodland, swampland, coastal marshes, river bottoms, farmland, prairie, chaparral, and desert (Stebbins 2003). In Clark County, it is most commonly found in Mojave Desert scrub and salt desert habitats in the vicinity of rock outcrops or clumps of vegetation (Clark County 2006). Within the Spring Mountains NRA boundary it would be expected to be found in rocky areas within the Sonora/Mojave Creosote Bush-White Bursage Desert Scrub/Mixed Salt Desert Scrub and the Inter-Mountain Basins Semi-Desert Shrub Steppe. However, specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The California kingsnake lays a clutch of 2 to 24 (6 to 12 on average) eggs from May to August (Stebbins 2003).

Measures

There is no specific data available to define measures of distribution and abundance for the California kingsnake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the current status of the California kingsnake in the Spring Mountains NRA. However, throughout the species' range its status is reported as secure (NatureServe 2007). In the Spring Mountains NRA, extensive general surveys for reptiles were completed within this species' potential habitat for the Wildland Urban Interface Fuels project (along Lee Canyon Road) and within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within either proposed project area.

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. As the species is found primarily on rocky outcrops, it is vulnerable to habitat fragmentation and mortality caused by roads and trails. Threats to the California kingsnake that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, and development around Cold Creek and Mountain Pass; mortality from vehicular traffic on highways and unimproved roads; loss from collection by commercial collectors and hobbyists; and habitat degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, and parking for these activities) (Clark County 2006).

Level of Analysis

Areas that would be inhabited by this the California kingsnake in the Spring Mountains NRA are primarily at lower elevations in rocky areas. Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its

distribution within Clark County and throughout the rest of its range. Presence in the Spring Mountains NRA is likely to be incidental. Surveys conducted within the Middle Kyle area and along Lee Canyon Road within suitable habitat did not detect this species. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact its habitat, no further analysis will be conducted as part of this landscape assessment.

4.3.9 Glossy Snake (*Arizona elegans*)

Status Designations

The glossy snake (*Arizona elegans*) is designated as covered in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The glossy snake occurs from the Great Plains of Texas, Oklahoma, and Kansas, across much of New Mexico, Arizona, California, and extreme southern Nevada from below sea level (desert sinks) to approximately 7,220 feet (2,200 meters) elevation (Stebbins 2003).

Distribution in the Spring Mountains NRA

Numerous subspecies of glossy snake have been described in the southwestern United States. Hiatt and Boone (2004) report the subspecies within Clark County as the desert glossy snake (*Arizona elegans eburnata*), which occurs within southern Nevada and southwestern California. The glossy snake has been reported in the Potosi area of the Spring Mountains NRA (Karen Harville, pers. comm.), though there are no available site-specific records.

Habitat

Range-wide, this species occurs in primarily rocky desert, grassland, and open woodland habitats. In Clark County, this species is found in Mojave Desert scrub, salt desert scrub, grassland, and pinyon-juniper habitats where there are open sandy surfaces, scattered brush, and rocky areas (Clark County 2006). Within the Spring Mountains the habitat series would thus range from the Sonora-Mojave Mixed Salt Desert Scrub to the Great Basin Pinyon-Juniper Woodland. Hiatt and Boone (2004) believe it would only occur within the extreme lower limit of the Spring Mountains NRA within Joshua tree and blackbrush habitats.

Life History

The glossy snake lays a clutch of 2 to 23 (average 8) eggs in the summer months with eggs hatching in late summer or early fall. Not all females are reproductive every year, suggesting female reproduction may be biennial (NatureServe 2007).

Measures

There are no specific data available to define measures of distribution and abundance for the glossy snake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

Throughout this species' range its current status is considered stable (NatureServe 2007). However, there have been no species-specific surveys for the glossy snake and there is insufficient information to determine its current status in the Spring Mountains NRA. Extensive general survey for reptiles completed within this species' potential habitat were for the Wildland Urban Interface Fuels project (along Lee Canyon Road) and within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within either proposed project area.

Threats

Specific threats in the Spring Mountains NRA have not been identified due to the limited information on the species' distribution. Areas in the Spring Mountains NRA that would be inhabited by this species are at lower elevations and relatively flat. Therefore, those portions of the Forest Service road system, and user defined OHV vehicle trails and horse trails, which are found within this species' potential habitat, could be a threat to the species or its habitat. Threats to the glossy snake that have been identified within Clark County and that may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, and development; mortality from vehicular traffic on highways and unimproved roads; loss from collection by commercial collectors and hobbyists; and habitat modification and degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, and parking for these activities) (Clark County 2006; NatureServe 2007).

Level of Analysis

Areas that would be inhabited by the glossy snake are primarily at lower elevations within Joshua tree/blackbrush habitat in the Spring Mountains NRA. Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Presence in the Spring Mountains NRA is likely to be incidental. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact its habitat, no further analysis will be conducted as part of this landscape assessment.

4.3.10 Sonoran Lyre Snake (*Trimorphodon biscutatus lambda*)

Status Designations

The Sonoran lyre snake (*Trimorphodon biscutatus lambda*) is designated as covered in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G5T5 S4 (NatureServe 2007).

Range-wide Distribution

This subspecies of lyre snake occurs throughout much of Arizona, southern California, extreme southern Nevada, extreme southwestern Utah, south into Mexico at elevations up to approximately 7,400 feet (2,250 meters) above sea level (Clark County 2006; NatureServe 2007; Stebbins 2003).

Distribution in the Spring Mountains NRA

There are no known documented occurrences of the Sonoran lyre snake within the Spring Mountains NRA, though it has been found within Clark County.

Habitat

Range-wide, this species is generally found on rocky slopes, boulder piles, and other rocky outcrops in desert scrub and desert grassland habitats, though it is occasionally found in rockless areas and at higher elevations (Stebbins 2003). In Clark County, this species is found in Mojave Desert scrub, pinyon-juniper, and mixed conifer habitats (Clark County 2006; Hiatt and Boone 2004). Potential habitat in the Spring Mountains NRA would be found within the Sonora-Mojave Creosote Bush-White Bursage Desert Scrub/mixed Salt Desert Scrub to the Rocky Mountain Mesic and Dry Mesic Mixed Conifer Forest and Woodland series.

Life History

The breeding behavior of the lyre snake is not well known but clutches of 7 to 20 eggs have been reported (Stebbins 2003).

Measures

There is no specific data available to define measures of distribution and abundance for the Sonoran lyre snake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status of this species within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine the current status of the Sonoran lyre snake in the Spring Mountains NRA. Extensive general surveys for reptiles completed within this species' potential habitat were conducted along and below rock faces within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within this proposed project area (Karen Harville, pers. comm.). Hiatt and Boone (2004) reported that although this species is infrequently observed in Clark County, it is probably widespread in the appropriate habitat. Throughout the species' range its status is considered secure (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. However, threats to the Sonoran lyre snake that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, development (e.g., Trout Canyon, Kyle Canyon, Cold Creek, and Mountain Pass); mortality from vehicular traffic on highways, unimproved roads, OHV trails, and OHV activities; loss from collection by commercial collectors and hobbyists; and habitat degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, and parking for these activities).

Level of Analysis

Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Presence has not been documented in the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact its habitat, no further analysis of this species will be conducted as part of this landscape assessment.

4.3.11 Western Leaf-nosed Snake (*Phyllorhynchus decurtatus*)

Status Designations

The western leaf-nosed snake (currently known as the spotted leaf-nosed snake (*Phyllorhynchus decurtatus*) is designated as a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The western leaf-nosed snake is found in the deserts of the southwestern United States and Mexico, from below sea level (desert sinks) to approximately 4,000 feet (1,220 meters) elevation. In the United States, it is found from southern California, southern Nevada, southwestern Arizona, and extreme southwestern Utah (Stebbins 2003).

Distribution in the Spring Mountains NRA

There are no documented occurrences of the western leaf-nosed snake within the Spring Mountains NRA. However, in Clark County this species is probably widely distributed in the appropriate habitat (Hiatt and Boone 2004).

Habitat

Range-wide, this species is found in sandy or gravelly desert often associated with creosote bush and open desert plains (Stebbins 2003). Within Clark County this species can be found in Mojave Desert scrub and salt desert scrub habitats in rocky areas and sandy flats (Clark County 2006). Specific habitat and distribution information on the Spring Mountains NRA has not been documented.

Life History

The western leaf-nosed snake is believed lay a clutch of 2 to 4 eggs during June and July, however little information is available (NatureServe 2007).

Measures

There are no specific data available to define measures of distribution and abundance for the western leaf-nosed snake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the western leaf-nosed snake and there is insufficient information to determine its current status in the Spring Mountains NRA. Throughout the species' range the status appears relatively secure, although populations may slowly be declining (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. However, threats to the western leaf-nosed snake that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, and development; mortality from vehicular traffic on

highways and unimproved roads; loss from collection by commercial collectors and hobbyists; and habitat modification and degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, parking for these activities) (Clark County 2006).

Level of Analysis

Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Presence has not been documented in the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact its habitat, no further analysis of this species will be conducted as part of this landscape assessment.

4.3.12 Mojave Rattlesnake (*Crotalus scutulatus scutulatus*)

Status Designations

The Mojave rattlesnake (*Crotalus scutulatus scutulatus*) is a designated covered species in the MSHCP (RECON 2000), and has a NatureServe conservation status rank of G5T5 S4 (NatureServe 2007).

Range-wide Distribution

The Mojave rattlesnake is found in the southwestern US and into Mexico. In the United States, it occurs from extreme southeastern California, extreme southern Nevada, western and southern Arizona into extreme southern New Mexico and extreme western Texas from sea level to approximately 8,300 feet (2,530 meters) elevation (Stebbins 2003).

Distribution in the Spring Mountains NRA

No documented occurrences of this snake have been reported in the Spring Mountains NRA; however it is probably widespread in Clark County in appropriate habitat (Hiatt and Boone 2004). No species-specific surveys have been conducted in the Spring Mountains NRA.

Habitat

Range-wide, this species occurs in primarily upland desert and lower mountain slopes in open areas where there is scattered vegetation such as creosote and mesquite (Stebbins 2003). In Clark County, it can be found in Mojave Desert scrub and blackbrush flats (Clark County 2006). Specific habitat and distribution information has not been documented in the Spring Mountains NRA.

Life History

The Mojave rattlesnake bears 3 to 9 live young between July and August (Stebbins 2003).

Measures

There is no specific data available to define measures of distribution and abundance for the Mojave rattlesnake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine its current status in the Spring Mountains NRA. Throughout the species' range its status is reported to be secure (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. Areas that would be inhabited by the Mojave rattlesnake in the Spring Mountains NRA are at lower elevations and relatively flat. Therefore, portions of the Forest Service road system, and user defined OHV vehicle trails and horse trails are found within this species potential habitat. Threats to the Mojave rattlesnake that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, and development; mortality from vehicular traffic on highways and unimproved roads; loss from collection by commercial collectors and hobbyists; and habitat modification and degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, parking for these activities).

Level of Analysis

Areas that would be inhabited by this species are primarily at lower elevations. Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Presence has not been documented in the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA and management activities are not likely to impact its habitat, no further analysis of this species will be conducted as part of this landscape assessment.

4.3.13 Speckled Rattlesnake (*Crotalus mitchellii*)

Status Designations

The speckled rattlesnake (*Crotalus mitchellii*) is a covered species under the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G5 S4 (NatureServe 2007).

Range-wide Distribution

The speckled rattlesnake occurs throughout the deserts of the southwestern United States and Baja California from sea level to approximately 8,000 feet (2,440 meters) elevation (Stebbins 2003). In the United States, its range encompasses southern California, southern Nevada, and western Arizona (Stebbins 2003).

Distribution in the Spring Mountains NRA

Of the three subspecies of speckled rattlesnake, two occur within the deserts of the southwestern United States, where the ranges of *C. m. pyrrhys* and *C. m. stephensi*, meet in the vicinity of the Spring Mountains (Stebbins 2003). The speckled rattlesnake has been informally reported to be found from Upper Willow Creek and Cabin Springs (Karen Harville, pers comm.), though there are no available site-specific records. The species was also documented in the Lovell Pass area and along lower Lee Canyon Road during surveys for the proposed Lovell Trails and Wildland Urban Interface Fuels projects.

Habitat

Range-wide, this species occurs in primarily rocky terrain on outcrops and boulders, but also in loose soil and sand (Stebbins 2003). In Clark County, this species is found in pinyon-juniper, sagebrush, Mojave Desert scrub, and blackbrush habitats (Clark County 2006). In the Spring Mountains NRA, it would be found from the Sonora-Mojave Creosote Bush-White Bursage Desert Scrub/Mixed Salt Desert Scrub to the Great Basin Pinyon-Juniper Woodland series.

Life History

The speckled rattlesnake gives birth to 2 to 11 (often 4 to 8) young from July to September. Adult females probably produce young at intervals of at least two years and may live more that 16 years (NatureServe 2007).

Measures

There are no specific data available to define measures of distribution and abundance for the speckled rattlesnake in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status within the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no species-specific surveys for the speckled rattlesnake and there is insufficient information to determine its current status in the Spring Mountains NRA. Extensive general surveys for reptiles completed within this species potential habitat were conducted for the Wildland Urban Interface Fuels project (along Lee Canyon Road) and within the lower Kyle Canyon area for the Middle Kyle Canyon Complex project. The species was not recorded within either proposed project area. Throughout this species' range its current status is considered secure (NatureServe 2007).

Threats

Specific threats have not been identified due to the limited information on the species' distribution in the Spring Mountains NRA. Many areas that would be inhabited by this species in the Spring Mountains NRA are lower elevation and relatively flat, compared to the higher mixed conifer zones. As a result, most of the Forest Service road system, and user defined OHV vehicle trails and horse trails are found within this species' potential habitat. Threats to the speckled rattlesnake that have been identified within Clark County and may apply to the Spring Mountains NRA include habitat fragmentation from roads, trails, and development (particularly in the Cold Creek and Mountain Pass areas); mortality from vehicular traffic on highways and unimproved roads; loss from collection by commercial collectors and hobbyists; and habitat modification and degradation due to concentrated recreation use (e.g., OHV vehicle activities, equestrian trail rides, and parking for these activities).

Level of Analysis

Areas that would be inhabited by the speckled rattlesnake are primarily at lower elevations. Considering the reported elevation range of the species, the presumed distribution of suitable habitat is restricted to the lower elevation edges of the Spring Mountains NRA and is of very limited extent, especially in comparison to its distribution within Clark County and throughout the rest of its range. Only four sightings of the species have been made in the Spring Mountains NRA. As its viability is not dependent upon habitat within the Spring Mountains NRA and

management activities are not likely to impact its habitat, no further analysis of this species will be conducted as part of this landscape assessment.

4.4 FISH

4.4.1 Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*)

Status Designation

The Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) is listed as threatened under the Endangered Species Act (40 FR 29863-29864). This subspecies is considered threatened by the Forest Service and it is a BLM sensitive species (NNHP 2005). It is listed in the CA as a species of concern (USFS 2003) and has a NatureServe conservation status rank of G4T3 S3 (NatureServe 2007).

Range-wide Distribution

This subspecies is endemic to lakes and streams throughout the Lahontan Basin of northern Nevada, eastern California, and southern Oregon (USFWS 1994). The Lahontan cutthroat trout has been introduced outside its native range and currently exists in approximately 155 streams and 6 lakes and reservoirs in Nevada, California, Oregon, and Utah (USFWS 1994).

Distribution in the Spring Mountains NRA

The Lahontan cutthroat trout has been introduced in the Carpenter Canyon area, which is outside of its native range. This population is not important to the recovery of this fish.

Habitat

The Lahontan cutthroat inhabits the cool, well-oxygenated waters of lakes and streams; it is adapted to highly mineralized waters (NatureServe 2007). In streams, this subspecies uses rocky areas, riffles, deep pools, and areas under logs and overhanging banks (NatureServe 2007). It requires spawning and nursery habitat characterized by pools in close proximity to cover and velocity breaks, well-vegetated and stable stream banks, or relatively silt-free rocky substrate in riffle-run areas (USFWS 1994, 2006). It feeds on terrestrial and aquatic insects (USFWS 2006).

Life History

The Lahontan cutthroat trout spawns in early spring or early summer; the timing depends on spring flow and temperature. It becomes sexually mature in 2 to 3 years in streams and 3 to 5 years in lakes (NatureServe 2007).

Measures

There are no specific data available to define measures of distribution and abundance for the Lahontan cutthroat trout in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Lahontan cutthroat trout has been introduced in the Carpenter Canyon area, which is outside of its native range. This subspecies was listed as endangered in 1970 and reclassified as threatened in 1975 in order to facilitate management actions and allow regulated angling (Elliott and Layton 2004).

Current Conditions in the Spring Mountains NRA

The range-wide status of this subspecies is currently declining (NatureServe 2007). In the Spring Mountains NRA, habitat for the Lahontan cutthroat trout is maintained and the population is regulated at stable numbers, although this population is not important to the recovery of this fish.

Threats

The two primary causes of population decline, which led to this subspecies being listed, are the degradation of aquatic habitat and the introduction of non-native trout (Elliott and Layton 2004). Principal threats to this subspecies range-wide include habitat loss associated with water diversions, poor water quality, hybridization with non-native trout, and competition with introduced species of fish (USFWS 1994).

Level of Analysis

Since the Lahontan cutthroat trout occurs only at one location within the Spring Mountains NRA as an introduced population outside of its native distribution, this population is not important to the recovery of this fish, it is not known to occur elsewhere on the Spring Mountains, and it is managed for recreational fishing by NDOW, an analysis of this subspecies will not be conducted as part of this landscape analysis.

4.5 INVERTEBRATES

4.5.1 Spring Mountains Checkerspot (*Chlosyne acastus robusta*)

Status Designations

The Spring Mountains checkerspot (currently known as the acastus checkerspot) (*Chlosyne acastus robusta*) is listed in the CA (USFS 1998) as a species of greatest management concern (USFS 1998), and is designated as a covered subspecies in the MSHCP (RECON 2000). This checkerspot is a subspecies of the sagebrush checkerspot, and is classified as a BLM Nevada sensitive species (BLM 2003), a Forest Service sensitive species, and has a NatureServe conservation status rank of G4G5T1 S1 (NatureServe 2007).

Range-wide Distribution

The Spring Mountains checkerspot is endemic to the Spring Mountains range, including both the Spring Mountains NRA and Red Rock Canyon NCA (Clark County 2006). The only site outside of the Spring Mountains NRA where this subspecies has been documented is at Switchback Spring in Red Rock Canyon NCA (Boyd 2004).

Distribution in the Spring Mountains NRA

The Spring Mountains checkerspot butterfly is known from the central core of the Spring Mountains (USFS 1998) and is found at Kyle Canyon wash, the north side of Mount Stirling, the west slope at Clark Canyon, and the north side of Mount Potosi (Clark County 2006). In 1999, this butterfly was documented at the upper end of Harris Mountain Road and continuing along Griffith Peak Trail to Griffith Peak, as well as above the Mount Potosi Boy Scout Camp (Boyd et al. 2000). Its presence at the Boy Scout camp indicates that a colony is in the area, apparently restricted to small canyons below the camp rappel tower and to the north of the camp (Boyd et al. 2000). Boyd and Austin (2002) later located an additional colony at Trough Spring. See

Figure 4-14 for locations of known occurrences, all of which occur between 5,309 and 9,840 feet (1,618 and 2,999 meters) elevation.

Habitat

This butterfly is found in mixed conifer and pinyon-juniper habitat, as well as in sagebrush (Clark County 2006). Many documented sites have been in areas of disturbance or old burns (Boyd and Austin 1999). The Spring Mountains checkerspot uses washes and other linear open areas (e.g., dirt roads and trails) as topographically distinct mate location sites where rabbitbrush (*Chrysothamnus* spp.), the suspected host plant, is often present (Boyd et al. 2000). Boyd et al. (2000) never witnessed females ovipositing on rabbitbrush; however, Boyd (2004) states that ovipositing was observed on *C. visidiflorus* in the summer of 2002. The nectar sources are Nevada goldeneye (*Heliomeris multiflora* var. *nevadensis*), dogbane (*Apocynum sp.*), Palmer's penstemon (*Penstemon palmeri*), narrowleaf yerba santa (*Eriodictyon angustifolium*), sweetclover (*Melilotus sp.*), ceanothus (*Ceanothus sp.*), and lobeleaf groundsel (*Senecio multilobatus*) (Boyd et al. 2000). Boyd (2004) noted mud sites may be an important ecological feature.

Life History

The overall flight period for the Spring Mountains checkerspot extends from mid-May through late July, and may be as short as 2 weeks (Boyd and Austin 1999).

Measures

A measure to be used to determine the status, trends and management recommendations for this species is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The earliest known record of this butterfly is from 1934 (Boyd and Austin 1999). This uncommon species was known from 12 sites by 1997 (Weiss et al. 1997). It was observed at the Deer Creek Picnic area in 1965 and Deer Creek Highway in 1987, but none were observed in this area in 1995 (Weiss et al. 1997). Similarly, it was found on the north side of Mount Stirling in 1983, but not in 1995 (Weiss et al. 1997). The Harris Mountain Road colony was first discovered in 1990 and was the largest colony in the Spring Mountains NRA (Boyd et al. 2000). Other sites reported in the late 1980s to early 1990s include the west slope of Clark Canyon, Coal Spring, and Wheeler Pass (Weiss et al. 1997). A new site was discovered in 1995 on the north side of Mt. Potosi in the wash below the Boy Scout rappel tower (Weiss et al. 1997). It was also recorded from Coal Springs in the 1990s (Clark County 2006). It was found at 2 sites in a 1998 study, Foxtail Canyon and near the lower campground of Kyle Canyon (Boyd and Austin 1999). Based on NNHP data there are 23 sites documented prior to 1998.

Prior to European settlement, the Spring Mountains checkerspot breeding behavior may have limited it to areas of disturbance, such as burned areas and washes. The larval host plant also prefers open areas further constricting their potential habitat. Conditions in the Spring Mountains NRA have changed over time, with human-created openings in the form of residences, campsites, and timber cutting, which may have slightly increased the availability of potential habitat in the Spring Mountains NRA (SWCA 2005a).

Figure 4-14 Spring Mountains Checkerspot Species Distribution

Figure 4-14 BACK

Current Conditions in the Spring Mountains NRA

The current status of the Spring Mountains checkerspot is thought to be declining (Clark County 2006; SWCA 2005a) due to development that is occurring in or near its habitat (Clark County 2006). In a 1999 study of seventeen areas in the Spring Mountains, the butterfly was only found at three of the sites (Boyd et al. 2000). Surveys completed by Boyd (2004) in 2002 and 2003 located butterflies at three sites where they were seen at least once, but more often multiple times through the survey period. The lack of more recent observations at previously known populated sites indicate that populations may be susceptible to extirpation and that recolonization may be slow, especially with the limited flight season (Weiss et al. 1997). Weiss et al. (1997) suggested that this species be of the highest priority management concern because of the lack of definitive knowledge about the host plant as well as other behavioral and ecological aspects. Boyd and Austin (1999) agree with Weiss et al. (1997) in that further research into the ecology and behavior needs to be completed to determine habitat and spatial requirements for the butterfly.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 39 sites where the Spring Mountains checkerspot butterfly have been documented.

Threats

Maintenance along the Deer Creek Highway could result in the loss or reduction of populations, including mowing of adult nectar sources (RECON 2000). The presumed host plant is found in open areas and is abundant along washes and roadsides, and many known occurrences are in burned or disturbed areas; therefore, fire suppression may lead to the decline of the host plant, and consequently the butterfly (RECON 2000). The Spring Mountains checkerspot may be of high management concern, especially given the level of trail and campground construction, private development, and recreational activity near the Kyle Canyon colony site, which is one of few established colony areas (Boyd and Austin 1999). Habitat degradation is potentially occurring through spring diversion and modification, fire suppression, OHV vehicle use, mowing, dispersed recreation (e.g., hiking, camping, and equestrian use), and ungulate grazing and trampling resulting in vegetation removal and loss of host plants (RECON 2000).

Based on mapping as of 2006 of the Spring Mountains checkerspot's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-14. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-14 Estimated Overlap Between the Spring Mountains Checkerspot Blue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Campgrounds	1
Concentrated Use Areas	8
Designated Horses/Burros Area	3
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	5
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	3
Fires 1954-1970	1

Table 4-14 Estimated Overlap Between the Spring Mountains Checkerspot Blue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Fires 1971-1988	3
Fires 1989-2005	3
Firewood Gathering	4
Non-System Trail	3
Motorized Trails (closed)	1
Motorized Trails (open)	1
Picnic Areas	2
Private Land	2
System Trail (high mileage)	1
Roads (paved)	4
Roads (unpaved)	7
Wildland Urban Interface	6

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Spring Mountains checkerspot butterfly as part of the landscape analysis.

4.5.2 Bernardino (=Bret's) Blue (*Euphilotes bernardino*)

Status Designations

This butterfly was formerly thought to be a subspecies and previously known as Bret's blue (=*E. battoides inyomontana*) (Boyd and Austin 1999). As a subspecies, it was designated under the CA (USFS 1998) as a species of greatest management concern, and was ranked as a high priority subspecies in the MSHCP (RECON 2000). This taxon has a NatureServe conservation status rank of G3G4T3T4 S2 (NatureServe 2007). These butterflies on the Spring Mountains NRA are now documented as part of the species Bernardino blue (*Euphilotes bernardino*) (Bisby et al. 2008).

Range-wide Distribution

Bret's blue butterfly was originally believed to be a subpopulation of the Bernardino blue butterfly of Inyo and Kern counties, California (Boyd and Austin 1999); however, further investigations determined it is not a subspecies. In Nevada, the Bernardino blue butterfly's range probably extends into Esmeralda, Eureka, Mineral, Nye, and White Pine counties, Nevada, as well as the Spring Mountains of Clark and Nye Counties, Nevada (Boyd and Austin 1999; Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

The actual distribution of the Bernardino blue butterfly in the Spring Mountains NRA is not fully known (SWCA 2005a). It has only been recorded from the northwestern portion of the Spring

Mountains near Big Timber Springs, Crystal Springs, and Horseshutem Springs (Boyd and Austin 1999); however, limited surveys have been performed. See Figure 4-15 for locations of known occurrences, all of which occur between 4,894 and 7,771 feet (1,492 and 2,369 meters) elevation.

Habitat

The Bernardino blue butterfly can be found in primarily big sagebrush, blackbrush/Utah juniper, and pinyon-pine/big sagebrush associations in the Spring Mountains NRA (SWCA 2005a). The larval host plant for Bernardino blue butterfly is Eastern Mojave buckwheat (*Eriogonum fasciculatum*), while the nectar host plants are sulfur flowered buckwheat (*Eriogonum umbellatum* var. *subaridum*) and juniper buckwheat (*Eriogonum umbellatum* var. *juniporinum*) (SWCA 2005a).

Life History

The overall flight period for Bernardino blue butterfly in the Spring Mountains NRA is unknown due to the limited survey data available. However, it is thought that the flight period may occur in late spring (Boyd and Austin 1999).

Measures

A measure to be used to determine the final status, trends, and management recommendations for this butterfly is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Bernardino blue butterfly was first discovered at Big Timber Springs in 1995 (Boyd and Austin 1999). In 1998, butterfly inventories were conducted at several locations and the butterfly was not located in Big Timber Springs; however, it was located in two new areas at both Crystal Spring and Horseshutem Spring (Boyd and Austin 1999). Based on NNHP data there is 1 element occurrence record that includes 1 site documented prior to 1998 in the Spring Mountains NRA.

Prior to European settlement, the habitat probably most utilized by Bernardino blue butterfly were most likely pristine springs and seeps, surrounded by native vegetation. Conditions in these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created openings in the form of residences, campsites, timber cutting, etc.

Current Conditions in the Spring Mountains NRA

The current status of the Bernardino blue butterfly is uncertain in the Spring Mountains NRA. Estimated population trends have not been identified in current documents (SWCA 2005a). There have been no recent specific surveys for Bernardino blue butterfly (SWCA 2005a).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 6 sites where the Bernardino blue butterfly has been documented in the Spring Mountains NRA.

Threats

Threats to Bernardino blue butterfly in the Spring Mountains NRA likely include changes in habitat and water quality from ungulate grazing, fire and fire suppression; habitat degradation

and population decreases resulting from the introduction, competition, and encroachment of exotic species; recreation activities including OHV vehicle use, horses, and biking; as well as back country recreation resulting in potential loss to host plants (SWCA 2005a).

Based on mapping as of 2006 of Bernardino blue butterfly occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-15. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-15 Estimated Overlap Between Bernardino Blue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	5
Private Land	2

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Bernardino blue butterfly as part of the landscape analysis.

4.5.3 Spring Mountains Dark Blue (*Euphilotes ancilla purpura*)

Status Designations

The Spring Mountains dark blue butterfly (*Euphilotes ancilla purpura =E. enoptes purpurea*) is listed as a Forest Service sensitive species, listed in the CA (USFS 1998) as a species of greatest management concern, and is a designated covered subspecies in the MSHCP (RECON 2000). This species is classified as a BLM Nevada sensitive species (BLM 2003), and has a NatureServe conservation status rank of G5T2 S1S2 (NatureServe 2007). Presently it is considered to be a subspecies of the dotted blue butterfly (*E. ancilla = E. enoptes*). Boyd et al. (2000) indicated that a more in-depth investigation is necessary to determine if there are two *Euphilotes* taxa on the Spring Mountains NRA, or if is there one taxon with site specific voltinism (many broods or generations per year at any one location).

Range-wide Distribution

The Spring Mountains dark blue butterfly is endemic to the Spring Mountains, Clark and Nye Counties, Nevada (Hiatt and Boone 2004).

Figure 4-15 Bret's Blue (Spring Mtns Phenotype) Species Distribution

Figure 4-15 BACK

Distribution in the Spring Mountains NRA

The Spring Mountains dark blue butterfly has occasionally been found to be locally common to abundant at Willow Creek and in other areas of the central and northwestern portion of the Spring Mountains, between approximately 5,905 and 8,200 feet (1,800 and 2,500 meters) elevation (Boyd and Austin 1999). It has been identified at a number of additional locations including: Cold Creek, Kyle Canyon, Carpenter Canyon, Lovell Canyon, Mount Stirling, Coal Springs (Hiatt and Boone 2004), Buck Spring, and West Mud Spring (SWCA 2005a). See Figure 4-16 for locations of known occurrences; GIS analysis indicates all the known sites occur between 5,309 and 7,919 feet (1,618 and 2,414 meters) elevation.

Habitat

The Spring Mountains dark blue butterfly is primarily found in mixed conifer and pinyon-juniper habitat, around stream banks, springs, and seeps. It will also use sagebrush and wet areas near high elevation springs (Hiatt and Boone 2004). The larval host plants are sulphur-flower buckwheat (*Eriogonum umbellatum* var. *subaridum*) and juniper buckwheat (*Eriogonum umbellatum* var. *juniporinum*), while the nectar plant also includes sulphur-flower buckwheat (SWCA 2005a). This butterfly requires water for puddling (SWCA 2005a) and most records are of males encountered at mud, indicating that this is a very important resource (Boyd and Austin 1999). Individuals have occasionally been observed away from water near the mouth of Kyle Canyon, and along the Harris Mountain Road, but this species is generally observed at mud banks (e.g., Willow Creek, Cold Creek, Coal Springs, Carpenter Canyon, Big Timber Spring) (Weiss et al. 1997).

Life History

The overall flight period for the Spring Mountains dark blue butterfly extends from mid-May through mid-August, with the majority recorded from early June to early August with no apparent peak (Boyd and Austin 1999). In 1999, males were observed in the Willow Creek area over a month before the emergence of females. It is possible that there may be two distinct flight periods, spring and summer (Boyd and Austin 2001). However, Boyd (2004) believes the difference in diapause response adds evidence for the argument that two subspecies allied to *E. ancilla* occur in the Spring Mountains.

Measures

A measure to be used to determine the status, trends, and management recommendations is the total number of occupied sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Spring Mountains dark blue was first discovered in the Spring Mountains NRA in 1928 and has since been found to be locally common to abundant at Willow Creek (Boyd and Austin 1999). It was known from Upper Kyle Canyon in 1928 and again in 1981, but not found there in 1995 (Weiss et al. 1997). In 1995, it was only common at Willow and Cold creeks (Weiss et al. 1995). Weiss et al. (1997) located this butterfly at 11 sites. Based on NNHP data as of 1998 or earlier, there are 10 sites documented.

Prior to European settlement, the Spring Mountains dark blue butterfly most likely inhabited pristine springs and seeps, surrounded by native vegetation, and lacking disturbance and invasive species. Conditions in these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created openings in the form of residences, campsites, timber cutting, etc.

Current Conditions in the Spring Mountains NRA

In a 1999 study, the butterfly was reported in a new location on the Potosi Pass Road near the Boy Scout camp entrance, as well as in the Willow Creek area (Boyd et al. 2000). Boyd and Austin (1999) suggest future research to determine the extent of the distribution and densities, as well as the protandry observed.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 30 sites where the Spring Mountains dark blue butterfly have been documented.

Threats

Threats to the Spring Mountains dark blue butterfly include habitat disturbance from campground and trail construction, picnic areas, mowing along Kyle Canyon and Lee Canyon Highways, vegetation removal and OHV use within the wash, which could destroy host plants (SWCA 2005a). Specific examples of these threats include maintenance along Lee and Kyle Canyon highways (RECON 2000). Unregulated or uncontrolled fires in the Cold Creek and Willow Creek areas could threaten the butterfly, as well as trampling of host plants or immature life stages due to unregulated camping or expansion of campgrounds and increased human activities in these areas (RECON 2000).

Based on mapping as of 2006 of Spring Mountains dark blue butterfly occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-16. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-16 Estimated Overlap Between the Spring Mountains Dark Blue Butterfly and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	8
Designated Horses/Burros Area	1
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	3
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	12
Fires 1954-1970	
Fires 1971-1988	5
Non-System Trail	3
Motorized Trails (closed)	3
Motorized Trails (open)	1
Picnic Areas	1
Private Land	2
System Trail (low mileage)	1
Roads (unpaved)	5
Wildland Urban Interface	5

Figure 4-16 Dark Blue Butterfly Species Distribution

Figure 4-16 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the dark blue butterfly as part of the landscape analysis.

4.5.4 Morand's Checkerspot (*Euphydryas chalcedona morandi*)

Status Designations

Morand's checkerspot butterfly (*Euphydryas chalcedona morandi =E. anicia morandi*) is a Forest Service sensitive species, listed in the CA (USFS 1998) as a species of greatest management concern, and is designated as a covered subspecies in the MSHCP (RECON 2000). This butterfly has a NatureServe conservation status rank of G5T2 S2 (NatureServe 2007).

Range-wide Distribution

Morand's checkerspot butterfly is endemic to the Spring Mountains NRA (Hiatt and Boone 2004; NatureServe 2007).

Distribution in the Spring Mountains NRA

Morand's checkerspot butterfly is distributed through the central portion of the Spring Mountains NRA, with most of the known localities occurring around the Kyle Canyon and Lee Canyon areas. Three distinct phenotypes of Morand's checkerspot butterfly have been recorded on the Spring Mountains (Weiss et al. 1997) at elevations ranging from approximately 6,890 to 10,500 feet (2,100 to 3,200 meters) (Hiatt and Boone 2004). The populations of Morand's checkerspot known to occur above the Lee Canyon ski area and its ridges are of the very dark phenotype (Boyd and Austin 1999), while those along the main ridgeline and in Kyle Canyon are orange, and those in Wallace Canyon are reddish (Weiss et al. 1997). See Figure 4-17 for locations of known occurrences of this species, all of which occur between 5,686 and 11,474 feet (1,733 and 3,497 meters) elevation.

Habitat

This butterfly primarily inhabits meadows and avalanche chutes within the alpine, bristlecone pine, mixed conifer, and pinyon-juniper habitats (Hiatt and Boone 2004). Sites at lower elevations appear to be associated with past fires (Wallace Canyon and mouth of Kyle Canyon), while other sites appear to be associated with avalanche chutes (3 in Lee Canyon, 1 at Big Falls) (Weiss et al. 1997) and associated with open bristlecone pine forests on rocky soils (Weiss et al. 1997) from Griffith Peak to Upper Carpenter Canyon along the ridgeline in 1995 (Clark County 2006). Morand's checkerspot has a patchy distribution and forms discrete colonies around its larval host plants (Weiss et al. 1997), which include Indian paintbrush (*Castilleja linariifolia*), Wavyleaf Indian paintbrush (=Clokey paintbrush) (*Castilleja applegatei* ssp. *martinii*), Charleston beardtongue (*Penstemon leiophyllus* var. *keckii*), and firecracker penstemon (*Penstemon eatonii*) (Boyd 2004; Clark County 2006). Known nectar host plants include common dandelion (*Taraxacum officinale*), wallflower (*Erysimum asperum*), and likely other *Penstemon* spp. (Weiss et al. 1997).

Life History

The overall flight period for Morand's checkerspot is from late May to early September with a peak in late June or early July; however, cold years may delay or warm years may move up this

flight period (Weiss et al. 1997; Boyd and Austin 1999; Boyd and Austin 2002). The higher elevation populations along the main ridgeline migrate later than those at lower elevations (Weiss et al. 1997).

Measures

A measure to be used to determine the status, trends, and management recommendations is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This butterfly was first discovered in the early 1920s (Boyd and Austin 1999). Weiss et al. (1997) reported Morand's checkerspot butterfly from 9 sites in 1995 at elevations from 6,890 to 10,499 feet (2,100 to 3,200 meters); however it had a patchy distribution. Boyd and Austin (1999) also reported that not all sites were occupied each year. Based on NNHP data there is 1 element occurrence record that includes 8 sites documented prior to 1998.

Prior to European settlement, Morand's checkerspot likely inhabited most meadows and openings created by avalanches. Conditions in these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created openings in the form of residences, campsites, timber cutting, etc. The effects of human caused avalanches are unknown.

Current Conditions in the Spring Mountains NRA

The butterfly's current range is very limited (NatureServe 2007; SWCA 2005a). In a 1999 study, Morand's checkerspot was found at 2 new locations as well as 2 locations where it had not been found since 1990 (Boyd et al. 2000).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 16 sites where the Morand's checkerspot butterfly have been documented.

Threats

Threats to the Morand's checkerspot include habitat degradation, spring diversion and modification, fire suppression, expansion and maintenance of recreational areas, OHV vehicle use, mowing, dispersed recreation (e.g., hiking, camping, and equestrian use), and ungulate grazing and trampling resulting in vegetation removal and loss of host plants (RECON 2000). In particular, mowing along the Kyle Canyon and Lee Canyon Highways could destroy nectar host plants (RECON 2000). An expansion of the ski area could impact this butterfly (the dark phenotype) in three avalanche chutes where it is known to occur (Weiss et al. 1997).

Figure 4-17 Morand's Checkerspot Butterfly Species Distribution

Figure 4-17 BACK

Based on mapping as of 2006 of Morand's checkerspot butterfly occurrence localities within the Spring Mountains NRA, overlapping with existing human activities on the landscape are indicated in Table 4-17. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-17 Estimated Overlap Between Morand's Checkerspot Butterfly and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	1
Campgrounds	1
Concentrated Use Areas	1
Fires 1954-1970	2
Ski Area	1
Snow Play Areas	2
Fires 1954-1970	1
Roads (unpaved)	1
Fires 1989-2005	2

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Morand's checkerspot butterfly as part of the landscape analysis.

4.5.5 Spring Mountains Comma Skipper (*Hesperia colorado mojavensis*)

Status Designations

The Spring Mountains comma skipper (*Hesperia colorado mojavensis =H. comma mojavensis*) is listed in the CA as a species of concern, and is designated as covered in the MSHCP (RECON 2000). This subspecies is classified as BLM sensitive (BLM 2003) and has a NatureServe conservation status rank of G5T3 S3 (NatureServe 2007).

Range-wide Distribution

The Spring Mountains comma skipper is endemic to the Spring Mountains in Clark and Nye counties, Nevada (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

The Spring Mountains comma skipper has been found to be widespread between approximately 4,925 and 9,850 feet (1,500 and 3,000 meters) (Boyd and Austin 1999). In a 1998 study, the Spring Mountains comma skipper was found at these locations: Foxtail Canyon, Whiskey Spring, and Lee Canyon (Boyd and Austin 1999); and in a 1999 study, it was documented near the junction of Trail Canyon and North Loop Trail, on Bonanza Peak Trail to the ridge, Bonanza Ridge, and Bonanza Peak (Boyd et al. 2000). It has also been recorded in Lovell Canyon and Switchback Spring (Boyd 2004) as well as Trough Springs, West Mud Spring, Middle Mud Spring, East Mud Spring, Sawmill Spring, and upper Lucky Strike Canyon (Boyd and Austin

2002). See Figure 4-18 for locations of known occurrences all of which occur between 5,205 and 11,386 feet (1,586 and 3,470 meters) elevation.

Habitat

The Spring Mountains comma skipper inhabits riparian areas in mixed conifer forests and pinyon-juniper communities where there is surface water at which males congregate before females arrive (Hiatt and Boone 2004). It is speculated that larval host plants for the Spring Mountains comma skipper include perennial grasses and sedges (*Carex sp.)*, which are common throughout the Spring Mountains (Weiss et al. 1997). Known nectar species include thistle (*Cirsium* spp.), Douglas' dustymaiden (*Chaenactis douglasii*), spreading dogbane (*Apocynum androsaemifolium*), rabbitbrush (*Chrysothamnus* spp.), dandelion (*Taraxacum officinale*), fringed twinevine (*Sarcostemma cynanchoides*), wallflower (*Erysimum asperum*), and Palmer's penstemon (*Penstemon palmeri*) (Weiss et al. 1997).

Life History

The overall flight period for the Spring Mountains comma skipper extends from mid-May to mid-November (Boyd and Austin 1999) with adults dispersing over hundreds of meters, and occupying the most available habitat (Weiss et al. 1997).

Measures

A measure to be used to determine the status, trends, and management recommendations is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Spring Mountains comma skipper was first documented in 1964, and described as a new subspecies in 1998 (Boyd and Austin 1999). It was widely distributed at 45 sites in the Spring Mountains woodland and forest belts between 1994 and 1995 (Clark County 2006). In a 1998 study, the comma skipper was encountered at 3 new localities (Boyd and Austin 1999). Based on all data sources there are 48 sites documented prior to 1998.

Prior to European settlement, the Spring Mountains comma skipper was probably found in recovering avalanche chutes and burned areas, since most of its known host plants are common in disturbed areas. Conditions in some of these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created openings in the form of residences, campsites, timber cutting, etc.

Current Conditions in the Spring Mountains NRA

The butterfly is distributed throughout the range (NatureServe 2007). A 1999 study recorded this butterfly at numerous locations between early June and mid-August, including four new locations (Boyd et al. 2000). As of 1999, it was considered abundant in the Spring Mountains NRA (Boyd and Austin 1999; Weiss et al. 1997).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there is currently 2 element occurrence record that include 73 sites where the Spring Mountains comma skipper have been documented.

Figure 4-18 Spring Mountains Comma Skipper Species Distribution

Figure 4-18 BACK

Threats

Threats to the Spring Mountains comma skipper include degradation, spring diversion and modification, fire suppression, OHV vehicle use, mowing, dispersed recreation (e.g., hiking, camping, and equestrian use), and ungulate (wild horse, burro) grazing and trampling resulting in vegetation removal and loss of host plants (RECON 2000). Vegetation removal has been noted within the wash between the lower Kyle Canyon and Lee Canyon golf course, and this could affect the Spring Mountains comma skipper, which is known to occur there. Boyd and Austin (1999) noted that a large stand of rabbitbrush (*Chrysothamnus* sp.), a nectar source, had been destroyed by the removal of vegetation in Trail and Echo Canyons.

Based on mapping as of 2006 of the Spring Mountains comma skipper occurrence localities within the Spring Mountains NRA, this butterfly overlaps with existing human activities on the landscape as indicated in Table 4-18. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-18 Estimated Overlap Between the Spring Mountains Comma Skipper and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Campgrounds	1
Campgrounds	1
Concentrated Use Areas	8
Designated Horses/Burros Area	7
Fires 1954-1970	5
Fires 1971-1988	8
Fires 1954-1970	2
Fires 1971-1988	6
Fires 1989-2005	2
Firewood Gathering	7
Picnic Areas	1
Private Land	2
Ski Area	2
Snow Play Areas	1
Picnic Areas	2
Private Land	3
Ski Area	1
Roads (paved)	2
Roads (unpaved)	1
Wildland Urban Interface	1

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Spring Mountains comma skipper as part of the landscape analysis.

4.5.6 Spring Mountains Icarioides Blue (*Plebejus icarioides austinorum*)

Status Designations

The Spring Mountains icarioides blue butterfly (*Plebejus icarioides austinorum =Icaricia icarioides austinorum*) is listed in the CA as a subspecies of concern, and is designated as a covered species in the MSHCP (RECON 2000). This butterfly is classified as BLM Nevada sensitive (BLM 2003) and has a NatureServe conservation status rank of G5T2 S2 (NatureServe 2007).

Range-wide Distribution

The Spring Mountains icarioides blue butterfly is endemic to the Spring Mountains, Clark and Nye counties, Nevada (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

The Spring Mountains icarioides blue butterfly has been found in the central and northwestern portion of the Spring Mountains NRA especially where stands of lupine (*Lupinus* spp.) are present between approximately 5,900 and 9,850 feet (1,800 and 3,000 meters) as reported by Boyd and Austin (1999). The largest known concentration is located in Kyle Canyon. However, its distribution has predicted to be everywhere lupines grow (Hiatt and Boone 2004; SWCA 2005a), which would be across much of the Spring Mountains (Clark County 2006). The icarioides blue has been recorded at multiple locations including Rainbow Canyon, Bonanza Peak, Bonanza Ridge (Boyd et al. 2000), Big Falls Canyon, Buck Spring, Trough Spring, and Cathedral Rock, as well as on the Bonanza Peak Trail up to the ridge (SWCA 2005a). See Figure 4-19 for locations of known occurrences, all of which occur between 5,686 and 11,386 feet (1,733 and 3,470 meters) elevation.

Habitat

The Spring Mountains icarioides blue butterfly can be found primarily in disturbed open stands and open meadows within bristlecone pine and mixed conifer, as well as in pinyon-juniper, sagebrush communities, and wet areas near springs (Hiatt and Boone 2004; SWCA 2005a). The larval host plant is silvery lupine (*Lupinus argenteus*) (Boyd and Austin 1999). Known nectar plants include sulphur-flower buckwheat (*Eriogonum umbellatum*), Douglas' dustymaiden (*Chaenactis douglasii*), cinquefoil (*Potentilla* spp.), sweetclover (*Melilotus sp.*), *Erigeron* spp., and lobeleaf groundsel (*Senecio multilobatus*) (Boyd and Austin 1999; Weiss et al. 1997). Important ecological factors include wet sites and standing mud where adult butterflies obtain moisture, minerals, and nutrients before host plants are in bloom (Hiatt and Boone 2004).

Life History

The overall flight season is from early May to late October with a peak in late June (Boyd and Austin 1999).

Figure 4-19 Spring Mountains Icarioides Blue Species Distribution

Figure 4-19 BACK

Measures

A measure to be used to determine the status, trends, and management recommendations is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This butterfly has been known from the Spring Mountains NRA since the early 1920s and has been found to be common to abundant, especially in association with lupine (Boyd and Austin 1999). Weiss et al. (1997) reported this butterfly from 23 sites in the Spring Mountains. In a 1998 study, it was found in one new location (Boyd and Austin 1999). Based on NNHP data there are 17 sites documented prior to 1998.

Most of the known host plants are common in disturbed areas suggesting that prior to European settlement the Spring Mountains icarioides blue butterfly was probably found in association with avalanche chutes and burned areas. As settlers began developing the Spring Mountains, the increased disturbance may have increased potential host plant abundance.

Current Conditions in the Spring Mountains NRA

The butterfly is distributed throughout the Spring Mountains. Boyd and Austin (1999) as well as Weiss et al. (1997) believe that special management practices for this taxon are not necessary at this time.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there is currently 34 sites where the Spring Mountains icarioides blue has been documented.

Threats

Threats that could affect the Spring Mountains icarioides blue butterfly include habitat degradation, spring diversion and modification, fire suppression, OHV use, mowing, dispersed recreation (e.g., hiking, camping, and equestrian use), and ungulate grazing and trampling resulting in vegetation removal and loss of host plants (RECON 2000). Maintenance along the Kyle Canyon and Lee Canyon roads could also destroy host plants and thereby reduce populations (RECON 2000).

Based on mapping as of 2006 of Spring Mountains icarioides blue occurrence localities within the Spring Mountains NRA, populations overlap with existing human activities on the landscape as indicated in Table 4-19. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-19 Estimated Overlap Between the Spring Mountains Icarioides Blue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Campgrounds	1
Concentrated Use Areas	6
Designated Horses/Burros Area	2
Fires 1954-1970	5
Fires 1954-1970	1
Fires 1971-1988	4
Fires 1989-2005	2
Ski Area	4
Snow Play Areas	2
Motorized Trails (closed)	2
Picnic Areas	1
Private Land	1
Ski Area	1
Snow Play Areas	1

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Spring Mountains blue butterfly as part of the landscape analysis.

4.5.7 Mt. Charleston Blue (*Plebejus shasta charlestonensis*)

Status Designations

The Mt. Charleston blue butterfly (*Plebejus shasta charlestonensis*) (=Spring Mountains blue; *Icaricia shasta charlestonensis*) is classified as Forest Service sensitive (USFS 2003). This subspecies is listed in the CA (USFS 1998) as a species of greatest management concern, is designated as a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G5T2 S2 (NatureServe 2007). The butterfly was petitioned for listing under the Endangered Species Act in 2005. The USFWS is currently completing a status review to determine if listing may be warranted.

Range-wide Distribution

The Mt. Charleston blue butterfly is endemic to the Spring Mountains in Clark County, Nevada (Hiatt and Boone 2004). It is a subspecies of the wider ranging Shasta blue butterfly (*Plebejus shasta*) which occurs throughout the western United States from Canada, east to Mount Stirling in the Spring Mountains (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

Until 2005, this butterfly was found regularly in the ski area in Lee Canyon (Weiss et al. 1995; Boyd and Austin 2001, 2002), but was sighted only once in 2006 at this site. It has also been sighted at Foxtail Canyon, Bonanza Trail, South Loop Trail (recorded at least 3 times in 2007), main crest between Griffith Peak and Upper Carpenter Canyon, North Loop Trail, and other various locations in Upper Lee Canyon (Boyd and Austin 1999; Hiatt and Boone 2004). See Figure 4-20 for locations of known occurrences, all of which occur between 5,686 and 11,386 feet (1,733 and 3,470 meters) elevation.

Habitat

This butterfly is found primarily on north-facing slopes in open areas like ridge lines, avalanche paths, and ski runs in bristlecone woodlands, or mixed conifer forests. These areas support the only known larval host plant, Torrey's milkvetch (*Astragalus calycosus* var. *calycosus*) (Hiatt and Boone 2004), which inhabits shallow, rocky soils (Clark County 2006) and requires open habitat along relatively flat ridgelines (Boyd and Austin 1999). Weiss et al. (1997) approximates that a minimum of 1 to 5 plants per square meter is about the minimum number of host plants necessary to support a population of this butterfly. Nectar plants include Torrey's milkvetch, Clokey fleabane (*Erigeron clokeyi*), aster (*Aster* spp.), and Lemmon's bitterweed (*Hymenoxys* lemmonii) (Boyd 2005; Weiss et al. 1995).

Life History

The overall flight period is from mid-June through mid-September with a peak in late June (Boyd and Austin 1999).

Measures

A measure to be used to determine the status, trends, and management recommendations is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Mt. Charleston blue butterfly has been known since the 1920s, and had a widespread distribution in disturbed areas including small isolated populations where habitat is present in the appropriate densities (Boyd and Austin 1999). Although some populations were extirpated from several historic sites, it was newly discovered at several less accessible sites in 1995 (RECON 2000). According to Weiss et al. (1997), virtually all suitable habitat for this butterfly may be occupied, with most of that habitat being in wilderness areas. Boyd and Austin (1999) observed that smaller colonies may be ephemeral in the long term, especially in tracking patterns of vegetation disturbance and regrowth. Fifteen sites were identified in the Spring Mountains up to the late 1990s where the butterfly had previously been reported to occur (Boyd and Austin 1999; Weiss et al. 1997); however, only 4 of those sites were confirmed occupied as of 1998. Six sites are presumed extirpated; these are: upper Willow Creek (last observed in 1928); Deer Creek area (last observed in 1950); Kyle Canyon near Old Town (last seen in early 1970s); Kyle Canyon old ski area (last observed in 1972); Cathedral Rock in Kyle Canyon (last seen in 1972); and Lee Canyon between the guard station and ski tow (last seen 1976). The five sites that the butterfly was last observed by Weiss et al. in 1995 are: Lee Meadow in Lee Canyon; ski area parking in Lee Canyon; Camp Gary Abbott in Lee Canyon; Clark County Youth Camp in Lee Canyon; and North Loop Trail.

Prior to European settlement, the Mt. Charleston blue butterfly most likely relied on dry, rocky, open areas at high elevation in habitats like montane meadows, avalanche chutes, and post-

burn area. Conditions in these areas have likely changed over time, due to fire suppression, water diversion, ski area construction, and other human-created openings in the form of residences, campsites, timber cutting, etc.

Current Conditions in the Spring Mountains NRA

This butterfly is believed to be at risk according to the State ranking (NatureServe 2007; SWCA 2005a). Field surveys show a steady decline of the Mt. Charleston blue butterfly and extirpation from many of the historic sites. From 1999 to 2005, it has only been known to occupy 3 sites: one location along the South Loop Trail between Griffith Peak in Kyle Canyon and Upper Carpenter Canyon, and two locations within the ski area in Lee Canyon (SWCA 2005a and NNHP). One site at Foxtail Girl Scout Camp in Lee Canyon was last observed in 1998 and has not been seen in recent surveys (Boyd and Austin 1999). In 2006 the butterfly was only seen once on the ski area, and was not seen at all in 2007.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that, based on historic and currently occupied sites, there are 15 sites where the Mt. Charleston blue butterfly have been documented. Two of those sites are considered to be currently occupied, although only the South Loop Trail was affirmed to be occupied in 2007.

Threats

Threats to the Mt. Charleston blue butterfly include loss of habitat due to the development and maintenance of recreational facilities, as well as inadvertent damage to habitat from Forest visitors and associated recreational activities. Most of the historic and currently occupied locations are within upper Lee and Kyle Canyons. These areas receive high levels of public visitation and are the most desirable for future development. Continued impacts to occupied sites include degradation of habitat, trampling, and crushing of host plants and larvae, and disturbance of natural surfaces and soil-holding crusts. The impacts are primarily from dispersed recreational activities such as cross-country travelers creating new trails, recreational users who create and utilize open areas for camp activities (concentrated use areas), and development or expansion of concentrated recreation facilities and their maintenance (e.g. ski area). It is unknown if the creation of artificial avalanches impacts this taxon

The suppression of fire since the early 1900s has likely resulted in the loss of early succession habitat needed for the larval host plant (Boyd and Austin 1999). Other fuels management activities may have resulted in short-term soil loss and compaction, and crushing of host plants (Clark County 2006).

Figure 4-20 Mt. Charleston Blue butterfly Species Distribution

Figure 4-20 BACK

Based on mapping as of 2006 of the Mt. Charleston blue butterfly occurrence localities within the Spring Mountains NRA, populations overlap with existing human activities on the landscape as indicated in Table 4-20. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-20 Estimated Overlap Between the Mt. Charleston Blue Butterfly and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	1
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	2
Designated Horses/Burros Area within ¼ mile of Springs and Perennial Streams	1
Fires 1954-1970	2
Firewood Gathering	1
Non-System Trail	1
Motorized Trails (open)	1
Ski Area	1
Snow Play Areas	3
System Trail (high mileage)	1
System Trail (low mileage)	1
Roads (paved)	1
Roads (unpaved)	1
Wildland Urban Interface	2

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Mt. Charleston blue butterfly as part of the landscape analysis.

4.5.8 Nevada Admiral (*Limenitis weidemeyerii nevadae*)

Status Designations

The Nevada admiral (*Limenitis weidemeyerii nevadae =Basilarchia weidemeyerii nevadae*)is listed under the CA as a subspecies of concern (USFS 1998), and is designated as a covered species under the MSHCP (RECON 2000). This butterfly has a NatureServe conservation status rank of G5T2T3 S2S3 (NatureServe 2007).

Range-wide Distribution

The Nevada admiral is endemic to southern Nevada and is only known from the Spring and Sheep Mountains in Clark County, Nevada (Hiatt and Boone 2004; NatureServe 2007).

Distribution in the Spring Mountains NRA

The Nevada admiral is thought to be widespread throughout the Spring Mountains NRA above approximately 4,925 feet (1,500 meters) elevation (Boyd and Austin 1999). It is known from Mt.

Potosi to Mt. Stirling in the Spring Mountains (Hiatt and Boone 2004). See Figure 4-21 for locations of known populations, all of which occur between 5,207 and 9,001 feet (1,587 and 2,744 meters) elevation.

Habitat

The Nevada admiral occurs in riparian habitats, bristlecone pine forests, mixed conifer forest, and pinyon-juniper communities (Hiatt and Boone 2004; SWCA 2005a). The primary larval host plant is likely quaking aspen (*Populus tremuloides*), as well as potentially willow (*Salix* spp.), and serviceberry (*Amelanchier utahensis*) (Boyd and Austin 1999). Important ecological features include riparian areas and the presence of host plants.

Life History

The overall flight period for the Nevada admiral extends from mid-May through early October with a peak in late June and early July (Boyd and Austin 1999).

Measures

A measure to be used to determine the status, trends and management recommendations is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first documented in the early 1920s (Boyd and Austin 1999). Weiss et al. (1997) reported it from 46 sites in 1995 at elevations from 4,921 to 9,186 feet (1,500 to 2,800 meters) throughout much of the Spring Mountains; however, a 1998 study only found 18 occupied sites, with 5 of these sites being new location records: Foxtail Canyon, Crystal Springs, Camp Stimpson, Old Mill Canyon, and the south fork of Deer Creek (Boyd and Austin 1999). Based on all combined data there are 29 sites documented prior to 1998 in the Spring Mountains NRA.

Prior to European settlement this butterfly would most likely have inhabited high elevation areas with complete/intact canopy cover and montane riparian habitats. Over time, conditions in these areas have changed due to timber harvest, recreational activities and facilities (e.g., trails, roads, ski resort), and development of private housing (SWCA 2005a).

Current Conditions in the Spring Mountains NRA

The population in the Spring Mountains NRA appears to be secure because of its distribution throughout the Spring Mountains (NatureServe 2007). A study conducted in 1999 revealed that the Nevada admiral was located at many sites within the Spring Mountains, including: Rainbow Canyon summer home area, lower Trail Canyon, junction of Trail Canyon with North Loop Trail, North Loop Trail, ridge above Lee Canyon, and Bonanza Peak Trail to ridge (Boyd et al. 2000). Boyd and Austin then recorded this species at Trough Spring, Buck Spring, West Mud Spring, Middle Mud Spring, Big Falls Canyon, Little Falls, Fletcher Canyon, Willow Creek, and Lovell Canyon (SWCA 2005a).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are 58 sites where the Nevada admiral has been documented in the Spring Mountains NRA.

Figure 4-21 Nevada Admiral Species Distribution

Figure 4-21 BACK

Threats

Threats to the Nevada admiral include maintenance along Lee Canyon, Deer Creek, and the Kyle Canyon highways that includes mowing of nectar sources from mid-July to end of November (RECON 2000). Also, diversions or modifications at Cold Creek or Willow Creek that reduce the habitat suitability for willows could result in population declines of the Nevada admiral (RECON 2000). Habitat degradation and habitat loss from fire suppression may bring about the reduction of low to mid-canopy shrubs necessary for development of the larval stage (Clark County 2006). Habitat degradation from wild horse and burro grazing and trampling may destroy larval host plants necessary to survival of butterflies (Clark County 2006). Habitat loss could occur due to development and maintenance of recreational facilities, and inadvertent damage to habitat could result from Forest visitors and their associated recreational activities. Some of the historic and currently occupied sites are within upper Lee and Kyle canyons. These areas receive high levels of public visitation and are the most desirable for future development. Continued impacts to occupied sites include degradation of habitat, trampling and crushing of host plants and larvae, and disturbance of natural surfaces and soil-holding crusts. The impacts are primarily from dispersed recreational activities such as cross-country travelers creating new trails, recreational users who create and utilize open areas for camp activities (i.e., concentrated use areas), and development or expansion of recreation facilities and their maintenance (e.g., ski area).

Based on mapping as of 2006 of the Nevada Admiral occurrence localities within the Spring Mountains NRA, populations overlap with existing human activities on the landscape as indicated in Table 4-21. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-21 Estimated Overlap Between the Nevada Admiral and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Buildings on private land	1
Campgrounds	1
Concentrated Use Areas	8
Designated Horses/Burros Area	5
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	12
Fires 1954-1970	2
Fires 1971-1988	8
Fires 1989-2005	2
Firewood Gathering	5
Invasive Species	1
Non-System Trail	2
Motorized Trails (closed)	2
Picnic Areas	3
Private Land	3
Ski Area	1

Table 4-21 Estimated Overlap Between the Nevada Admiral and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Snow Play Areas	2
Structures on FS Land	1
System Trail (low mileage)	1
Roads (paved)	3
Roads (unpaved)	8
Wildland Urban Interface	13

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Nevada admiral as part of the landscape analysis.

4.5.9 Carole's Silverspot (*Speyeria carolae*)

Status Designations

Carole's silverspot butterfly (currently known as Carole's fritillary) (*Speyeria carolae =S. zerene carolae*) (Boyd 2005; Boyd and Austin 2002) is listed under the CA (USFS 1998) as a subspecies of concern. It is designated as a covered species in the MSHCP (RECON 2000), and has a NatureServe conservation status rank of G2G3 S2S3 (NatureServe 2007).

Range-wide Distribution

Carole's silverspot butterfly is endemic to the Spring Mountains NRA (Hiatt and Boone 2004).

Distribution in the Spring Mountains NRA

Investigations have shown that this butterfly is widespread and common on both slopes in the central portion of the Spring Mountains range, between approximately 6,560 and 8,860 feet (2,000 and 2,700 meters) in elevation (Boyd and Austin 1999). Known locations include the Rainbow Canyon summer homes area, Lower Trail Canyon, the junction of Trail Canyon and North Loop Trail, Trough Springs, Big Falls Canyon, Little Falls, Cathedral Rock, Fletcher Canyon as well as some additional canyons and springs (SWCA 2005a). In a 1998 study, it was discovered in 5 new localities: Mt. Potosi, Foxtail Canyon, Camp Stimpson, Old Mill Canyon, and the south fork of Deer Creek (Boyd and Austin 1999). See Figure 4-22 for locations of known occurrences, all of which occur between 5,015 and 11,386 feet (1,529 and 3,470 meters) elevation.

Figure 4-22 Carole's Silverspot Species Distribution

Figure 4-22 BACK

Habitat

Carole's silverspot occurs throughout all vegetation zones. They occur in bristlecone pine forests, white fir-Ponderosa pine forests, pinyon-juniper forests, sagebrush, chaparral, and desert habitats (SWCA 2005a). The larval host plant for Carole's silverspot butterfly is Charleston violet (*Viola purpurea* var. *charlestonensis*) (SWCA 2005a). Nectar plants include Arizona thistle (*Cirsium arizonicum*), sanddune wallflower (*Erysimum capitatum*), spreading dogbane (*Apocynum androsaemifolium*), Wood's rose (*Rosa woodsii*), rough angelica (*Angelica scabrida*), dustymaiden (*Chaenactis* sp.), lupine (*Lupinus* sp.), Clokey thistle (*Cirsium clokeyi*) (SWCA 2005a), mountain monardella (*Mondardella odoratissima*), and rubber rabbitbrush (*Chrysothamnus nauseosus*) (Boyd 2005).

Life History

The overall flight period extends from mid-June through early November with a peak in mid- and late July (Boyd and Austin 1999). In a 2004-2005 study, monitoring was conducted from June through September in Kyle and Lee Canyons to study the phenology, distribution, and resource use (Boyd 2005) of selected populations. Results indicated that the peak flight time occurs from July to August (Boyd 2005).

Measures

A measure to be used to determine the status, trends and management recommendations for this species is the total number of occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Carole's silverspot butterfly was collected, but not recognized as distinct until 1942 (Boyd and Austin 1999). Dozens of adults were observed in 1995 in Wallace Canyon where large concentrations of butterflies sometimes occur (Weiss et al. 1997). In a 1998 study, this subspecies was discovered in 5 new locations (Boyd and Austin 1999). Based on all data sources, there are 31 sites documented prior to 1998.

Prior to European settlement, Carole's silverspot butterfly most likely inhabited montane meadows, openings created by avalanches, and areas recovering from fire. Conditions in these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created openings due to construction of residences and campgrounds, timber cutting, and other activities.

Current Conditions in the Spring Mountains NRA

This butterfly is believed to be stable based on current distribution compared to historic records (Clark County 2006). It has been suggested that at this time intensive monitoring is unnecessary, and every other year counts should be adequate to address this species (Boyd and Austin 1999).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 50 sites where the Carole's silverspot butterfly have been documented.

Threats

Threats to Carole's silverspot butterfly include activities that result in the loss of host plants such as habitat degradation and vegetation removal, OHV use, and mowing (SWCA 2005a). Other

general threats identified in Clark County that apply to the Spring Mountains NRA include habitat degradation and loss from dispersed recreational activities such as hiking, equestrian use, camping, and mountain biking, and the impacts associated with these activities (i.e., traveling and parking on, and removing and trampling plants; and disturbing natural surfaces and soil-holding crusts); habitat degradation and loss from development or expansion of concentrated recreation facilities and their maintenance and use (e.g., camping, ski areas, parking); habitat degradation from wild horse and burro grazing and trampling; urban and rural development; highway and road construction, improvement, and maintenance; and fire suppression and fuels management (Clark County 2006).

Based on mapping as of 2006 of Carole's silverspot butterfly occurrence localities within the Spring Mountains NRA, site occurrences overlap with existing human activities on the landscape as indicated in Table 4-22. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-22 Estimated Overlap Between the Carole's Silverspot Butterfly and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Campgrounds	1
Concentrated Use Areas	3
Designated Horses/Burros Area	3
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	2
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1
Fires 1954-1970	1
Fires 1971-1988	3
Fires 1989-2005	1
Firewood Gathering	5
Invasive Species	1
Non-System Trail	1
Motorized Trails (open)	1
Picnic Areas	2
Private Land	1
Ski Area	1
Snow Play Areas	3
Structures on FS Land	1
System Trail (high mileage)	1
System Trail (low mileage)	1
Roads (paved)	3
Roads (unpaved)	5
Wildland Urban Interface	11

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Carole's silverspot butterfly as part of the landscape analysis.

4.5.10 Charleston Ant (*Lasius nevadensis*)

Status Designations

The Charleston ant (*Lasius nevadensis*) is listed as a species of concern in the CA (USFS 1998) and has a NatureServe conservation status rank of G1 S1 (NatureServe 2007).

Range-wide Distribution

The Charleston ant is only found within the Spring Mountains in Clark County, Nevada (Hiatt and Boone 2004; NatureServe 2007).

Distribution in the Spring Mountains NRA

The Charleston ant is known only from Kyle Canyon in the Spring Mountains NRA (Hiatt and Boone 2004; NatureServe 2007). See Figure 4-23 for the presumed location of the one known occurrence of this species, mapped between 7,781 and 7,806 feet (2,372 and 2,379 meters).

Habitat

This species occupies subterranean nests in unshaded areas within coniferous forest habitats (Hiatt and Boone 2004).

Life History

The Charleston ant is a non-migrating species (NatureServe 2007).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites and element occurrences.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information to indicate a reference status for this species within the Spring Mountains NRA. From the time of the first European settlement in the Spring Mountains, there have been substantial impacts within the conifer zone due to human activities such as timber harvest, livestock grazing, road construction, and development. Based on NNHP data, the one site and element occurrence of the Charleston ant was documented prior to 1998.

Current Conditions in the Spring Mountains NRA

There is insufficient data to determine the current status of the Charleston ant. It is known from a single collection made earlier than the mid-1950s.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there is currently 1 site where the Charleston ant has been reported.

Threats

The Charleston ant is threatened by increased recreational use of the Spring Mountains NRA (NatureServe 2007). Ant nests are probably vulnerable to trampling by hikers (NatureServe 2007).

Level of Analysis

Since there are limited documented occurrences of the Charleston ant, only a general descriptive analysis will be conducted as part of this landscape assessment.

4.5.11 Spring Mountains Springsnail (*Pyrgulopsis deaconi*)

Status Designations

The Spring Mountains springsnail (currently known as the Spring Mountains pyrg) (*Pyrgulopsis deaconi*) is listed in the CA (USFS 1998) as a species of greatest management concern. It is designated as a covered species in the MSHCP (RECON 2000), and has a NatureServe conservation status rank of G1 S1 (NatureServe 2007).

Range-wide Distribution

The Spring Mountains springsnail is endemic to the Spring Mountains in Nye and Clark counties, Nevada (Hiatt and Boone 2004; NatureServe 2007), and currently occurs in both the Spring Mountains NRA and Red Rock Canyon NCA. In the Red Rock Canyon NCA it is currently known to occur in Red Spring and Rainbow Spring, and was reintroduced to Willow Spring in 2001 (Sada 2002).

Distribution in the Spring Mountains NRA

The Spring Mountains springsnail is known from Kiup Spring and Horse Springs (spring #1 and #2) in the Spring Mountains NRA (Sada 2002). Note: Kiup Spring occurs very close to the NRA boundary and it is uncertain if it is within or outside the Spring Mountains NRA. See Figure 4-24 for locations of known occurrences of this species, all of which occur between 5,200 and 5,346 feet (1,585 to 1,629 meters) elevation.

Habitat

The Spring Mountains springsnail is found in springs with a permanent flow of highly mineralized, but relatively unpolluted water (Hiatt and Boone 2004). Springsnails are small in size (<5 mm high) and their habitat is generally limited to spring sources and short lengths of spring brook (Sada 2002). They occupy habitats with good water quality and a slow to moderate current (Sada 2002). They feed on algae gleaned from substrate and aquatic vegetation (Sada 2002). Preferred substrates are sand, gravel, or cobble, but they also occupy aquatic vegetation (Sada 2002).

Life History

The Spring Mountains springsnail is non-migrating and completes all its life stages within one year (USFS 1998).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites and element occurrences.

Figure 4-23 Charleston Ant Species Distribution

Figure 4-23 BACK

Figure 4-24 Spring Mountains Springsnail Species Distribution

Figure 4-24 BACK

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Outside of the Spring Mountains NRA boundary, two populations of the Spring Mountains springsnail were extirpated: one at Willow Spring in the Red Rock Canyon NCA in the 1980s as a result of habitat alterations from diverting the spring's discharge into pipes and troughs during development of a picnic area at this site; and another at Manse Spring on private land in Pahrump, Nye County, which coincided with the drying of the spring due to nearby ground water pumping in the early 1970s (Sada 2002). Within the Spring Mountains NRA two populations were known as of 1998: one at Kiup Springs; and a second, previously unknown population was discovered at Horse Springs (spring #1 and #2) in Nye County during surveys conducted in the late 1990s and early 2000s (Sada 2002). Based on NNHP data and Sada (2002), four sites were known to be occupied by the Spring Mountains springsnail as of 1998 with two occurring in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

The current status of the Spring Mountains springsnail is estimated to be stable or possibly declining (Sada 2002). In Red Rock Canyon NCA, population monitoring during 1999-2001 showed the springsnail to be common at Red Spring, scarce at Rainbow Spring, and extirpated from Willow Spring. This species was part of a restoration program at Willow Spring (in Red Rock Canyon NCA), whereby the spring was fenced and water was returned to its initial channel in 1998 (Sada 2002). In 2001, this species was collected from Red Spring in Red Rock Canyon NCA and stocked into Willow Spring (Sada 2002). Throughout its range (includes the Spring Mountains NRA and Red Rock Canyon NCA), the Spring Mountains springsnail was known from 5 sites as of 2006 (based on NNHP data; Sada 2003).

In the Spring Mountains NRA, population monitoring during 1999-2001 showed the springsnail to be sparse in numbers at Kiup Spring, but abundant in numbers at Horse Springs (Sada 2002). In addition, the surveys indicated that the Spring Mountains springsnail occupied approximately 5 meters of spring length at Kiup Spring, 75 meters of spring length at Horse Spring #1, and 30 meters of spring length at Horse Spring #2 (Sada 2002). The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate there are currently 2 sites where the Spring Mountains springsnail has been documented in the Spring Mountains NRA.

Threats

Threats to the Spring Mountains springsnail include habitat alteration due to recreation, spring brook diversion, non-native ungulates, and the introduction of non-native aquatic species (Sada 2003).

Based on mapping as of 2006 of the Spring Mountains springsnail occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-23. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-23 Estimated Overlap Between Spring Mountains Springsnail and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Designated Horses/Burros Area	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the Spring Mountains springsnail as part of the landscape analysis.

4.5.12 Southeast Nevada Springsnail (*Pyrgulopsis turbatrix*)

Status Designations

The southeast Nevada springsnail (currently known as the southeast Nevada pyrg) (*Pyrgulopsis turbatrix*) is listed in the CA as a species of greatest management concern (USFS 1998), and is designated as a covered species under the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

The southeast Nevada springsnail is endemic to the northern portion of the Spring Mountains in Clark and Nye counties of Nevada, including both the Spring Mountains NRA and Red Rock Canyon NCA, and in Cain Spring at the Nevada Test Site on Department of Energy lands in Nye County (Sada 2002). Outside of the Spring Mountains NRA, it is found on lands managed by the BLM on the east slopes of the Spring Mountain Range in Lost Canyon Creek, La Madre Spring, and Grapevine Spring #2, as well as in Harris Ranch Spring on private land (Sada 2002; Clark County 2006). The southeast Nevada springsnail is known from approximately 10 populations range-wide, which makes it one of the most widely distributed springsnails in southern Nevada (Sada 2002).

Distribution in the Spring Mountains NRA

The southeast Nevada springsnail occurs in the northeastern part of the Spring Mountains in Cold Creek and Willow Creek, and on the western side in Horseshutem Springs and Wood Canyon Spring (Sada 2002). See Figure 4-25 for locations of known occurrences of this species, all of which occur between 4,980 and 9,048 feet (1,518 and 2,758 meters) elevation.

Habitat

The southeast Nevada springsnail occurs in perennial freshwater spring habitat (Clark County 2006). Springsnails are small in size (<5 mm high) and their habitat is generally limited to spring sources and short lengths of spring brook (Sada 2002). They occupy habitats with good water quality and a slow to moderate current (Sada 2002). They feed on algae gleaned from substrate and aquatic vegetation (Sada 2002). Preferred substrates are sand, gravel, or cobble, but they also occupy aquatic vegetation (Sada 2002).

Figure 4-25 Southeast Nevada Springsnail Species Distribution

Figure 4-25 BACK

Life History

The southeast Nevada springsnail completes all its life stages within one year (USFS 1998).

Measures

A measure to be used to determine the status, trends, and management recommendations for this species is the total number of known occupied sites.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Outside of the Spring Mountains NRA, two populations have been extirpated due to habitat alteration in the form of spring brook diversion at Willow Spring in Red Rock Canyon NCA and Grapevine Spring #1 on the western side of the Spring Mountains on BLM land in Nye County (Sada 2002). Throughout its range (includes the Spring Mountains NRA, BLM lands, and the Department of Energy lands), the southeast Nevada springsnail was known from 9 sites as of 1998 [extirpated from Willow Spring and Grapevine Spring #1, but Grapevine Springs complex (#1 and #2) counted as one site; based on NNHP data and Sada 2002].

There are no clear reference conditions for this species in the Spring Mountains NRA. Based on combined data sources, there are 3 sites (Cold Creek, Willow Creek and Horseshutem Spring) documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

The status of this southeast Nevada springsnail is presumed to be stable (Clark County 2006). Surveys conducted during 1999-2001 located three previously unknown occurrences along the east side of the Spring Mountains Range: at Wood Canyon Spring, Middle Horseshutem Springs, and Harris Ranch Springs (on private land) (Sada 2002). This species is part of a restoration program at Willow Spring (in Red Rock Canyon NCA), whereby the spring was fenced and water was returned to its initial channel in 1998 (Sada 2002). In 2001, this species was collected from Lost Canyon Creek in Red Rock Canyon NCA and stocked into Willow Spring (Sada 2002). Sada (2002) also reported that the species was abundant at Grapevine Spring #2, and common at La Madre Spring, Cain Spring, and Harris Ranch Spring, but scarce at Lost Canyon Creek. Throughout its range (includes the Spring Mountains NRA, BLM lands, and the Department of Energy lands), the southeast Nevada springsnail was known from 10 sites as of 2006 [reintroduced to Willow Spring; still extirpated from Grapevine Spring #1, but Grapevine Springs complex (#1 and #2) counted as one site; based on NNHP data and Sada 2002].

In the Spring Mountains NRA, population monitoring during 1999-2001 showed the southeast Nevada springsnail to be scarce in numbers at Cold Creek and Willow Creek, but common in Wood Canyon Spring, Horseshutem Spring and Middle Horseshutem Spring (Sada 2002). In addition, the surveys indicated that the species occupied approximately 75 meters of spring length at Cold and Willow creeks, 40 meters at Horseshutem Spring, 15 meters at Middle Horseshutem Spring, and 30 meters at Wood Canyon Spring (Sada 2002). The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 4 sites where the southeast Nevada springsnail has been documented [the Horseshutem Springs complex (main Horseshutem Spring and Middle Horseshutem Spring) is counted as one site; based on NNHP data].

Threats

Southeast Nevada springsnail populations are susceptible to influences of habitat alteration due to recreation, spring brook diversion, and the introduction of non-native aquatic species (Sada 2002). A major threat to the southeast Nevada springsnail is disturbance at spring sites due to excessive grazing by non-native ungulates (Sada 2002, 2003).

Based on mapping as of 2006 of the southeast Nevada springsnail's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-24. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-24 Estimated Overlap Between the Southeast Nevada Springsnail and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites
Concentrated Use Areas	1
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	3
Fires 1971-1988	1
Non-System Trail	1
Motorized Trails (closed)	1
Private Land	2
Roads (unpaved)	2
Wildland Urban Interface	1

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of the southeast Nevada springsnail as part of the landscape analysis.

4.6 FLOWERING PLANTS

4.6.1 Rough Angelica (*Angelica scabrida*)

Status Designations

Rough angelica or Charleston Mountain angelica (*Angelica scabrida*) is a Forest Service sensitive species and is designated as a species of greatest management concern in the CA (USFS 1998). This species is designated as a covered species under the MSHCP (RECON 2000) with an NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Rough angelica is endemic to the Spring Mountains, found in both the Spring Mountains NRA at upper elevations and the Red Rock Canyon NCA at lower elevations. Morefield (2001) reported 12 occurrences at 1 km separation with an estimated total count of 3,781+ individuals covering 137 acres across the range of the species. This species is found at elevations ranging from 3,700 to 11,486 feet (1,128 to 3,500 meters) (SWCA 2005a).

Distribution in the Spring Mountains NRA

Rough angelica occurs in three drainages: Kyle Canyon, Deer Creek, and Lovell Canyon (Lund 2003; Glenne and Johnson 2002). See Figure 4-26 for locations of known occurrences of this species, all of which occur between 6,145 and 11,486 ft feet (1,873 and 3,500 meters).

Habitat

Rough angelica in the Spring Mountains NRA occurs on calcareous-based substrates in mixed conifer communities and near springs on moist gravelly soils of washes, ephemeral streams, gullies, montane slopes, and avalanche chutes (Lund 2003; Clark County 2006). It is associated with ponderosa pine, mountain mahogany, wavyleaf Indian paintbrush (=Clokey paintbrush), and aspen (Glenne and Johnson 2002).

Within the Spring Mountains NRA, Nachlinger and Reese (1996) sampled rough angelica on 8 plots, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (5 plots), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot), Rocky Mountain Subalpine-Montane Fen (1 plot) and Rocky Mountain Subalpine-Montane Riparian Woodland (1 plot). Reese (2007) reclassified those plots into the following US National Vegetation Classification (NVC) compliant associations: *Abies concolor* Shrubland (1 plot), *Abies concolor - Juniperus scopulorum* Sparse Understory Forest (1 plot), *Cercocarpus ledifolius* Sparse Woodland (1 plot), *Dodecatheon redolens - Aquilegia formosa* Herbaceous Vegetation (1 plot), *Pinus ponderosa* Woodland (1 plot), and *Populus tremuloides - Abies concolor* Woodland (3 plots).

Phenology

Rough angelica is a perennial herb that flowers from July to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatic fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Morefield (2001) reported an estimated total count of 3,781+ individuals covering 137 acres. Based on NNHP data (2005), there are 5 element occurrence records that include 13 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species, although presumed stable, appears to fluctuate widely between years in two monitored populations. Both populations are meeting management objectives for this species (Walker 2005). There is no documentation of recent declines, loss, or extensive degradation of habitat or populations since the Federal Highways project in Kyle Canyon (USFS 2003).

The extent of existing known sites have been better documented including a large site in 2002 at the Kyle Canyon summer homes. In 2002, a Kyle Canyon Summer Home Fuel Reductions Project survey estimated a population of approximately 22,000+ individual plants over 50 acres.

In 2003, a new population estimated at more than 1,000 plants over an estimated 15-acre area was documented in The Narrows in the upper reaches of the Lovell Canyon drainage on the west side of the Spring Mountains NRA (Lund 2003). A new population has also been documented in Deer Creek.

There are currently 5 element occurrence records that include 8 sites and 7 polygons on 126.8 acres where the rough angelica have been documented (NNHP 2005).

Threats

This species is subject to natural disturbances arising from flash floods and avalanches. According to Nachlinger and Combs (1996) and Reese (pers. comm.), the greatest threat to rough angelica is destruction and modification of habitat, such as: mountain home development, road construction and maintenance, lot clearing, mowing and snow plow disturbance, wildflower collecting, encroachment of weedy species along cultural developed land borders and the construction and maintenance of recreation facilities in Kyle Canyon. Concentrated recreation such as campgrounds, backcountry camping, picnicking, and visiting spring and seep sites, have altered habitat (Nachlinger and Combs 1996). Dispersed recreation, such as hiking and horseback riding on trails and up drainages, has also altered habitat (Nachlinger and Combs 1996).

Based on mapping as of 2006 of the rough angelica's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4.25. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4.25 Estimated Overlap Between Rough Angelica and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Buildings on private land	0	1	5.88
Concentrated Use Areas	0	1	2.32
Non-System Trail	1	1	0.03
Picnic Areas	1	1	1.27
Private Land	0	1	12.64
Snow Play Areas	0	1	7.17
System Trail (high mileage)	1	1	2.51
System Trail (low mileage)	0	2	8.73
Trailheads in Developed Canyons	0	1	1.03
Roads (paved)	1	2	1.24
Roads (unpaved)	0	1	3.71
Wildland Urban Interface	4	4	31.31

Figure 4-26 Rough Angelica Species Distribution

Figure 4-26 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the rough angelica as part of the landscape analysis.

4.6.2 Charleston Pussytoes (*Antennaria soliceps*)

Status Designations

The Charleston pussytoes or Charleston Mountain pussytoes (*Antennaria soliceps*) is a Forest Service sensitive species and is designated as a species of concern in the CA (USFS 1998). The plant is designated as a covered species in the MSHCP (RECON 2000) with a NatureServe conservation status rank of G1G2 S1S2 (NatureServe 2007).

Range-wide Distribution

Charleston pussytoes is endemic to the Spring Mountains, located only in high elevations of the Spring Mountains NRA (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Charleston pussytoes occurs along and below the ridgeline from Mummy Mountain to Charleston Peak to Griffith Peak, and in the upper elevations of the Bristlecone Trail in Lee Canyon (Glenne and Johnson 2002; SWCA 2005a; NatureServe 2007). See Figure 4-27 for locations of known occurrences of this species, all of which occur between 7,739 and 11,516 feet (2,359 and 3,510 meters).

Habitat

Charleston pussytoes occurs in mountain meadows, avalanche chutes, spring sources, open scree slopes, and on north facing cliffs (Glenne and Johnson 2002) on gravel, talus, carbonate scree, and crevices in the alpine, subalpine conifer to upper montane conifer zones (Morefield 2001). Common associated plants include other high-elevation species such as bristlecone pine, white fir, mountain gooseberry, common juniper, Charleston tansy, and hidden ivesia (Glenne and Johnson 2002). Nachlinger and Reese (1996) found it in wind swept, ridge crest subalpine meadows characterized by *Achnatherum lettermanii* and *Oxytropis oreophila*, as well as a riparian species found in temporarily flooded, wooded herbaceous vegetation characterized by *Cirsium clokeyi* and *Juniperus communis* var. *depressa*.

Nachlinger and Reese (1996) sampled Charleston pussytoes on 8 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (4 plots), Inter-Mountain Basins Semi-Desert Grassland (1 plot), and Rocky Mountain Subalpine-Montane Riparian Shrubland (1 plot).

Reese (2007) reclassified those plots into the following US NVC compliant associations: *Achnatherum lettermanii - Oxytropis oreophila* Herbaceous Vegetation (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Wooded Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (2 plots), *Pinus longaeva* Sparse Shrubland (1 plot), *Pinus longaeva* Sparse Understory Woodland (1 plot), and *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot).

Phenology

Charleston pussytoes is a perennial herb that flowers from July to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded by Jaeger near Charleston Peak in 1926 (SWCA 2005a). Two estimates of the population size were similar. Morefield (2001) reported 25 sites mapped at 0.16 km (0.1 mi) separation with 122,000 total estimated individuals occupying an estimated 178+ acres with the last survey data reported at 1994. Smith (1995) reported an estimated 97,640 individuals at an estimated 22 sites and occupying an estimated 188 acres. Based on NNHP data there are 6 element occurrence records that include 25 sites documented prior to 1998 (NNHP 2005).

Current Conditions in the Spring Mountains NRA

The status of this species appears to be stable. There has been no documentation of recent declines, loss or extensive degradation of habitat, or loss of populations (USFS 2003). It is a member of the high elevation plant community that is monitored every three years along the Charleston ridgeline (Nachlinger 2000a); however, it is of such low occurrence that it is not represented in the alpine plots themselves (USFS 2003). It is found in 20 percent of the Peak bristlecone high elevation plot in 1998/1999 which declined to 10 percent with less than 1 percent absolute cover in 2002 (Beyer 2003b). The high elevation monitoring plots do not track this species sufficiently to draw any inferences concerning the status of the population (USFS 2003).

There are currently 6 element occurrence records that include 25 sites where the Charleston pussytoes have been documented (NNHP 2005).

Threats

The greatest threats to Charleston pussytoes are human activities, including hiking on scree slopes, camping, equestrian use, free roaming horses, mountain biking, other recreational uses, global warming, and extreme rarity (Smith 1995; USFS 2003). Several existing trails bisect populations and users often travel off established trails (USFS 2003). All populations appear to represent a single female genotype that reproduces asexually; therefore, the absence of genetic variation may contribute to its restriction to a narrow habitat range and increase its susceptibility to disease or stochastic events, and reduce its ability to survive changing climatic or other conditions (Morefield 2001).

Figure 4-27 Charleston Pussytoes Species Distribution

Figure 4-27 BACK

Based on mapping as of 2006 of the Charleston pussytoes' occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-26. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-26 Estimated Overlap Between Charleston Pussytoes and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Private Land	1	NA*	NA
System Trail (high mileage)	2	NA	NA

NA = Polygon is not available for a spatial analysis

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston pussytoes as part of the landscape analysis.

4.6.3 White Bear Poppy (*Arctomecon merriamii*)

Status Designations

The white bear poppy or desert bearpoppy (*Arctomecon merriamii*) is a Forest Service sensitive species (USFS 2003) and is designated as a covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G3 S3 (NatureServe 2007).

Range-wide Distribution

White bear poppy occurs in a narrow range of the northeastern Mojave Desert (Morefield 2001). It can be found in Clark County (including the Air Force's Nellis Test & Training Range), the extreme southwest corner of Lincoln County, the southern tip of Nye County (Ash Meadows National Wildlife Refuge), the Death Valley area, and Inyo County, California (Glenne and Johnson 2002; Clark County 2006). White bear poppy is found in the western half of Clark County and is widely, but sparsely, distributed throughout a 9,650 square mile area between 2,000 and 6,280 feet (610 and 1,910 meters) elevation; approximately one third of its distribution is in Clark County (Morefield 2001; Clark County 2006). For all of Nevada, the NNHP reported 71 mapped occurrences at 1 km separation with an estimated total count of 20,000+ individuals on 974 acres (Morefield 2001).

Distribution in the Spring Mountains NRA

This species is generally known from Horseshutem Spring (in the northern portion of the Spring Mountains NRA); however, no site-specific locality data is available (Glenne and Johnson 2002).

Habitat

White bearpoppy occurs in salt desert scrub and Mojave Desert scrub habitats (Clark County 2006). Populations are scattered within various habitats including limestone and dolomite

ridges, rocky slopes, gravelly canyon washes, and less often on valley bottoms, disturbed sites such as roadsides and bladed areas, and old lakebeds derived from carbonate rock sources (Glenne and Johnson 2002; Clark County 2006). It is found on a wide variety of dry to sometimes moist basic soils, including alkaline clay and sand, gypsum, calcareous alluvial gravels, and carbonate rock outcrops (Morefield 2001). Associated plants include creosote bush, shadscale, blackbrush, and white bursage (Glenne and Johnson 2002).

Phenology

The white bearpoppy is a perennial herb that flowers in the spring, from April to early June (Glenne and Johnson 2002).

Measures

There are no known sites in the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There are no known sites within the Spring Mountains NRA. However, desert scrub habitats have been degraded due to various factors including historic grazing by livestock, wild horse and burro use, OHV use, and invasion of non-native vegetation.

Current Conditions in the Spring Mountains NRA

There is insufficient information to determine its current status. However, the population in Nevada is considered stable, except in the Las Vegas Valley (Clark County 2006).

Threats

Threats to the white bearpoppy could include OHV use, habitat fragmentation, removing and trampling plants, disturbing natural surfaces and soil-holding crusts, and wild horse and burro grazing and trampling (Lund 2006a). Populations near Las Vegas have been extirpated by development (Clark County 2006).

Level of Analysis

Because field surveys over time have not found occurrences on the Spring Mountains NRA, and its viability is not dependent upon habitat within the Spring Mountains NRA, no further analysis will be done for the white bear poppy.

4.6.4 Rosy King Sandwort (*Arenaria kingii* spp. *rosea*)

Status Designations

The rosy King sandwort or King's rosy sandwort (*Arenaria kingii* spp. *rosea*) is a Forest Service sensitive species, designated as a species of concern in the CA (USFS 1998), and designated as a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G4T2 S2 (NatureServe 2007).

Range-wide Distribution

Taxonomically, the species, *A. kingii*, is a polymorphic taxon distributed across the Great Basin; but the subspecies, *A. k.* spp. *rosea*, is endemic to the east side of the Spring Mountains (USFS 2003; Clark County 2006). The majority of this species is on Forest Service lands included in the Spring Mountains NRA; the remaining sites are located on private lands on the north fork of

Deer Creek and Griffith Mine in Kyle Canyon (Clark County 2006). Morefield (2001) documented 6 occurrences at 1 km separation.

Distribution in the Spring Mountains NRA

Rosy King sandwort is known from Lee Canyon, Kyle Canyon, and Deer Creek (Glenne and Johnson 2002). See Figure 4-28 for locations of known occurrences of this species, all of which occur between 6,545 and 9,898 feet (1,995 and 3,017 meters).

Habitat

Rosy King sandwort is typically found on dry to moist, shallow, gravelly soils of limestone, sandstone, gravel, or silt loam on dry rocky hillsides or ridges (Glenne and Johnson 2002; USFS 2003; SWCA 2005a). It is generally located on wooded slopes and ridges in the upper pinyon-juniper, montane coniferous forest, and lower subalpine coniferous zones (Morefield 2001; SWCA 2005a). At the lower elevation sites this species occurs in white fir, ponderosa pine, and curlleaf mountain mahogany plant communities on moist to dry slopes (USFS 2003). At the middle elevation sites, it occurs in limber pine and white fir communities dominated by a mix of conifers, including common dwarf juniper and ponderosa and bristlecone pines (USFS 2003). Associated plants include limber pine, ponderosa pine, rock goldenrod, wavyleaf Indian paintbrush (=Clokey paintbrush), Clokey thistle, Charleston beardtongue, Clokey eggvetch, Clokey mountain sage, and Charleston ground daisy (Glenne and Johnson 2002; USFS 2003).

Nachlinger and Reese (1996) sampled rosy King sandwort on 6 classification plots and 1 validation point, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (1 plot) and Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (5 plots and 1 validation point which keyed to their *Pinus flexilis-Pinus longaeva* Association). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor-Pinus ponderosa / Cercocarpus ledifolius* Sparse Understory Woodland (1 plot), *Pinus flexilis-Pinus longaeva* Sparse Understory Woodland (1 plot), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus flexilis-Pinus longaeva* Sparse Woodland (2 plots), and *Pinus longaeva-P. flexilis / Juniperus communis* var. *depressa* Sparse Woodland (1 plot).

Phenology

Rosy King sandwort is a perennial herb that flowers from June to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatic fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Rosy King sandwort was first recorded by Heller in Lee Canyon in 1913 (USFS 2003). Knight completed a status report for this species in 1990 (USFS 2003). Based on NNHP data (2005), there are 7 element occurrence records that include 23 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

Rosy King sandwort is presumed to be stable due to the large numbers of individual plants reported in the 1999 status report; however, there is little recent data to support this assessment. Nachlinger and Sheldon's 1999 status report estimated 66,000 to 314,000 individual plants, occurring primarily in upper Lee Canyon on 120 acres. Glenne surveyed for this species along the North Loop Trail in 1998 and found thousands of individuals (SWCA 2005a). Additional sites have also been located (NNHP 2005).

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 8 element occurrence records that include 12 sites and 16 polygons on 114.8 acres where the rosy King sandwort has been documented.

Threats

Potential threats have been documented for many of the known sites, although the degree of threats was fairly minimal (Nachlinger and Sheldon 1999). Rosy King sandwort typically occurs in relatively open forested plant communities with sparse understories (Nachlinger and Sheldon 1999). Fire suppression has resulted in increased canopy cover of overstory trees and shifting species composition as well as modification of natural fire frequencies and intensities. This alteration of the fire regime may be a theat to the sustainability of the rosy King sandwort (Nachlinger and Sheldon 1999). According to the Forest Service, the expanding population and recreation use of the Spring Mountains is a threat, along with wild horses present within its habitat (NatureServe 2007; Morefield 2001). Concentrated recreation near Dolomite and the upper McWilliams campgrounds in Lee Canyon is a threat, as a large habitat area immediately upslope from these campgrounds is one that receives high recreational use and some of this use is off-trail hiking into occupied habitat (USFS 2003). It is possible this species is being impacted by off-trail foot traffic and projects in upper Lee Canyon, where surveys identified the species below the Bristlecone Trail (USFS 2003). In addition, increased development of recreation facitilities in upper Kyle Canyon also threatens this species (SWCA 2005a).

Figure 4-28 Rosy King Sandwort Species Distribution

Figure 4-28 BACK

Based on mapping as of 2006 of the rosy King sandwort's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-27. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-27 Estimated Overlap Between Rosy King Sandwort and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Campgrounds	0	1	9.14
Concentrated Use Areas	0	1	0.03
Designated Horses/Burros Area	2	0	0
Fires 1954-1970	0	1	0.13
Fires 1971-1988	1	0	0
Firewood Gathering	1	0	0
Non-System Trail	1	0	0
Snow Play Areas	0	2	1.81
System Trail (high mileage)	1	9	7.71
System Trail (low mileage)	0	1	0.03
Roads (unpaved)	1	0	0
Wildland Urban Interface	2	1	12.76

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the rosy King sandwort as part of the landscape analysis.

4.6.5 Clokey Milkvetch (*Astragalus aequalis*)

Status Designations

The Clokey milkvetch (*Astragalus aequalis*) is a Forest Service sensitive species and designated in the CA as a species of concern (USFS 1998). This plant is designated as a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Clokey milkvetch is endemic to the Spring Mountains in Clark County, Nevada (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

This species is known from Deer Creek and Lee and Kyle Canyons (Glenne and Johnson 2002). It is also known from Harris Mountain, Harris Saddle, Lucky Strike Mine, Mud Spring, Cold Creek areas, between Cold and Willow creeks, the east side of Wheeler Pass, Wheeler

Well, Trough Spring, and Clark, Wallace, and Carpenter canyons (Glenne and Johnson 2002). See Figure 4-29 for locations of known occurrences of this species, all of which occur between 5,902 and 8,294 feet (1,799 and 2,528 meters).

Habitat

Clokey milkvetch is found on calcareous gravelly flats, hillsides, and open ridges, often sheltered under sagebrush, pines, or Gambel's oak (SWCA 2005a). It is typically found in pinyon-juniper communities, but can also be found in mixed conifer and sagebrush habitat (Clark County 2006). This species is associated with white fir, ponderosa pine, mountain mahogany, montane washes, blackbrush, and mixed desert scrub (Glenne and Johnson 2002; Morefield 2001; SWCA 2005a). Clokey milkvetch is found on gravel, limestone, gravelly fine sandy loam, and very gravelly fine sandy loam with a bedrock substratum (SWCA 2005a). It is often associated with disturbed areas (Glenne and Johnson 2002). Nachlinger and Reese (1996) found it in woodlands at Deer Creek which are characterized by *Juniperus scopulorum* and *Cercocarpus ledifolius* var. *montanu*s, as well as in a *Rosa woodsii* dominated riparian area with sparse ground cover, and a wooded chaparral characterized by *Arctostaphylos pungens*.

Nachlinger and Reese (1996) sampled Clokey milkvetch on 3 plots, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (1 plot), Rocky Mountain Subalpine-Montane Riparian Shrubland (1 plot), and Sonora-Mojave Semi-Desert Chaparral (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Arctostaphylos pungens* Wooded Shrubland (1 plot), *Juniperus scopulorum / Cercocarpus ledifolius* Woodland (1 plot), and *Rosa woodsii* Sparse Understory Shrubland (1 plot).

Phenology

Clokey milkvetch is a perennial herb that flowers from May to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the final status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the large yearly fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Clokey milkvetch was first recorded in the Spring Mountains NRA in 1898 by Woodbury (USFS 2003). In 1991, Knight and Leavitt found this species during a rare plant survey in the Wheeler Wash area (SWCA 2005a). In 1994, Nachlinger reported over 50 plants on the upland slopes of the Willow Creek Campground area, but no plants were discovered there in 2002; this area is heavily impacted by OHV use, equestrian use, and feral horse and elk grazing (USFS 2003). In 1998, Glenne recorded at least 30 individual plants at the base of the road leading north from Kyle Canyon to Stanley B Spring along Kyle Canyon Road (USFS 2003). In 1998, Glenne also recorded at least 30 individual plants along the base of Fletcher Canyon Trail along Kyle Canyon Road; additionally, over 10 individual plants were located along Macks Canyon Road just north of Lee Canyon Road (USFS 2003). The NNHP reported 26 occurrences mapped with an estimated total individual count of 2,621+ individuals covering 136+ acres (Morefield 2001). Based on NNHP data (2005) there are 20 element occurrence records for Clokey milkvetch that include 38 sites documented prior to 1998.

Figure 4-29 Clokey Milkvetch Species Distribution

Figure 4-29 BACK

Current Conditions in the Spring Mountains NRA

Both the total number of occurrences and estimated individuals of Clokey milkvetch has increased since the 1994 status report by Nachlinger (SWCA 2005a) due to increased survey efforts. In 1999, Hundt found this plant along roads in upper Lee Canyon, while Rademaker and Hundt found 338 plants along the user-created Blue Tree trail system (USFS 2003; Lund 2006a). The largest population of an estimated 1,000 plants was found by Lund in 2002 near the crest of Wheeler Pass Road along a shallow drainage, while another 68 plants were observed northeast of Wheeler Pass (SWCA 2005a; Lund 2006a). Clokey milkvetch has risen in inventory priority because of impacts to a number of known populations by projects; however, new populations have also been found (USFS 2003).

As of 2006, there are currently 25 element occurrence records that include 13 sites and 43 polygons on 291.3 acres where the Clokey milkvetch have been documented.

Threats

The Clokey milkvetch has disappeared from previously known sites that now have heavy recreation use (NatureServe 2007). Thirty plants were covered with the original construction of the Kyle Canyon RV site and campground (Beyer 2002). The construction of a new Sawmill Trailhead directly impacted this species, as well as increase indirect impacts through dispersed recreation in that area (SWCA 2005a). During 2002 surveys, Lund identified OHV use, and feral horse grazing and trampling as the major threats to this species in the Willow Creek area; and, he also noted reductions in subpopulations in this area (SWCA 2005a). Recreation and development have been identified as the major threats to Clokey milkvetch in both the Willow Creek and Cold Creek areas (SWCA 2005a). Maintenance and construction of roads in the Cold Creek, Willow Creek, Harris Springs, and Deer Creek areas could also directly impact this species (SWCA 2005a). It is anticipated that this species will be impacted by the Middle Kyle Canyon complex (USFS 2003). Additional threats are mountain home development, fire management, road construction and maintenance, and wild horse and burro trampling (NatureServe 2007).

Based on mapping as of 2006 of the Clokey milkvetch's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-28. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-28 Estimated Overlap Between Clokey Milkvetch and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Campgrounds	0	1	0.64
Concentrated Use Areas	0	16	20.68
Designated Horses/Burros Area	3	17	127.20
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	2	5	54.21
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1	2	7.48
Fires 1954-1970	1	6	6.60
Fires 1971-1988	1	2	1.44
Fires 1989-2005	0	6	57.92
Firewood Gathering	0	6	54.42
Invasive Species	0	5	1.67
Non-System Trail	0	12	14.84
Motorized Trails (closed)	0	11	5.89
Motorized Trails (open)	0	4	0.53
Private Land	2	1	0.05
System Trail (low mileage)	0	1	1.87
Trailheads in Developed Canyons	0	1	0.23
Roads (paved)	1	3	0.80
Roads (unpaved)	0	15	28.45
Wildland Urban Interface	1	5	7.55

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey milkvetch as part of the landscape analysis.

4.6.6 Black Woollypod (*Astragalus funereus*)

Status Designations

The black woollypod or Funeral Mountain milkvetch (*Astragalus funereus*) is a Forest Service Sensitive species and designated as a species of greatest management concern (low elevation plant) in the CA (USFS 1998). The black woollypod is listed as an evaluation species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

The distribution of black woollypod is limited to southwestern Clark, Nye, and possibly Lincoln counties in Nevada, and also in Inyo County, California (Morefield 2001; Glenne and Johnson 2002). In California, it is only known from 5 locations in the Death Valley region (NatureServe 2007). In Nevada, there are 14 element occurrences (NNHP 2005). Morefield (2001) reported an estimated total count of 1,514+ individuals covering 1,137+ acres in Nevada (based on 12 element occurrences). Nye County locations are documented near Tonopah, Beatty, and on the Nevada Test Site (Glenne and Johnson 2002). The population near Tonopah has not been relocated in recent searches and is possible *Astragalus newberryi* (NNHP 2005). This species is found on the northeastern slopes of the Spring Mountains (Morefield 2001). Range-wide, this species can be found at elevations between approximately 3,200 and 7,680 feet (975 to 2,341 meters) (NatureServe 2007).

Distribution in the Spring Mountains NRA

The black woollypod is known in the Spring Mountains NRA from two sites, one in lower Kyle Canyon and another on the west side of Wheeler Pass (Glenne and Johnson 2002). See Figure 4-30 for locations of known occurrences of this species, all of which occur between 6,204 and 7,848 feet (1,891 and 2,392 meters).

Habitat

Black woollypod inhabits dry, open, steep, gravelly slopes of volcanic tuff, alluvium or occasionally dry limestone scree, mainly on east and south slopes, less commonly on west slopes, and rarely on north aspects (Morefield 2001; Glenne and Johnson 2002). This species occurs in blackbrush, sagebrush, and pinyon-juniper vegetation communities (USFS 2003). Associated species include hopsage, fourwing saltbush, and green ephedra (Glenne and Johnson 2002).

Phenology

Black woollypod is a matted, perennial herb that flowers from March to May (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Crosby completed the only known status report for this species in 1978 (SWCA 2005a). Based on NNHP data there are 2 element occurrence records that include 2 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

No new populations have been found on the Spring Mountains NRA.

The combined available data sources as of 2006, converted to site-specific GIS mapping, indicate that there are currently 2 element occurrence records that include 2 sites where the black woollypod have been documented.

Threats

Existing threats to the black woollypod in the Spring Mountains NRA include grazing by wild horses, heavy recreation use, and frequent fires (Morefield 2001). Range-wide, threats to this species include gold mining in Bulldog Hills and construction of a railroad line to Yucca Mountain (USFS 2003). This species has small and localized populations that are distributed in limited habitat in relatively low densities, and is susceptible to stochastic, natural, or man-made events (USFS 2003).

Based on mapping as of 2006 of the black woollypod's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-29. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-29 Estimated Overlap Between Black Woollypod and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Designated Horses/Burros Area	1	NA*	NA
Fires 1954-1970	1	NA	NA
Roads (unpaved)	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the black woollypod as part of the landscape analysis.

4.6.7 Half-ring Pod Milkvetch (*Astragalus mohavensis* var. *hemigyrus*)

Status Designations

The half-ring pod milkvetch (*Astragalus mohavensis* var. *hemigyrus*) is a Forest Service sensitive species (USFS 2003) and is designated as a species of greatest management concern (low elevation plant) in the CA (USFS 1998). It has a NatureServe conservation status rank of G3T2T3 S2S3 (NatureServe 2007).

Range-wide Distribution

Half-ring pod milkvetch is restricted to southern Nevada, having been extirpated from California (Morefield 2001; USFS 2003). In Nevada, the species' range includes the Spring Mountains, Sheep Range, Indian Ridge, and Indian Springs in both Clark and Lincoln counties, and Mt. Montgomery in Nye County (Glenne and Johnson 2002; USFS 2003). The NNHP reported that range-wide, 30 occurrences at 1 km separation with an unknown number of individuals covering 403+ acres (Morefield 2001). Range-wide, this species can be found at elevation between approximately 3,000 to 5,600 feet (914 to 1,707 meters) (Morefield 2001).

Figure 4-30 Black Woollypod Species Distribution

Figure 4-30 BACK

Distribution in the Spring Mountains NRA

The half-ring pod milkvetch occurs entirely on BLM land on lower elevations of the Spring Mountains. The NNHP (2005) updated occurrence maps show locations very near, but outside, the western Spring Mountains NRA boundary below Carpenter and Trout canyons. Given this close proximity to the Spring Mountains NRA boundary, it is possible for individual plants to occur in the Spring Mountains NRA over time, but surveys have not found this species on Forest Service lands (Lund 2006a; Glenne and Johnson 2002).

See Figure 4-31 for locations of known occurrences of the half-ring pod milkvetch, all of which occur between 4,363 and 5,875 feet (1,330 and 1,791 meters).

Habitat

The half-ring pod milkvetch is found on carbonate gravels and derivative soils on terraced hills and ledges, open slopes, and along washes in the creosote-bursage, blackbrush, and mixed shrub zones in the foothills of desert mountains (Morefield 2001; USFS 2003). Associated plants include creosote bush, desert trumpet, Joshua tree, Indian tea, and desert marigold (Glenne and Johnson 2002).

Phenology

Half-ring pod milkvetch is a perennial herb that flowers from April to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Prior to 1999, this species was only known from lower Trout Canyon outside the boundary of the Spring Mountains NRA (SWCA 2005a). Based on NNHP data there are no element occurrence records documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

This species does not occur in the Spring Mountains NRA. Focused surveys in 1998 and 1999 documented numerous occurrences and populations on BLM land at low elevations on the east and west sides of the Spring Mountains, but all were below the boundaries of the Spring Mountains NRA (Niles et al. 1998, 1999; SWCA 2005a).

Threats

In Nevada, some of this species' habitat is vulnerable to OHV use and other recreational activities, dumping, and feral horse and burro trampling (Morefield 2001).

Table 4-30 Estimated Overlap Between Half-Ring Pod Milkvetch and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	0	0	0

Level of Analysis

Because field surveys over time have not found occurrences on the Spring Mountains NRA, and its viability is not dependent upon habitat within the Spring Mountains NRA, no further analysis will be done for the half-ring pod milkvetch.

4.6.8 Clokey Eggvetch (*Astragalus oophorus* var. *clokeyanus*)

Status Designations

The Clokey eggvetch or egg milkvetch (*Astragalus oophorus* var. *clokeyanus*) is a Forest Service sensitive species and is designated as a species of greatest concern in the CA (USFS 1998). This species is a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G4T2 S2 (NatureServe 2007).

Range-wide Distribution

Clokey eggvetch is located in the Spring Mountains in Clark County and the Belted Range, Pahute Mesa, Timber Mountain, Elena Range and Shoshone Mountain in Nye County (Nachlinger and Combs 1996; Glenne and Johnson 2002; Clark County 2006). Morefield (2001) reported 23 mapped occurrences at 1.0 km (0.6 mile) separation with 4,313+ total estimated individuals occupying 274 acres of total estimated area for all occurrences across the range. Range-wide, elevations range from 5,400 to 8,990 feet (1,646 to 2,740 meters) (Morefield 2001).

Distribution in the Spring Mountains NRA

The main areas where Clokey eggvetch occurs are upper Lee and Clark canyons and the Wheeler Pass area (Clark County 2006). It is also known from Willow Peak, Bonanza Trail above the Cold Creek area, and Carpenter Canyon (Glenne and Johnson 2002). Based on occurrence data from the NNHP, 10 percent of the known mapped habitat acres of Clokey eggvetch are located in the Spring Mountains NRA. See Figure 4-32 for locations of known occurrences of this species, all of which occur between 6,276 and 8,983 feet (1,913 and 2,738 meters).

Figure 4-31 Half-ring Pod Milkvetch Species Distribution

Figure 4-31 BACK

Figure 4-32 Clokey Eggvetch Species Distribution

Figure 4-32 BACK

Habitat

This species occurs in pinyon-juniper and mixed conifer communities on moist to dry, often disturbed gravelly soils, in openings of forests, shrublands, and woodlands (Clark County 2006). It has been reported to be associated with ponderosa pine, pinyon pine, Utah juniper, white fir, mutton grass (Glenne and Johnson 2002), and the co-occurrence of Gambel's oak (*Quercus gambelii*) and sagebrush (*Artemisia tridentata)* (Nachlinger and Reese 1996). Key habitat attributes include open ridges or slopes and gravelly soil derived from limestone (Nachlinger and Combs 1996).

Nachlinger and Reese (1996) sampled Clokey eggvetch on 4 plots, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (2 plots) Great Basin Pinyon-Juniper Woodland (1 plot), and Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Shrubland (1 plot), *Pinus monophylla - Quercus gambelii / Artemisia tridentata* Woodland (1 plot), *Pinus ponderosa* Woodland (1 plot), and *Quercus gambelii / Artemisia tridentata* Wooded Shrubland (1 plot).

Phenology

Clokey eggvetch is a perennial herb that flowers from June to July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatically induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Nachlinger, in 1994, reported a presumed declining population trend. Nachlinger and Sheldon (1995) recorded 1,812 individuals present in 13 sites on 20.9 acres. According to monitoring studies report by Anderson in 1998, the population status of Clokey eggvetch was stable or increasing throughout its range on the Nevada Test Site. Based on NNHP data (2005), there are 9 element occurrence records that include 23 sites documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

The status of this species in the Spring Mountains NRA is uncertain. The two monitored populations have varied significantly from 1997 to 2005 (Walker 2006). The populations declined in 2002 but have recovered. Both populations are reproducing. This annual variability may be due to natural population fluctuations or attributable to overstory canopy closure, fire suppression, feral ungulate grazing and trampling, recreation activity, recent drought conditions, or a combination of factors (Beyer and Sikula 2002). Populations on the Nevada Test Site and Nellis Test and Training Range are relatively secure from human impacts due to access restrictions (Anderson 1998; Smith 2001; Clark County 2006).

There are currently 9 element occurrence records that include 19 sites and 7 polygons on 23.1 acres where the Clokey eggvetch have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

According to Nachlinger and Combs (1996), the greatest threat to Clokey eggvetch is destruction and modification of habitat. In Lee Canyon, known sites are threatened by development activities including recreational facilities, water infrastructure facilities, and road and trail construction and maintenance (Nachlinger and Combs 1996). Concentrated recreational activities, including campgrounds, backcountry camping, winter downhill and cross-country skiing, picnicking, trailhead and nearby trail use, occur in Lee Canyon within limited habitat of this species, especially where a large population of Clokey eggvetch is located adjacent to Bristlecone Trail (Nachlinger and Combs 1996). Dispersed recreation, including hiking, mountain biking, horse riding on trails, and four-wheel driving on roads adjacent to known sites threaten the habitat along Bristlecone and Bonanza Trails, Wheeler Pass, and Wheeler Well areas (Nachlinger and Combs 1996). Competition with exotic species is a possible threat in Cold Creek area, as well as in Lee Canyon where nearby ski slopes are seeded with non-native plants for slope stabilization purposes (Nachlinger and Combs 1996). Trampling and grazing by wild horses impacts habitat at known population sites (Nachlinger and Combs 1996). It has been speculated that the species may be declining due to long-term fire suppression activities (Clark County 2006).

Based on mapping as of 2006 of the Clokey eggvetch's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-31. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-31 Estimated Overlap Between Clokey Eggvetch and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Campgrounds	0	2	0.70
Concentrated Use Areas	2	0	0
Designated Horses/Burros Area	6	2	0.42
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1	0	0
Fires 1954-1970	1	2	0.40
Fires 1971-1988	1	0	0
Fires 1989-2005	1	1	0.17
Firewood Gathering	1	0	0
Private Land	2	1	0.05
Ski Area	1	1	0.42
Snow Play Areas	3	1	6.58
Structures on FS Land	0	1	0.01
System Trail (high mileage)	3	2	0.44
Roads (unpaved)	3	1	0.26
Wildland Urban Interface	2	2	11.41

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey eggvetch as part of the landscape analysis.

4.6.9 Spring Mountains Milkvetch (*Astragalus remotus*)

Status Designations

The Spring Mountains milkvetch (*Astragalus remotus*) is a Forest Service sensitive species (USFS 2003), is designated in the CA (USFS 1998) as a species of greatest management concern (low elevation plant), and as a covered species in the MSHCP (RECON 2000). The Spring Mountains milkvetch is a BLM Nevada sensitive species (BLM 2003), and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Spring Mountains milkvetch is endemic to the southeastern slopes of the Spring Mountains (Clark County 2006). It is known from the south portion of the Spring Mountains in the Red Rock Canyon NCA from Rocky Gap to Goodsprings, including Cottonwood Pass and Mountain Springs (Glenne and Johnson 2002; SWCA 2005a). The main portion of the population is on the Red Rock Canyon NCA and BLM lands east and south of the Spring Mountains NRA boundary (NNHP 2005). There are 16 known element occurrence for this species (NNHP 2005). Range-wide, this species is found at an elevation range of 2,953–7,050 feet (900–2,149 meters). Range-wide, Morefield (2001) reported an estimated total individual count of 5,018+ individuals covering 499 acres.

Distribution in the Spring Mountains NRA

There are 2 occurrences for this species in the Spring Mountains NRA: Mountain Pass (Niles et al. 1998) and Yellow Plug, south of Mt. Potosi (Nachlinger 1994). See Figure 4-33 for locations of known occurrences of this species, all of which occur between 5,394 and 7,277 feet (1,644 and 2,218 meters).

Habitat

Spring Mountains milkvetch occurs on rocky hillsides or ledges, canyon banks, and in washes and drainages on gravelly sandstone or limestone soils (Glenne and Johnson 2002). It is found in pinyon-juniper, sagebrush, grassland, blackbrush, and Mojave Desert scrub habitats (Clark County 2006). Associated plants include serviceberry, velvet ash, juniper, oak, and wild grape (Glenne and Johnson 2002).

Phenology

The Spring Mountains milkvetch is a perennial herb that flowers from April to June.

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The Spring Mountains milkvetch was found by Niles et al. in 1998-1999 surveys from rocky foothills at the southern end of the Spring Mountains (SWCA 2005a). One element occurrence was documented by Nachlinger in the Spring Mountains NRA in 1994 (SWCA 2005a). Based on NNHP data there are 2 element occurrence records that include 2 sites documented prior to 1998 in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

The current status of this species is presumed to be stable throughout its range (Clark County 2006). Of the eleven recorded sites where populations of this species occur, one is within the Spring Mountain Ranch State Park, 5 are within Red Rock Canyon NCA, 3 are on a combination of BLM and Forest Service lands, and 2 are within a combination of BLM and private land parcels (Clark County 2006). Additional populations have been located within the known distribution.

There are currently 3 element occurrence records that include 3 sites where the Spring Mountains milkvetch have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

Threats to the Spring Mountains milkvetch include livestock and wild horse grazing, trampling due to heavy recreational use, and frequent fires in the area (Morefield 2001). Fire is suspected to have devastating effects on this species when intensified by introduced non-native grasses (SWCA 2005a). General threats include habitat degradation and modification due to fire suppression and fuels management, traveling and parking off designated roads and trails, off-trail recreational use such as hikers, equestrians, campers, mountain bikers, and OHV users, and habitat fragmentation from urban and rural development (RECON 2000).

Based on mapping as of 2006 of the Spring Mountains milkvetch's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-32. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-32 Estimated Overlap Between Spring Mountains Milkvetch and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	1	NA*	NA
Private Land	1	NA	NA
Wildland Urban Interface	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Figure 4-33 Spring Mountains Milkvetch Species Distribution

Figure 4-33 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a qualitative habitat-based evaluation of the Spring Mountains Milkvetch.

4.6.10 Clokey Paintbrush (*Castilleja martinii* var. *clokeyi*)

Status Designations

The Clokey paintbrush (currently known as the wavyleaf Indian paintbrush) (*Castilleja applegatei* ssp. *martini =C. martinii* var. *clokeyi*) (USDA, NRCS 2008) is designated as a covered species in the MSHCP (RECON 2000), with an NNHP ranking of G3T3Q S3Q (Morefield 2001). The NatureServe conservation status rank for Castilleha applegatei ssp. martini is G5T5SNR.

Range-wide Distribution

Clokey paintbrush is endemic to the Mojave Desert and Colorado Plateau (Glenne and Johnson 2002). In California, it is found in the Panamint and Inyo Mountains in Inyo County (Glenne and Johnson 2002). In Nevada, it is known from the Quinn Canyon Range to the Sheep Range and into the Spring Mountains) in Nye and Clark counties (Glenne and Johnson 2002). For Nevada populations, NNHP reported 38 occurrences at 1 km separation with an estimated total count of 3,031+ individuals covering an unknown number of acres within an elevation ranges from 2,730 to 11,500 feet (832 to 3,505 meters) (Morefield 2001).

Distribution in the Spring Mountains NRA

It is locally common at higher elevations in the Spring Mountains, and occurs in Deer Creek, Cathedral Rock, Peak Spring, Macks Canyon, Kyle Canyon, Lee Canyon, and near the major high elevation trails (Clark County 2006; Glenne and Johnson 2002). See Figure 4-34 for locations of known occurrences of this species, all of which occur between 6,486 and 11,516 feet (1,977 and 3,510 meters).

Habitat

Clokey paintbrush is found in bristlecone pine and mixed conifer habitats on dry gravelly slopes (Clark County 2006; Glenne and Johnson 2002). It is can also be found in montane shrubland and alpine habitats (USFS 2003). Associated plants include pinyon pine, Utah juniper, ponderosa pine, limber pine, bristlecone pine, white fir, and aspen (Glenne and Johnson 2002). Nachlinger and Reese (1996) also found it in riparian zones dominated by shrubs and herbaceous vegetation, a subalpine meadow and a fen.

Within the Spring Mountains NRA, Nachlinger and Reese (1996) sampled Clokey paintbrush on 41 plots, representing the following Ecological Systems: Great Basin Pinyon-Juniper Woodland (2 plots), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (14 plots), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (2 plots), Inter-Mountain Basins Semi-Desert Grassland (1 plot), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (17 plots), Rocky Mountain Alpine Bedrock and Scree (2 plots), Rocky Mountain Subalpine-Montane Riparian Shrubland (2 plots), and Rocky Mountain Subalpine-Montane Fen (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Shrubland (3 plots), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Woodland (1 plot), *Achnatherum lettermanii - Oxytropis oreophila* Herbaceous Vegetation (1 plot), *Cercocarpus ledifolius* Sparse Woodland

(1 plot), *Cercocarpus ledifolius / Artemisia tridentata* ssp. *vaseyana* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Wooded Herbaceous Vegetation (1 plot*), Dodecatheon redolens - Aquilegia formosa* Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (2 plots), *Ivesia cryptocaulis* Sparsely Vegetated Alliance (1 plot), *Pinus flexilis - Pinus longaeva* Sparse Woodland (4 plots), *Pinus flexilis - Pinus longaeva* Sparse Understory Woodland (2 plots), *Pinus flexilis - Pinus longaeva* Woodland (2 plots), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus longaeva* Sparse Understory Woodland (3 plots), *Pinus longaeva* Woodland (1 plot), *Pinus longaeva - P. flexilis/Juniperus communis* var. *depressa* Sparse Woodland (2 plots), *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot), *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Sparse Understory Shrubland (1 plot), *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Sparse Understory Shrubland (1 plot), *Pinus ponderosa* Sparse Shrubland (1 plot), *Pinus ponderosa* Sparse Woodland (1 plot), *Populus tremuloides* Shrubland (2 plots), *Populus tremuloides - Abies concolor* Woodland (4 plots), *and Populus tremuloides - Abies concolor* Sparse Woodland (2 plots).

Phenology

Clokey paintbrush is a perennial herb that flowers from May to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1 kilometer site separation distance. Number of individuals is not an appropriate measure due to the climatically induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

In 1998, Glenne found thousands of individuals along the North Loop Trail, as well as near Deer Creek Springs, Macks Canyon, and McFarland Spring (SWCA 2005a). Based on NNHP data there are 22 element occurrence records that include 33 sites documented prior to 1998 in the Spring Mountains NRA.

Figure 4-34 Clokey Paintbrush Species Distribution

Figure 4-34 BACK

Current Conditions in the Spring Mountains NRA

This plant is fairly widespread throughout the Spring Mountains and is presumed stable (SWCA 2005a). There were a couple of recent locations documented for this species and there seems to be a better understanding of its overall distribution since 1999 (SWCA 2005a). In 1999, this species was found along roads in upper Lee Canyon, and below and near Willow Creek (SWCA 2005a). Also in 1999, it was located along the Pinyon Pine Trail, Mud Spring Trail, Rocky Gorge Trail, Mark's Piece of Cake Trail, and Lower Deer Creek Trail (SWCA 2005a). In 2000, this species was found in the vicinity of Mazie Spring and Three Springs (SWCA 2005a). In 2003, one individual was found while surveying lower Trail Canyon and it was also documented along Bristlecone and Old Mill trails (SWCA 2005a). Clokey paintbrush is monitored every 3 years as part of the high elevation plant community monitoring project, and in 1999, it was found in 20 percent of the Peak bristlecone plot and 10 percent of the Lee Canyon bristlecone plot for this project at less than 1 percent absolute cover (Nachlinger 2000b) and was not observed in 2002 (Beyer 2003b). Overall cover and diversity declined at this site possibly due to below average precipitation or annual variation (Baggs 2006). The high elevation monitoring plots do not track the species sufficiently to draw inference concerning the status of the species in the Spring Mountains.

There are currently 26 element occurrence records that include 35 sites and 5 polygons on 124.2 acres where the Clokey paintbrush have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

Five plants were found within the proposed project area for the Middle Kyle Canyon complex (USFS 2003). During the Sawmill Trailhead project, individual plants were mapped on either side of the equestrian-created trails that are associated with the official trail system (USFS 2003). In 2001, this species was documented at 4 rock climbing sites associated with the Mount Charleston Rock Climbing Survey (USFS 2003). The one known individual of this species in Trail Canyon was directly impacted by the Kyle Canyon Reservoir project (SWCA 2005a). More general threats include degradation and loss of habitat from recreational activities such as hiking, hunting, equestrian use, camping, mountain biking, and OHV use, which may cause loss of individuals as well as fragmentation of habitat and soil disturbance (USFS 2003). Impacts associated with the management of existing recreation facilities and their maintenance and use (i.e., camping, ski area, and parking) may also exist (USFS 2003). It is susceptible to stochastic natural or man-made events because it is an endemic species with small and localized populations distributed in limited habitat and relatively low densities (USFS 2003).

Based on mapping as of 2006 of the Clokey paintbrush's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-33. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-33 Estimated overlap between Clokey paintbrush and human activities occurring within the Spring Mountains NRA.

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	0	2	1.01
Designated Horses/Burros Area	1	1	9.78
Fires 1954-1970	1	0	0
Fires 1971-1988	0	1	8.84
Fires 1989-2005	1	0	0
Invasive Species	0	1	1.33
Non-System Trail	0	1	1.36
Motorized Trails (closed)	0	1	1.35
Picnic Areas	1	0	0
Private Land	2	0	0
Ski Area	2	0	0
System Trail (high mileage)	1	1	7.12
Trailheads Outside of Developed Canyons	0	1	0.16
Roads (paved)	2	0	0
Roads (unpaved)	0	2	2.13
Wildland Urban Interface	2	0	0

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey paintbrush as part of the landscape analysis**.**

4.6.11 Clokey Thistle (*Cirsium clokeyi*)

Status Designations

The Clokey thistle or whitespine thistle (*Cirsium clokeyi =C. eatonii* var. *clokeyi*) is listed as a species of concern in the CA (USFS 1998) and is designated as a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G2G3 S2S3 (NatureServe 2007).

Range-wide Distribution

Clokey thistle is endemic to the Spring Mountains (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Clokey thistle is widespread and common in higher elevation eastside canyons, slopes, and riparian areas in the Spring Mountains NRA (Glenne and Johnson 2002; SWCA 2005a). It is found along the main spine of the range from Griffith Peak to Mummy Mountain, with occurrences at Charleston Peak, Deer Creek, upper Lee Canyon, and Kyle Canyon (Glenne

and Johnson 2002; USFS 2003). Reese (pers. comm.) has also seen it on virtually inaccessible, vertical exposure seeps alongside Little Falls and in the riparian zone below the Wallace Canyon waterfalls. It is to be expected above the Little Falls and Wallace Canyon Falls (reference the falls symbol on the 7.5 minute topographic quadrangle for location), but the habitat has not been explored. See Figure 4-35 for locations of known occurrences of this species, all of which occur between 7,474 and 11,516 feet (2,278 and 3,510 meters).

Habitat

Clokey thistle occurs in alpine, bristlecone pine, and mixed conifer habitat on open, gravelly slopes, dry ridges and talus slopes, and around springs or other moist areas such as snow depressions, drainage bottoms, avalanche chutes and other moisture-enriched microsites in forest openings (Morefield 2001; Glenne and Johnson 2002; SWCA 2005a). It is associated with Clokey paintbrush, aspen, silver lupine, and mountain gooseberry (Glenne and Johnson 2002). Nachlinger and Reese (1996) also found it in dry subalpine meadows, subalpine fens and montane aspen woodlands with sparse understory vegetation. Lower elevation populations have been attributed to seed displacement from snow slides originating in the alpine zones (USFS 2003).

Nachlinger and Reese (1996) sampled Clokey thistle on 16 plots, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (2 plots), Inter-Mountain Basins Semi-Desert Grassland (3 plots), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (2 plots), Rocky Mountain Alpine Bedrock and Scree (1 plot), Rocky Mountain Subalpine-Montane Fen (1 plot), and Rocky Mountain Subalpine-Montane Riparian Shrubland (4 plots). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Achnatherum lettermanii - Oxytropis oreophila* Herbaceous Vegetation (3 plots), *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Wooded Herbaceous Vegetation (2 plots), *Dodecatheon redolens - Aquilegia formosa* Herbaceous Vegetation (2 lots), *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (1 plot), *Pinus longaeva* Sparse Understory Woodland (1 plot), *Pinus longaeva - P. flexilis/Juniperus communis* var. *depressa* Woodland (1 plot), *Populus tremuloides* Sparse Woodland (1 plot), *Populus tremuloides - Abies concolor* Sparse Woodland (1 plot), and *Salix lasiolepis / Rosa woodsii* / Mixed Herbs Shrubland (1 plot).

Phenology

Clokey thistle is a biennial or perennial herb that flowers from late July to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the climatic fluctuations and the occasional natural disturbances which characterize the riparian habitats for this species.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Population estimate is 9,422+ estimated total individuals occupying an estimated 588+ acres (Morefield 2001). Based on NNHP data (2005), there are 12 element occurrence records that include 26 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable, where not subjected to high levels of natural disturbance. There is no documentation of recent declines, loss, or extensive degradation of habitat, or loss of populations (USFS 2003). This species is a member of the high elevation plant community that is monitored every three years along the Mt. Charleston ridgeline. It is found in 30 percent of the peak bristlecone high elevation plot (Nachlinger 2000b), but was not located in 2002 (Beyer 2003b). Overall cover and diversity declined in 2002 possibly due to below average precipitation or annual variability, but additional monitoring is needed to understand trends (Baggs 2006). Clokey thistle is maintaining and reproducing at Maize Spring (8 to 80 plants from 1998 to 2003) and Three Springs (Baggs 2006). Few impacts were noted.

There are currently 12 element occurrence records that include 27 sites and 1 polygon on 5 acres where the Clokey thistle has been documented (NNHP 2005).

Threats

Natural disturbances include flash flooding and avalanches. Human threats include adverse habitat modification and the indirect effects of dispersed and concentrated recreational activities; trail construction; maintenance in Macks, Lee, and Kyle canyons and along high elevation trails; and the physical alteration of spring and spring outflow habitats that result in changes to the natural flow, temperature, and sediment regimes of springs, and habitat degradation and population decreases from introduction, competition, and encroachment of non-native, invasive species (USFS 2003). An unknown number of individuals were buried during the reconstruction of the upper end of the Las Vegas Ski and Snowboard Resort lift #1 (Lund 2006b). It has been suggested that this species may be subject to hybridization with other thistles (Lund 2006b). Clokey thistle is a nectar source for both the endemic Spring Mountains comma skipper and the regionally endemic Nevada admiral butterfly; therefore, any threats to this species may be detrimental to these butterflies as well (SWCA 2005a).

Based on mapping as of 2006 of the Clokey thistle's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-34. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-34 Estimated Overlap Between Clokey Thistle and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	1	0	0
Invasive Species	1	0	0
Private Land	2	0	0
Snow Play Areas	1	0	0
System Trail (high mileage)	2	1	0.57
Wildland Urban Interface	1	0	0

Figure 4-35 Clokey Thistle Species Distribution

Figure 4-35 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey thistle as part of the landscape analysis.

4.6.12 New York Mountains Catseye (*Cryptantha tumulosa*)

Status Designations

The New York Mountains catseye or New York Mountain cryptantha (*Cryptantha tumulosa*) is a Forest Service sensitive species (USFS 2003) and is on the watch list of species in the MSHCP (RECON 2000). It has a NatureServe conservation status rank of G4 S2 (NatureServe 2007).

Range-wide Distribution

New York Mountains catseye is found in the Mojave Desert and Colorado Plateau (Glenne and Johnson 2002). It occurs in Nevada in Clark County in the Spring and Sheep mountains, and in Nye County in the McCullough Mountains (Morefield 2001; Glenne and Johnson 2002). Throughout Nevada the NNHP reported 10 occurrences with no separation given with an estimated total individual count of 408+ individuals covering an unknown number of acres (Morefield 2001). It is also found in San Bernardino and Inyo County, California.

Distribution in the Spring Mountains NRA

In the Spring Mountains NRA, the New York Mountains catseye is known from Mt. Potosi, Harris Springs, Trout Canyon, Kyle Canyon, and Lee Canyon (Glenne and Johnson 2002; Lund 2006a). See Figure 4-36 for locations of known occurrences of this species, all of which occur between 5,669 and 7,125 feet (1,728 and 2,172 meters).

Habitat

Habitat for this species consists of gravelly clay soils on limestone hills and in washes (Glenne and Johnson 2002). Associated plants include big sagebrush, mountain mahogany, Utah juniper, and pinyon pine (Glenne and Johnson 2002). Nachlinger and Reese (1996) found New York Mountains catseye in sparse understory woodlands and wooded shrublands characterized by *Pinus monophylla* and *Artemisia tridentata,* with *Juniperus osteosperma* present in the 10 percent cover class.

Nachlinger and Reese (1996) sampled New York Mountains catseye on 2 classification plots and 1 validation plot, all in the Great Basin Pinyon-Juniper Woodland Ecological System. Their validation point keyed to their *Pinus monophylla-Juniperus osteosperma/Artemisia tridentat*a Association. Reese (2007) reclassified those plots into the following US NVC compliant associations: *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Sparse Understory Woodland (1 plot) and *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Wooded Shrubland (1 plot).

Phenology

New York Mountains catseye is a perennial herb.

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences

based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatically induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on NNHP data, there are 3 element occurrence records that include 3 sites documented prior to 1998 in the Spring Mountains NRA. However, Nachlinger and Reese (1996) found it at 3 other locations and those locations have not been evaluated by the NNHP to determine if they represent new element occurrences. This species was always found in their plots in the 1 percent cover class.

Lower elevation habitats have been historically degraded due to various factors including historic grazing by livestock, wild horse and burro use, OHV use, and invasion on non-native vegetation.

Current Conditions in the Spring Mountains NRA

The current status in the NRA unknown but believed to be stable. The species is locally common in suitable habitat.

There are currently 3 element occurrence records that include 3 sites where the New York Mountains catseye has been documented (NNHP 2005). However, surveys and documentation of known sites remain incomplete.

Threats

General threats to the New York Mountains catseye include habitat degradation and modification due to fire suppression and fuels management, traveling and parking off designated roads and trails, habitat fragmentation from rural development, wild horse and burro trampling, and recreational use such as hiking, equestrian use, mountain biking, and OHV use (Lund 2006a).

Based on mapping as of 2006 of the New York Mountains catseye's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4.35. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4.35 Estimated Overlap Between New York Mountains Catseye and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Designated Horses/Burros Area	1	NA*	NA
Roads (unpaved)	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Figure 4-36 New York Mountains Catseye Species Distribution

Figure 4-36 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation of New York Mountains catseye as part of the landscape analysis.

4.6.13 Jaeger Whitlowgrass (*Draba jaegeri*)

Status Designations

The Jaeger whitlowgrass or Jaeger's draba (*Draba jaegeri*) is a Forest Service sensitive species and designated as a species of concern in the CA (USFS 1998). This plant is a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Current Range-wide Distribution

Jaeger whitlowgrass is endemic to the Spring Mountains (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Jaeger whitlowgrass occurs along and below the ridge line from Mummy Mountain to Griffith Peak, in Lee Canyon along the North Loop Trail, in Kyle Canyon along the South Loop Trail, and on Charleston Peak (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-37 for locations of known occurrences of this species, all of which occur between 8,399 and 11,516 feet (2,560 and 3,510 meters).

Habitat

Jaeger whitlowgrass occurs in alpine and bristlecone pine communities in alpine fell fields and talus rubble, near or at timberline (Clark County 2006). It is found in rock crevices, among broken limestone rocks, and on gravelly slopes on gravel, limestone, sandstone, waste rock and refuse, and fine sandy loam to loamy fine sand (Glenne and Johnson 2002; SWCA 2005a). Jaeger whitlowgrass inhabits moist, sheltered areas in openings of the upper montane forest, near seeps in drainage areas or areas where snowdrifts lie until late summer (NatureServe 2007). Associated plants are limber pine, bristlecone pine, ponderosa pine, and white fir (Glenne and Johnson 2002). Nachlinger and Reese (1996) also found it in subalpine riparian shrubland.

Nachlinger and Reese (1996) sampled Jaeger whitlowgrass on 10 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (5 plots), Rocky Mountain Alpine Bedrock and Scree (3 plots), and Rocky Mountain Subalpine-Montane Riparian Shrubland (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Ivesia cryptocaulis* Alpine Sparse Shrubland (1 plot), *Ivesia cryptocaulis* Alpine Sparse Vegetation (3 plots), *Pinus longaeva* Sparse Woodland (2 plots), *Pinus longaeva* Sparse Understory Woodland (1 plot*), Pinus longaeva* Woody Sparse Vegetation (1 plot), and *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot).

Phenology

Jaeger whitlowgrass is a low scapose perennial that flowers from June to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Jaeger whitlowgrass was first recorded near Charleston Peak in 1926 (SWCA 2005a). Surveys for this species were conducted by Woodbury in 1980, Knight in 1990, and Glenne in 1998 (SWCA 2005a). Glenne documented more than 10 individual plants along the North Loop Trail, as well as populations in upper Kyle Canyon and along the central ridgeline (SWCA 2005a). Morefield (2001) reported 13 sites mapped with an estimated total individual count of 2,449+ individuals covering 100+ acres. Based on NNHP data there are 7 element occurrence records that include 15 sites documented prior to 1998.

Current Conditions in the Springs Mountains NRA

This plant is only known from the upper elevations of the Spring Mountains, but it is presumed stable (SWCA 2005a). Jaeger whitlowgrass is monitored every three years as part of the high elevation plant community monitoring project (Nachlinger 2000b). Jaeger whitlowgrass increased from a frequency of 10 percent in 1998-1999 to 20 percent on the alpine transects with an absolute cover below 1 percent (Baggs 2006). In the Peak bristlecone woodland plots, Jaeger whitlowgrass was not recorded in 2002 decreasing from a frequency of 20 percent (Beyer 2003b). This may be due to annual variation or below average precipitation

There are currently 8 element occurrence records that include 13 sites and 3 polygons on 13.4 acres where the Jaeger whitlowgrass have been documented (NNHP 2005). The reduction of element occurrences is due to new sites and better documentation of existing sites.

Threats

Glenne documented hiking as a major threat to this species along the North Loop Trail near the summit of Mt. Charleston (SWCA 2005a). Other threats include spring diversions, recreational activities, and competition from exotic species, as well as threats to populations in spring and seep areas that are frequented by hikers, wild horses and burros (NatureServe 2007). Jaeger whitlowgrass is narrowly endemic to higher elevations in the Spring Mountains and is therefore susceptible to local threats, stochastic events, and climate change (SWCA 2005a; NatureServe 2007).

Figure 4-37 Jaeger Whitlowgrass Species Distribution

Figure 4-37 BACK

Based on mapping as of 2006 of the Jaeger whitlowgrass' occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-36. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-36 Estimated Overlap Between Jaeger Whitlowgrass and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Fires 1954-1970	1	0	0
Non-System Trail	1	0	0
Snow Play Areas	1	0	0
System Trail (high mileage)	3	3	0.95
Wildland Urban Interface	1	0	0

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Jaeger whitlowgrass as part of the landscape analysis.

4.6.14 Charleston Draba (*Draba paucifructa*)

Status Designations

The Charleston draba or Charleston Mountain draba (*Draba paucifructa*) is a Forest Service sensitive species, a species of concern in the CA (USFS 1998) and a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G1G2 S1S2 (NatureServe 2007).

Range-wide Distribution

Charleston draba is endemic to the Spring Mountains (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Charleston draba is known along and below the ridgeline from Mummy Mountain to Griffith Peak, in upper east side canyons including Lee, Mazie, Deer, and Kyle canyons, and at Charleston Peak and ridgeline (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-38 for locations of known occurrences of this species, all of which occur between 8,202 and 11,430 feet (2,500 and 3,484 meters).

Habitat

Charleston draba occurs in moist places, rock ledges, avalanche chutes, alpine fell fields, and near seeps in drainage areas or late-lying snowdrifts in alpine and bristlecone pine communities (Glenne and Johnson 2002). The five largest populations occupy avalanche paths in steep subalpine drainages in Kyle and Lee canyons, and harbor 70 percent of the estimated total individuals (USFS 2003). Associated species include bristlecone pine, limber pine, shooting star, and red alumroot (Glenne and Johnson 2002). At lower elevation sites, it occupies habitat

in mixed conifer forests on moist slopes adjacent to avalanche chutes (Nachlinger and Sheldon 1999). This species is dependent on wetland margin areas (Morefield 2001).

Nachlinger and Reese (1996) sampled Charleston draba on 3 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (1 plot) and Rocky Mountain Subalpine-Montane Riparian Shrubland (2 plots). Reese (2006) reclassified those plots into the following US NVC compliant associations: *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Wooded Herbaceous Vegetation (1 plot), and *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot).

Phenology

Charleston draba is a perennial herb that flowers from June to July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the large yearly fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Charleston draba was first documented by Jaeger in 1926 (SWCA 2005a). Based on NNHP data (2005), there are 6 element occurrence records that include 27 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

There has been no documentation of recent declines, loss or extensive degradation of habitat, or loss of populations (USFS 2003). Nachlinger and Sheldon (1999) reported an estimated 1,750 individuals found in 27 sites over approximately 67 acres including new locations such as upper Kyle and Lee canyons (the North Fork of Deer Creek and along the South Loop Trail) (SWCA 2005a). Nachlinger found this species at Three Springs and in the vicinity of Mazie Spring in 1998 (Nachlinger 2000b). Charleston draba is monitored every three years as part of the high elevation plant community monitoring program and this species was found in 10 percent of the Lee Canyon bristlecone woodland plot (Nachlinger 2000b) and was not located in 2002 (Beyer 2003b). This species was located in the alpine monitoring transects in 2001 at a low frequency (10%) and absolute cover (<1%). In 2000 and 2003, Charleston draba was not relocated at the Three Springs or Maize Springs (Baggs 2006).

There are currently 8 element occurrence records that include 18 sites and 17 polygons on 54.8 acres where the Charleston draba have been documented (NNHP 2005).

Threats

In Lee and Kyle Canyons, the main threats are spring diversion and piping, wild horse trampling, hiking and dispersed recreation, and introduction of exotic species, as well as threats to populations in spring and seep areas frequented by both hikers and wild horses (SWCA 2005a; NatureServe 2007). This species is narrowly endemic to higher elevations in the Spring Mountains and is therefore susceptible to local threats and stochastic events (SWCA 2005a; NatureServe 2007), including climate change.

Figure 4-38 Charleston Draba Species Distribution

Figure 4-38 BACK

Based on mapping as of 2006 of the Charleston draba's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-37. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-37 Estimated Overlap Between Charleston Draba and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Fires 1971-1988	1	0	0
Snow Play Areas	0	1	0.24
System Trail (high mileage)	0	1	0.00

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston draba as part of the landscape analysis.

4.6.15 Nevada Willowherb (*Epilobium nevadense*)

Status Designations

The Nevada willowherb (*Epilobium nevadense*) is a Forest Service sensitive species (USFS 2003), a species of concern in the CA (USFS 1998), and a high priority evaluation species in the MSHCP (RECON 2000). The Nevada willowherb is a BLM Nevada sensitive species and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Nevada willowherb is known from southwestern Utah (Millard, Iron, and Washington counties) and eastern Nevada (Clark, Eureka, and Lincoln counties) (NatureServe 2007). Most of the Nevada populations are concentrated in the extreme southern part of the state (NatureServe 2007). Throughout Nevada the NNHP reported 7 occurrences in 3 widely separated areas given with an estimated total individual count of 111+ individuals covering 34.8+ acres (Morefield 2001). In Utah, this species is found in 4 widely separated areas (Franklin 2005). Range-wide, this species is found at an elevation range of 5,118 to 9,200 feet (1,560 to 2,804 meters).

Distribution in the Spring Mountains NRA

In the Spring Mountains NRA, Nevada willowherb is known in Kyle Canyon from Cathedral Rock, above Mary Jane Falls, and Fletcher Canyon. It has also been found in Lee Canyon, presumably including the Foxtail snow play area and Girl Scout camp (Glenne and Johnson 2002; USFS 2003; SWCA 2005a). See Figure 4-39 for locations of known occurrences of this species, all of which occur between 7,523 and 9,016 feet (2,293 and 2,748 meters) elevation.

Habitat

Nevada willowherb occurs on limestone talus slopes with rock outcrops and is associated with Clokey paintbrush, singleleaf pinyon pine, and ponderosa pine (Morefield 2001; Glenne and

Johnson 2002). Its topographic position varies from near crest and upper slope to slope bottoms, usually on slopes with varying aspect and precipitous gradient (NatureServe 2007). This species is found in xeric, shallow, and coarse soils (NatureServe 2007).

Phenology

The Nevada willowherb is a shrubby perennial herb that flowers from July to September.

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on NNHP data there are 5 element occurrence records for the Nevada willowherb that include 5 sites documented prior to 1998 in the Spring Mountains NRA. The species was not found on Nachlinger and Reese (1996) plots.

Current Conditions in the Spring Mountains NRA

The current status of Nevada willowherb in the Spring Mountains NRA cannot be determined. No recent targeted surveys have been conducted for this species (SWCA 2005a), it has not been reported by botanists who have searched in suitable habitat, and little information is available on the status of individual sites. Data on the Cathedral Rock population is lacking (USFS 2003).

There are currently 5 element occurrence records that include 5 sites where the Nevada willowherb has been documented in the Spring Mountains NRA (NNHP 2005).

Threats

General threats include road construction, mineral exploration, and increased recreational use of the area it inhabits (NatureServe 2007). This species or its habitat would likely be negatively affected by increased recreation from the construction of the Middle Kyle Canyon Complex project (USFS 2003; SWCA 2005a).

Based on mapping as of 2006 of the Nevada willowherb's occurrence localities within the Spring Mountains NRA, this habitat overlaps with existing human activities on the landscape as indicated in Table 4-38. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-38 Estimated Overlap Between Nevada Willowherb and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
System Trail (low mileage)	1	NA*	NA

* NA = Polygon is not available for a spatial analysis.

Figure 4-39 Nevada Willowherb Species Distribution

Figure 4-39 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Nevada willowherb as part of the landscape analysis.

4.6.16 Charleston Goldenbush (*Ericameria compacta*)

Status Designations

The Charleston goldenbush or Charleston Mountain goldenbush is a Forest Service sensitive species (USFS 2003), with a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Charleston goldenbush is endemic to southern Nevada, known from the Spring and Sheep mountain ranges in Clark County (Morefield 2001; NatureServe 2007). Throughout Nevada, there are 14 known element occurrences (NNHP 2005).

Distribution in the Spring Mountains NRA

Charleston goldenbush is known from Charleston Peak, the ridgeline from Mummy Mountain to Griffith Peak, Kyle Canyon along the South Loop Trail, and the lower North Loop Trail (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-40 for locations of known occurrences of this species, all of which occur between 7,858 and 11,378 feet (2,395 and 3,468 meters).

Habitat

Charleston goldenbush occurs throughout the higher elevation bristlecone woodland areas on open forest slopes (Glenne and Johnson 2002; NatureServe 2007). It inhabits sparsely forested carbonate slopes, avoiding exposed ridges, and adjacent ridges and outcrops in the subalpine and montane conifer zones (Morefield 2001; SWCA 2005a). It is associated with bristlecone, limber, and ponderosa pine (Morefield 2001; Glenne and Johnson 2002). This species is found on gravel, limestone, sandstone, and silt loam soils (SWCA 2005a). Nachlinger and Reese (1996) additionally found it in sparsely vegetated woodland and shrubland associations with such characteristic species as *Abies concolor, Cercocarpus ledifolius* var. *montanus, Juniperus com*munis var. *depressa* and *Populus tremuloides*, in addition to those above. It was also rarely found in or adjacent to subalpine fens and riparian zones. Reese (pers. comm.) finds that it predictably occurs on steep quartzite slopes in sparse subalpine woodlands around the Sisters peaks of Lee Canyon.

Nachlinger and Reese (1996) sampled Charleston goldenbush on 21 plots and 5 validation point, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (6 plots and 5 validation points which keyed out to their *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. i*ntermontanus* Association), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (11 plots), Rocky Mountain Subalpine-Montane Fen. Reese (2006) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Shrubland (1 plot), *Abies concolor - Pinus ponderosa - Pinus longaeva* Sparse Understory Woodland (1 plot), *Cercocarpus ledifolius* Sparse Woodland (1 plot), *Dodecatheon redolens - Aquilegia formosa* Herbaceous Vegetation (1 plot), *Pinus flexilis-Pinus longaeva* Woodland (2 plot), *Pinus flexilis - Pinus longaeva* Sparse Woodland (3 plots), *Pinus flexilis - Pinus*

longaeva Sparse Understory Woodland (2 plots), *Pinus longaeva* Woodland (1 plot), *Pinus longaeva* Sparse Understory Woodland (2 plots), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus longaeva - P. flexilis / Juniperus communis* var. *depressa* Sparse Woodland (1 plot), *Pinus ponderosa* Wooded Dwarf Shrubland (1 plot), *Pinus ponderosa* Woodland (1 plot), *Pinus ponderosa* Sparse Woodland (1 plot), *Populus tremuloides* Shrubland (1 plot).

Phenology

The Charleston Mountain goldenbush is a long lived woody shrub that flowers from August to September (SWCA 2005a).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

In 1998, Glenne found hundreds of individuals along the North Loop Trail (SWCA 2005a). Prior to this time, this species was unidentified in any documents related to its presence in that area (SWCA 2005a). Based on NNHP data there are 7 element occurrence records that include 8 sites documented prior to 1998 in the Spring Mountains NRA.

Prior to 1900, and the beginning of cultural development in the Spring Mountains, this species most likely inhabited forested slopes in low and high conifer zones throughout the Spring Mountains range. Conditions in these areas have changed over time due to fire suppression, water diversion, ski area construction, and other human created disturbances including timber harvest, and development of roads, residences, campsites, and trails.

Current Conditions in the Spring Mountains NRA

This plant is fairly common in the central range of the Spring Mountains and is presumed stable (SWCA 2005a). There have been several recent occurrences documented for this species and there seems to be a better understanding of its overall distribution since 1999 (SWCA 2005a). In 2003, Smith found 59 individuals while surveying lower Trail Canyon, while 3,769 individual plants were observed while surveying from the start of Trail Canyon trail and up along the North Loop Trail (SWCA 2005a). Reese (pers. comm.) considers it to be widespread on steep, wooded subalpine slopes in the Spring Mountains NRA, where its rooting system appears adapted to constant colluvial depositions.

There are currently 12 element occurrence records that include 9 discrete sites and 4 polygons on 122.3 acres where the Charleston Mountain goldenbush have been documented in the Spring Mountains NRA (NNHP 2005).

Figure 4-40 Charleston Mountain Goldenbush Species Distribution

Figure 4-40 BACK

Threats

This species is subject to natural disturbance from colluvial deposition on steep slopes, which limits its density. It would likely be negatively affected by trampling from the Kyle Canyon summer homes fuel reduction project and by habitat modification and increased recreation from the construction of the Upper Kyle Canyon Day Use Complex (USFS 2003; SWCA 2005a). Lund noted that the plants in Trail Canyon and along the North Loop Trail are threatened by dispersed hiking, camping, and horseback riding (SWCA 2005a). Other threats include habitat degradation and modification due to fire suppression and fuels management and off-trail recreational use, such as hikers, equestrians, campers, rock climbers, and mountain bikers (Lund 2006a).

Based on mapping as of 2006 of the Charleston Mountain goldenbush's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-39. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-39 Estimated Overlap Between Charleston Mountain Goldenbush and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	0	1	3.65
Non-System Trail	0	1	0.12
System Trail (high mileage)	1	2	11.27
System Trail (low mileage)	1	0	0
Roads (paved)	0	1	0.14
Roads (unpaved)	0	1	1.27

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Charleston goldenbush as part of the landscape analysis.

4.6.17 Inch High Fleabane (*Erigeron uncialis* spp. *conjugans*)

Status Designations

The inch high fleabane or lone fleabane (*Erigeron uncialis* spp. *conjugans*) is designated as a covered species in the MSHCP (RECON 2000), and is a Forest Service sensitive species (USFS 2003). It has a NatureServe conservation status rank of G3G4T3 S3 (NatureServe 2007).

Range-wide Distribution

Inch high fleabane is found in Clark and Nye counties in the Spring Mountains and Sheep Range, as well as in White Pine and Lincoln counties in Nevada (Glenne and Johnson 2002). Range-wide, there are 8 mapped element occurrences, however, the Sheep Mountain

populations are not mapped (NNHP 2005). Range-wide, this species can be found at elevations between approximately 6,069 and 9,662 feet (1,850 to 2,945 meters) above sea level (Morefield 2001).

Distribution in the Spring Mountains NRA

In the Spring Mountains NRA, inch high fleabane occurs in Deer Creek and in Kyle, Lee, Fletcher, and Carpenter canyons (Glenne and Johnson 2002). See Figure 4-41 for locations of known occurrences of this species, all of which occur between 6,070 and 9,662 feet (1,850 and 2,945 meters).

Habitat

Inch high fleabane occurs in bristlecone pine, mixed conifer, pinyon-juniper, and sagebrush communities (SWCA 2005a). It is restricted to crevices in faces of limestone cliffs and carbonate outcrops (Glenne and Johnson 2002). Associated plants include white fir, pinyon pine, ponderosa pine, and Utah juniper (Glenne and Johnson 2002). Nachlinger and Reese (1996) consistently found it in sparse vegetation associations which had less than 10 percent total plant cover.

Nachlinger and Reese (1996) sampled inch high fleabane on 4 plots, representing the following Ecological Systems: Inter-Mountain Basins Cliff and Canyon (1 plot), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (3 plots). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Jamesia americana* var. *rosea / Petrophytum caespitosum - Ivesia jaegeri* Sparse Vegetation (1 plot), *Pinus longaeva* Sparse Shrubland (2 plots), and *Pinus longaeva* Woody Sparse Vegetation (1 plot).

Phenology

Inch high fleabane is a scapose perennial herb that flowers from June to July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Inch high fleabane was first documented by Blake in 1934 (SWCA 2005a). Based on NNHP data there are 5 element occurrence records that include 5 sites documented prior to 1998 in the Spring Mountains NRA.

Figure 4-41 Inch High Fleabane Species Distribution

Figure 4-41 BACK

Current Conditions in the Spring Mountains NRA

Current status of this species in unknown in the Spring Mountains NRA. Occurrence reports since 1998 are few with no new information of condition or trend (SWCA 2005a); one new location was found in middle Kyle Canyon (NNHP 2005).

There are currently 6 element occurrence records that include 6 sites where the inch high fleabane have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

No specific threats were identified in the Spring Mountains NRA, but general threats to this species include: recreational use such as hiking, camping, and rock climbing, traveling off designated trails, removing and trampling plants, and disturbing natural surfaces (SWCA 2005a).

Based on mapping as of 2006 of the inch high fleabane's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-40. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-40 Estimated Overlap Between Inch High Fleabane and Human Activities Occurring Within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	1	NA*	NA
Designated Horses/Burros Area	1	NA	NA
System Trail (low mileage)	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the inch-high fleabane as part of the landscape analysis.

4.6.18 Clokey Buckwheat (*Eriogonum heermannii var. clokeyi*)

Status Designations

The Clokey buckwheat (*Eriogonum heermannii var. clokeyi*) is a Forest Service sensitive species (USFS 2003) and designated as a low priority evaluation species under the MSHCP (RECON 2000). It is a BLM Nevada sensitive species (BLM 2003) and has a NatureServe conservation status rank of G5T2 S2 (NatureServe 2007).

Range-wide Distribution

Clokey buckwheat is endemic to southern Nevada and found in Clark and Nye counties (Glenne and Johnson 2002). Range-wide, this species is found at an elevation range of approximately 3,806 to 6,562 feet (1,160 to 2,000 meters) (SWCA 2005a). There are 10 known element

occurrence for Clokey buchwheat (NNHP 2005). Throughout Nevada, an estimated total individual count of 459+ individuals covering an unknown area (Morefield 2001).

Distribution in the Spring Mountains NRA

Clokey buckwheat is known from Wheeler Wash, and Lee and Kyle canyons; however, site-specific data is not available for the Wheeler Wash location (Glenne and Johnson 2002). See Figure 4-42 for locations of known occurrences of this species, all of which occur between 5,387 and 5,994 feet (1,642 and 1,827 meters).

Habitat

Clokey buckwheat occurs on limestone foothills and slopes, carbonate outcrops, and talus, scree, and gravelly washes and banks (Morefield 2001; Glenne and Johnson 2002). It occurs in the creosote-bursage, shadscale, and blackbrush vegetation zones (Morefield 2001). Associated plants include creosote bush, rubber rabbitbrush, banana yucca, Mojave yucca, Joshua tree, and desert globemallow (Glenne and Johnson 2002). Soil type includes gravel, limestone, rock outcrops, very gravelly sandy loam, clay loam, and cobbly fine sandy loam (SWCA 2005a). Nachlinger and Reese (1996) frequently found it in cliff-side associations with total plant cover of less than 10 percent. Characteristic associated plants included *Cercocarpus intricatus* and *Ivesia jaegeri*.

Nachlinger and Reese (1996) sampled Clokey buckwheat on 5 classification plots and 2 validation points, representing the following Ecological Systems: Inter-Mountain Basins Cliff and Canyon (3 plots), Mojave Mid-Elevation Mixed Desert Scrub (1 plot and 1 validation point which keyed out to their *Coleogyne ramosissima-Purshia Mexicana* var. *stansburiana* Series), Great Basin Pinyon-Juniper Woodland (1 validation point which keyed out to their *Pinus monophylla-Cercocarpus ledifolius* var. *intermontanus/Artemisia tridentata* Association), and North American Warm Desert Bedrock Cliff and Outcrop (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Cercocarpus intricatus/Ivesia jaegeri* Sparse Dwarf-shrubland (1 plot), *Cercocarpus intricatus/Ivesia jaegeri* Sparse Vegetation (2 plots), *Eriogonum heermannii* Rock Outcrop Sparse Vegetation (1 plot), and *Purshia (stansburiana, mexicana*) Sparse Shrubland (1 plot).

Phenology

The Clokey buckwheat is a densely branched, perennial subshrub that flowers from late spring to summer (Morefield 2001; Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on NNHP data there are 2 element occurrence records that include 2 sites documented prior to 1998.

Figure 4-42 Clokey Buckwheat Species Distribution

Figure 4-42 BACK

Current Conditions in the Spring Mountains NRA

The status of this species in the Spring Mountains NRA is unknown as very little is known about the distribution of this species. Clokey buckwheat has not yet been systematically surveyed (Morefield 2001). Recent surveys located two populations on BLM land. This plant is fairly uncommon, although there remains extensive unsurveyed cliff habitat on the Spring Mountains NRA.

There are currently 2 element occurrence records that include 2 sites where Clokey buckwheat has been documented (NNHP 2005).

Threats

Nachlinger and Reese (1996) observed no natural or artificial threats to the populations at their 5 classification plot locations, perhaps due to the cliff-side nature of those populations. General threats to this species include: habitat degradation and modification due to fire suppression and fuels management, and increased fire susceptibility due to introduction of non-native grasses; off-trail recreational use such as hikers, equestrians, campers, mountain bikers, and OHV users; and susceptibility to stochastic events due to its limited distribution (Lund 2006a). No site-specific threats are known at this time.

Based on mapping as of 2006 of the Clokey buckwheat's occurrence localities within the Spring Mountains NRA, this habitat overlaps with existing human activities on the landscape as indicated in Table 4-41. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-41 Estimated Overlap Between Clokey Buckwheat and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Designated Horses/Burros Area	1	NA*	NA
Roads (paved)	2	NA	NA
Wildland Urban Interface	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Clokey buckwheat as part of the landscape analysis.

4.6.19 Barrel Cactus (*Ferocactus cylindraceus var. lecontei*)

Status Designations

The barrel cactus or Leconte's barrel cactus (*Ferocactus cylindraceus var. lecontei =F. acanthoides var. lecontei*) (USDA, NRCS 2008*)* in Nevada is a Forest Service sensitive species (USFS 2003) and is listed on the "watch list" in the MSHCP (RECON 2000). The barrel cactus has a NatureServe conservation status rank of G5T4?Q S4 (NatureServe 2007).

Range-wide Distribution

The barrel cactus (at the species level) occurs in the eastern Mojave and western Sonoran deserts of California, Nevada, Arizona, New Mexico, Utah, and northern Mexico at elevations of greater than 2,300 feet (700 meters) (Lund 2006a). Most of the range of the variety *lecontei* is found in western Arizona and eastern California south to Mexico (Hickman 1993; NatureServe 2007).

Distribution in the Spring Mountains NRA

The barrel cactus has not been recorded within the boundaries of the Spring Mountains NRA. In Nevada, it is known to occur south of Indian Springs and the rocky ridge east of Wilson's Ranch along the road to the Blue Diamond mill and mine (Clokey 1951 as cited in Lund 2006a). It is also known from Red Rock Canyon NCA where it occurs throughout the area (Leary and Niles 1996 as cited in Lund 2006a).

Habitat

The barrel cactus is found in gravelly or rocky places and occasionally on gravelly-rocky hillsides and rock ledges in creosote-white bursage desert scrub. It is occasional to locally common where found (Lund 2006). This species is usually found on igneous and limestone substrates on rocky slopes (Zimmerman and Parfitt 2004).

Phenology

The barrel cactus has 5 to 7 central spines and seeds are 1 to 2 millimeters.

Threats

If this species were to occur on the Spring Mountains, potential threats could include collecting, trampling by wild horses and burros, road maintenance, and recreational activities such as equestrian use, mountain biking, OHV activities, and traveling and parking off designated roads and trails (Lund 2006a).

Level of Analysis

Field surveys over time have not found occurrences on the Spring Mountains NRA and the present status is that the species does not occur in the NRA. For this reason, no further analysis will be done on this species.

4.6.20 Clokey Greasebush (*Glossopetalon clokeyi*)

Status Designations

The Clokey greasebush (*Glossopetalon clokeyi*) is a species of concern in the CA (USFS 1998) and is a designated covered species in the MSHCP (RECON 2000). This species is classified as a Forest Service sensitive species (USFS 2003) and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Clokey greasebush is endemic to the Spring Mountains Range (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Clokey greasebush occurs in the core limestone areas of the Spring Mountains including cliffs in Kyle and Carpenter Canyons, as well as at Robber's Roost and Mount Potosi (USFS 2003; NatureServe 2007). See Figure 4-43 for locations of known occurrences of this species, all of which occur between 7,966 and 9,144 feet (2,428 and 2,787 meters).

Habitat

Clokey greasebush occurs in mixed conifer forest communities in cracks and crevices on the northern side of vertical and near-vertical limestone cliff faces and ledges in the mountain brush, mountain conifer, and subalpine conifer zones (USFS 2003; SWCA 2005a; NatureServe 2007). Vegetation on the cliff faces is generally sparse and dominated by small, xerophytic shrubs and cespitose perennials with little soil accumulation (USFS 2003). Associated plant species include ponderosa pine, limber pine, bristlecone pine, white fir, mountain mahogany, Jaeger ivesia, and Heermann's buckwheat (Glenne and Johnson 2002; USFS 2003).

Nachlinger and Reese (1996) sampled Clokey greasebush on 1 plot, representing the Inter-Mountain Basins Cliff and Canyon Ecological System. Reese (2007) reclassified that plot into the US NVC compliant association of *Jamesia americana* var. *rosea / Petrophytum caespitosum - Ivesia jaegeri* Sparse Vegetation.

Phenology

Clokey greasebush is an intricately branched perennial subshrub that flowers from May to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded by Clokey in 1940 (SWCA 2005a). Up to 1999, NNHP recorded 15 occurrences mapped at 0.16 km (0.1 mi) separation with an estimated 7,446+ total individuals occupying an estimated 26.7 acres (Morefield 2001). In 1998, Glenne found approximately 100 individuals in the Robber's Roost area (USFS 2003). Based on NNHP data (2005), there are 7 element occurrence records that include 14 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable. There has been no documentation of recent declines, loss or extensive degradation of habitat, or loss of populations (USFS 2003). The general distribution of this species was documented fairly well before 1999, but recent surveys have increased both the number of known occurrences and estimated population size (SWCA 2005a). Most sites supporting this species are not subject to threats because of the relatively inaccessible nature of its vertical cliff habitat (USFS 2003).

There are currently 7 element occurrence records that include 16 sites where the Clokey greasebush have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

Habitat modification and displacement of individual plants due to rock climbing is a major threat at Trail Canyon, Robber's Roost, and Kyle Canyon, especially the destruction of habitat that is most accessible to climbers as interest in recreational climbing increases (Nachlinger 1994, USFS 2003). It is susceptible to stochastic events because it is a narrow endemic species with small and localized populations distributed in limited habitat and relatively low densities (USFS 2003).

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey greasebush as part of the landscape analysis. Only six sites on steep slopes were used in the quantitative analysis.

4.6.21 Smooth Dwarf Greasebush (*Glossopetalon pungens* var. *glabrum*)

Status Designations

Currently known as the dwarf greasebush (*Glossopetalon pungens*) (USDA, NRCS 2008), the varieties smooth dwarf greasebush (*Glossopetalon pungens* var. *glabrum*) and smooth pungent greasebush (*Glossopetalon pungens* var. *pungens*) have been combined. It is distinguished from *G. p.* var. *pungens* only by the absence of hairs (Morefield 2001). The two varieties are not recognized by the Jepson Manual. This variety is "maintained provisionally" by the NNHP because the two varieties "exhibit substantial geographic segregation with only a few mixed occurrences known" (Morefield 2001). Prior to this taxonomic revision, smooth dwarf greasebush was designated as a Forest Service Sensitive species (USFS 2003), a CA species of concern (USFS 1998), and an MHSCP Covered Species (RECON 2000), with a NNHP ranking of G2G3T1Q S1 (NatureServe 2007).

Range-wide Distribution

Smooth dwarf greasebush is a Mojave Desert endemic and is restricted to the Sheep Range and the Spring Mountains (Glenne and Johnson 2002) in southern Nevada. It also occurs in only one location in the Clark Mountains in San Bernardino County, California (Glenne and Johnson 2002). In Nevada, there are 5 known element occurrences (NNHP 2005) with one additional site in California (CNDDB 2007). Range-wide, the species is found at an elevation range of 4,000 to 7,800 feet (1,341 to 2,377 meters) (Morefield 2001).

Distribution in the Spring Mountains NRA

Smooth dwarf greasebush is known only from the Mt. Potosi area in both the NRA and Red Rock Canyon NCA (Glenne and Johnson 2002). See Figure 4-44 for locations of known occurrences of this species, all of which occur between 6,027 and 7,221 feet (1,837 and 2,201 meters).

Figure 4-43 Clokey Greasebush Species Distribution

Figure 4-43 BACK

Figure 4-44 Smooth Dwarf Greasebush Species Distribution

Figure 4-44 BACK

Habitat

Smooth dwarf greasebush occurs in pinyon-juniper, sagebrush, and ponderosa pine communities in the vertical crevices of limestone and sandstone cliff faces and rocky slopes or outcrops, generally avoiding southern exposures (Glenne and Johnson 2002; Lund 2006a). Vegetation is generally sparse on the cliff faces and dominated by small, drought-tolerant shrubs and dense, tufted perennials with little soil accumulation (Lund 2006a). Associated plant species include Jaeger ivesia, Utah juniper, California coffeeberry (*Frangula californica*), and pinyon and ponderosa pines (Glenne and Johnson 2002).

Phenology

The smooth dwarf greasebush is a perennial subshrub that flowers from April to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on NNHP data (2005), there are 2 element occurrence records that include 2 sites documented prior to 1998. Much of the habitat is inaccessible with the possible exception of specific climbing routes (Nachlinger 1994).

Current Conditions in the Spring Mountains NRA

The status of this species is unknown, but presumed to be stable due to the stability and inaccessibility of its habitat. Cliff surveys were conducted in 2001 at 10 Mount Charleston climbing areas and 2 bouldering sites, and this species was not found (USFS 2003). Surveys for this species remain largely incomplete (Morefield 2001).

There are currently two element occurrence records that include two sites where smooth dwarf greasebush have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

Because this plant grows on cliffs and steep rock faces, it is generally threatened by recreation such as rock climbing on cliffs and rock scrambling. These activities can result in removing and trampling of plants, disturbing natural surfaces, and individual displacement by rock climbers (Clark County 2006). This species occurs in small sub-populations making it more susceptible to local threats and stochastic events (Lund 2006a).

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey greasebush as part of the landscape analysis.

4.6.22 Smooth Pungent Greasebush (*Glossopetalon pungens* var. *pungens*)

Status Designations

Currently known as the dwarf greasebush (*Glossopetalon pungens*) (USDA, NRCS 2008), the varieties smooth pungent greasebush (*Glossopetalon pungens* var. *pungens*) and smooth dwarf greasebush (*Glossopetalon pungens* var. *glabrum*) have been combined. It is distinguished from *G. p.* var. *glabrum* only by the presence of hairs (Morefield 2001). The two varieties are not recognized by the Jepson Manual. This variety is "maintained provisionally" by the NNHP because the two varieties "exhibit substantial geographic segregation with only a few mixed occurrences known" (Morefield 2001). Prior to this taxonomic uncertainty, smooth pungent greasebush was listed as a CA Species of Concern (USFS 1998), and designated as a MSHCP covered species (RECON 2000), with a NNHP ranking of G2G3T2Q S2 (NatureServe 2007).

Range-wide Distribution

Smooth pungent greasebush is a southern Nevada endemic known from the Mt. Stirling area in Nye County in the northern portion of the Spring Mountains NRA and the Sheep Range in Clark County (Glenne and Johnson 2002), Morefield 2001). Throughout Nevada, Morefield (2001) reported 7 occurrences at 1 km separation with 211+ estimated individuals. Range-wide, the species can be found at elevations between 4,000 and 7,800 feet (1,341 to 2,377 meters) (Morefield 2001).

Distribution in the Spring Mountains NRA

Smooth pungent greasebush has been reported only from the Mount Sterling area in Nye County (Glenne and Johnson 2002). See Figure 4-45 for locations of known occurrences of this species, all of which occur between 6,184 and 6,207 feet (1,885 and 1,892 meters).

Habitat

Smooth pungent greasebush occurs in pinyon-juniper, sagebrush, and montane conifer communities in vertical crevices of limestone cliff faces, outcrops, and rocky slopes, generally avoiding southerly exposures (Morefield 2001; Lund 2006a). Vegetation is generally sparse on the cliff faces and dominated by small, drought-tolerant shrubs and dense, tufted perennials with little soil accumulation (Lund 2006a). Associated plant species include Jaeger ivesia, Utah juniper, California coffeeberry, and pinyon and ponderosa pines (Glenne and Johnson 2002).

Phenology

The smooth pungent greasebush is a perennial subshrub that flowers from April to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species include the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Based on NNHP data (2005), there is one element occurrence records that include one site documented prior to 1998. Much of the habitat is inaccessible with the possible exception of specific climbing routes (Nachlinger 1994).

Figure 4-45 Smooth Pungent Greasebush Species Distribution

Figure 4-45 BACK

Current Conditions in the Spring Mountains NRA

The status of this species is unknown, but presumed to be stable due to the stability and inaccessibility of its habitat. Cliff surveys were conducted in 2001 at 10 Mount Charleston climbing areas and 2 bouldering sites, and this species was not found (USFS 2003). Surveys for this species remain largely incomplete (Morefield 2001) and many sites have not been visited for over 20 years.

There is currently one element occurrence records that include one site where the smooth pungent greasebush have been documented in the Spring Mountains NRA (NNHP 2005).

Threats

Because this plant grows on cliffs and steep rock faces, it is generally threatened by rock climbing on cliffs and rock scrambling in the general habitat. These activities can result in removing and trampling of plants, disturbing natural surfaces, and individual displacement by rock climbers (Clark County 2006). Threats to the known locations are minimal since Mount Sterling is remote with limited use. This species occurs in small sub-populations making it more susceptible to local threats and stochastic events (Lund 2006a).

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey greasebush as part of the landscape analysis.

4.6.23 Charleston Ivesia (*Ivesia cryptocaulis*)

Status Designations

The Charleston ivesia or Charleston Peak mousetail (*Ivesia cryptocaulis*) is designated as a species of concern in the CA (USFS 1998) and a covered species in the MSHCP (RECON 2000). This species is a Forest Service sensitive species (USFS 2003) and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Charleston ivesia is endemic to the Spring Mountains in Clark County, Nevada (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Charleston ivesia is found in only 2 alpine areas including a square-mile area on the Charleston Peak ridgeline and another site on Mummy Mountain (Glenne and Johnson 2002; USFS 2003). It is one of the few species growing at the highest elevations in the Spring Mountains (Glenne and Johnson 2002). See Figure 4-46 for locations of known occurrences of this species, all of which occur between9,862 and 11,913 feet (3,006 and 3,631 meters).

Habitat

Charleston ivesia occurs in moist to dry carbonate scree, talus, outcrops, and gravelly limestone slopes, ridges, and alpine flats in the alpine and upper subalpine conifer zones (Morefield 2001; USFS 2003; SWCA 2005a). Associated plant species include Charleston tansy, Jaeger draba, Charleston pussytoes, Charleston kittentails, bristlecone pine, mountain currant, Clokey fleabane, and alpine fescue (Glenne and Johnson 2002; USFS 2003). If bristlecone pine are

present in habitat adjacent to Charleston Peak, they are infrequent and stunted or krumholtz in stature (Nachlinger and Reese 1996). This species was typically found in 9 Nachlinger and Reese (1996) plots in the 1 percent cover class and rarely in the 3 percent class.

Nachlinger and Reese (1996) sampled Charleston ivesia on 9 plots, all of which were found within the Rocky Mountain Alpine Bedrock and Scree Ecological System. Reese (2006) reclassified those plots into the following US NVC compliant associations: Ivesia cryptocaulis Alpine Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Sparse Shrubland (1 plot), *Ivesia cryptocaulis* Alpine Sparse Vegetation (4 plots), and *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (2 plots).

Phenology

Charleston ivesia is a matted, perennial herb that flowers from June to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Charleston ivesia was first recorded on Charleston Peak in 1935 (SWCA 2005a). Up to 1994, Morefield (2001) reported an estimated 130,000 individuals occupying an estimated 121 acres. Based on NNHP data (2005), there are 2 element occurrence records that include 9 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable, with no documentation of recent declines, loss, or extensive degradation of habitat, or loss of populations (USFS 2003). The distribution of this species has been well documented for over a decade, and the range, area of occupancy, number of occurrences, and estimated population size were almost the same in 2001 as they were in 1995 (SWCA 2005a). Surveys have been extensive for this species, but some potential habitat likely remains unexamined (Morefield 2001). Charleston ivesia is monitored every three years as part of the high elevation plant community monitoring project (Nachlinger 2000a). In 1998-1999 and 2001, this species was found between 40 to 50 percent of all alpine transects and less than 1 percent cover in the alpine macroplot (Baggs 2006).

There are currently 2 element occurrence records that include 13 polygons on 127.5 acres where the Charleston ivesia have been documented (NNHP 2005).

Threats

Threats to Charleston ivesia include habitat modification and indirect effects due to dispersed recreational activities including horseback riding, hiking, and camping in the alpine zone (USFS 2003). The main threats to this species have been reported as climatic change, frost heaving, and the shifting of talus slopes (SWCA 2005a). It is susceptible to stochastic natural or man-made events because it is an endemic species with small and localized populations distributed in limited habitat and relatively low densities (USFS 2003).

Figure 4-46 Charleston Ivesia Species Distribution

Figure 4-46 BACK

Based on mapping as of 2006 of the Charleston ivesia's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-42. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-42 Estimated Overlap Between Charleston Ivesia and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Private Land	NA*	1	16.18
System Trail (high mileage)	NA	6	5.73

* NA = Point occurrence data is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston ivesia as part of the landscape analysis.

4.6.24 Jaeger Ivesia (*Ivesia jaegeri*)

Status Designations

The Jaeger ivesia or Charleston Peak mousetail (*Ivesia jaegeri*) is designated as a species of concern in the CA, and as a covered species in the MSHCP (RECON 2000). This species is a Forest Service sensitive species (USFS 2003) and has a NatureServe conservation status rank of G2G3 S2S3 (NatureServe 2007).

Range-wide Distribution

Jaeger ivesia is found only in the Spring Mountains in Nevada and the Clark Mountains in San Bernardino County, California (Clark County 2006). There are 21 element occurrences rangewide (NNHP 2005) with two additional sites in California (CNDDB 2007).

Distribution and Abundance in the Spring Mountains NRA

Jaeger ivesia occurs in Lee, Kyle, and Carpenter canyons, Deer Creek, and from La Madre Mountain to Mount Potosi (Glenne and Johnson 2002; Clark County 2006). See Figure 4-47 for locations of known occurrences of this species, all of which occur between 5,988 and 11,270 feet (1,825 and 3,435 meters).

Habitat

Jaeger ivesia occurs in bedrock and crevices of vertical and near-vertical cliff faces of limestone and dolomite outcrops in shaded or limited sunlight sites within bristlecone pine and mixed conifer communities (Clark County 2006; Glenne and Johnson 2002; USFS 2003). Associated plants include ponderosa pine, pinyon pine, bristlecone pine, and California coffeeberry (Glenne and Johnson 2002). A key habitat attribute is limestone or sandstone cliffs and crevices. Nachlinger and Reese (1996) additionally list among its characteristic associates: *Cercocarpus intricatus, Jamesia americana* var. *rosea* and *Petrophytum caespitosum*. They found it over a

wide elevation range, most commonly in areas of less than 10 percent plant cover, with no significant tree canopy. Low elevation populations appeared to require north-facing cliffs in order to ameliorate the heat of summer. It was also be found colonizing conglomerate cliffs and boulders.

Nachlinger and Reese (1996) sampled Jaeger ivesia on 9 plots, solely within the Inter-Mountain Basins Cliff and Canyon Ecological System. Reese (2007) reclassified those plots into the following US NVC compliant associations: *Cercocarpus intricatus/Ivesia jaegeri* Sparse Dwarf-shrubland (1 plot), *Cercocarpus intricatus / Ivesia jaegeri* Sparse Vegetation (4 plots), *Jamesia americana* var. *rosea / Petrophytum caespitosum-Ivesia jaegeri* Dwarf-shrubland (1 plot), *Jamesia americana* var. *rosea / Petrophytum caespitosum-Ivesia jaegeri* Sparse Vegetation (3 plots).

Phenology

Jaeger ivesia is a hanging to finely matted perennial herb that flowers from May to July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

According to Nachlinger (1994), this species has an estimated 25,355+ individuals occupying a total estimated area of 80+ acres. Two of the largest populations are in Kyle Canyon with over 10,000 individuals in each, while all other populations are generally under 200 individuals (Nachlinger 1994). Based on NNHP data there are 12 element occurrence records that include 39 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

Current population estimates are likely to be conservative because many suitable cliff habitats have not yet been surveyed for this species (Lund 2006a). The status of this species is presumed stable. There has been no documentation of recent declines, loss or extensive degradation of habitat, or loss of populations. Projects since the Conservation Agreement include the Sawmill Trailhead project and surveys of various Mount Charleston rock climbing areas conducted during the summer of 2001, where this species was documented at four sites (USFS 2003).

There are currently 15 element occurrence records that include 14 sites and 28 polygons on 61.7 acres where the Jaeger ivesia have been documented in the Spring Mountains NRA (NNHP 2005).

Figure 4-47 Jaeger Ivesia Species Distribution

Figure 4-47 BACK

Threats

Threats to Jaeger ivesia include habitat modification and displacement of individuals from dispersed and concentrated recreational rock climbing activities, particularly in the Mary Jane Falls, Echo Cliff, Deer Creek and Robbers Roost areas (Clark County 2006; USFS 2003). This species would likely be negatively affected by increased access to climbing routes due to the construction of the Upper Kyle Canyon Day Use Complex (Lund 2006a).

Based on mapping as of 2006 of Jaeger ivesia's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-43. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-43 Estimated Overlap Between Jaeger Ivesia and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Caves/tunnels	0	2	0.04
System Trail (low mileage)	1	1	0.04

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Jaeger ivesia as part of the landscape analysis.

4.6.25 Hitchcock Bladderpod (*Lesquerella hitchcockii*)

Status Designations

The Hitchcock bladderpod (*Lesquerella hitchcockii*) is designated as a covered species under the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G3 S3 (NatureServe 2007). Recent taxonomic treatments have separated this species into two varieties: *Physaria hitchcockii* var. *hitchcockii* from the Sheep Range and Spring Mountains and var. *confluens* from Nye and White Pine counties (Holmgren et al. 2005).

Range-wide Distribution

Hitchcock bladderpod is endemic to Nevada and known from Clark, Nye, Lincoln, and White Pine counties (Glenne and Johnson 2002; Morefield 2001). Range-wide, this species is found at an elevation range of 7,000 to 11,710 feet (2,130 to 3,569 meters). Throughout Nevada the NNHP reported 29 occurrences at 1 km separation (Morefield 2001).

Distribution in the Spring Mountains NRA

Hitchcock bladderpod occurs at Kyle Canyon, Big Falls, Mummy Mountain, Charleston Peak Trail, and South Loop Trail (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-48 for locations of known occurrences of this species, all of which occur between 8,186 and 11,621 feet (2,495 and 3,542 meters).

Habitat

Hitchcock bladderpod is found on dry, gravelly, carbonate soils; scree and talus; and outcrops on knolls, flats, and slopes (Morefield 2001; SWCA 2005a). It is found in the lower alpine, subalpine, conifer, subalpine sagebrush, montane conifer, and upper pinyon-juniper zones (SWCA 2005a) in scattered, somewhat isolated sites (Morefield 2001). Nachlinger and Reese (1996) also found it in or adjacent to a subalpine riparian shrubland. It is most commonly found in sparse woodlands and shrublands characterized by *Pinus longaeva* and in alpine.

Within the Spring Mountains NRA, Nachlinger and Reese (1996) sampled Hitchcock's bladderpod on 35 classification plots and 2 validation points, representing the following Ecological Systems: Great Basin Pinyon-Juniper Woodland (3 plots), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (8 plots and 1 validation point which keyed to their *Abies concolor-Pinus ponderosa* var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* Association), Inter-Mountain Basins Semi-Desert Grassland (2 plots), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (13 plots and 1 validation point which keyed to their *Pinus flexilis-Pinus longaeva* Association), Rocky Mountain Alpine Bedrock and Scree (8 plots), and Rocky Mountain Subalpine-Montane Riparian Shrubland (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Achnatherum lettermanii - Oxytropis oreo*phila Herbaceous Vegetation (2 plots), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Understory Woodland (1 plot), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Woodland (1 plots), *Abies concolor - Pinus ponderosa - Pinus longaeva* Sparse Understory Woodland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Ivesia cryptocaulis* Alpine Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Sparse Shrubland (1 plot), *Ivesia cryptocaulis* Alpine Sparse Vegetation (4 plots), *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (2 plots), *Pinus flexilis-Pinus longaeva* Sparse Woodland (1 plot), *Pinus flexilis-Pinus longaeva* Woodland (1 plot), *Pinus longaeva* Sparse Understory Woodland (2 plots), *Pinus longaeva* Sparse Shrubland (3 plots), *Pinus longaeva* Sparse Woodland (3 plots), *Pinus longaeva / Ribes montigenum* Sparse Shrubland (3 plots), *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Sparse Understory Shrubland (1 plot), *Pinus monophylla / (Juniperus osteosperma) / Artemisia tridentata* Woodland (1 plot), *Pinus monophylla / Symphoricarpos oreophilus - Artemisia tridentata* Shrubland (1 plot), *Pinus ponderosa* Sparse Understory Forest (1 plot), *Pinus pond*erosa Woodland (2 plots), *Populus tremuloides - Abies concolor* Sparse Woodland (1 plot), *Populus tremuloides - Abies concolor* Woodland (1 plot).

Phenology

The Hitchcock bladderpod is a small perennial herb that flowers from June to August (SWCA 2005a).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatically induced population fluctuations.

Figure 4-48 Hitchcock Bladderpod Species Distribution

Figure 4-48 BACK

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The first record is from Munz in 1927 (SWCA 2005a). Based on NNHP data there are 11 element occurrence records that include 25 sites documented prior to 1998.

Prior to 1900, this species was most likely found throughout the low and high conifer area, specifically in open areas such as montane meadows, avalanche chutes, and post fire areas. Conditions in these areas have changed over time with fire suppression, water diversion, ski area construction, and other human created disturbances including timber harvest and development of roads, residences, campsites, and trails.

Current Conditions in the Spring Mountains NRA

The current status for Hitchcock bladderpod is presumed stable (SWCA 2005a). In 1999, this species was located along Mud Spring Trail and Lower Deer Creek Trail (SWCA 2005a). Hitchcock bladderpod is monitored every three years as part of the high elevation plant community monitoring project; and, in 1998-1999, Nachlinger found this species at a frequency of 100 percent within the bristlecone monitoring plot and in 75 percent of all alpine transects for this study (Nachlinger 2000b). Frequencies were maintained in 2001 and absolute cover remains less than 1 percent (Baggs 2006). The high elevation monitoring plots do not track this species sufficiently to draw any inferences concerning the status of the population, only the site. In 2003, close to 3,000 individual plants were documented in Lee Canyon, on Bristlecone Trail, and on Old Mill Trail (SWCA 2005a).

There are currently 14 element occurrence records that include 28 sites and 4 polygons on 9.7 acres where the Hitchcock bladderpod has been documented (NNHP 2005).

Threats

Threats to Hitchcock bladderpod include herbivory by deer and wild horses which was noted in Upper Lee Canyon by Flores et al. in 2003 (SWCA 2005a). Kyle Canyon Interim Visitor Center and Barracks Biological Evaluation found that the species would be impacted as five plants were found during a June 2000 survey of the project area (USFS 2003). Additionally, recreational activity is a potential threat in some areas (Morefield 2001).

Based on mapping as of 2006 of the Hitchcock bladderpod's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-44. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-44 Estimated Overlap Between Hitchcock Bladderpod and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	1	0	0
Fires 1954-1970	0	1	0.32
Non-System Trail	1	0	0
Private Land	1	1	1.16
Snow Play Areas	0	2	5.81
System Trail (high mileage)	2	2	0.05
Roads (unpaved)	1	1	0.14
Wildland Urban Interface	1	1	1.16

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Hitchcock bladderpod as part of the landscape analysis.

4.6.26 Charleston Pinewood Lousewort (*Pedicularis semibarbata* var. *charlestonensis*)

Status Designations

The Charleston pinewood lousewort (*Pedicularis semibarbata* var. *charlestonensis*) is designated as a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G4T3Q S3.

Range-wide Distribution

Charleston pinewood lousewort is endemic to southern Nevada, occurring within an elevation range from 6,900 to 9,850 feet (2,100 to 3,000 meters) elevation. It is known from the Spring and Sheep Mountains in Clark County (Glenne and Johnson 2002; NatureServe 2007). There are 14 known occurrence throughout the range of Charleston pinewood lousewort (NNHP 2005).

Current *Distribution in the Spring Mountains NRA*

Charleston pinewood lousewort is known from Deer Creek, Harris Springs, and Lee, Kyle, Carpenter, and Fletcher canyons (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-49 for locations of known occurrences of this species, all of which occur between 7,536 and 9,646 feet (2,297 and 2,940 meters).

Figure 4-49 Charleston Pinewood Lousewort Species Distribution

Figure 4-49 BACK

Habitat

Charleston pinewood lousewort occurs on dry slopes in conifer woods (Glenne and Johnson 2002). Associated plants include ponderosa, pinyon, bristlecone, and limber pines, as well as white fir and mutton grass (Glenne and Johnson 2002). This species is found on gravel, limestone, sandstone, gravelly fine sandy loam, cobbly fine sandy loam to very gravelly loamy sand, and silt loam (SWCA 2005a). Nachlinger and Reese (1996) rarely found it in young shrubland or open woodland associations characterized by *Populus tremuloides*. Other characteristic associates included *Cercocarpus ledifolius* var. *montanus* and *Juniperus scopulorum*.

Nachlinger and Reese (1996) sampled Charleston pinewood on 26 plots and 3 validation points, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (16 plots), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (9 plots and three validation points which keyed to their *Pinus flexilis-Pinus longaeva* Association). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa* / *Cercocarpus ledifolius* Sparse Shrubland (2 plots), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Understory Woodland (1 plot), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Woodland (1 plot), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Woodland (3 plots), *Abies concolor - Pinus ponderosa - Pinus longaeva* Sparse Understory Woodland (1 plot), *Cercocarpus ledifolius* Woodland (1 plot), *Juniperus scopulorum / Cercocarpus ledifolius* Woodland (1 plot*), Pinus flexilis-Pinus longaeva* Sparse Understory Woodland (2 plots), *Pinus flexilis-Pinus longaeva* Sparse Woodland (3 plots), *Pinus flexilis-Pinus longaeva* Woodland (1 plot), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus longaeva-P. flexilis / Juniperus communis* var. *depressa* Sparse Woodland (2 plots), *Pinus ponderosa* Sparse Understory Forest (1 plot), *Pinus ponderosa* Sparse Woodland (1 plot), *Pinus ponderosa* Woodland (3 plots), *Populus tremuloides* Shrubland (1 plot), *Populus tremuloides - Abies concolor* Sparse Woodland (1 plot).

Phenology

The Charleston pinewood lousewort is a perennial herb that flowers May to June and fruits in July (SWCA 2005a).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the climatically induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

In 1998, Glenne found thousands of individuals along the North Loop Trail (SWCA 2005a). Based on NNHP data there are 4 element occurrence records that include 8 sites documented prior to 1998.

Prior to 1900, this species was most likely found throughout the low and high conifer zones, specifically in areas such as montane meadows, avalanche chutes, and post fire areas. Conditions in these areas have changed over time due to fire suppression, water diversion, ski area construction, and other human created disturbances including timber harvest and development of roads, residences, campsites, and trails.

Current Conditions in the Spring Mountains NRA

The current status of this species is unknown but presumed stable (SWCA 2005a). This species is abundant and widespread throughout its habitat and elevation range throughout the NRA, but is likely underreported (Lund 2006b). In 1999, this species was found along the Mud Springs Trail; and, in 2003, it was located in Lee Canyon and along the Bristlecone and Old Mill Trails (SWCA 2005a). In 2004, Anderson found 17 individuals near the Desert Viewpoint area along the Deer Creek Highway (SWCA 2005a). The few recent surveys performed for this species have failed to create a better understanding of its population size, population trend, or area of occupancy (SWCA 2005a).

There are currently 10 element occurrence records that include 12 sites and 14 polygons on 202.3 acres where the Charleston pinewood lousewort have been documented (NNHP 2005).

Threats

Charleston pinewood lousewort occurs in small sub-populations, making it more susceptible to local threats and stochastic events (SWCA 2005a). Other general threats include habitat degradation and modification due to fire suppression and fuels management, increased fire susceptibility due to introduction of non-native grasses, and off-trail recreational use such as hunters, hikers, equestrians, campers, mountain bikers, and OHV users (Lund 2006b). However, Nachlinger and Reese (1996) data shows it tolerates both shade and open conditions, suggesting that opening canopies for fuels management should not adversely impact the species. An unknown number of individual plants were buried during the reconstruction of the Las Vegas Ski and Snowboard Resort replacement activities for lift #1 (Lund 2006b).

Based on mapping as of 2006 of the Charleston pinewood lousewort's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-45. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-45 Estimated Overlap Between Charleston Pinewood Lousewort and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Buildings on private land	0	1	0.75
Campgrounds	1	2	1.85
Concentrated Use Areas	0	5	27.65
Designated Horses/Burros Area	0	1	1.30
Firewood Gathering	1	3	5.03
Invasive Species	0	1	0.87
Non-System Trail	0	5	6.55
Motorized Trails (closed)	0	5	6.32
Motorized Trails (open)	0	1	0.31
Picnic Areas	0	1	1.33
Private Land	0	3	10.72

Table 4-45 Estimated Overlap Between Charleston Pinewood Lousewort and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Ski Area	1	0	0
Snow Play Areas	2	1	2.59
Structures on FS Land	3	0	0
System Trail (high mileage)	1	1	1.32
System Trail (low mileage)	0	2	0.11
Trailheads in Developed Canyons	0	1	0.25
Roads (paved)	0	5	2.58
Roads (unpaved)	0	6	5.33
Wildland Urban Interface	2	6	69.70

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Charleston pinewood lousewort as part of the landscape analysis.

4.6.27 Bicolored (=yellow two-tone) Beardtongue (*Penstemon bicolor* ssp. *bicolor*)

Status Designations

The bicolored, yellow two-tone), or pinto beardtongue (*Penstemon bicolor* ssp. *bicolor*) is designated as a Forest Service sensitive species (USFS 2003) and as a high priority evaluation species in the MSHCP (RECON 2000). The bicolored beardtongue has a NatureServe conservation status rank of G3T2Q S2 (NatureServe 2007).

Range-wide Distribution

Bicolored beardtongue is found in Clark County, Nevada, mostly on BLM and private lands adjacent to the limits of the Las Vegas urban area, including LaMadre Mountain, the Bird Springs Range, McCullough Mountains, and Cottonwood Spring (Glenne and Johnson 2002; NatureServe 2007). Throughout Nevada, 31 occurrences at 1 km separation have been reported with 784+ estimated individuals within an unspecified area (Morefield 2001). Range-wide, this species is found at an elevation range of 1,970 to 5,480 feet (600 to 1,670 meters) (Glenne and Johnson 2002). Recent treatments and assessments do not recognize the two subspecies of *Penstemon bicolor* (Holmgren 2002, Smith 2005). This species has been observed to hybridize with Palmer's beardtongue (*Penstemon palmeri*) (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

The only presumed location on the Spring Mountains NRA for this species is from a collection made by Clokey in 1937 reported to be from Kyle Canyon (NNHP 2005). Of the 34 known

occurrences of this species range-wide, this occurrence is the highest elevation recorded. It appears likely that the Spring Mountains NRA occurrence was either mistakenly mapped at an inappropriate elevation or, represents an occurrence that is no longer extant (Smith 2005). See Figure 4-50 for location of the one suspected occurrence of this species, mapped at an elevation of 5,616 feet (1,712 meters).

Habitat

Bicolored beardtongue occurs on calcareous or carbonate soils in washes, roadsides, rock crevices, outcrops, or similar places receiving enhanced runoff, specifically in very shallow gravelly washes, along roadsides, and on cliff areas above steeper washes (Morefield 2001; Glenne and Johnson 2002). It occurs in the creosote-bursage, blackbrush, mixed-shrub, and lower juniper zones (Morefield 2001). Associated plants include creosote bush, Joshua tree, and cheese bush (Glenne and Johnson 2002). Preferred soil type for this species includes all of the following: gravel, limestone, sandstone, rock outcrop, very gravelly sandy loam, and very stony sandy loam (SWCA 2005a).

Phenology

The bicolored beardtongue is a perennial herb that flowers from April to May (Morefield 2001).

Measures

There is no specific data available to define measures of distribution and abundance for the bicolored beardtongue on the Spring Mountains NRA.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

The only record of this species in the NRA was based on a 1937 collection (Morefield 2001). In 1987, Lathrop was unable to locate this species or find records of this species (SWCA 2005a); however, it is not clear if Lathrop did a field search and did not find the plant or just did a literature search and did not find other records (Lund 2006a). Based on NNHP data there is 1 element occurrence record that includes 1 site reported prior to 1998.

Current Conditions in the Spring Mountains NRA

The bicolored beardtongue is not considered to be present. Despite recent surveys range-wide, the already low numbers of this species are considered to be on a downward trend (SWCA 2005a).

There is currently 1 suspected element occurrence record that includes 1 site where bicolored beardtongue has been reported (NNHP 2005).

Level of Analysis

Field surveys over time have only documented one historic occurrence within the Spring Mountains NRA. The Spring Mountains NRA is likely at the extreme edge of this species range, and management actions are not likely to impact this species and its viability. Since there is only one historic siting and the Spring Mountains are at the every edge of the range, no further analysis will be conducted.

Figure 4-50 Bicolored Beardtongue Species Distribution

Figure 4-50 BACK

4.6.28 Rosy Two-colored (=two-tone) Beardtongue (*Penstemon bicolor* ssp. *roseus*)

Status Designations

The rosy two-colored, two-tone, or pinto beardtongue (*Penstemon bicolor* ssp. *roseus*) is designated as a Forest Service sensitive species (USFS 2003) and as a high priority watch list species under the MSHCP (RECON 2000). The rosy two-colored beardtongue has a NatureServe conservation status rank of G3T3Q S3 (NatureServe 2007).

Range-wide Distribution

Rosy two-colored beardtongue is found in lower elevation sites in Clark and Nye counties, Nevada (Glenne and Johnson 2002). It is known from Harris Springs Canyon and Wheeler Wash in the Spring Mountains ecosystem, but all occurrences are outside the boundary of the Spring Mountains NRA at lower elevations (Glenne and Johnson 2002; NNHP 2005). It was reported from Wallace Canyon and Wheeler Pass at an elevation of 4,200 feet (1,280 meters), also well outside the boundaries of the NRA (SWCA 2005a). It has been documented in the Sheep Mountains in Nevada as well (Lund 2006a). This species is also found in Mojave County, Arizona and San Bernardino County, California (NatureServe 2007). Throughout Nevada, NNHP reported 49 occurrences at 1 km separation with 6,049+ estimated individuals in a 204+ acre area (Morefield 2001). Range-wide, this species is found at an elevation range of 1,800 to 5,477 feet (548 to 1,669 meters) (SWCA 2005a). Recent treatments and assessments do not recognize the two subspecies of *Penstemon bicolor* (Holmgren 2002; Smith 2005). This species has been observed to hybridize with Palmer's beardtongue (*Penstemon palmeri*) (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

There are no documented records for this species (NNHP 2005). All known locations for this species range-wide occur at lower elevations.

Habitat

Rosy two-colored beardtongue occurs in rocky calcareous, granitic, or volcanic soils in washes, roadsides, scree at outcrop bases, rock crevices, cliff areas above steeper washes, or similar places receiving enhanced runoff (Glenne and Johnson 2002; Morefield 2001). It is found in the creosote-bursage, blackbrush, and mixed-shrub zones (Morefield 2001). Associated plants include creosote bush, Joshua tree, and cheese bush (Glenne and Johnson 2002). Soil type includes gravel, gravelly fine sandy loam, and limestone (SWCA 2005a).

Phenology

The rosy two-colored beardtongue is a perennial herb that flowers from March to September (Morefield 2001).

Measures

There is no specific data available to define measures of distribution and abundance for the rosy two-colored beardtongue.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

There is no information showing this species occurs in the Spring Mountains NRA.

Current Conditions in the Spring Mountains NRA

There have been no past or recent recordings of this species within the boundary of the Spring Mountains NRA (SWCA 2005a).

Level of Analysis

Because field surveys over time have not found occurrences on the Spring Mountains NRA and the present status is that the species does not occur in the Spring Mountains NRA, no further analysis will be done in this Landscape Analysis.

4.6.29 Death Valley Beardtongue (*Penstemon fruticiformis* spp. *amargosae*)

Status Designations

The Death Valley beardtongue (*Penstemon fruticiformis* spp. *amargosae*) is currently designated as a Forest Service sensitive species (USFS 2003) and as a species of greatest management concern (low elevation plants) under the CA (USFS 1998). The Death Valley beardtongue has a NatureServe conservation status rank of G4T3 S2 (NatureServe 2007).

Range-wide Distribution

Death Valley beardtongue is known from the Spring Mountains mainly in Nye County with a few sites in Clark County, Nevada, as well as Inyo and San Bernardino counties, California (Glenne and Johnson 2002). There are 20 element occurrences in Nevada with an additional 11 locations in California (CNDDB 2007, NNHP 2005). Range-wide, this species is found at elevations ranging from approximately 2,790 to 6,700 feet (945 to 2,042 meters).

Distribution in the Spring Mountains NRA

Death Valley beardtongue is limited to the lower elevation western slopes of Mt. Stirling south to Wood Canyon Spring, with occurrences on both the NRA and BLM land (USFS 2003). NRA occurrences also include Santa Cruz Spring, Horseshutem Spring, Crystal Spring, and the area below Bill Smith Spring (Glenne and Johnson 2002; USFS 2003). See Figure 4-51 for locations of known occurrences of this species, all of which occur between 4,377 and 6,332 feet (1,334 and 1,930 meters).

Habitat

Death Valley beardtongue occurs on sandy or gravelly washes in blackbrush, mixed desert shrub, and pinyon-juniper vegetation associations (Glenne and Johnson 2002; SWCA 2005a). Associated plants include Utah juniper, creosote bush, saltbush, and blackbrush (Glenne and Johnson 2002). Soil type includes gravel, limestone, and sandstone, including limestone mixed with dolomite and chert nodules (SWCA 2005a; Lund 2006a). Nachlinger and Reese (1996) found it on a steep, unstable quartzite talus slope among large boulders.

Nachlinger and Reese (1996) sampled Death Valley beardtongue on 1 plot, representing the North American Warm Desert Bedrock Cliff and Outcrop Ecological System. Reese (2007) reclassified that plot into the US NVC compliant *Eriogonum fasciculatum* Rock Outcrop Shrubland association.

Phenology

The Death Valley beardtongue is a perennial shrub that flowers from April to July.

Figure 4-51 Death Valley Beardtongue Species Distribution

Figure 4-51 BACK

Measures

Measures to be used to determine the final status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatic fluctuations.

Reference Status in the Spring Mountains NRA as of 1998

The first recorded site in the Spring Mountains NRA was in 1970 by Niles et al. (SWCA 2005a). Based on NNHP data there are 2 element occurrence records that include 2 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

Population trends for this species are unknown. Wild horse and burro herds near Horseshutem Springs may reduce populations where accessible to their grazing. The Ecological Systems Map of the Spring Mountains NRA identifies extensive suitable habitat in very remote areas on slopes and soils very unstable to humans and wild animals. These areas would be expected to maintain populations, unless warming trends cause conditions too xeric to support this not particularly drought adapted species.

Surveys for Death Valley beardtongue have been extensive and are ongoing, but remain incomplete (Morefield 2001). Niles et al. searched for this species throughout the NRA in 1998 and 1999 and found it in Wood Canyon and on the southwestern slopes of Mt. Stirling in populations as large as 500 individual plants. A new location was discovered in 1998 at the western base of Mt. Stirling above Grapevine Springs (as well as one site on BLM land near the NRA boundary at Kwichup Spring) (USFS 2003). A new location was discovered in 2002 at the western base of Mt. Stirling at the lower end of Santa Cruz Spring (USFS 2003).

There are currently 10 element occurrence records that include 10 sites and 4 polygons on 84.7 acres where the Death Valley beardtongue have been documented inside the Spring Mountains NRA boundary.

Threats

Natural disturbance from colluvial deposition on slopes greater than the angle of repose represents a significant threat to talus slope populations (Reese, per. com.). General threats to this species include increased susceptibility to fire due to introduction of non-native grasses; off-trail recreational use such as hunters, hikers, equestrians, campers, mountain bikers, and OHV users; removing and trampling plants; wild horse and burro grazing and trampling; and susceptibility to stochastic events of a limited distribution species (SWCA 2005a; Lund 2006a). The showiness and large size of the flower makes it susceptible to casual collecting, although its habitat is sparsely visited. It has been suggested that this species may be subject to hybridization with other *Penstemon* species (SWCA 2005a).

Based on mapping as of 2006 of the Death Valley beardtongue's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-46. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-46 Estimated Overlap Between Death Valley Beardtongue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Concentrated Use Areas	0	2	2.50
Designated Horses/Burros Area	1	0	0
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	3	3	36.84
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	5	4	47.86
Motorized Trails (closed)	0	1	1.61
Private Land	1	0	0
Roads (unpaved)	0	2	0.25

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Death Valley beardtongue as part of the landscape analysis.

4.6.30 Charleston Beardtongue *(Penstemon leiophyllus* var. *keckii*)

Status Designations

The Charleston or Keck's beardtongue *(Penstemon leiophyllus* var. *keckii*) is designated as a species of concern in the CA (USFS 1998) and as a covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G3T2 S2 (NatureServe 2007).

Range-wide Distribution

Charleston beardtongue is endemic to the Spring Mountains (Glenne and Johnson 2002). Elevation ranges from approximately 8,000 to 11,000 feet (2,400 to 3,400 meters) as reported by Glenne and Johnson (2002).

Distribution in the Spring Mountains NRA

Charleston beardtongue occurs at Deer Creek, on Mummy Mountain, and in Lee and Kyle canyons (Glenne and Johnson 2002). It is also known from higher elevations along the main ridgeline and at Peak Spring (Glenne and Johnson 2002). See Figure 4-52 for locations of known occurrences of this species, all of which occur between 8,136 and 11,427 feet (2,480 and 3,483 meters) elevation.

Figure 4-52 Charleston Beardtongue Species Distribution

Figure 4-52 BACK

Habitat

This species occupies bare gravelly areas or open meadows at or near timberline (Glenne and Johnson 2002). Associated plants include bristlecone pine, limber pine, aspen, and Clokey paintbrush (Glenne and Johnson 2002). Soil type includes gravel and sandstone (SWCA 2005a).

Nachlinger and Reese (1996) sampled Charleston beardtongue on 13 classification plots and one validation point, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (2 plots), Inter-Mountain Basins Semi-Desert Grassland [sensu Southern Rocky Mountains Montane-Subalpine Grassland] (3 plots), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (7 plots, 1 validation point), and Rocky Mountain Subalpine-Montane Riparian Shrubland (1 plot). Reese (2007) reclassified those classification plots into the following US NVC compliant associations: *Achnatherum lettermanii - Agropyron trachycaulum* Herbaceous Vegetation (1 plot), *Achnatherum lettermanii - Oxytropis oreophila* Herbaceous Vegetation (2 plots), *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Pinus longaeva* Sparse Shrubland (1 plot), *Pinus longaeva* Sparse Understory Woodland (1 plot), *Pinus longaeva* Woodland (1 plot), *Pinus flexilis-Pinus longaeva* Sparse Understory Woodland (1 plot), *Pinus longaeva-P. flexilis / Juniperus communis* var. *depressa* Woodland (1 plot), *Pinus longaeva / Ribes montigenum* Sparse Shrubland (2 plots), *Populus tremuloides* Shrubland (1 plot), and *Populus tremuloides - Abies concolor* Woodland (1 plot).

Phenology

The Charleston beardtongue is a perennial herb that flowers from June to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatic fluctuations.

Reference Status in the Spring Mountains NRA as of 1998 or Earlier

The first record of this species was reported by Holmgren in 1984 in Lee Canyon (SWCA 2005a). In 1998, Glenne found thousands of individuals along the North Loop Trail, and later noted this species in upper Kyle Canyon, upper Trail Canyon, upper Lee Canyon, and along the South Loop Trail near Charleston Peak and Griffith Peak (SWCA 2005a). Based on NNHP data there are 14 element occurrence records that include 24 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

This plant is fairly common in the central portion of the Spring Mountains and is presumed stable (SWCA 2005a). Charleston beardtongue is monitored every three years as part of the high elevation plant community monitoring project in the bristlecone pine woodland. The frequency of Charleston beardtongue from 90 percent in 1998-1999 to 40 percent in 2002 at a low absolute cover (<1%) (Baggs 2006). Overall, cover and diversity declined possibly due to below average precipitation or annual variation. The high elevation monitoring plots do not track this species sufficiently to draw any inference concerning the status of the species, only the site.

There are currently 14 element occurrence records that include 21 sites and 6 polygons on 137.5 acres where the Charleston beardtongue has been documented (NNHP 2005).

Threats

General threats to this species include: off-trail recreational use such as hikers, equestrians, campers, and mountain bikers; wild horse grazing and trampling; habitat fragmentation; and the ski area development and maintenance (SWCA 2005a; Lund 2006b). An uncounted number of individuals were buried during reconstruction of the Las Vegas Ski and Snowboard Resort lift #1 replacement activities (Lund 2006b). In 1998 in Upper Lee Canyon, Trail Canyon, and along the North Loop Trail, Glenne identified the major threats to the species as hiking, horseback riding, and weed invasion (SWCA 2005a).

Based on mapping as of 2006 of the Charleston beardtongue's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-47. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-47 Estimated Overlap Between Charleston Beardtongue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Campgrounds	2	0	0
Fires 1954-1970	0	1	0.12
Non-System Trail	1	0	0
Picnic Areas	1	0	0
Private Land	1	0	0
Ski Area	1	0	0
Snow Play Areas	1	0	0
System Trail (high mileage)	0	4	5.21
Roads (paved)	1	0	0
Roads (unpaved)	1	1	0.54
Wildland Urban Interface	1	0	0

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Charleston beardtongue as part of the landscape analysis.

4.6.31 Jaeger Beardtongue (*Penstemon thompsoniae* spp. *jaegeri*)

Status Designations

The Jaeger beardtongue (*Penstemon thompsoniae* spp. *jaegeri*) is designated as a covered species under the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G4T2 S2 in Nevada (NatureServe 2007).

Range-wide Distribution

Jaeger beardtongue is a southern Nevada endemic with all of its range in Clark County, where it occurs from the Spring Mountains east to the Sheep Range (Morefield 2001). Range-wide, this species can be found at elevations between 5,575 to 11,060 feet (1,700 to 3,371 meters) (Morefield 2001). Throughout Nevada, NNHP (2005) documents 28 element occurrences.

Distribution in the Spring Mountains NRA

Jaeger beardtongue occurs in Kyle, Lovell, Carpenter, and Lee canyons, Trout Creek, Deer Creek, the North Loop Trail area, and Mount Potosi (Glenne and Johnson 2002). See Figure 4-53 for locations of known occurrences of this species, all of which occur between 5,568 and 10,951 feet (1,697 and 3,307 meters).

Habitat

Jaeger beardtongue inhabits gravelly limestone banks or hillsides on knolls or slopes, in drainages, and under conifers (Glenne and Johnson 2002; Morefield 2001). It is found from the pinyon-juniper to the subalpine conifer zones (Morefield 2001). Associated plants include pinyon pine, ponderosa pine, Utah juniper, and Clokey paintbrush (Glenne and Johnson 2002). Nachlinger and Reese (1996) sampled one plot in chaparral characterized by *Arctostaphylos pungens*, although it was absent from most areas with this vegetation. It was also found in *Juniperus scopularum* and *Cercocarpus ledifolius* woodlands – the former being an association of very limited distribution in the Spring Mountains NRA. An occurrence was noted at one validation point in the *Ceanothus greggii* Association of Nachlinger and Reese (1996). The cooperative USGS/FS/BLM TEUI/ESI project found it in the *Artemisia tridentata* Series of Nachlinger and Reese (1996).

Within the Spring Mountains NRA, Nachlinger and Reese (1996) sampled Jaeger beardtongue on 6 plots, representing the following Ecological Systems: Great Basin Pinyon-Juniper Woodland (1 plot), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (3 plots), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot), and Sonora-Mojave Semi-Desert Chaparral (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa* / *Cercocarpus ledifolius* Sparse Shrubland (1 plot*), Arctostaphylos pungens* Shrubland (1 plot), *Cercocarpus ledifolius* Woodland (1 plot), *Juniperus scopulorum* Wooded Shrubland (1 plot), *Juniperus scopulorum / Cercocarpus ledifolius* Woodland (1 plot), and *Pinus monophylla* - (*Juniperus osteosperma*) / *Artemisia tridentata* Sparse Understory Shrubland (1 plot).

Phenology

The Jaeger beardtongue is a matted semi-woody perennial herb that flowers from the end of May to August (Morefield 2001).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Specific data is not available regarding this species' known area of occupancy in the NRA prior to 1999 (SWCA 2005a). Based on NNHP data there are 9 element occurrence records that include 14 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

Though there have been no recent species-specific surveys for Jaeger beardtongue, this species is presumed to be stable, based on the increased documented number of occurrences for this species (SWCA 2005a).

There are currently 15 element occurrence records that include 14 sites and 21 polygons on 250.9 acres where the Jaeger beardtongue have been documented (NNHP 2005).

Threats

General threats to this species' include: habitat degradation and modification due to fire suppression and fuels management, and increased fire susceptibility due to introduction of non-native grasses; off-trail recreational use such as hikers, equestrians, campers, mountain bikers, and OHV users; and wild horse grazing and trampling (SWCA 2005a; Lund 2006b). This species occurs in small sub-populations making it more susceptible to local threats and stochastic events (SWCA 2005a).

Based on mapping as of 2006 of the Jaeger beardtongue's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-48. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-48 Estimated Overlap Between Jaeger Beardtongue and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	0	12	25.83
Designated Horses/Burros Area	2	3	2.47
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	2	1	17.19
Fires 1971-1988	1	7	53.85
Fires 1989-2005	0	4	16.29
Firewood Gathering	2	3	2.27
Motorized Trails (closed)	0	17	13.11
Motorized Trails (open)	0	4	9.81
Picnic Areas	1	0	0
Private Land	0	3	0.64
Roads (paved)	1	0	0
Roads (unpaved)	1	12	8.39
Wildland Urban Interface	3	4	25.20

Figure 4-53 Jaeger Beardtongue Species Distribution

Figure 4-53 BACK

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Jaeger beardtongue as part of the landscape analysis.

4.6.32 Clokey Mountain Sage (*Salvia dorrii* var. *clokeyi)*

Status Designations

The Clokey mountain sage or purple sage (*Salvia dorrii* var. *clokeyi=Salvia dorrii* ssp*. dorrii* var*. clokeyi)* (USDA,NRCS 2008) is a Forest Service sensitive species, a species of concern in the CA (USFS 1998) and a covered species in the MSHCP (RECON 2000). This species has a NatureServe conservation status rank of G5T3 S3 (NatureServe 2007).

Range-wide Distribution

Clokey mountain sage is endemic to Clark County, Nevada in both the Spring Mountains and Sheep Range (Glenne and Johnson 2002). There are 23 documented element occurrence across Clokey mountain sage's range (NNHP 2005). Range-wide, this species can be found at elevations between 6,000 to 10,000 feet (1,800 to 3,050 meters) (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Clokey mountain sage occurs in Macks, Lee, and Kyle canyons, the Deer Creek area; Bonanza Peak; Mud Springs; Harris Mountain; Harris Saddle, Mount Potosi Road (Glenne and Johnson 2002; Clark County 2006, USFS 2003). Morefield (2001) reported 19 occurrences at 1 km separation. See Figure 4-54 for locations of known occurrences of this species, all of which occur between 6,765 and 10,046 feet (2,062 and 3,062 meters).

Habitat

Clokey mountain sage occurs in bristlecone pine, mixed conifer, and pinyon-juniper communities (Clark County 2006). It is typically found on shallow gravelly washes in carbonate soils, along ridges, where bedrock outcrops occur, and in rocky slope drainages (Glenne and Johnson 2002; Clark County 2006). Other associated plants are limber pine, white fir, Clokey paintbrush, and Charleston ground daisy (Glenne and Johnson 2002). Reese (pers. comm.) has also observed it as characteristic on quartzite talus slopes in the subalpine, where associated with *Cercocarpus intricatus*.

Nachlinger and Reese (1996) sampled Clokey mountain sage on 10 classification plots and 4 validation points, representing the following Ecological Systems: Great Basin Pinyon-Juniper Woodland (2 plots), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (5 plots), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (3 plots and 4 validation points keyed to their *Pinus flexilis - Pinus longaeva* Association). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Dwarf Shrubland (1 plot), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Shrubland (1 plot), *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Woodland (1 plot), *Pinus flexilis - Pinus longaeva* Sparse Woodland (1 plot), *Pinus flexilis - Pinus longaeva* Woodland (1 plot), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus monophylla - Cercocarpos ledifolius* var. *intermontanus* Shrubland (1 plot), *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Wooded Shrubland (1 plot), *Pinus ponderosa* Sparse Shrubland (1 plot), *Pinus ponderosa* Sparse Woodland (1 plot).

Phenology

Clokey mountain sage is a low, spreading, matted perennial shrub that flowers from May to July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first recorded in 1979 in Lee Canyon (SWCA 2005a). In 1994, the population was estimated at 12,586 individuals over 260 acres of habitat at 23 sites (USFS 2003). In 1998, Glenne found over 1,200 of this species along the North Loop Trail, Macks Canyon, McFarland Spring, and near Deer Creek Springs (SWCA 2005a). Based on NNHP data (2005), there are 10 element occurrence records that include 26 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed to be stable (Clark County 2006). Many new populations have been discovered since 1998. In 1999, this species was found along Mud Spring Trail, Mark's Piece of Cake Trail, and Lower Deer Creek Trail (SWCA 2005a). In 2002, it 75 individual plants were documented along the Mt. Potosi Road; and in 2003, it was noted this species occurs along the Bristlecone Trail (SWCA 2005a). In 2004, 8 individual plants were found while surveying the area around the Desert Viewpoint.

There are currently 15 element occurrence records that include 5 sites and 41 polygons on 437.7 acres where the Clokey mountain sage have been documented (NNHP 2005).

Threats

Nachlinger (1994) identified the biggest threat to this species as development and maintenance of recreation facilities, roads, and trails in Lee Canyon, Macks Canyon, and along Deer Creek Highway. Glenne (1998 in SWCA 2005a) noted hiking as the biggest threat near the lower portions of the North Loop Trail, and invasion of weeds as a threat in Macks Canyon and near McFarland Spring. Beyer (2002) noted the potential loss of about 15 individual plants near the Potosi Mountain Area, because of an electrical line installation and road maintenance project (SWCA 2005a).

Threats to Clokey mountain sage are from the destruction and modification of its habitat from concentrated and dispersed recreational activities including hiking, equestrian use, OHV use, and dispersed camping; and road construction and maintenance. Fuels treatments (cutting ladder fuel and clearing of the understory) have modified habitat for this species as well. Wild horse trampling in the northeast quadrant of the Spring Mountains is also a threat. Development of recreation facilities and mountain homes in recent years has resulted in habitat fragmentation and degradation (USFS 2003).

Figure 4-54 Clokey Mountain Sage Species Distribution

Figure 4-54 BACK

Based on mapping as of 2006 of Clokey mountain sage's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-49. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-49 Estimated Overlap Between Clokey Mountain Sage and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Concentrated Use Areas	0	9	27.28
Designated Horses/Burros Area	0	11	92.93
Firewood Gathering	0	3	57.82
Non-System Trail	1	16	13.58
Motorized Trails (closed)	0	2	0.24
Snow Play Areas	0	1	0.30
System Trail (high mileage)	0	6	13.09
Roads (paved)	0	1	0.05
Roads (unpaved)	1	4	19.49
Wildland Urban Interface	0	2	0.26

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey mountain sage as part of the landscape analysis.

4.6.33 Clokey Silene (*Silene clokeyi*)

Status Designations

The Clokey silene or Clokey's catchfly (*Silene clokeyi*) is a Forest Service sensitive species, a species of concern in the CA (USFS 1998) and a covered species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Clokey silene is endemic to the Spring Mountains Range (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Clokey silene occurs along the Charleston Peak ridge line and east-facing cliff bands, as well as on Mummy Mountain and Griffith Peak (Glenne and Johnson 2002; USFS 2003). See Figure 4-55 for locations of known occurrences of this species, all of which occur between 10,659 and 11,378 feet (3,249 and 3,468 meters).

Habitat

Clokey silene occurs in dry to moist carbonate scree, talus, and loose rocky soils on ridges, flats, and steep slopes on gravel, limestone, or sandstone (USFS 2003; SWCA 2005a). It is often found near persistent snowbanks in open areas, on fell-fields, and on steep eastern drop-offs in the lower alpine and upper subalpine conifer zones (Lund 2006a; Morefield 2001; USFS 2003). It is associated with bristlecone pine, Jaeger draba, Charleston pussytoes, Clokey fleabane, Hitchcock bladderpod, mountain gooseberry, Charleston tansy, Charleston ivesia, and Clokey thistle (Glenne and Johnson 2002; NatureServe 2007; USFS 2003). Nachlinger and Reese (1996) did not observe this species in subalpine meadows – a habitat which has erroneously been listed in some secondary source documentation.

Nachlinger and Reese (1996) sampled Clokey silene on 5 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (2 plots), Rocky Mountain Alpine Bedrock and Scree (3 plots). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Ivesia cryptocaulis* Alpine Sparse Vegetation (2 plots), *Pinus longaeva* Sparse Shrubland (1 plot), *Pinus longaeva* Sparse Woodland (1 plot), (*Pinus longaeva) / Ribes montigenum* Sparse Dwarf Shrubland (1 plot).

Phenology

Clokey silene is a perennial herb that flowers in July (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the large yearly fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Clokey silene was first recorded by Clokey near Charleston Peak in 1937 (SWCA 2005a). Morefield (2001) reported 8 sites mapped at 0.16 km (0.1 mi) separation with a total estimated 9,107+ individuals occupying an estimated 7.9 acres. Based on NNHP data (2005), there are 3 element occurrence records that include 8 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable but possibly declining. There has been no documentation of recent declines, loss, or extensive degradation of habitat, or loss of populations (USFS 2003). There have been several surveys for this species over the course of the last ten years, but little has changed about its known distribution in the Spring Mountains NRA (SWCA 2005a). Clokey silene is monitored every three years as part of the high elevation plant community monitoring project; however, in 2000, Nachlinger was unable to find this species in any of the high elevation monitoring plots (SWCA 2005a).

There are currently 3 element occurrence records that include 2 sites and 6 polygons on 3.9 acres where the Clokey silene have been documented (NNHP 2005).

Figure 4-55 Clokey Silene Species Distribution

Figure 4-55 BACK

Threats

Threats include habitat modification and indirect effects due to dispersed recreational activities including horseback riding, hiking, and camping in the alpine zone (USFS 2003). Other threats include competition from exotic species (NatureServe 2007). This species is susceptible to stochastic natural or man-made events because it is an endemic species with small and localized populations distributed in limited habitat and relatively low densities (USFS 2003).

Based on mapping as of 2006 of the Clokey silene's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-50. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-50 Estimated Overlap Between Clokey Silene and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Private Land	0	1	0.67

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Clokey silene as part of the landscape analysis.

4.6.34 Charleston Tansy (*Sphaeromeria compacta*)

Status Designations

The Charleston tansy or compact chickensage (*Sphaeromeria compacta*) is a Forest Service sensitive species and designated as a species of concern in the CA (USFS 1998). This plant is a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G2 S2 (NatureServe 2007).

Range-wide Distribution

Charleston tansy is endemic to the Spring Mountains Range (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Charleston tansy occurs on the Charleston Peak ridge line and trail, North Loop Trail, South Loop Trail, upper Lee Canyon, and Mummy Mountain (USFS 2003; Glenne and Johnson 2002). See Figure 4-56 for locations of known occurrences of this species, all of which occur between 9,219 and 11,867 feet (2,810 and 3,617 meters).

Habitat

Charleston tansy occurs in the lower alpine and upper subalpine conifer zones on talus and scree slopes, gravelly hillsides, rocky ridge lines and slopes, crevices in limestone, and rock outcrops (NatureServe 2007; USFS 2003). Associated species include bristlecone pine, hidden

ivesia, Jaeger draba, Clokey fleabane, Clokey silene, Charleston ivesia, Clokey thistle, and Hitchcock bladderpod (Glenne and Johnson 2002; USFS 2003, NatureServe 2007).

Within the Spring Mountains NRA, but not available for GIS analysis, Nachlinger and Reese (1996) sampled Charleston tansy on 13 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (6 plots), Rocky Mountain Alpine Bedrock and Scree (7 plots). Reese (2007) reclassified those plots into the following US NVC compliant associations: Ivesia cryptocaulis Alpine Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Sparse Shrubland (1 plot*), Ivesia cryptocaulis* Alpine Sparse Vegetation (3 plots), *Ivesia cryptocaulis* Alpine Wooded Herbaceous Vegetation (2 plots), *Pinus longaeva* Sparse Shrubland (3 plots), *Pinus longaeva* Woody Sparse Vegetation (1 plot), (*Pinus longaeva*) / *Ribes montigenum* Sparse Dwarf Shrubland (1 plot), *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot),

Phenology

Charleston tansy is a densely tufted, cushion forming perennial herb that flowers from July to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first collected by Heller at the head of Lee Canyon in 1913 (SWCA 2005a). Up to 1999, NNHP reported 12 occurrences mapped at 0.16 km (0.1 mi) separation with 28,000+ estimated total individuals occupying a total estimated area of 116 acres (Morefield 2001). Based on NNHP data (2005), there are 2 element occurrence records documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable, and no documentation is available of recent declines, loss or extensive degradation of habitat, or loss of populations (USFS 2003). Surveys have shown that the population status of this species has changed very little over the last decade (USFS 2003). Charleston tansy is monitored every three years as part of the high elevation plant community monitoring project (Nachlinger 2000a)**.** In 1998-1999 to 2001, Charleston tansy was found from a frequency of 60 to 50 percent respectively, in the alpine transects and less than 1 percent cover in the alpine macroplot (Baggs 2006).

There are currently 2 element occurrence records that include 3 sites and 45 polygons on 118.4 acres where the Charleston tansy have been documented (NNHP 2005).

Figure 4-56 Charleston Tansy Species Distribution

Figure 4-56 BACK

Threats

Threats to this species include habitat modification and indirect effects due to dispersed recreational activities including horseback riding, hiking, and camping in the alpine zone (USFS 2003). Other reported threats include climatic change, frost heaving, and shifting of talus slopes (SWCA 2005a). It is also susceptible to stochastic natural or man-made events because it has small and localized populations distributed in limited habitat in relatively low densities (USFS 2003).

Based on mapping as of 2006 of the Charleston tansy's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-51. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-51 Estimated Overlap Between Charleston Tansy and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Concentrated Use Areas	0	1	0.35
Invasive Species	0	1	0.00
Private Land	0	3	19.77
System Trail (high mileage)	0	20	5.34

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston tansy as part of the landscape analysis.

4.6.35 Charleston Kittentails (*Synthyris ranunculina*)

Status Designations

The Charleston kittentails or Charleston Mountain kittentails (*Synthyris ranunculina*) is a Forest Service sensitive species, and designated as a species of concern in the CA (USFS 1998). This plant is a covered species in the MSHCP (RECON 2000) and has a NatureServe conservation status rank of G2G3 S2S3 (NatureServe 2007).

Range-wide Distribution

Charleston kittentails is endemic to the Spring Mountain Range (Glenne and Johnson 2002).

Distribution in the Spring Mountains NRA

Charleston kittentails occurs primarily in upper Kyle and Lee Canyons, in the vicinity of Mummy Mountain, and on the ridge line in the vicinity of Griffith Peak (Clark County 2006). It is also known from the Charleston Peak trail, Echo Spring, Three Springs, other high east side springs, and seep areas in Deer, Mazie, and Little Falls canyons (Glenne and Johnson 2002; USFS 2003). See Figure 4-57 for locations of known occurrences of this species, all of which occur between 8,730 and 11,791 feet (2,966 and 3,594 meters).

Habitat

Charleston kittentails occurs in dark, organic, and/or gravelly, permanently moist soils near snow banks, at seeps or springs, in meadows, avalanche chutes, fell fields, along creeks, on moss-covered wet rocks, or in moist cliff crevices, mostly over carbonate rocks on northerly or otherwise sheltered exposures in the subalpine conifer to lower alpine zone (Morefield 2001, USFS 2003). Associated species include bristlecone pine, limber pine, Charleston draba, Jaeger draba, Clokey silene, Charleston ivesia, Clokey thistle, bristlecone pine, mountain currant, pink alumroot, red alumroot, valerian, and fragile fern (Glenne and Johnson 2002). Nachlinger and Reese (1996) found it from temporarily flooded riparian areas characterized by *Cirsium clokeyi* and *Juniperus communis* var. *depressa*, rather than in "permanently damp" areas. They also found it in sparse dwarf shrublands and sparse shrublands characterized by *Ribes montigenum*, either with or without *Pinus longaeva* in the overstory.

Nachlinger and Reese (1996) sampled Charleston kittentails on 6 plots, representing the following Ecological Systems: Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (3 plots), Rocky Mountain Alpine Bedrock and Scree (1 plot), Rocky Mountain Subalpine-Montane Riparian Shrubland (2 plots). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Cirsium clokeyi / Juniperus communis* var. *depressa* Shrubland (1 plot), *Cirsium clokeyi / Juniperus communis* var. *depressa* Wooded Herbaceous Vegetation (1 plot), *Ivesia cryptocaulis* Alpine Sparse Vegetation (1 plot), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus longaeva / Ribes montigenum* Sparse Shrubland (1 plot), (*Pinus longaeva) / Ribes montigenum* Sparse Dwarf Shrubland (1 plot).

Phenology

Charleston kittentails is a rhizomed perennial herb that flowers from late June to August (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the climatic induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first collected by Heller at the head of Lee Canyon in 1913 (SWCA 2005a). Morefield (2001) reported 36 occurrences mapped at 0.16 km (0.1 mi) separation with 694+ total estimated individuals covering 133 acres. These number include surveys up to 1999. Based on NNHP data (2005), there are 2 element occurrence records that include 44 sites documented prior to 1998.

Figure 4-57 Charleston Kittentails Species Distribution

Figure 4-57 BACK

Current Conditions in the Spring Mountains NRA

The status of this species is presumed stable. There has been no documentation of recent declines, loss or extensive degradation of habitat, or loss of populations (USFS 2003). Surveys have shown that the population status of this species has changed very little over the last decade (USFS 2003). Charleston kittentails is monitored every three years as part of the high elevation plant community monitoring project, and is found at a frequency of 20 percent of in the Lee Canyon bristlecone woodland plot with less than 1 percent absolute cover (Nachlinger 2000b; SWCA 2005a) and was not observed in 2002 (Beyer 2003b). Overall cover and density declined possible due to below average precipitation or yearly variation. The high elevation monitoring plots do not track this species sufficiently to draw any inferences concerning the status of the population, only the site.

There are currently 2 element occurrence records that include 26 sites and 18 polygons on 61.3 acres where the Charleston kittentails have been documented (NNHP 2005).

Threats

Threats to Charleston kittentails include habitat modification and indirect effects due to dispersed recreational activities including horseback riding, hiking, and camping (USFS 2003). Glenne noted in her 1998 survey that hikers had trampled plants and caused erosion by hiking around snowbanks along the North Loop Trail just below Charleston Peak (SWCA 2005a). In the subalpine areas where this plant occurs, exotic plants are also a threat (NatureServe 2007). Physical alteration of springs and outflows resulting in alterations to the natural flow, temperature and sediment regimes, also pose threats to this species (USFS 2003). Specifically, spring diversion at Three Springs in upper Lee Canyon has reduced the outflow of water and therefore reduced the amount of quality habitat available to this species (SWCA 2005a). This species is susceptible to stochastic natural or man-made events because it is an endemic species with small and localized populations distributed in limited habitat and relatively low densities (USFS 2003).

Based on mapping as of 2006 of the Charleston kittentails' occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-52. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-52 Estimated Overlap Between Charleston Kittentails and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Fires 1971-1988	2	0	0
Non-System Trail	1	0	0
Private Land	1	0	0
Snow Play Areas	1	0	0
System Trail (high mileage)	0	3	1.09

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston kittentails as part of the landscape analysis.

4.6.36 Charleston Grounddaisy (*Townsendia jonesii* var. *tumulosa*)

Status Designations

The Charleston grounddaisy or Jones' Townsend daisy (*Townsendia jonesii* var. *tumulosa*) is a Forest Service sensitive species (USFS 2003), a species of greatest management concern in the CA (USFS 1998), and a covered species under the MSHCP (RECON 2000). It is a Nevada BLM sensitive species with a NatureServe conservation status rank of G4T3 S3 (NatureServe 2007).

Range-wide Distribution

Charleston grounddaisy is endemic to southern Nevada and occurs in both Clark and Nye counties (Morefield 2001). This species is abundant in the Sheep Mountains and Spring Mountains in Clark County (Glenne and Johnson 2002) while it is only known from one location in Nye County, at Sunnyside, about 150 miles north-northeast of Charleston Peak (USFS 2003). Throughout Nevada the NNHP (2005) documents 28 element occurrences. Range-wide, this species is found at an elevation range of 5,200 to 11,060 feet (1,585 to 3,371 meters).

Distribution in the Spring Mountains NRA

Charleston grounddaisy is known from the north-central portion of the Spring Mountains from approximately 6,500 to 11,060 feet (1,981 to 3,371 meters) elevation. It has been located at Bonanza Peak, Charleston Peak, Deer Creek, Mud Spring, North Loop Trail area, and from Lee, Macks, Scout, and Clark canyons (Glenne and Johnson 2002). It is also known from the vicinity of Bridge Mountain, Mount Wilson, and Potosi Mountain (USFS 2003). Several small, isolated sites may be interacting as one large metapopulation, such as in the Macks Canyon area and upper Lee Canyon (USFS 2003). See Figure 4-58 for locations of known occurrences of this species, all of which occur between 6,503 and 10,951 feet (1,982 and 3,338 meters) elevation.

Habitat

Charleston grounddaisy inhabits ridges, slopes, saddles, and washes in open places away from shrubs or exposed knolls in forest clearings (Morefield 2001; Glenne and Johnson 2002). It is generally found on shallow, gravelly, carbonate soils including gravel, limestone, sandstone, and silt loam (SWCA 2005a). This species is mostly found in the montane conifer zone, extending to the pinyon-juniper, mountain mahogany, and lower subalpine conifer zones, and in the upper shadscale/mixed shrub and lower sagebrush zones (Morefield 2001). Associated plants include pinyon pine, Ponderosa pine, bristlecone pine, white fir, Charleston beardtongue, Clokey mountain sage, Clokey paintbrush, and white squaw currant (*Ribes cereum*) (Glenne and Johnson 2002; USFS 2003). This species occurs as widely scattered individuals growing in full or partial sun away from shrubs (USFS 2003).

Nachlinger and Reese (1996) sampled Charleston grounddaisy on 8 plots and 1 validation point, representing the following Ecological Systems: Great Basin Pinyon-Juniper Woodland (1 plot), Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (3 plots), and Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (4 plots and 1 validation point which keyed to their *Pinus flexilis - Pinus longaeva* Association).

Figure 4-58 Charleston Grounddaisy Species Distribution

Figure 4-58 BACK

Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Sparse Understory Woodland (1 plot), *Pinus flexilis - Pinus longaeva* Sparse Woodland (2 plots), *Pinus longaeva* Sparse Woodland (1 plot), *Pinus longaeva* Sparse Understory Woodland (1 plot), *Pinus monophylla - (Juniperus osteosperma) / Artemisia tridentata* Wooded Shrubland (1 plot), *Pinus ponderosa* Sparse Shrubland (1 plot), and *Pinus ponderosa* Sparse Woodland (1 plot).

Phenology

The Charleston grounddaisy is a perennial herb that flowers from March to July.

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to the large yearly fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first collected by Reveal near Deer Creek in 1968 (SWCA 2005a). In 1998, Glenne found many sites where this species was present, including upper Trail Canyon, Deer Creek Springs, along the North Loop Trail, and in upper Lee Canyon (SWCA 2005a). Based on NNHP data there are 15 element occurrence records that include 39 sites documented prior to 1998.

Prior to European settlement this species was probably found in avalanche chutes, or in areas following a fire. Conditions in these areas have changed over time, with fire suppression, water diversion, ski area construction, and other human created disturbances including timber harvest and development of roads, residences, campsites, and trails.

Current Conditions in the Spring Mountains NRA

The current status of this species is unknown, but presumed stable (SWCA 2005a). Several surveys for this species have occurred over the last decade, resulting in new locations and an increased area of occupancy, population size, and number of occurrences (SWCA 2005a). In 1999, this plant was found along the Pinyon Pine Trail and the Mud Spring Trail (SWCA 2005a). In 2003, close to 600 individual plants were located at three sites along the lower Bristlecone Trail (SWCA 2005a). This species occurs in widely scattered sites with widely scattered individual plants that make surveys and population assessments difficult; additionally, they are small plants that bloom and disappear quickly (USFS 2003). The Spring Mountains NRA contains most of the known populations of this species where there have generally been minor impacts to this species (USFS 2003).

There are currently 18 element occurrence records that include 13 sites and 41 polygons on 1,048.9 acres where Charleston grounddaisy have been documented (NNHP 2005).

Threats

Increased recreational use of the Spring Mountains is the main threat to this species, especially habitat disturbance and destruction (Morefield 2001; SWCA 2005a). Based on prior surveys, the threats include trampling by humans and horses, especially near the Lee Ski area, the head of Bristlecone Trail, in Trail Canyon, and along the North Loop Trail (SWCA 2005a). Invasive weeds are also a problem in Trail Canyon, in middle Lee Canyon, and along the North Loop

Trail (SWCA 2005a). Dispersed and concentrated recreation; road, trail, and recreational construction and maintenance; and mountain home development are threats in and around Lee Canyon, and off the Deer Creek Highway and Macks Canyon Road (USFS 2003). Cutting and clearing of woodlands along Macks Canyon Road directly modifies the habitat for this species (USFS 2003). Future projects may also threaten this species, such as the construction of a new Sawmill Trailhead, which would increase dispersed recreation in the area, indirectly impacting this species; also, the Lee Canyon water system replacement and well drilling project could have a negative impact through trampling and other adverse effects by construction crews (SWCA 2005a).

Based on mapping as of 2006 of Charleston grounddaisy's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-53. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-53 Estimated Overlap Between Charleston Grounddaisy and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping polygons	Number of Overlapping polygon acreage
Concentrated Use Areas	0	4	5.25
Designated Horses/Burros Area	0	13	552.08
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	2	0	0
Fires 1954-1970	0	1	0.32
Firewood Gathering	0	1	5.85
Invasive Species	0	1	0.26
Non-System Trail	0	16	50.31
Motorized Trails (closed)	0	2	4.98
Motorized Trails (open)	0	2	14.47
Private Land	0	1	0.08
Snow Play Areas	0	4	3.80
System Trail (high mileage)	1	5	5.18
Roads (paved)	0	1	2.30
Roads (unpaved)	0	4	1.51
Wildland Urban Interface	0	4	13.05

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and a quantitative habitat-based evaluation of the Charleston grounddaisy as part of the landscape analysis.

4.6.37 Charleston Violet (*Viola charlestonensis*)

Status Designations

The Charleston violet or Charleston Mountain violet (*Viola purpurea* var. *charlestonensis*= *Viola charlestonensis*) is designated as a covered species in the MSHCP (RECON 2000) with a NatureServe conservation status rank of G3Q S2S3 (NaturfeServe 2007).

Range-wide Distribution

Charleston violet occurs within the Mojave Desert and Colorado Plateau; it is presumed that the majority of its habitat occurs in Clark County, Nevada, including the Spring Mountains, Virgin Mountains and the Sheep Range (Clark County 2006). It is known from Hidden Lake in Red Rock Canyon NCA (Glenne and Johnson 2002). Its range also includes the southwestern corner of Utah (Washington County) and one occurrence in northern Arizona (SWCA 2005a; NatureServe 2007). Range-wide, this species can be found at elevations between 6,500 to 9,800 feet (1,981 to 2,987 meters) above sea level (SWCA 2005a). In Nevada, as of 1989, NNHP reported 11 occurrences mapped at 1 km separation with 211+ total estimated individuals covering a total estimated 10.1 acres (Morefield 2001).

Distribution in the Spring Mountains NRA

Charleston violet is locally common within the Spring Mountains Range, known from Kyle and Lee canyons, Deer Creek, Mud Springs, McFarland Canyon, and lower Trail Canyon (Glenne and Johnson 2002; SWCA 2005a). See Figure 4-59 for locations of known occurrences of this species, all of which occur between 5,804 and 10,029 feet (1,769 and 3,057 meters).

Habitat

Charleston violet occurs in mixed conifer forests and pinyon-juniper communities on limestone hills, slopes, and dry washes in gravel or gravelly fine sandy loam (Clark County 2006; Glenne and Johnson 2002; SWCA 2005a). Associated plants are pinyon pine, ponderosa pine, aspen, Utah juniper, firecracker penstemon, and Charleston pinewood lousewort (Glenne and Johnson 2002). Nachlinger and Reese (1996) also found it in a subalpine fen, aspen and fir woodland and bristlecone pine woodland. With the exception of the fen, it typically occurs under an overstory canopy of 60 percent or more. This species serves as the sole larval host plant for Carole's silverspot butterfly (SWCA 2005a).

Nachlinger and Reese (1996) sampled Charleston violet on 8 classification plots and two validation points, representing the following Ecological Systems: Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (4 plots), Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland (1 plot), Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (2 plots, plus 1 point which keyed to their *Pinus flexilis-Pinus longaeva* Association and one point which keyed to their *Pinus longaeva* Association), and Rocky Mountain Subalpine Montane Fen (1 plot). Reese (2007) reclassified those plots into the following US NVC compliant associations: *Abies concolor - Pinus ponderosa / Cercocarpus ledifolius* Woodland (1 plot), *Cercocarpus ledifolius* Woodland (1 plot), *Dodecatheon redolens - Aquilegia formosa* Herbaceous Vegetation (1 plot), *Juniperus scopulorum / Cercocarpus ledifolius* Woodland (1 plot), *Pinus flexilis - Pinus longaeva* Woodland (1 plot), *Pinus longaeva - P. flexilis / Juniperus communis* var. *depressa* Woodland (1 plot), *Pinus ponderosa* Sparse Woodland (1 plot), *Populus tremuloides - Abies concolor* Woodland (1 plot).

Phenology

Charleston violet is a perennial herb that flowers from May to June (Glenne and Johnson 2002).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites, acres of occupied habitat, and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to climatically induced population fluctuations.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Charleston violet was first recorded in 1937 (SWCA 2005a). In 1998, Glenne found more than ten individuals along the North Loop Trail (SWCA 2005a). Based on NNHP data there are 11 element occurrence records that include 13 sites documented prior to 1998.

Current Conditions in the Spring Mountains NRA

The overall status of this species is presumed stable. There have been many recent surveys for this species which have resulted in a greater understanding of population status, and several new element occurrence records (SWCA 2005a). In 1999, this species was found along Mud Spring Trail and Lower Deer Creek Trail (SWCA 2005a). In 2003 surveys, 12 individuals were found in lower Trail Canyon and this species was also noted in Lee Canyon (SWCA 2005a). In a 2004 survey around the Desert Viewpoint, 24 individual plants were located by Anderson (SWCA 2005a).

There are currently 22 element occurrence records that include 17 sites and 25 polygons on 537.8 acres where the Charleston violet have been documented (NNHP 2005).

Threats

General threats to the species include habitat degradation and modification due to fire suppression and fuels management, and increased fire susceptibility due to introduction of non-native grasses; off-trail recreational use such as hiking, equestrian use, camping, mountain biking, and OHV use; and wild horse grazing and trampling (SWCA 2005a). It was estimated that less than 10 plants were buried during the installation of a water line down Foxtail Ridge during the Lee Canyon Water System project in 2002 (Lund 2006b). This species would also directly be impacted by the proposed Kyle Canyon Reservoir project, slated for construction in Trail Canyon (SWCA 2005a).

Figure 4-59 Charleston Violet Species Distribution

Figure 4-59 BACK

Based on mapping as of 2006 of the Charleston violet's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-54. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-54 Estimated Overlap Between Charleston Violet and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Campgrounds	0	2	2.67
Concentrated Use Areas	0	8	42.16
Designated Horses/Burros Area	1	3	37.94
Designated Horses/Burros Area between 1/4 mile and 1 mile of Springs and Perennial Streams	0	1	7.44
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	0	1	0.55
Fires 1971-1988	0	4	15.53
Fires 1989-2005	0	2	6.67
Firewood Gathering	1	3	6.79
Invasive Species	0	3	0.59
Non-System Trail	0	7	19.78
Motorized Trails (closed)	0	8	8.64
Motorized Trails (open)	0	3	2.58
Private Land	0	2	10.30
Snow Play Areas	1	1	3.22
System Trail (high mileage)	1	3	2.66
System Trail (low mileage)	0	1	0.14
Trailheads in Developed Canyons	0	1	0.26
Roads (paved)	0	4	2.51
Roads (unpaved)	0	6	8.98
Wildland Urban Interface	4	7	54.21

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston violet as part of the landscape analysis.

4.7 FERNS AND MOSSES

4.7.1 UpsweptMoonwort (*Botrychium ascendens*)

Status Designations

The upswept moonwort or triangellobe moonwort (*Botrychium ascendens*) is a Forest Service sensitive species (USFS 2003), a high priority evaluation species in the MSHCP (RECON 2000) and a species of greatest management concern in the CA (USFS 1998), with a NatureServe conservation status rank of G2G3 S1 (NatureServe 2007).

Range-wide Distribution

Upswept moonwort is known from western Canada and Alaska south to Oregon, Wyoming, Montana, California, and Nevada (Morefield 2001). In Nevada, it is only known from the Spring Mountains in Clark County (Morefield 2001). This species is widely scattered and rare in North America (NatureServe 2007).

Distribution in the Spring Mountains NRA

Upswept moonwort is known from south Deer Creek Spring, Three Springs, Mummy Spring, Mazie Spring, Echo Spring, Peak Spring, and Rainbow Falls (Farrar 2002, 2004; NNHP 2005). Rainbow Falls is a historical location and the reference may be to Mary Jane Falls Spring. See Figure 4-60 for locations of known occurrences of this species, all of which occur between 8,143 and 11,696 feet (2,482 and 3,565 meters).

Habitat

Upswept moonwort occurs in the moist ground of springhead areas in deep shade on north-facing slopes with scented shootingstar (*Dodecatheon redolens*), starry false lily of the valley (*Smilacina stellata*), western columbine (*Aquilegia formosa*), and singleleaf pinyon pine, ponderosa pine, limber pine, and bristlecone pine (Morefield 2001). Upswept moonwort is a riparian species that is wetland-dependent in the Spring Mountains (Morefield 2001). It is generally found on limestone soils (Farrar 2006).

Phenology

The upswept moonwort is a small perennial fern that is fertile from late spring to summer (Morefield 2001).

Measures

Measures to be used to determine the status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

In 1998, Glenne found 35 individuals at the south Deer Creek Spring; however, specific data are not available regarding this species' known area of occupancy in the NRA prior to 1999 (NNHP 2005). Based on NNHP data there are 3 element occurrence records that include 3 sites documented prior to 1998.

Figure 4-60 Upswept Moonwort Species Distribution

Figure 4-60 BACK

Current Conditions in the Spring Mountains NRA

Farrar's work in 2002 has greatly increased knowledge of this species in the NRA, even though it is only known from a few locations (Farrar 2002). Farrar confirmed this species in 2002 at the south Deer Creek, Three, Mummy, Mazie, and Echo springs (Farrar 2002, 2004). Other documented ocrrences are Peak Spring and Rainbow Falls (NNHP 2005).

There are currently 7 element occurrence records that include 7 sites where upswept moonwort have been documented (NNHP 2005, Farrar 2002).

Threats

Potential threats to upswept moonwort may include the lack of understand on the population dynamics for the species in the Spring Mountains NRA; drought and the lack of adequate water for both the moonwort and the health of the mycorrhizae fungi with which moonworts have an obligate relationship; exotic weed invasion; trampling and soil compaction by recreational users or large ungulates such as elk or horses; fire; possibly grazing (although removal of leaf tissue may have little effect); burial by surface deposition; and alteration of springs and spring outflows (Lund 2006a). Current horse populations in the Spring Mountains may be influencing moonwort habitat around springs by compacting surrounding soils and trampling vegetation to access the spring, and distributing exotic plant species from one location to another (USFS 2003). Trampling, dispersed camping at spring sites, and invasion of weedy species were identified by Glenne in 1998 as threats to this species in upper Deer Creek near Mummy Spring (USFS 2003). The construction of a new Sawmill Trailhead would indirectly impact this species by increasing dispersed recreation in the area (SWCA 2005a). Other general threats include small animal herbivory, flooding, and changes in hydrology of its streamside habitat (NatureServe 2007).

Based on mapping as of 2006 of the upswept moonwort's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-55. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-55 Estimated Overlap Between Upswept Moonwort and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Sites	Number of Polygons	Polygon Acreage
Non-System Trail	1	NA*	NA
Private Land	1	NA	NA
Wildland Urban Interface	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston violet as part of the landscape analysis.

4.7.2 Dainty Moonwort (*Botrychium crenulatum*)

Status Designations

The dainty moonwort or scalloped (*Botrychium crenulatum*) is a Forest Service Sensitive species, and designated as a species of greatest management concern in the CA (USFS 1998). This plant is an evaluation species in the MSHCP (RECON 2000), with a NatureServe conservation status rank of G3 S1 (NatureServe 2007).

Range-wide Distribution

Dainty moonwort is found in western North America in Washington, Idaho, Oregon, Wyoming, Montana, California, Utah, Arizona, and Nevada (Glenne and Johnson 2002; Morefield 2001). In Nevada, it has been documented in the Jarbridge and Ruby mountains in Elko County (Farrar 2004), the White Mountains in Esmeralda County (NatureServe 2007), and the Spring Mountains in Clark County (Glenne and Johnson 2002). This species possibly occurs in other counties as well, most likely in isolated pockets in many of the higher and wetter mountains of Nevada (Morefield 2001). There are 13 known sites in Nevada (NNHP 2005).

Distribution in the Spring Mountains NRA

Dainty moonwort occurs along the north branch of Deer Creek Springs, Three Springs, Macks Canyon, Mazie Spring, Mummy Springs, Peak Spring, Rainbow Spring, South Loop Trail, and Wood Spring (Johnson and Madril 1999; Farrar 2002, 2004). Rainbow Falls is a historical location and the reference may be to Mary Jane Falls Spring. See Figure 4-61 for locations of known occurrences of this species, all of which occur between 8,143 and 11,155 feet (2,482 and 3,400 meters).

Habitat

Dainty moonwort is associated with seeps and springs at higher Spring Mountains NRA elevations (USFS 2003). It grows in saturated soils of seeps and along the stabilized margins of small streams, often among dense herbaceous vegetation, and is usually found in partly shaded to heavily shaded sites at mid to high elevations (Farrar 2006). Associated plants include shooting star, red columbine, bristlecone pine, and white fir (Glenne and Johnson 2002), as well as *Carex aurea* (Farrar 2006).

Phenology

Dainty moonwort is a small, perennial fern that flowers from July to August (Morefield 2001).

Measures

Measures to be used to determine the final status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance. Number of individuals is not an appropriate measure due to difficulties of consistent detection among dense vegetation growth and annual variation in numbers of individuals.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was first reported in the Spring Mountains NRA by Clokey (NNHP 2005). Based on NNHP data there are 5 element occurrence records that include 5 sites documented prior to 1998.

Figure 4-61 Dainty Moonwort Species Distribution

Figure 4-61 BACK

Current Conditions in the Spring Mountains NRA

Since 1998, the number of known occurrences has increased in the NRA to eight spring sites (Farrar 2002). However, the status of this species is uncertain and more complete habitat surveys may increase the number of known sites, individuals, and acres occupied. In 2000, Glenne found about ten individual plants along the North Loop Trail, in an area not affiliated with a spring or riparian area, while Nachlinger found this species at Mazie Spring (SWCA 2005a). Farrar found this species at Three Springs and north Deer Creek Spring in 2002, and at Macks Canyon in 2004 (Farrar 2004*).* Botrychium species including dainty moonwort are monitored every three years as part of the high elevation plant community monitoring project at Maize and Three Springs (Nachlinger 2006). Dainty moonwort and other moonworts appear to be persisting at both sites (Baggs 2006). The discovery of the dainty moonwort in an area not affiliated with a riparian area increases the possibility that there is additional suitable habitat for this species (SWCA 2005a).

There are currently 9 element occurrence records that include 9 sites where the dainty moonwort has been documented (NNHP 2005).

Threats

Main threats to dainty moonwort include impacts to individuals and their spring habitats from trampling by recreational users or large ungulates such as elk or horses, soil compaction, fire, possibly grazing (although removal of leaf tissue may have little effect), burial by surface deposition, timber harvest, and alteration of springs and spring outflows (USFS 2003). More generally, lack of information available on the species (which makes it difficult to know what is a threat to their survival); drought and the lack of adequate water for both the moonwort and the health of the mycorrhizae fungi with which moonworts have an obligate relationship; and exotic weed invasion (USFS 2003).

Based on mapping as of 2006 of the dainty moonwort's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-56. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-56 Estimated Overlap Between Dainty Moonwort and Human Activities Occurring on the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Designated Horses/Burros Area within 1/4 mile of Springs and Perennial Streams	1	NA*	NA
Non-System Trail	1	NA	NA
Private Land	1	NA	NA
System Trail (high mileage)	1	NA	NA
Wildland Urban Interface	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston violet as part of the landscape analysis.

4.7.3 Slender Moonwort (*Botrychium lineare*)

Status Designations

The slender moonwort or narrowleaf moonwort (*Botrychium lineare*) is a Forest Service sensitive species (USFS 2003), and is a former candidate for listing under the Endangered Species Act.

Range-wide Distribution

This species is widespread but with a very spotty distribution in primarily western states including Alaska, California, Colorado, Idaho, Montana, Nevada, Oregon, and Washington, as well as into Canada (NatureServe 2007). Range-wide, it is mostly found at higher elevations of 4,921 to 9,842 feet (1,500 to 3,000 meters) (NatureServe 2007).

Distribution in the Spring Mountains NRA

Slender moonwort is suspected to occur in the Spring Mountains based on genetic analysis (Donald Farrar, pers. comm. 2004). Slender moonwort was found at Mary Jane Falls Spring (believed to be the historic Rainbow Falls collection), the north branch of Deer Creek Springs, and Echo Springs (Farrar 2002; Donald Farrar pers. comm. 2003, 2008). See Figure 4-62 for locations of known occurrences of the slender moonwort, all of which occur between 8,520 and 9,797 feet (2,597 and 2,986 meters).

Habitat

Slender moonwort is found in highly varied habitats at relatively high elevations (and northern latitudes) (Farrar 2006). Habitat types include high elevation montane forests and meadows, roadsides in open habitat dominated by low-growing forbs, meadows dominated by knee-high grass, shaded woods, openings in pine, spruce, and fir forests dominated by grasses and/or forbs, and grassy horizontal ledges on north-facing limestone cliffs (Farrar 2006).

Phenology

The slender moonwort is a fern with fronds maturing in August.

Measures

Measures to be used to determine the final status, trends, and management recommendations for this species are the total number of known occupied sites and number of element occurrences based on a 1-kilometer site separation distance.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

This species was described in 1994 (NatureServe 2007). A historical collection is known from the Spring Mountains from a historic collection at Rainbow Falls (Farrar 2004).

Current Conditions in the Spring Mountains NRA

Slender moonwort was found at Mary Jane Falls Spring (believed to be the historic Rainbow Falls collection), the north branch of Deer Creek Springs, and Echo Springs (Farrar 2002; Donald Farrar pers. comm. 2003, 2008). Its sporadic occurrence is likely a true reflection of its rarity (Farrar 2006).

There are currently 3 viable element occurrence records that include 3 sites where the slender moonwort is strongly suspected to be present (NNHP 2005).

Figure 4-62 Slender Moonwort Species Distribution

Figure 4-62 BACK

Threats

Potential threats to upswept moonwort may include the lack of taxonomic and ecological information that is available on the species (which makes it difficult to know where they occur and what truly is a threat to their survival); drought and the lack of adequate water for both the moonwort and the health of the mycorrhizae fungi with which moonworts have an obligate relationship; exotic weed invasion; trampling and soil compaction by recreational users or large ungulates such as elk or horses; fire; possibly grazing (although removal of leaf tissue may have little effect); burial by surface deposition; and alteration of springs and spring outflows (Lund 2006a). This species may tolerate some disturbance since it appears to be a habitat generalist and is found in disturbed areas (NatureServe 2007). Due to this fern's small and highly disjunct populations, it is vulnerable to loss due to stochastic events (NatureServe 2007).

Based on mapping as of 2006 of the slender moonwort's occurrence localities within the Spring Mountains NRA, this species overlaps with existing human activities on the landscape as indicated in Table 4-57. A single location may occur more than once in the table if it overlaps with multiple activities.

Table 4-57 Estimated Overlap Between Slender Moonwort and Human Activities Occurring within the Spring Mountains NRA

Activity	Number of Overlapping Sites	Number of Overlapping Polygons	Number of Overlapping Polygon Acreage
Private Land	1	NA*	NA
System Trail (high mileage)	1	NA	NA
Wildland Urban Interface	1	NA	NA

* NA = Polygon is not available for a spatial analysis.

Level of Analysis

The available data, including mapping of occurrence information, will be used to conduct a qualitative site-based evaluation and quantitative habitat-based evaluation of the Charleston violet as part of the landscape analysis.

4.7.4 Dicranoweisia Moss (*Dicranoweisia crispula*)

Status Designations

The Dicranoweisia moss (*Dicranoweisia crispula*) is designated as a covered species in the MSHCP (RECON 2000).

Range-wide Distribution

This moss is a widespread, western North American species, occurring in the Pacific Northwest and in the mountains of Utah where it is considered common (SWCA 2005a). The southern Nevada populations represent the southernmost known populations of this plant (SWCA 2005a). Range-wide, this species is found at an elevation range of 3,500 to 7,500 feet (1,067 to 2,500 meters) (SWCA 2005a).

Distribution in the Spring Mountains NRA

This species is known from three localities in the Spring Mountains: Lee Canyon, Deer Creek, and the Bonanza Peak trail (Stark 2001). It was originally collected in Lee Canyon in 1955 (Lawton 1958) and not refound until the last few years (Stark 2001). Indications are that the species is likely to be found elsewhere in Clark County (SWCA 2005a; Clark County 2006).

Habitat

This moss generally occurs on logs of fallen trees. It grows in dense green clusters along cracks in bark (SWCA 2005a). It is associated with mixed conifer or pinyon-juniper habitats (Clark County 2006).

Phenology

Spores are produced frequently by this species in the spring and early summer.

Reference Conditions in the Spring Mountains NRA as of 1998 or Earlier

Lawton first recorded this species in Lee Canyon in 1955 (SWCA 2005a). Specific data are not available regarding this species' known area of occupancy in the Spring Mountains NRA prior to 1999 (SWCA 2005a).

Current Conditions in the Spring Mountains NRA

Although the original Lee Canyon population has not been refound recently, populations at Deer Creek and the Bonanza Peak Trail were healthy as of 2005. Within the Spring Mountains NRA the species is found on downed wood and occasionally on rock. The taxonomic status of this species is currently in flux, with recent authors (Brinda et al. 2007) considering this species to be, in the strict sense, a member of a genus segregate with a new name, *Hymenoloma conterminum* (Renauld and Cardot) Ochyra.

Threats

This species is thought to react negatively to both fire and fuels management, as it is often found on downed logs (SWCA 2005a). Other threats include habitat degradation from wood collection and litter removal (Clark County 2006). No specific threats were identified in the Spring Mountains NRA, but general threats to this species include: habitat loss with stream and creek diversion; increased fire susceptibility due to introduction of non-native grasses; recreational use such as hunters, hikers, equestrians, campers, mountain bikers, and OHV users; littering, traveling and parking off designated roads and trails; removing and trampling plants and disturbing natural surfaces; habitat fragmentation; and urban and rural development (SWCA 2005a). This species occurs in small sub-populations making it more susceptible to local threats and stochastic events (SWCA 2005a).

Level of Analysis

Since there are limited documented occurrences of this moss on the Spring Mountains NRA, a general descriptive analysis will be conducted as part of the landscape assessment.

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APPENDIX A

DATA SOURCES AND SPECIAL MAPPING CRITERIA AND DATA ANALYSIS

Vegetation – SWReGAP

Source: RS/GIS Laboratory, College of Natural Resources, Utah State Univ. USGS GAP Analysis Program
Publication_Date: 2004-09-15
Title: 'PROVISIONAL' Digital Landcover Dataset for the Southwestern US, *V*ersion 1.0, "Southwest Regional GAP Analysis Project Final Report."
Geospatial_Data_Presentation_Form: raster digital data
Online_Linkage: <http://earth.gis.usu.edu/swgap/>
Content: Multi-season satellite imagery (Landsat ETM+) from 1999-2001 was used in conjunction with digital elevation model (DEM) derived datasets (e.g. elevation, landform, aspect, etc.) to model natural and semi-natural vegetation. The minimum mapping unit for this dataset is approximately 1 acre. Landcover classes are drawn from NatureServe's Ecological System concept.

Source: Reese, G.A. 2007
Publication_Date: 2007-03-03
Content: 1-m resolution Forest Service color DOQQs from 2004, 0.61m panchromatic QuickBird imagery from 2006 and 2.44m 4 band multispectral QuickBird imagery from 2006. Landcover classes are drawn 1997 Federal Geographic Data Committee "Vegetation Classification Standard".

Fuels – Wildlands Urban Interface

Source: Humboldt-Toiyabe NF
Content: Areas of proposed fuel reduction treatments adjacent to private lands and USFS developed facilities including campgrounds, picnic sites, administration buildings, etc.

Map of Known Fire Occurrences on the Spring Mountains

Source: Humboldt-Toiyabe NF
Content: Mapped polygons of larger burned areas since the mid-1900s

Invasive Weeds

Source: Humboldt-Toiyabe NF
Content: Results of invasive weed ground surveys conducted between 2004 and 2005 by the National Park Service.

Insect Damage:

Source: Humboldt-Toiyabe NF
Content: Aerial detection surveys for insect damage to forest trees conducted between 2003 and 2004 by the US Forest Service – Region 4.

Ski Area:

Content: Ski area boundary digitized from USGS Digital Ortho Quadrangle map (air photo)

Picnic Areas:

Source: Humboldt-Toiyabe NF
Content: Point data

Roads and Trails:

Source: Humboldt-Toiyabe NF
Content: Line data

Campgrounds:
Source: Humboldt-Toiyabe NF
Content: Point data converted to polygons by digitizing campground outline using USGS topographic maps

Springs/Wells:
Source: Humboldt-Toiyabe NF
Content: Point data

Streams:
Source: Humboldt-Toiyabe NF
Content: Linear data

Property Ownership:
Source: Humboldt-Toiyabe NF
Content: Polygons

Nevada Natural Heritage Program Element Occurrence Database

1. Shapefile 'NRA_precision_Eos' from NNHP
2. Shapefile 'NRA_observed_areas' from NNHP

Data Analysis

1. Data with *general* precision: (field BCD_PREC) will only be used for qualitative purposes and will not be included in the model.
2. Data with *minute* and *second* precision: polygons from NRA_observed_areas will be utilized and buffered to 0.1 acre.
3. All *second* precision EOs have corresponding Observed Area polygons. Therefore, the Observed Area records, being more accurately mapped, will take precedence (precision EO polygons with second precision are usually round buffered to an area of 20 acres that reflects the "locational uncertainty distance".)

MAMMALS

Bats

GIS Data:

1. Shapefile 'Location_Data_w_source' located in SWCA data folder (SWCA 2005 Species point data)
2. Shapefile 'NRA_precision_Eos' from NNHP data (29 July 2005)
3. Shapefile 'NRA_observed_areas' from NNHP data (29 July 2005)

Data Analysis:

1. SWCA points and polygons from NNHP that correspond to water sources or are roost sites will be included in the mapped occurrences database. Any occurrences not cited as corresponding to water sources or roosts will be used in qualitative assessment.
   - *Water Sources*: If occurrence is within 150 feet of a spring or an intermittent or perennial stream, then it will be considered to correspond to a water source and will be included in the mapped occurrences database (NOTE: 150 feet was chosen as this is the range of an 'ultrasonic acoustical recorder which is used to locate bats). Water sources located within 150 feet of an occurrence will be buffered by 37 feet (0.1 acre) and included as mapped habitat.

- *Roost Sites*: If an occurrence is located within 150 feet of a cave/tunnel or mine shaft or on slopes greater than 60 degrees then it will be included in the mapped occurrences database. Caves/tunnels/slopes corresponding to SWCA points will be buffered by 37 feet (0.1 acre) and included as mapped habitat. Springs in O'Farrell's 2002 and 2006 reports identified as bat habitat will be buffered by 37 feet (0.1 acre) and included in mapped habitat.

2. Springs in Ramsey 1997 identified as bat habitat will be buffered by 37 feet (0.1 acre) and included in mapped habitat.

Palmer's Chipmunk

GIS Data:

1. Shapefile 'Location_Data_w_source' from SWCA (2005 Species point data) located in SWCA data folder
2. Potential habitat derived from info in Lowrey (2002) and Christopher Lowrey's draft model of potential habitat developed at the U.S. Geological Survey

BIRDS

Northern Goshawk

GIS Data: four shapefiles of surveyed potential habitat in Goshawk Habitat files and one shapefile of 2005 nesting locations all provided by NDOW.

1. Shapefile 'theme2' corresponding to hot habitat surveys (located in 2003-2006 Goshawk Projects\GoshawkHabitat\hot habitat surveyed)
2. Shapefile 'theme2' corresponding to cold habitat surveys (located in 2003-2006 Goshawk Projects\GoshawkHabitat\cold habitat surveyed)
3. Shapefile '2005_goshawk_broadcast_survey_area' (located in 2003-2006 GoshawkProjects\GoshawkHabitat\goshawk_sheets \2005\Goshawks 05 data\post fledging habitat\goshawk survey area)
4. Shapefile '2005_dawn_acoustic__survey_area' (located in 2003-2006 Goshawk Projects\GoshawkHabitat\goshawk_sheets\2005\Goshawks 05 data\post fledging habitat\goshawk survey area)
5. Shapefile '2005_raptor_nests' (located in 2003-2006 Goshawk Projects\)

Data Analysis

1. Buffer raptor nests from '2005_raptor_nests' by 1,165 feet (to create 200-acre polygons surrounding the nests, consistent with Forest Service designated goshawk protected activity centers). Select areas within the 200-acre polygons that are 'suitable nesting habitat' as defined by the surveyed habitat area in layers enumerated in 1 through 4 above (derived from the NRA goshawk nesting habitat model).

2. Digitize sightings from the document 'Final northern goshawk report', which includes UTMs of all goshawk sightings, and analyze as described above for '2005_raptor_nests' data points.

American Peregrine Falcon

GIS Data

1. Bird_Atlas from the 2005 GBBO Cumulative Database
2. 13 shapefiles with point data in 12 locations in folder 'peregrine surveys', 12 shapefiles are named 'point' and one shapefile is named 'theme2' (data collected May – July 2004)

Data Analysis

1. Occurrences in 2005 GBBO will be included as mapped habitat if they correspond to cliff habitat (i.e., nesting habitat). The GBBO location data indicates the SE corner of the UTM (universal transverse mercator) grid (which is 1,000 meters by 1,000 meters) in which the bird was sighted. The point at the center of the grid will be buffered by 700 meters (i.e., a 2,300-foot-radius circle will encompass the square grid, creating a polygon of 380 acres). All areas within the buffered area corresponding to cliff habitat will be included in the mapped occurrences database. Occupied cliff habitat is defined as any land within the 380-acre buffered area that has slope greater than 60 degrees.

<u>Flammulated Owl</u>

GIS Data:

1. Shapefile 'owl and nest locations' (May – July 2002)
2. Shapefile '2005_acoustic_survey_owl_detections'

Data Analysis

1. Buffer known occurrences by 185 feet (1 hectare or 2.5-acre polygon defined based on concentrated foraging area) and then select areas that correspond to associated vegetation communities and elevation (as defined below) to incorporate into the mapped occurrences database.
   - *Elevation range*: Occurrences located within the elevation band 7,050-9,850 feet (from Arsenault 2002)
   - *Vegetation communities*: Occurrences located in
     Great Basin pinyon-juniper woodland
     Rocky Mountain montane mesic mixed conifer forest and woodland
     Rocky Mountain montane dry-mesic mixed conifer forest and woodland

<u>Burrowing Owls:</u>

GIS Data: None existing.

Data Analysis

1. Digitize 2 sites (Spring 2004 and May 2006) described in "Data provided to ENTRIX June 22, 2006"). Buffer occurrences by 56 meters ([185 feet] resulting area approximately 1 hectare) and overlayed with vegetation. Only vegetation series in the buffered area that are classified as a 'desert shrubland' community zone will be included as mapped habitat. (NOTE: 56 meters (185 feet) was selected for the buffer distance, as this was the estimated nesting/primary foraging area.)

<u>Other Desert and Stream/Riparian Species</u>

Southwestern willow flycatcher (No Data)
Phainopepla (GBBO) – not breeding
Blue grosbeak (No data)
Summer tanager (GBBO) – not breeding

GIS Data:

1. Bird_Atlas from the 2005 GBBO Cumulative Database
2. NBC_Data from the 2005 GBBO Cumulative Database

Data Analysis

1. Occurrences in 2005 GBBO will be included as mapped habitat if they correspond to riparian areas/water features and are classified as breeding. The GBBO location data indicates the SE corner of the UTM (universal transverse mercator) grid (which is 1,000 meters by 1,000 meters) in which the bird was sighted. For the occurrence information classified as breeding or nesting, the point at the center of the grid where the sighting occurred will be buffered by 700 meters (i.e., a 2,300-foot-radius circle will encompass the square grid of the sighting). All areas within a resulting 380-acre buffered polygon corresponding to a riparian area or water feature will be included in the mapped occurrences database:
   - *Breeding* Occurrences listed in the Bird_Atlas data as 'confirmed' or 'probable' for breeding (field 'CONFIRMBL') or are classified in the NBC data as breeding (yes in the field 'BREEDING') will be buffered by 700 meters (2,300 feet, the buffer necessary to encompass the area of the observation grid). Riparian areas/water features within the buffer will be classified as mapped habitat.
   - *Riparian Area*: Buffered areas that are classified in ReGAP vegetation layer as "North American Warm Desert Wash and Lower Montane Riparian Woodland or Riparian Shrubland" and Rocky Mountain Alpine-Montane Wet Meadow will be included in the mapped occurrences database.
   - *Water Feature*: Springs within the buffered areas will be selected and buffered by 11 meters (37 feet, creating a 0.1-acre polygon) and included in the mapped occurrences database.

REPTILES

GIS Data:

1. Nevada Department of Wildlife (NDOW). 2008. Wildlife Diveristy data through 2005 delivered to the Spring Mountains NRA (April 2008). Nevada Department of Wildlife, Reno, NV)

Data Analysis

1. No analysis – data from NDOW will be used as is.

BUTTERFLIES

GIS Data:

1. Shapefile 'Location_Data_w_source' from SWCA (2005 Species point data) located in SWCA data folder
2. Shapefile 'NRA_precision_Eos' from NNHP data (29 July 2005)
3. Shapefile 'NRA_observed_areas' from NNHP data (29 July 2005)
4. Boyd et al. (2000), Boyd (2004 & 2005), Boyd and Austin (1999, 2001 & 2002), and Weiss et al. (1995 & 1997)

Data Analysis

1. SWCA points will be buffered by 37 feet (0.1 acre)
2. Polygons from NNHP will be entered into the mapped occurrences database.
3. For each butterfly species, include springs that are noted as providing habitat to that species in SWCA Springs Database Master_Butterflies. Spring point data will be buffered by 37 feet (0.1 acre).
4. Digitize additional site information from Boyd and Austin and Weiss 1995 and 1997 and buffer identified springs by 37 feet (0.1 acre).

ANTS

GIS Data:

1. Shapefile 'NRA_precision_Eos' from NNHP data (29 July 2005)
2. Shapefile 'NRA_observed_areas' from NNHP data (29 July 2005)

Data Analysis

1. No analysis; utilize NNHP data as is.

SPRINGSNAILS

Spring Mountains springsnail (*Pyrgulopsis deaconi*)
Southeast Nevada springsnail (*Pyrgulopsis turbatrix*)

GIS Data

1. Shapefile 'Location_Data_w_source' located in SWCA data folder (SWCA 2005 Species point data)
2. Shapefile 'NRA_precision_Eos' from NNHP data (29 July 2005)
3. Shapefile 'NRA_observed_areas' from NNHP data (29 July 2005)
4. Data file 'Sub_Swca Springs Species' from SWCA Springs Database (original data from sources from 1999-2005)

Data Analysis

1. All occurrences in any of the NNHP or SWCA data will be attributed to the nearest spring. Springs with occurrences will be buffered by 37 feet (1/10 of an acre) and included in the mapped occurrences database.

PLANTS

General

GIS Data:

1. Shapefile 'rare_plants_polygons_2005_edits' from 2005 NRA Plant Survey Database
2. Shapefile 'NRA_precision_Eos' from NNHP (29 July 2005)
3. Shapefile 'NRA_observed_areas' from NNHP (29 July 2005)

Data Analysis

1. Polygons from 'rare_plants_polygons_2005_edits' (2005 NRA Plant Survey Database) will be entered directly into the mapped occurrences database.
2. Polygons from NNHP will be entered into the mapped occurrences database.
3. Digitize data from Biological Monitoring reports that provide occurrence locations.

Cliff Species

Clokey greasebush (*Glossopetalon clokeyi*)

Data Analysis

1. Select Heritage and Rare Plant Survey polygon occurrence data for areas that are located on slopes of 60 degrees or more and define these areas as suitable habitat.

Botrychium species

GIS Data:

1. Data file 'Sub Swca Springs Species' from SWCA Springs Database (original data from sources from 1999-2005)
2. Summary of Botrychium sites from NNHP (2005), Farrar (2002), pers. comm. Farrar (2003, 2008) and site specific surveys

Data Analysis

1. Buffer springs that are identified by Farrar as Botrychium habitat by 37 feet (0.1 acre).

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APPENDIX B

FLORISTIC CHECKLIST FOR PLANTS ON OR NEAR THE SPRING MOUNTAINS NRA

Ecological Systems of the Spring Mountains National Recreation Area

2. Sonora-Mojave Creosotebush-White Bursage Desert Scrub Ecological System
3. Mojave Mid-Elevation Mixed Desert Scrub Ecological System
4. Sonora-Mojave Semi-Desert Chaparral Ecological System
5. Great Basin Pinyon-Juniper Woodland Ecological System
6. Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland Ecological System
7. Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland Ecological System
8. Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland Ecological System
9. Inter-Mountain Basins Semi-Desert Grassland Ecological System
10. Sonora-Mojave Mixed Salt Desert Scrub Ecological System
12. North American Warm Desert Cienega Ecological System
16. North American Warm Desert Bedrock Cliff and Outcrop Ecological System
17. Inter-Mountain Basins Cliff and Canyon Ecological System
18. Rocky Mountain Alpine Bedrock and Scree Ecological System
19. Rocky Mountain Subalpine-Montane Riparian Shrubland Ecological System
20. Rocky Mountain Subalpine-Montane Riparian Woodland Ecological System
21. North American Warm Desert Lower Montane Riparian Woodland and Shrubland Ecological System
22. North American Warm Desert Riparian Woodland and Shrubland Ecological System
23. North American Warm Desert Wash Ecological System
25. Rocky Mountain Subalpine-Montane Fen Ecological System

Nachlinger & Reese (1996) Series and Associations of the Spring Mountains National Recreation Area

(cross-walked to numbered Ecological Systems)

DESERT SHRUBLANDS ZONE

Larrea tridentata Series

Hymenoclea salsola Association 23
Larrea tridentata-Ambrosia dumosa Association 2

Mixed Desert Shrub Series

Gutierrezia microcephala-Salazaria mexicana Association 23
Coleogyne ramosissima-Thamnosma montana Association 3,10
Coleogyne ramosissima/Juniperus osteosperma Series
Coleogyne ramosissima Association 3
Coleogyne ramosissima/Juniperus osteosperma Association 3
Coleogyne ramosissima/Juniperus osteosperma-Pinus monophylla Association 3,5
Coleogyne ramosissima-Purshia mexicana var. *stansburiana* Series 3
Artemisia tridentata Series 3

LOW CONIFER WOODLAND, MONTANE SHRUBLAND AND CHAPARRAL ZONE

Arctostaphylos pungens Series

Ceanothus greggii Association 4
Arctostaphylos pungens-Garrya flavescens Association 4

Pinus monophylla/Artemisia tridentata Series

Pinus monophylla-Juniperus osteosperma/Artemisia tridentata Association 4,5
Pinus monophylla-Cercocarpus ledifolius var. *intermontanus/Artemisia tridentata* 5,6
Association 5,6
Pinus monophylla/Artemisia tridentata Association 5

HIGH CONIFER FOREST AND WOODLAND ZONE

Abies concolor-Pinus ponderosa var. *scopulorum-Cercocarpus ledifolius* var. *intermontanus* Series

Abies concolor-Juniperus scopulorum Association 6,7
Abies concolor-Pinus ponderosa var. *scopulorum-Cercocarpus ledifolius* var. intermontanus Association 6,7,17
intermontanus Association 6,7,17
Populus tremuloides-Abies concolor Association 6,7

Pinus flexilis-Abies concolor Series

Pinus flexilis-Pinus longaeva Association 7,8
Pinus longaeva-Pinus flexilis/Juniperus communis var. *depressa* Association 8

Pinus longaeva Series

Pinus longaeva Association 8
Stipa lettermanii-Oxytropis oreophila Association 9
Stipa lettermanii-Agropyron trachycaulum Association 9

ALPINE ZONE

Ivesia cryptocaulis Series 18

AZONAL STEEP SLOPES AND CLIFFLANDS

Desert Mass-wasted Slopes Habitat 3,16
Montane Mass-wasted Slopes Habitat 16,17

Cercocarpus intricatus Series

Cercocarpus intricatus/Ivesia jaegeri Association 17
Jamesia americana/Petrophytum caespitosum-Ivesia jaegeri Association 17

AZONAL RIPARIAN AND SPRINGS

Disturbed Spring Habitats

Tamarix ramosissima Association 22
Baccharis sergiloides Association 21
Salix exigua-Peraphyllum ramosissimum Habitat 19
Artemisia tridentata/Elymus cinereus Association 12,19

Rosa woodsii var. *ultramontana* Series

Betula occidentalis/Smilacina stellata Association 19
Rosa woodsii var. *ultramontana* Association 19,20
Bromus inermis-Potentilla hippiana var. *diffusa* Association 9

Dodecatheon redolens-Aquilegia formosa Series

Aquilegia formosa-Smilacina stellata/Rosa woodsii var. *ultramontana* Association 12,20,25
Dodecatheon redolens-Angelica kingii Association 25
Juniperus scopulorum/Epilobium ciliatum Habitat 20
Cirsium clokeyi/Juniperus communis var. *depressa* Association 19

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