FINAL REPORT
LANDSCAPE ANALYSIS

CHAPTER 5:
SYNTHESIS

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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ACRONYMS

AME	Aggregate Magnitude of Effect
AO	Area of Overlap
AOI	area of influence
BLM	Bureau of Land Management
CUAs	concentrated use areas
DNR	Department of Natural Resources
GBBO	Great Basin Bird Observatory

GIS	Global Information System
GPS	Global Positioning System
HMA	Horse Management Area
I&E	information and education
ID	interdisciplinary
LVSSR	Las Vegas Ski and Snowboard Resort
ME	magnitude of effect
MKC	Middle Kyle Canyon Framework Plan
MSHCP	Multiple Species Habitat Conservation Plan
NDSP	Nevada Division of State Parks
NEPA	National Environmental Policy Act
NNHP	Nevada Natural Heritage Program
NRA	National Recreation Area
NSRE	National Survey on Recreation and the Environment
NVUM	National Visitor Use Monitoring
NVUM	National Visitor Use Monitoring
NW	northwest
O&M	Operations and Maintenance
OHV	off-highway vehicle
PHD	Potential Habitat Distribution
PO	Preferred Option
PO	Preferred Option
PwC	PricewaterhouseCoopers
RCM	recreation capability model
RV	Recreational vehicle
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SMEs	subject matter experts
SNPLMA	Southern Nevada Public Land Management Act
WSAs	Wilderness Study Areas
WUI	Wildland Urban Interface

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1.0 INTRODUCTION

Ecosystems include a suite of dynamic processes. Successful conservation approaches, therefore, cannot be built upon simple perceptions of static ecosystem attributes. They should be directed by the desired ecosystem function characteristics associated with future conditions, rather than a characterization of the attributes from the past. Improved function can facilitate natural recovery, improve productivity, stabilize site ecosystems, and reduce risks (Ehrenfeld and Toth 1997; Falk et al. 2006). Improved ecosystem function may also increase economic return from recreation or other land use activities, as well as restore high-value ecosystem services such as carbon cycling, flood control, water purification, oxygen production, and dust control (Daily 1997). A clear understanding of the conservation actions available and the relative costs of these actions is an important component of developing a successful conservation strategy. The ranges of conservation actions available for implementation are directly related to the current state of the ecosystem in relation to biotic and abiotic thresholds.

The overarching objective of a conservation management strategy is to conserve biological diversity, as well as ecological systems and processes. It contains a series of guidelines for decision makers to integrate biodiversity considerations into the resource management planning and development process. Conservation management strategies often employ avoidance, minimization, and mitigation measures. Implementation of these measures is based on achieving resource management goals. As such, it is important to recognize that:

> *"Ecosystem management demands an additional step: that restoration plans and targets become part of managing the entire system."*
>
> –Michael F. Allen, The Role of Restoration Ecology in Ecosystem Management: Opportunities and Responsibilities, The Role of Restoration in Ecosystems Management (1996)

The central goal of a conservation management strategy is often to create a self-sustaining ecosystem that is resilient to perturbation without further assistance. Conservation strategies aim to reverse the losses of biodiversity and the degradation of ecosystems that have occurred through time as humans have affected landscapes. Unfortunately, while ecological knowledge and technical skills have increased, reversing those trends has been limited. The reasons for failure are often associated with societal obstacles such as cost constraints, insufficient land allocation, and deficient time/labor. Barriers to successful conservation strategies can also include competition from additional land uses or values.

Congressional Designation of the Spring Mountains as a National Recreation Area is recognition of its importance as a regional outdoor recreation resource. Conservation management, which involves diverse natural resources and social interests, may best find the most successful course through due recognition of the competing priorities for the area. Strategies that directly conflict with other key land uses could be more problematic to implement. The stated purposes of the Spring Mountains National Recreation Act clearly indicate the Congressional expectations that Spring Mountains NRA management incorporate both resource conservation and public recreational values:

- Preserve scenic, scientific, historic, cultural, natural, wilderness, watershed, riparian, wildlife, threatened and endangered species, and other values contributing to public enjoyment and biological diversity in the Spring Mountains of Nevada;
- Ensure appropriate conservation and management of natural and recreation resources in the Spring Mountains; and

- Provide for the development of public recreation opportunities in the Spring Mountains for the enjoyment of present and future generations. (Emphases added.)

Public investments in natural resources can be increased by developing beneficial relationships between local communities and the natural environment in the context of conservation management. The ecological needs of a conservation management area have the greatest potential to be achieved when the local community investments are greatest. The interaction between needs (use) and investments (commitment) provides a basis for conservation planning and implementation which reduces the potential ecological and societal roadblocks to success. This is an important challenge for the Spring Mountains National Recreation Area (Spring Mountains NRA): balancing unique biological diversity with recreational use.

The Spring Mountains NRA was established in 1993, with a General Management Plan (GMP) completed in 1996. The GMP established broad goals for the NRA, several of which pertain to human uses and generally tier to the stated purposes of the Spring Mountains NRA Act:

- 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 NRA as we do.

- 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 to all of us on our own past. These heritage resource sites remind us 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.

Key questions were developed early in this process to provide further guidance and focus to this Landscape Analysis. Those questions generally continue the theme established by the Spring Mountains NRA Act and the Spring Mountains NRA GMP of jointly addressing resource conservation and recreation management issues and strategies. To plot strategies that afford the best opportunities for successful Spring Mountains NRA management, the analyses and conclusions developed in this Synthesis Chapter must ultimately set the stage and lead to Chapter 6 recommendations that integrate viable ways to provide sustainable recreation opportunities with effective natural resource conservation.

1.1 OVERVIEW

The analysis in Chapter 5 is an important component of the Landscape Analysis. In this chapter, information from Chapters 1, 2, 3, and 4 is synthesized and interpreted. The interaction of biological, physical, and social processes comes together both spatially and temporally. The implications of these interactions for the purpose of our objectives will be identified in Chapter 6 for management recommendations. A useful glossary of terms is included in Appendix 5A.

The purpose of the Landscape Analysis is to:

- Identify land (human) use activities and future use patterns,

- Identify species and habitat distribution in relation to land use patterns,
- Identify potential conflicts between special status species and land uses,
- Evaluate the benefits of conservation measures for species, and
- Identify the value of existing information for evaluating the potential effects of land uses on species.

In this chapter, the issues and key questions of the Landscape Analysis are addressed by the data that has been collected and interpreted. Biological and human use data developed in previous tasks are integrated to assess the types and relative magnitude of potential effects on the long-term viability of species by both human and natural causes, while identifying recreational opportunities that are compatible with species and habitat preservation.

Reference and current condition information are used to summarize changes in ecological and social conditions over time, as well as to identify what drives these trends. The capability of different areas of the Spring Mountains NRA to sustain different types and levels of human use and activities are determined through the relationship among ecosystem, landscape, human use, and management strategies.

All steps of the synthesis process are documented and traceable, as a transparent process (Appendix 5B). The analysis incorporates all of the biological and human use data collected from other chapters and uses it to synthesize the data and develop recommendations.

The analysis provides a means to prioritize special status species occurrences and key habitat, and to determine the extent, magnitude, and location of human and natural activity impacts on each species. The level of analysis for each species and activity varies depending on the degree of spatial overlap and impact intensity as well as the extent and quality of available data. Each species have a list of both natural and human induced threats. These threats are ranked so that potential and actual impacts can be assessed based on individual threats to the species, as well as collective threats to a group of species or a habitat type (see Section 3.1).

Information for each species in the database is coupled with data regarding the unique existing and proposed recreational facilities and activities, identified by location and season, in order to map areas with resource conflict and resource capability. Mapping of these areas synthesizes information to prioritize conservation actions and accommodation of recreational activities. The results of mapping these areas provide the basis for management recommendations that reach the ultimate goal of the Spring Mountains NRA staff: providing recreation opportunities while providing for species conservation.

The recreation demand within the Spring Mountains NRA is projected for top ranked activities identified in the 2005 National Visitor Use Monitoring (NVUM) survey based on available data. The synthesis evaluates the unique capacity of the Spring Mountains NRA to accommodate projected recreational demand. This information is as specific as possible within the constraints of existing data. Capacity levels are estimated and compared with projected recreation demand to define and evaluate activities where projected demand exceeds recreational capacity for specific recreation sites. An overall visitor capacity for the Spring Mountains NRA has not been estimated. Based on the biological and recreational guidelines developed in Chapters 3-4, additional locations for potential recreational development will be evaluated. The capability levels for each of these indices are explained in this chapter.

The ultimate goal of the synthesis chapter is to provide the analytical basis for providing management recommendations for the Forest Service that will provide for adequate protection of species and habitats, as well as accommodation for recreational opportunities within the Spring Mountains NRA (Chapter 6). The analysis incorporated a quantitative potential effects/geo-spatial analytical approach, a qualitative conservation status assessment, and current professional knowledge and trends for each species, habitat type, and recreation activity in the Spring Mountains NRA.

1.2 GENERAL ANALYTICAL APPROACH

The overall analytical approach for this Landscape Analysis was divided into five general categories:

- Database construction (compilation of existing information),
- Spatial overlap of species and activities,
- Determination of the potential effect of activities on species,
- Determination of the benefits of established conservation measures on reducing the potential effects of activities, and
- Spring Mountains NRA species conservation status assessment.

Database construction refers to the compilation of relevant information on species, habitat and activities occurring on the Spring Mountains NRA. The organization of much of this information occurred during the development of Chapters one through four. The synthesis analysis encompasses the quantitative geo-spatial analytical approach (spatial overlap, potential effects determination, and value of conservation measures) (Figure 5-1), with the qualitative Spring Mountains NRA conservation status assessment (see below). The spatial overlap analysis was designed to determine the place at a point in time where Spring Mountains NRA activities intersect with areas and/or habitats utilized by species. A detailed description of this analysis is included below in Section 3 (Biological Assessment) and a workbook that was used by interdisciplinary team for the conducting the analysis in Appendix 5B. Information developed as part of the spatial overlap of activities and species (specific occurrence locations and potential habitat) was used in the potential effect determination to estimate the amount of potentially affected habitat. This involved the use of professional judgment and knowledge to estimate the direct and indirect effect mechanisms of an activity for a particular species. All potential conservation measures were identified, summarized, and evaluated in terms of implementation. The value of conservation measures at offsetting those potential effects was also incorporated into the analysis through use of professional judgment. Additionally, the Spring Mountains NRA conservation status assessment was based on professional knowledge and judgment.

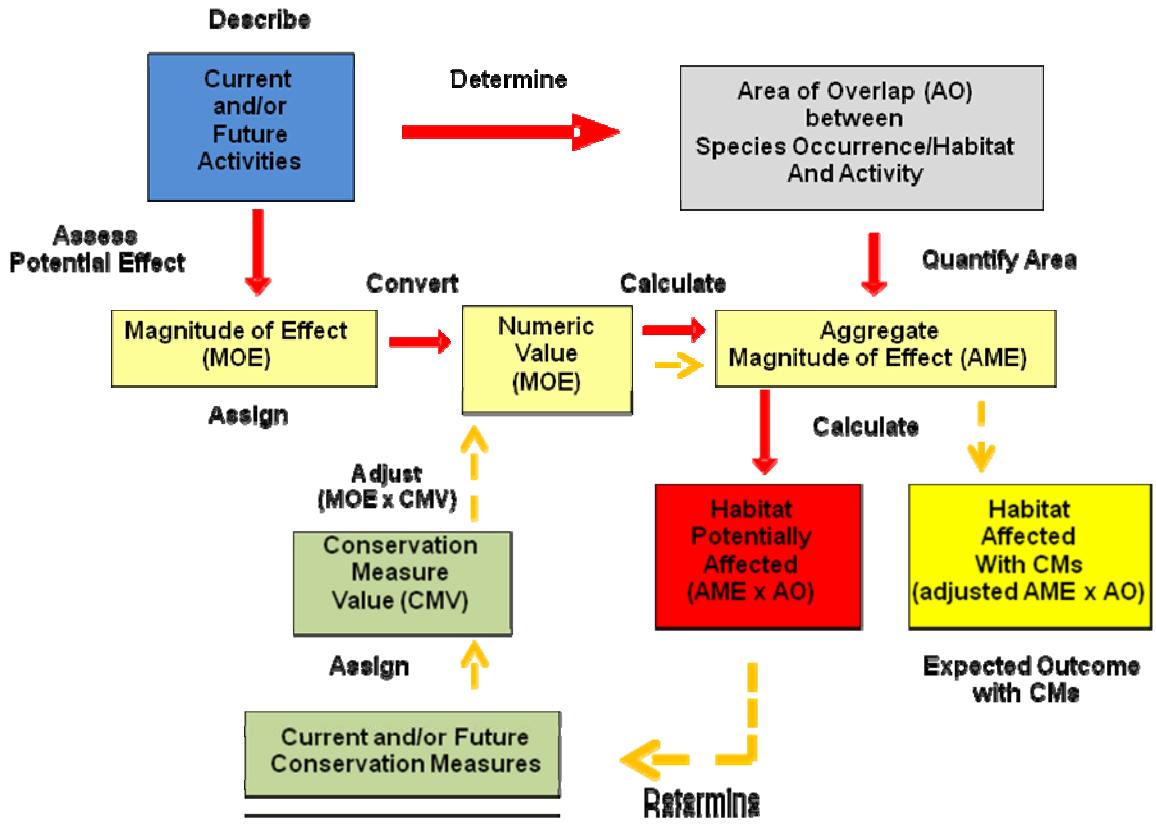

Figure 5-1 **A schematic representation of the geo-spatial analysis associated with determining the potential effect of human activities as well as the benefit of conservation measures on species and their habitats.**

1.2.1 Database Construction

The five key data types used in the database are summarized below:

- Species Distribution Database
  - Occurrence Locality Distribution – information on the location where species have been observed.
  - Potential Habitat Distribution – spatial distribution of the potential habitat of a species based on preference associated with areas described by Global Information System (GIS) layers.
- Activities Database
  - Information about the locations (footprint and area of influence) where authorized activities on the Spring Mountains NRA lands occur. It includes area occupied by a typical activity.
- Potential Effects Database
  - Information on the potential effect of an activity on species.

- Conservation Measures Database
  - Information on existing conservation measures and their value on reducing the potential effects of activities on species.
- Spring Mountains NRA Conservation Status Assessment Database
  - Information on the conservation status of species, including natural history characteristics, population numbers and areas of occurrence, population trends, and threats, protection and management.

Much of the information associated with development of these databases was originally presented in Chapters 3-4. The data sets served as the basis of the overlap and effects determination steps. Each data type and its associated databases are discussed below.

1.2.1.1 Species Distribution Database

OCCURRENCE LOCALITIES

Information on the occurrence of species in the Spring Mountains NRA was in two formats: 1) point datasets, and 2) polygon datasets.

POTENTIAL DISTRIBUTION/RANGE

Information obtained in the development of the species descriptions in Chapters 3-4 was used to characterize the area within the Spring Mountains NRA potentially suitable for use by a given species. In some cases, a species distribution was previously described in a GIS platform based on extensive surveys. For species without this information, the distribution was determined using potential habitat as a surrogate for distribution. To spatially represent potential habitat, the following was used: 1) information in the species literature surveys, and 2) locality records for species in the Spring Mountains NRA that indicated a preference within GIS habitat classification datasets. If information was not sufficient to conservatively estimate distribution of a species, no potential habitat distribution map was created. The details of this analysis are presented in the biological analysis section.

1.2.1.2 Activities Database

The activities database is a dataset of the following descriptive information about the spatial components of the activities:

- Activity Group. Spring Mountains NRA activities have been assigned to two major groups: current and future.
- Activity Type. Within each major activity group, activities were designated to a category as defined by Spring Mountains NRA.
- Activity Component. The nature of the activity: structure, operation, and maintenance.
- Activity Characteristic. The components of the activity that provide further detail of each activity component, or decomposes the activity into elements that are related to the potential effects on species.

1.2.1.3 Potential Effects Database

The potential effects database includes information on the relationship between the species, its habitat or location, and the extent and magnitude of potential effects of specific activities to a species. The database was developed through extensive literature review and professional judgment. For the purposes of this analysis, the magnitude of the potential effect included an assessment of the value of conservation measures that are currently in place.

1.2.1.4 Conservation Measures Database

The conservation measures database includes two components: 1) a summary of the current conservation measures identified for the Spring Mountains NRA, and 2) information of the relationship between the effect of activities on species and the value of conservation measures (avoidance, minimization, mitigation) at reducing that potential effect. The assessment of the value of conservation measures focused on the potential for their implementation in the future. That is, the value of conservation measures already implemented were accounted for in the potential effect data.

1.2.1.5 Spring Mountains NRA Conservation Status Assessment Database

The Spring Mountains NRA conservation status assessment database includes information on natural history characteristics; population numbers and areas of occurrence; population trends; and threats, protection, and management for species based on NatureServe methods. This information is a qualitative analysis that is crucial for targeting conservation efforts towards those species and habitats in greatest need. NatureServe and its natural heritage member programs have developed a consistent method for evaluating the relative imperilment of both species and ecological communities. For plant and animal species, these ranks provide an estimate of extinction risk, while for ecological communities it provides an understanding of the risk of elimination.

2.0 SPRING MOUNTAINS NRA LAND USE ACTIVITIES

2.1 DISTRIBUTION OF LAND USE ACTIVITIES ON THE SPRING MOUNTAINS NRA

A total of 46 land use activities have been identified and described for the Spring Mountains NRA (Table 5-1 and Figure 5-2). These activities include a footprint and/or an area of influence (AOI). The footprint is often an area where the activity has the largest effect on habitat for any given species. In many cases, the area has lost the habitat benefit. The AOI, however, is simply the buffer zone around the corresponding activity or area. This area is sometimes directly or indirectly affected by the recreation activity taking place on the footprint, but in other cases, it remains relatively unaffected by recreation or human use. Effects of land uses on both footprint and AOI areas associated with land use activities are analyzed below.

2.1.1 Current Activities

The free ranging horse and burro activities occur on the most acreage (164,489) of all current activities on the Spring Mountains NRA (Table 5-1 and Figure 5-2). This activity includes horse and burro use within one mile of water, as well as use in other areas of the Horse Management Area (HMA). Horse and burro use greater than one mile from a water source includes the greatest number of acres (over 112,000). Both horses and burros have been introduced to the Spring Mountains to be managed in designated HMAs, but their presence within and outside the HMAs may disturb the landscape by trampling or consuming vegetation, contributing to erosion, and dispersing seeds of non-native plants.

Table 5-1 Summary of Current[1] and Future[2] Land Use Activities on the Spring Mountains NRA.

Current Activities	Acres		Future Activities	Acres
Campground AOI	52.34		Future Campground AOI	67.88
Campground Footprint	115.79		Future Campground Footprint	159.27
Cave/Tunnel	0.95		Future EEA AOI	5.07
Climbing Area	0.38		Future EEA Footprint	2.94
CUA AOI	1,126.80		Future Foot Bridge AOI	3.83
CUA Footprint	93.51		Future Foot Bridge Footprint	0.44
Firewood Gathering Area	1,499.68		Future System Trails AOI	376
FS Structure AOI	41.86		Future System Trails Footprint	11.6
FS Structure Footprint	6.1		Future Picnic AOI	7.74
All Trails AOI	1,410.60		Future Picnic Area Footprint	35.34
All Trails Footprint	133.2		Future Ski Area AOI	168.85
All Horses/Burros	164,488.80		Future Ski Area Footprint	160.33
All Roads AOI	1,847.60		Future Trailheads AOI	3.21
All Roads Footprint	1,344.40		Future Trailheads Footprint	14.16
Picnic Area AOI	19.08		Future Visitor Center AOI	8.58
Picnic Area Footprint	62.92		Future Visitor Center Footprint	19.68
Private Land and Building Footprint	4,690.10		West Side PO Camping AOI	866.74
PVT Building AOI	134.78		West Side PO Camping Footprint	4,653.68
Ski Area AOI	57.04		West Side PO Trailheads AOI	21
Ski Area Footprint	58.41		West Side PO Trailheads Footprint	312.3
Snow Play Area	45.19		West Side PO Trails AOI	445
All Trailheads AOI	4.5		West Side PO Trails Footprint	39.8
All Trailheads Footprint	4.5			
Wildland Urban Interface	3,723.17			

[1]The following activities were deleted from analysis: Fire History, Invasive Species, and the Future Fishing Pond AOI and Footprint.

[2]West Side PO RV Camping AOI and Footprint were combined with West Side PO Camping AOI and Footprint.

The second largest activity area footprint is for the private land and private buildings activity. These areas cover 4,690 acres of land on the Spring Mountains NRA. Private land includes residential areas, private developments, undeveloped private lands, and state roads.

Other significant land use activities include the Wildland Urban Interface (WUI), which covers 3,723 acres on the Spring Mountains NRA, and the Firewood Gathering Area (1,500 acres) and footprint of all paved and unpaved roads (1,344 acres). The WUI is the area where human structures or development and forests or wildlands meet. This could be on private land where a home is surrounded by the woodlands of the Spring Mountains NRA, or where the edge of a housing community or access roads transition to forested land that is part of the Spring Mountains NRA. Firewood gathering areas are usually concentrated along roads in designated areas that vary each season.

In terms of current recreational land uses, the AOI for all trail types (motorized, non-motorized, system, non-system) is about 1,410 acres. Another major recreational land use activity is use of concentrated use areas (CUAs). These areas are widely dispersed across the Spring Mountains NRA and receive relatively low management attention compared to developed recreation sites. The AOI for all CUAs is approximately 1,127 acres.

Figure 5-2 Distribution of Current Land Use in the Spring Mountains National Recreation Area

Figure 5-2 BACK

2.1.2 Future Activities

The largest footprint area that would potentially be affected by a future activity is West Side Preferred Option (PO) camping areas, which accounts for 4,654 acres of land on the Spring Mountains NRA (Table 5-1 and Figure 5-2). This includes west side PO RV camping areas as well. Camping areas may include either flush or vault toilets and drinking water. Recreational vehicle (RV) camping areas would include RV hookups as well. Other activities with larger footprints are relatively insignificant for the potential future and west side activities. The West Side PO Trailheads footprint covers 312 acres and includes both major and minor trailhead footprints. Trailheads are usually associated with a campground or a developed trail and may include a parking area.

The Future Ski Area footprint covers 160 acres. The current ski area has 11 runs and 4 lifts and is only open in the winter season. Maintenance is conducted on the ski area in the summer. The future ski area would include new runs, chair lifts, and multiple buildings for winter season activities, as well as potential facilities and equipment for summer season activities. The number of future recreationists that would use future facilities is discussed in Section 2.2.6. Within this same section Tables 5-3 and 5-5 report estimated quantities of recreation facilities that are needed to support future demand.

2.2 OVERVIEW OF RECREATION SUPPLY AND DEMAND ASSESSMENT

As described above, recreation is a major land use on the Spring Mountains NRA. Current and future recreation uses on the Spring Mountains NRA are analyzed within the context of supply and demand.

Recreation supply and demand were assessed to answer key question 2 for the Core Topic Recreation and Human Use: In light of current and future recreational demands and use patterns on the Spring Mountains NRA, what potential recreation strategies would be most effective in providing for recreation opportunities while maintaining species viability?

We used a recreation capability model (RCM) developed specifically for estimating lands capable of supporting future recreation development in the Spring Mountains NRA (ENTRIX 2007). The model considers the importance of different landscape criteria such as slope or proximity to roads for evaluating the capability of a particular location within the Spring Mountains NRA to support various types of recreation facilities. The impetus behind the model was the planning team's realization that a tool was needed to predict where future recreation development could be accommodated within the Spring Mountains NRA. Most of the Spring Mountains NRA is comprised of steep slopes, and a substantial portion (42.5 percent or 137,289 acres) is in federally designated wilderness areas. Therefore, it was considered important to take a careful look at the relatively small amount of land available for future recreation development. The model is intended to be used with a level of detail in between programmatic (Forest Plan level) planning and site-specific project planning. Stated another way, the capability model represents a "coarse filter" approach to identifying areas capable of supporting recreation facility development. Further details are provided in Section 2.2.1.

Future recreation demand was estimated to determine how many areas capable of supporting recreation facilities would actually need to be developed. We used multiple data sources to estimate future recreation demand. Data from the 2005 NVUM were used, along with information in the Nevada Trails Plan and Nevada State Comprehensive Outdoor Recreation Plan and information from the U. S. Census, to estimate future demand for activities that require some type of facility (e.g., campgrounds, trailheads). The Executive Summary Report of the

PricewaterhouseCoopers (PwC) market and financial analyses developed for and funded by Middle Kyle Canyon/East Side developed canyons ("Eastside Study") and the West Side ("Westside Study") of the Spring Mountains NRA - Southern Nevada Public Land Management Act (SNPLMA) projects were also referenced. These work products are proprietary and are not the property of Clark County. Further details are provided in Section 2.2.6.

2.2.1 Recreation Capability Model to Assess Supply

This section outlines the steps used to model capability for supply of 11 types of recreation facilities including:

- Highly developed summer campgrounds
- Highly developed multi-season campgrounds
- Designated developed picnic areas
- Designated multi-season picnic areas
- Designated primitive summer campgrounds
- Designated primitive multi-season campgrounds
- Trailheads with parking
- High mileage trails (two miles or greater)
- Low mileage trails (less than two miles)
- Snow play areas
    - Parking lots

2.2.1.1 Step 1. Determine Recreation Criteria and Landscape Thresholds

Recreation criteria and landscape thresholds were identified in several brainstorming sessions between ENTRIX and Forest Service recreation planners. Criteria had to have a spatial component, since a GIS-based model was used to estimate recreation capability. The criteria included the following attributes:

- Slope
- Elevation
- Presence of shade trees
- Proximity to roads
- Proximity to cities
- Proximity to Forest Service system trails
- Proximity to trailheads

- Proximity to picnic areas/campgrounds
- Proximity to snow play areas
- Proximity to wilderness areas
- Proximity to other attractions
- Proximity to utilities
- Proximity to private land (scored as a negative value)
- Proximity to private land (scored as a positive value)
- Proximity to motorized trails (scored as a negative value)
- Overlap with user-created trails
- Overlap with CUA inventory areas
    - Solitude/proximity to trailheads, developed campgrounds, and picnic areas

Landscape thresholds were developed for each criterion to create a "landscape ranking" that indicates how well a particular location fulfills the criteria. Each location on the landscape has three possible threshold capability levels for each criterion:

- 1 = Highly capable
- 0.5 = Fairly capable
- 0 = Not capable

Areas with relatively low slope were ranked higher than other areas for estimating capability for developed recreation facilities. Thresholds varied according to recreation facility type. For example, three different landscape thresholds for slope were used to model capability for all types of developed recreation sites, trails and snow play areas. An area for which development of a recreation site is desired requires a relatively flat slope. In contrast, a trail can be constructed on areas having a varying slope, and a snow play area needs a minimum slope to accommodate sledding and tubing activities, but a maximum slope to account for safety.

2.2.1.2 Step 2. Apply Importance Index to Landscape Thresholds

Since not all criteria are equally important for estimating capability, importance indices were developed based on the recreation facility under consideration. The importance index scale could have five values as follows:

- 1 = Highly important
- 0.75 = Important
- 0.50 = Moderately Important
- 0.25 = Slightly Important

- 0 = Not Important

For example, slope was given an index of “1” for estimating capability for developed summer campgrounds.

2.2.1.3 Step 3. Calculate Landscape Capability Index

The Landscape Capability Index was then calculated as the product of the criteria importance index and the landscape ranking, divided by the criteria importance index. The equation is:

Landscape Capability Index = sum product (criteria importance index * landscape ranking) / sum of criteria importance index

2.2.1.4 Step 4. Estimate Capability for All Lands within the Spring Mountains NRA for Each Recreation Facility

This is a GIS and Access based exercise that analyzed the landscape across the Spring Mountains NRA to estimate how many acres there were for each capability criterion. Source data came from 28 GIS layers. Multiple landscape capability layers were created individually in GIS using ArcGIS version 9.2, based on the above-mentioned landscape threshold criteria. Each capability layer consisted of areas that fell into one of three rankings - high, moderate, low, or none. These rankings were based on how well the landscape met the threshold criteria. An example of this would be a ‘proximity to roads’ criteria layer. Areas closer to roads would rank higher than areas that are further away from roads. Once the landscape capability layers were created from the source data they were integrated (combined), with each resulting polygon containing the individual rank from up to 28 original layers. An Excel spreadsheet containing multiple worksheets depicts which layers were used for each capability model, along with landscape thresholds and importance indices of each threshold, is found in Appendix 5C.

The tabular data from this combined GIS layer were then entered into a Microsoft Access database that was used to perform a series of queries and calculations to determine the “Capability Index” for each polygon. A polygon represents any combination of the landscape threshold criteria; there were 100s to 1,000s of polygons for each capability model. To model each recreation facility type, the queries were set up to select records from only those layers that are necessary to determine landscape capability for any given recreation activity. The “Capability Index” was derived by multiplying the rank of a polygon by the “Importance Index” of that rank for all layers that are required, then summing all of these scores. The sum product of criteria importance index multiplied by landscape rankings is then divided by the sum of the Importance rankings. The end result was a table that contains values ranging from zero to one for each recreation facility type where zero is not capable and one is highly capable. These tabular data were joined back to the combined GIS layer where the results are classified into four recreation capability levels and mapped accordingly. Increasing an importance ranking for a single criterion while holding all other values constant does not appreciably increase the landscape capability index. A 10-acre minimum polygon size was used for:

- Highly Developed Summer Campgrounds
- Highly Developed Multi-Season Campgrounds
- Snow Play Areas

For the remaining types of recreation facilities modeled, there was not a minimum polygon requirement. Capable land was removed from Wilderness Areas and Wilderness Study Areas (WSAs) for the following maps:

- Highly Developed Summer Campgrounds
- Highly Developed Multi-season Campgrounds
- Summer Picnic Areas
- Multi-season Picnic Areas
- Parking Lots
- Trailheads with Parking
- Snow play Areas

2.2.2 Results of Recreation Capability Modeling

The following section reports results of RCM. Results are reported by describing the allocation of Spring Mountains NRA lands across the four capability classes, which range from no capability to high capability areas.

2.2.2.1 Designated Primitive Summer Campground (See Figure 5-3)

There are about 2,497 acres with high capability for this type of recreation facility; 54,861 acres have moderate capability; about 181,335 acres have low capability; and, 84,136 acres have no capability to support primitive summer campgrounds. Capability is based on slopes for developed sites, solitude, elevation in summer to provide climatic relief, overstory trees to provide shade, proximity to roads, proximity to wilderness areas, proximity to other attractions, (negative) proximity to private land, and overlap of CUA inventory areas. Slope, elevation, and shade trees were considered important (given ratings of 0.75) in the model, while solitude (operationalized as distance from roads and motorized trails) and overlap with existing CUA areas were considered highly important and therefore assigned 1.0 in the model.

2.2.2.2 Designated Primitive Multi-Season Campground (See Figure 5-4)

There are 33,449 acres with high capability for this type of recreation facility; about 67,806 acres have moderate capability; 193,845 acres have low capability; and about 27,728 acres have no capability to support primitive multi-season campgrounds. Capability is based on slopes for developed sites, solitude, elevation in spring, autumn, and winter (which has both a different range of values and lower threshold values than for summer primitive campgrounds), shade trees, proximity to roads, proximity to wilderness areas, proximity to other attractions, (negative) proximity to private land, and overlap of CUA inventory areas. Slope, elevation, and shade trees were considered important (given ratings of 0.75) in the model, while solitude (operationalized as distance from roads and motorized trails) and overlap with CUAs were considered highly important and therefore each assigned a 1.0 in the model.

2.2.2.3 Highly Developed Summer Campgrounds (See Figure 5-5)

There are 603 acres with high capability for this type of recreation facility; about 15,060 acres have moderate capability; 65,560 acres have low capability; and about 241,604 acres have no capability to support highly developed summer campgrounds. A high amount of acreage occurs

in the no capability category due in part to the amount of land within the Spring Mountains NRA in wilderness or WSA designations, where development is not permitted. Wilderness and WSAs comprise about 137,289 acres in the Spring Mountains NRA. In this model slope, proximity to roads, proximity to utilities, and proximity to private lands (scored as a negative value) were considered highly important and therefore were each assigned a 1.0.

2.2.2.4 Highly Developed Multi-Season Campgrounds (See Figure 5-6)

There are 4,475 acres with high capability for this type of recreation facility; about 18,679 acres have moderate capability; 85,333 acres have low capability; and about 214,331 acres have no capability to support highly developed multi-season campgrounds. A high amount of acreage occurs in the no capability category due in part to the amount of land within the Spring Mountains NRA in wilderness or wilderness study area designations, where development is not permitted. Wilderness and wilderness study areas comprise about 137,289 acres in the Spring Mountains NRA. In this model slope, proximity to roads, proximity to utilities, and proximity to private lands (scored as a negative value) were considered highly important and therefore each were assigned a 1.0. In contrast to the highly developed summer campground model, shade trees were not used in this model, and a lower minimum landscape threshold (4,500 feet as compared to a minimum of 5,600 feet for summer) for elevation was used.

2.2.2.5 High Mileage Trails (See Figure 5-7)

There are about 3,604 acres with high capability for this type of recreation facility; about 93,008 acres have moderate capability; 203,754 acres have low capability; and about 22,462 acres have no capability to support high mileage trails. In this model, only slope was considered highly important and therefore assigned a 1.0.

2.2.2.6 Low Mileage Trails (See Figure 5-8)

There are about 8,227 acres with high capability for this type of recreation facility; about 67,476 acres have moderate capability; 222,661 acres have low capability; and about 24,464 acres have no capability to support low mileage trails. Slope, proximity to roads, and proximity to other attractions were considered highly important and therefore were assigned a 1.0 in the model.

2.2.2.7 Snow Play Areas (See Figure 5-9)

There are 5,577 acres with high capability for this type of recreation facility; about 13,685 acres have moderate capability, 73,444 acres have low capability; and about 230,123 acres have no capability to support snow play areas. Slope, elevation, proximity to roads, and proximity to private lands (scored as a negative value) were considered highly important and were assigned a 1.0 in the model.

2.2.2.8 Summer Picnic Areas (See Figure 5-10)

There are 1,346 acres with high capability for this type of recreation facility; about 18,168 acres have moderate capability, 72,335 acres have low capability; and about 230,979 acres have no capability to support summer picnic areas. Proximity to roads and private land (scored as a negative value) were considered highly important and were assigned 1.0 in the model.

2.2.2.9 Multi-Season Picnic Areas (See Figure 5-11)

There are 9,556 acres with high capability for this type of recreation facility; about 39,886 acres have moderate capability, 73,419 acres have low capability; and about 199,968 acres have no capability to support multi-season picnic areas. Proximity to roads, snow play areas, and private land (scored as a negative value) were considered highly important and were assigned 1.0 in

the model. The minimum elevation was 4,500 feet, as compared to 5,600 feet for summer picnic areas.

2.2.2.10 Trailheads with Parking (See Figure 5-12)

There are 13,976 acres with high capability for this type of recreation facility; about 31,222 acres have moderate capability, 82,858 acres have low capability; and about 194,773 acres have no capability to support trailheads with parking. Proximity to roads was considered highly important and assigned a 1.0 in the model.

2.2.3 Validation of Middle Kyle Canyon Framework Plan and West Side Plan facilities with the RCM

To validate the recreation capability models, maps for each facility model were overlaid with proposed recreation facilities associated with the Middle Kyle Canyon Framework Plan (MKC) and Westside Plan Preferred Option (PO). In order to validate the models, we expect that for a particular type of facility, such as proposed developed camping, would appear in either a high or a moderate capability polygon. It is also important to note that the 11 activities modeled for recreation capability are not a complete match with the activities being planned for by the Forest Service. For example, the RCM considered two types of camping; developed and designated primitive. In contrast, the Westside Plan initially defined six types of camping facilities ranging from "backcountry" to "RV", which was later refined to include designated dispersed and developed sites with modest facilities (Table 5-2). However, the RCM did not include the same level of design detail as the descriptions provided in Table 5-2, nor is the RCM considered a substitute for site level analysis when deciding exactly where to locate facilities.

Table 5-2 Range of Camping Facilities Considered for the West Side Spring Mountains NRA.

Campsite type	Definition	Key features
Backcountry	Camping along backcountry trails at certain designated sites. Campsites are very primitive (no fire rings or toilets) to preserve wilderness qualities of solitude and nature.	• Marker designates camping site • Widely separated sites (>500 ft) within camping zones
Designated Dispersed	Camping at designated campsites along system roads or motorized trails. Setting is natural and primitive. Spacing of campsites offers opportunities to experience solitude.	• Marker designates camping site •Simple parking space •Level space for tent • Fire ring
Primitive	A designated campground with few amenities. Campsites are limited in number and widely separated to preserve the natural character. Some sites may be "walk-in" or "bike-in." No group sites.	• Vault toilet •Parking for autos and small RVs • Level space for tent •Fire rings
Developed (modest facilities)	Camping in a natural setting in the company of others. A relatively large number of campsites (15 - 40) are provided. Some group sites available.	• Vault toilet • Parking for tent sites • Fire rings/Grills • Picnic tables
Equestrian	A small campground with modest facilities that is designed to serve equestrians. Equestrian trails are located nearby.	• Similar to above, • Corrals/Hitching Posts • Horse trailer parking
Hardened developed	Sites hardened and developed to accommodate heavy use and RVs. Running water at restrooms; may have showers. May have group sites.	• Restrooms • Potable water • Fire rings/Grills • Picnic tables • Dump stations

Table 5-2 Range of Camping Facilities Considered for the West Side Spring Mountains NRA.		
Campsite type	Definition	Key features
RV	Similar to the hardened developed campground, but with RV Hook-ups. Minimum of 50 sites are provided. The natural environment is modified, yet attractive.	• Similar to above • Electric Hook-ups • Showers • Dump stations
Source: Westside Master Plan, Shapins Associates, 2006		

When interpreting the results of the overlays it is important to consider the current status and analysis that is guiding development of both these plans.

Campground polygons mapped for the Westside Recreation Plan PO were intentionally oversized to allow the Forest Service some flexibility, and this needs consideration when interpreting recreation footprint and special status species overlaps and potential effects generated in the analysis. In some cases, this allows proposed developments for the two plans to "spill over" into several recreation capability polygons.

Current emphasis on development of the west side of the Spring Mountains NRA by the Forest Service is focused on Wheeler Wash and Lower Lovell Canyon. This decision is based upon the Forest Service's review of the findings of the Westside Study conducted by PwC. This focus is the result of discussions with PwC about smaller, more realistic demand projections and fewer, more efficient locations for future recreation facilities that would then be more financially sustainable than the suite of recreation facilities originally proposed in the 2006 Master Plan.

The findings of the PwC Westside Study indicated that recreation demand is sufficient to use up to 90 camping units on the west side. The recommended facility development levels range from designated dispersed sites to a developed campground with modest facilities. These site types are both relatively primitive compared to the hardened or RV campgrounds that were originally part of the Master Plan PO.

The findings of the PwC Westside Study indicated that estimates of future recreation demand have been substantially reduced since the Westside Plan preferred option was developed.

The findings of the PwC Westside Study indicated that future recreation facilities should be clustered for efficient management.

We did not model specifically for off-highway vehicle (OHV) trails, which typically have different design criteria than non-motorized trails because the travel management decisions had already been made for the Spring Mountains NRA. OHV routes were the one recreation facility for which the findings of the PwC Westside Study indicated that demand projections were greater than those in the Westside Plan PO. Future decisions on travel management will utilize this modeling process.

2.2.3.1 Designated Primitive Summer Campgrounds

There is good correspondence between Westside PO camping sites and medium capability polygons. The designated dispersed camping sites are still being considered in the Westside Plan, based on the findings of the PwC Westside Study.

Figure 5-3 Designated Primitive Summer Campgrounds

Figure 5-3 BACK

Figure 5-4 Designated Primitive Winter Campgrounds

Figure 5-4 BACK

Figure 5-5 Highly Developed Summer Campgrounds

Figure 5-5 BACK

Figure 5-6 Highly Developed Winter Campgrounds

Figure 5-6 BACK

Figure 5-7 High Mileage Trails

Figure 5-7 BACK

Figure 5-8 Low Mileage Trails

Figure 5-8 BACK

Figure 5-9 Snow Play Areas

Figure 5-9 BACK

Figure 5-10 Summer Picnic Areas

Figure 5-10 BACK

Figure 5-11 Multi-Season Picnic Areas

Figure 5-11 BACK

Figure 5-12 Trailheads with Parking

Figure 5-12 BACK

2.2.3.2 Designated Primitive Multi-Season Campgrounds

There is good correspondence with proposed Westside Plan PO sites and high capability polygons. The only difference in the summer and multi-season models are elevation and presence of shade trees in the summer designated primitive capability model. This model fits well with the idea of providing three season campgrounds spelled out in the Westside Plan. These locations are not being considered for snow camping. This model does not fit well for Westside Plan PO backcountry sites because they are located along trails, not roads. It fits reasonably well for designated dispersed sites (less so for the summer model). Most opportunities identified in the Westside Plan PO are low elevation, low shade, near roads on the west side of the Spring Mountains NRA.

2.2.3.3 Highly Developed Summer and Multi-Season Campgrounds

Many acres are in no capability polygons due to the presence of wilderness areas (where no development is allowed). The large RV polygon located near Highway 160 overlaps mostly moderate capability polygon(s). For summer highly developed campgrounds, there is some overlap with high capability for winter-developed campgrounds. Developed campground polygons are depicted in blue on map Figure 5-5. There are three small blue polygons on the west side of the Spring Mountains NRA boundary in low capability areas. These polygons are not proximate to other developed sites, or other attractions. With the exception of snow play areas and parking lots, the RCMs use proximity to other recreation attractions, usually considered important or highly important for the activities modeled. However, these criteria do not work well for west side of the Spring Mountains NRA, due to current absence of facilities. Other blue polygons show up in moderate capability polygons, and are located in Wheeler Wash.

2.2.3.4 Summer and Multi-Season Picnic Areas

Results from these two models should have greater correspondence with each other. ENTRIX assumed all potential access roads could be paved to reduce travel times as well as a different elevation range (minimum of 5,600 feet for summer, 4,500 feet for multi-season), proximity to snow play for winter. However, the paved roads assumption is not consistent with the findings of the PwC Westside Study in the area of future recreation demand projections and economically viable development. There is more high capability acreage in the northwest (NW) corner of the Spring Mountains NRA than expected. This is due to an assumption made about paving all roads that access the west side of the NRA. This assumption was based on rapid growth that was occurring in Nye County during the time modeling exercises were initiated. Future analyses may consider more conservative assumptions given the decreases in population growth in Nye County. For the west side, PwC recommends developing picnicking capabilities in concert with trails and trailheads. There are springs and seeps in the NW corner location, a possible recreation attraction, as well as rock art. The capability model appears to work relatively well in Wheeler Wash and lower Lovell Canyon.

2.2.3.5 Trailheads with Parking

This RCM did not use presence of shade trees or elevation; otherwise, it used similar rankings as for summer picnic areas. It should be noted that as a result of the Forest Service reviewing the findings of the PwC Westside Study, the number of motorized trailheads has been increased. There is a proposed trailhead near the town of Cold Creek, and this proposed polygon is in a moderate capability polygon. The second of the motorized trailheads would serve the Clark and Wheeler drainages and might well be located outside the Spring Mountains NRA boundary to also serve and direct use to the Bureau of Land Management (BLM) front country. The third motorized use trailhead would be in Lovell Canyon, in addition to another

trailhead in upper Lovell Canyon that is already constructed for non-motorized access. There are multiple proposed trailheads in Wheeler Wash, to allow for access to the trail loop at multiple points. They all fall in moderate capability polygons. This model is a relatively good fit except for the areas in the NW corner of the Spring Mountains NRA. There is one proposed trailhead near Potosi that is in a low capability polygon; however, this area could get more development and use if the road is paved and private land parcels are developed.

2.2.3.6 Parking Lots

This map (Figure 5-9) depicts many low capability polygons. High capability areas are located at Mary Jane Trailhead and the ski resort, both areas where expanded parking may be needed.

2.2.3.7 Interpretive Facilities

There may not be a need to estimate capable lands for this type of facility; however, the model criteria are logical given that they require interpretive facilities to be located near existing recreation facilities.

2.2.3.8 Low and High Mileage Trails

Trails are a low cost facility, relatively easy and inexpensive to construct. This low mileage capability model was developed to reflect the idea that high capability areas would have close proximity to cities, roads, other non-motorized system trails. Both trail maps look very similar. There is a major trail going through an elongated blue polygon (running north-south) because the "Solitude" attribute is operationalized as relatively close distance (minimum of 0.25 mile of greater) to any developed recreation facility including trails or trailheads. However, the trailhead no longer exists. Through the Forest Service OHV route designation process, resource conditions changed in 2007, and this motorized trail is now closed, so the trailhead is no longer functional. Proximity to other attractions is constraining the model for high mileage trails. Any trail development on the west side needs to occur in concert with other facilities. However, there are no designated attractions on the west side under current conditions.

2.2.3.9 Snow Play Areas

The large polygons depicting high capability along Deer Creek Highway and in upper Lee Canyon are reasonable. There are also many small polygons depicting high capability areas in Lee, Kyle, Lovell, and Trout canyons. Some of these areas appear too low for prime snow play. Areas in upper Kyle Canyon are depicted mostly as low capability. There are solid bands of moderate capability areas down to the Spring Mountains NRA boundary in Kyle, Lee, Highway 160/Lovell, and in the NW corner of the Spring Mountains NRA. Some of these areas would only have occasional snow cover, and would only be feasible for snow play with artificial snow. The minimum elevation for lands to be scored in the low capability category for snow play is 7,500 feet.

2.2.4 Results of recreation demand projections and interviews with subject matter experts

In addition to examining recreation capability on a broad level, recreation demand was evaluated in a similar manner. During November through December 2007, interviews to qualitatively assess outdoor recreation trends in southern Nevada were conducted with the following experts:

- Dr. Deborah Chavez, USDA Forest Service, PSW Research Station;

- Dr. Emilyn Sheffield, California State University-Chico;
- Jim Holland, Lake Mead NRA, National Park Service;
- Terry Hansen, Nevada State Parks;
- Cheryl Surface, Nevada State Parks; and
- Steve Weaver, Nevada State Parks.

All subject matter experts (SMEs) were asked a series of questions pertaining to trends in outdoor recreation in southern Nevada. A summary of trends is provided, followed by the individual interview results for each SME. Not every SME directly answered each question. Rather, each SME offered broad perspectives on outdoor recreation trends in southern Nevada based on their respective professional experience.

2.2.4.1 Continued Rapid Population Growth, With Rapid Growth by Latinos

Most of the SMEs acknowledged that southern Nevada would continue to experience rapid population growth. Dr. Emilyn Sheffield indicated population growth in this region will continue, and indicated that families with young children and Latinos will be heavily represented in next wave of population growth. Dr. Deborah Chavez indicated that the southern Nevada region will experience "hyper growth" for Latinos. Dr. Chavez indicated there might be more weekday and day use recreation on the Spring Mountains NRA compared to other national forest units, due to the fact that there is a large local population, and many are likely to work weekends (casino/service related employment). Jim Holland indicated he has observed increased Latino participation at day use and shoreline areas at Lake Mead even though lake levels have been declining in recent years. Both Drs. Chavez and Sheffield believe that Latino recreation patterns that emerge on the Spring Mountains NRA will mirror patterns observed on the southern California national forests, with large family groups engaging in "passive" activities in day use settings.

2.2.4.2 Growth in "Urban" Camping

Several SMEs indicated there will be increased demand for more highly developed settings for camping on the Spring Mountains NRA. This more developed setting includes attributes such as full electrical hookups for RVs, wireless fidelity (Wi-Fi) computer access, running water, and waste disposal facilities. Dr. Sheffield indicated that campers will bring their own equipment to make traditional Forest Service campsites more comfortable. Steve Weaver also indicated that RV camping demand is increasing, while tent camping is declining. Visitors want more amenities such as hot showers and Wi-Fi access. Related to this trend is a rise in "alternate camping," with Oregon State Parks offering tent cabins, and California State Parks experimenting with yurt rentals at several of their park units. This finding is consistent with findings from the East and Westside studies prepared by PwC and the Nevada's Statewide Comprehensive Outdoor Recreation Plan (SCORP) showing that among individuals that participate in camping, there is growing interest in using campsites with more amenities.

2.2.4.3 Uncertainty about Demand for Interpretive Services

There was not agreement on whether demand for interpretive services will increase on the Spring Mountains NRA. Cheryl Surface indicated that demand for interpretive services on state park units has not increased, and that interpretive facilities often receive just one visit from those recreating at Nevada State Park units. Jim Holland indicated there is limited interest among visitors to learn about natural and cultural resources. In contrast, Dr. Chavez indicated that

providing basic information about rules, regulations, and what to see and do on national forests is very important among Latino recreationists. She indicated the Angeles National Forest has had good success with an information van that visits recreation sites during peak use periods. The van offers informational sources in Spanish. Dr. Sheffield indicated there is a need to change how interpretive services are presented to ethnic minorities, suggesting the traditional Ranger program offered to children does not work; ethnic minorities are looking for a more integrated interpretive program. Steve Weaver mentioned there is a growing need for Spanish speaking interpreters and exhibits.

2.2.4.4 Growing Demand for Trails

Most of the SMEs indicated there is growing demand for trails in southern Nevada. Cheryl Surface indicated there is demand for connected trails, trails closer to people's residences, and trails in proximity to transportation corridors. Jim Holland offered a similar perspective. Steve Weaver indicated that trail use has been increasing, with OHV use, mountain biking, and hiking all increasing as well. Mr. Weaver also noted an increase in walking and that many walkers are accompanied by a dog.

2.2.4.5 Emerging Activities

Perhaps the most interesting statements were in response to the question about future recreation uses. Dr. Sheffield indicated that all forms of outdoor recreation will be become more technologically enabled. Mechanized recreation will become more accessible to novices (e.g., use of segways). Geocaching as a form of recreation was mentioned by Dr. Sheffield as well as the other SMEs. Representatives from Nevada State Parks expressed concern about impacts on plants and soils resulting from geocaching. Steve Weaver believes there will be an increase in more sedentary forms of recreation. Several SMEs expressed concern about an increase in OHV use on public lands. Dr. Chavez mentioned there could be a moderate increase in snow play related activities, such as "mountain boarding." Terry Hansen indicated there has been an increase in requests for special events, such as OHV events, athletic competitive events, and weddings, on state park units in southern Nevada. Jim Holland indicated a similar pattern (fishing tournaments) with regard to recreation at the Lake Mead NRA.

2.2.5 Description of Discrepancies between the Current Resource Conditions and Relevant Management Plan Objectives

2.2.5.1 Reiterate Results Obtained From Interviews with Recreation Subject Matter Experts

SME interviews provided a different perspective on future recreation demand. Whereas the findings of the PwC Eastside Study are based on demonstrated market demand for recreational activities projected for ten years, the SME interviews focused on future recreation demand that may occur as a result of changes in recreation user tastes and preferences. To some extent, interviews verify the work being conducted by PwC. In other cases, SMEs identify changes not addressed by current or proposed facilities. For example, some SMEs predict substantially greater use of the NRA by Latinos. Well established research by Chavez (2001) on Latino recreation patterns in southern California suggest a different type of recreation behavior and a need for different facility designs, compared to traditional users of Forest Service recreation facilities. Other trends not addressed in the findings of the PwC Eastside Study are possible growing demand for activities such as geocaching, and demand for activities such as competitive special events. These items will be addressed in Chapter 6, Recommendations.

2.2.5.2 Key Findings from the Nevada State Trails Plan and the Nevada State Comprehensive Outdoor Recreation Plan

The Nevada Division of State Parks (NDSP) prepared its most recent version of the State Comprehensive Outdoor Recreation Plan in 2003. NDSP also prepared a statewide trails plan in 2005. Both plans used similar study methods. Both engaged public land managers, local recreation providers, and outdoor recreation stakeholders to identify and rank issues. Both solicited survey input from the general public at the state level and in doing so, solicited information on participation rates for a variety of outdoor recreation activities (for the trails plan, only participation for trail related recreation was solicited). Details on both of these plans may be found at http://parks.nv.gov/scorp.htm, and http://parks.nv.gov/trail/plan.htm.

NEVADA SCORP

The Nevada SCORP is updated regularly to provide a strategic perspective on addressing outdoor recreation issues at the state level. The Nevada SCORP identified and ranked issues facing outdoor recreation across the state. The top seven issues, listed in order of importance are:

- Public access to public lands' diverse recreation opportunities,
- Funding park and recreation resources,
- Trails and pathways,
- Balancing protection of cultural and natural resources with user demands,
- Protecting water resources for recreation,
- Interpretation and education for outdoor recreation opportunities, and
- Growing demand from Nevada's population on outdoor recreation resources and suppliers.

These issues are directly relevant to the Spring Mountains Landscape Analysis, and are being addressed through specific plans (Westside Plan, MKC Framework Plan, Interpretive Master Plan) which are summarized in Chapter 4 of the Landscape Analysis. The statewide user survey found high levels of participation in a variety of outdoor recreation activities and ranked participation among Nevadans aged 16 years or older, in order of frequency of participation:

- Pleasure Driving 55.1%
- Picnicking 47.6%
- Walking—Without a Dog 41.0%
- Swimming in a Pool 39.6%
- Wildlife Viewing 39.2%
- Swimming in Lake or Stream 38.7%
- Hiking 37.7%

- Walking With a Dog 34.5%
- Lake Fishing 33.6%
- Motor Boating 33.1%
- Bicycling 27.6%
- Tent Camping 27.6%
- Golf 25.1%
- Off Road 4 Wheeling (Jeeps, 4x4s, etc.) 20.1%
- Vehicle Camping 17.4%
- Downhill Skiing/Snowboarding 17.1%
- Stream Fishing 16.7%
- Jogging 16.7%
- Waterskiing 13.7%
- Off Road ATV's 13.7%
- Mountain Biking 12.6%

Some of these activities are being responded to in the various recreation plans currently being prepared for the Spring Mountains NRA. However, some activities, such as water based recreation, are not available within the Spring Mountains NRA and therefore are not addressed within those recreation plans or in this analysis. Additionally, the Nevada SCORP is relevant to the Landscape Analysis in that the findings of the PwC Eastside and Westside Studies indicated that PwC evaluated statewide participation rates for activities such as mountain biking to inform their market analysis for the Westside Plan PO.

NEVADA TRAILS PLAN

The Nevada Trails Plan reported that about 61 percent of Nevada residents participated in a trail related activity during the last 12 months. On average, residents used trails a little more than 20 days a year. Non-motorized trail users traveled an average of 6.7 miles per day, while motorized users traveled an average of about 30 miles per day. The Nevada Trails Plan also used a panel of experts and stakeholders to identify and rank the most serious issues affecting trails. The top five issues were:

- Loss of public access to trails
- Lack of funding for trails
- Closure of trails and roads
- Not enough trails
- Not enough support for facilities near trails

The panel also recommended actions to address each of these issues, several of which are relevant to actions being taken for the MKC Framework Plan and Westside Plan PO.

ISSUE 3A. PRESERVE EXISTING TRAILS

Inventory and protect areas that provide trail experiences and make the information available to trail users, land use managers and decision makers

- Acquire fee simple title, rights of way and easements to protect existing access points and connections

ISSUE 3B. PROMOTE MITIGATION BEFORE CLOSURE

- Include trail user input when considering alternatives to closures, mitigate loss of trail opportunities through the creation of new or alternative opportunities
- Educate trail users on trail use etiquette and environmental ethics
- Develop site specific management prescriptions for trail systems that includes signage and maintenance plans

ISSUE 4A. INCREASE THE QUANTITY AND QUALITY OF TRAILS IN NEVADA FOR MULTIPLE TRAIL USES

- Establish connections and linkages between urban communities and rural trail opportunities
- Develop trails and support facilities for specialized trail uses
- Identify and mark trails for different/specialized uses
- Establish long distance trails and connections to them

ISSUE 5A. ENHANCE AND EXPAND SUPPORT FACILITIES

- Provide support facilities
- Promote trails that link to communities and existing support facilities
- Develop specialized support facilities and design standards for specific trail uses

Many of these action items are being implemented in the MKC and Westside Plans. Additionally, the Nevada Trails Plan is relevant to the Landscape Analysis in that the findings of the PwC Eastside and Westside studies indicate that the statewide trail survey was used to inform their market analysis for trail related uses. Specifically, the findings of the PwC Westside Study indicated that statewide trail survey information was used to estimate participation rates and average miles traveled per day for proposed trails in the Westside Plan.

2.2.6 Projections of Future Use Methods to Assess Demand

PwC was hired by the Forest Service with MKC Framework Plan and Westside Planning SNPLMA project funds to analyze market conditions for future recreation demand on the Spring Mountains NRA. PwC work products are proprietary and are not the property of Clark County. Market analysis was focused on the MKC Framework Plan preferred option and the Westside Plan PO prior to preparing National Environmental Policy Act (NEPA) documents and detailed site plans for those projects. Demand forecasts focused on existing, known activities with a

planning horizon of ten years. Demand forecasts were also constrained by the levels of capital investment, and operations and maintenance that could be financially sustainable for the Forest Service. Finally, these forecasts did not attempt to assess changes in recreation user tastes and preferences, which could lead to demand for new activities. A brief discussion of possible changes in recreation user tastes and preferences is provided in Section 2.2.4, results of interviews with subject matter experts.

2.2.6.1 East Side Spring Mountains NRA Demand Approach

For the MKC project, the findings of PwC Eastside Study indicated that PwC estimated demand for a variety of activities/uses associated with the project including: a visitor center with retail space, a food area, outdoor classrooms, an artist in residence program, picnic areas, camping areas, and trails.

2.2.6.2 West Side Spring Mountains NRA Demand Approach

For the Westside Plan PO, the findings of the PwC Westside Study indicated that demand was estimated for the following: picnic sites of varying size, campsites for tents and RVs, equestrian trails/campgrounds/corrals, hiking trails, bike trails (including mountain and road bike paths), and interpretive facilities (3 types). Interpretive facilities included: 1) roadway pull-offs and kiosks in Lovell, Clark and Wheeler canyons, 2) gateway facilities in Lovell and Clark canyons and Cold Creek, and 3) interpretive overlooks in Lovell and Clark canyons. Demand was also estimated for OHV trailheads and staging areas. In addition to these activities, PwC also analyzed demand for OHV trails that might be associated with the OHV staging areas.

Although the Spring Mountains NRA west side area is currently open to and used by the public, since the area is undeveloped, the Forest Service does not formally track visitor use of the area. Therefore, PwC used several sources of recreational use data to inform estimates of demand.

The primary sources used included:

- Nevada State Comprehensive Outdoor Recreation Plan (“SCORP”);
- 2004 Trail Activities in Nevada Study (“NV Trails Study”);
- USFS National Visitor Use Monitoring Results for the Spring Mountains National Recreation Area, September 2006 (“Spring Mountains NVUM”);
- Off-Highway Vehicle Recreation in the United States, Regions, and States, June 2005 (“OHV Study”);
- Occupancy data for USFS picnic and campground facilities from the Kyle, Lee, and Deer Creek areas of the east side of the Spring Mountains NRA;
- Occupancy for campground facilities located in Red Rock Canyon National Conservation Area (“Red Rock Canyon”) and Valley of Fire State Park (“Valley of Fire”); and
- Qualitative interviews with equestrian, mountain bike, and OHV trail enthusiasts.

The 2003 Nevada SCORP was developed in part to identify statewide recreation issues and actions recommended to address those issues, and to provide and summarize research results on outdoor recreation needs and participation collected at the statewide level. This type of document is prepared by every state in the U. S., and they are commonly used to support regional and local recreation planning efforts that call for forecasts of recreation demand. The

2005 Nevada Trails Study serves a similar purpose as the SCORP, focusing specifically on trail related issues, uses, and participation levels. The Spring Mountains NVUM is a systematic survey that each national forest completes approximately every four to six years to 1) estimate visitor use, and 2) survey visitors to national forests for recreation about their experiences, interests, and participation levels in a variety of recreation activities. It provides a recurring perspective on visitor satisfaction and activity participation for the Spring Mountains NRA as a whole. The "OHV Study" was an analysis by the USDA Forest Service Southern Research Station that used National Survey on Recreation and the Environment (NSRE) data to better understand OHV rider trends and user habits. With representative data from every state, the study was able to summarize OHV usage data by regions and by state. This study included information on the percentages of metropolitan and non-metropolitan populations that are OHV users. Occupancy data for picnic and campground facilities provides the most specific and detailed use information at the sites where it was collected, and was used to provide insight about future use of similar types of facilities planned for the Spring Mountains NRA. Finally, qualitative interviews are commonly used to provide additional insight into use patterns when more detailed quantifiable information is lacking.

The findings of the PwC Westside Study utilized multiple data sources to estimate future recreation demand. In most cases future demand was estimated by 1) reviewing statewide demand for a recreation activity and generalizing statewide frequency of use and activity participation rates to the Pahrump/Las Vegas area based on that proportion of the Nevada population, or 2) using 2005 NVUM data to estimate recreation demand. For trail related uses, the findings of the PwC Westside Study were derived from average annual and daily trail use estimates from the Nevada Trails Plan. Finally, it should be noted that information described above was taken from Executive Summaries for two reports (Eastside Study and Westside Study) the PwC prepared for the Forest Service. Information from the more detailed reports prepared by PwC are not referenced in this Landscape Analysis. It should also be noted these methods and data sources used by PwC for the MKC Framework Plan and Westside Plan PO are widely used to forecast demand for outdoor recreation. More detailed descriptions of these methods can be found in Loomis and Walsh (1997).

2.2.6.3 West Side Future Demand Analysis-Results

As stated above, PwC estimated future recreation demand on the west side of the Spring Mountains NRA for:

- Campsites for tents and RVs
- Picnicking, equestrian trails/campgrounds/corrals, hiking trails, bike trails (including mountain and road bike paths)
- Trailheads
- OHV staging areas

These estimates focused on demand in the near term (demand from 2006 through 2015). Future demand for campsites and tents was estimated by examining comparable camping areas on the eastside of the Spring Mountains NRA, and on adjacent lands managed by Nevada State Parks and BLM. PwC acknowledges that locating camping areas on the west side may limit seasonality of use. The areas where camping areas may be located would be hotter in the summer than eastside areas that currently support camping on the Spring Mountains NRA. Moreover, these areas do not experience warm temperatures in the winter. PwC's findings identified that demand for a "destination" campground did not exist. As such, PwC evaluated

camping demand assuming visitors would be primarily local. The west side of the Spring Mountains NRA may also be somewhat attractive for visitors traveling in between Death Valley National Park and Las Vegas. Another key assumption used in PwC's market analysis is that any proposed campgrounds would have supporting trail infrastructure. This is consistent with the RCM that ENTRIX used where capability for developed camping needs to consider proximity to other attractions. PwC also consulted SMEs to assess the future market for camping. Results of this consultation suggest that prospective campers want to be able to experience nature with their families. However, an increasing number of prospective campers also want to bring the comforts of home along with them (similar trends were anticipated by SMEs interviewed as reported in Section 2.2.4). With these considerations in mind, PwC findings include two financially viable scenarios for accommodating the anticipated camping demand:

- Up to 90 designated dispersed camping sites (see Table 5-3), or
- Up to 90 campsites in two developed campgrounds with modest facilities (see Table 5-3)

Table 5-3 Estimated Quantities to Support Projected West Side Recreation Demand

Facility	Location	Units	Unit Measure	Conversion to Area	Acreage	Area of influence
Developed Campground	Lovell Rd corridor	70	campsites	assume 3 sites/acre	24	10.7
	Clark/Wheeler	20	campsites	assume 3 sites/acre	7	6.3
Picnic Area	incidental to trailheads	0			0	0
Non-motorized Trailhead	Upper Lovell (under construction)	10	vehicles	site plan	0.5	0.3
	Clark/Wheeler	50	vehicles	conceptual layout	3	0.75
Motorized Trailhead	Lovell Rd corridor	50	vehicles	conceptual layout	4	0.8
	Clark/Wheeler	50	vehicles	conceptual layout	4	0.8
	Cold Creek	40	vehicles	conceptual layout	4	0.8
High Mile Trails	upper Lovell (planned)	9.7	miles	2' tread	2.4	35.3
	Clark/Wheeler	15	miles	2' tread	3.6	54.5
Motorized Trails	West side (some BLM)	106	miles	6' tread	77.1	514.2

Source: USDA Forest Service, 2008

Note: as of the time of this writing, none of these developed recreation facilities are in use. The Upper Lovell trailhead and associated trail are currently under construction

PwC estimates that a developed campground would achieve an annual occupancy rate of 20 percent. This figure is based on average annual occupancy for east side Spring Mountains NRA campgrounds of 45 percent. PwC also points out this type of campground is further from Las Vegas and does not have the same number of attractions as the Red Rock Canyon and Valley of Fire campgrounds, hence a lower estimated annual occupancy is assumed.

PwC states that the town of Pahrump has few options for picnicking at developed sites. In contrast, the Las Vegas area has numerous local and regional options for picnicking at developed sites. As a result, most demand for picnicking areas on the Westside of the Spring Mountains NRA will originate in the Pahrump area and will generally occur in conjunction with trail use activities. Thus, PwC's findings recommend not developing stand-alone picnic sites but rather providing picnic facilities in conjunction with trailhead facilities.

PwC estimated future demand for equestrian trail use based a combination of two methods. They used self-reported participation in equestrian use from the 2005 NVUM survey, and the proportion of horse owners in the Las Vegas and Pahrump areas. An assumption associated with PwCs estimate is that the market area for west side Spring Mountains NRA equestrian trail

use are the Las Vegas and Pahrump areas. PwC estimated future demand for several types of trail use. For hiking, PwC estimated future demand for hiking based on the 2005 NVUM data, and assumed the market area for hiking on the west side of the Spring Mountains NRA is the Pahrump area. PwC estimated future demand for mountain biking trails based on the Nevada SCORP study, since the 2005 NVUM data did not query visitors about mountain biking participation. The market area for mountain biking was considered the Pahrump area only, since there are many other mountain biking opportunities near the Las Vegas area. PwC estimated future demand for OHV use based on the 2005 NVUM study. The market area for OHV use is the entire state of Nevada. The market area for this user group is larger than for other trail related activities because other studies (Chavez and Baas 1992) of OHV users have shown this group will travel long distances for riding opportunities.

The amount of space needed to support a traditional Forest Service developed campground (such as might be constructed on the West Side) is three sites per acre; the amount of space to support a picnic area is based on a coefficient of four units per acre, and finally the amount of space needed to support an OHV or equestrian trailhead and staging area is based on a coefficient that ranges from 12 to 17 vehicles per acre, depending on site constraints. (Table 5-2). For the main campground proposed for the Middle Kyle Canyon complex campsites would be more densely developed compared to the west side plans for three campsites per acre.

2.2.6.4 East Side Future Demand Analysis Results

PwC's market analysis evaluated several scenarios ranging from a status quo, traditional day use option (Scenario 3) to an aggressive development program (Scenario 5). The option on which future demand is based most closely resembles Scenario 4, described below. Scenario 4: Expanded Day Use and Overnight Camping Facilities and Emerging Destination Area. Current capacities/quantities are found in Table 5-4, and estimated capacities/quantities needed to support Eastside future demand are found in Table 5-5. This scenario focuses on a development scale that allows for expansion and enhancement of day use activities and the beginning of a transition of day-use demand from the Upper Kyle Canyon down to the Middle Kyle Canyon. This alternative would include implementation of the currently proposed improvements to the existing campgrounds in Lee and Kyle canyons, but proposes reevaluation of the day use improvements in Lee Canyon and the use of Lee Canyon picnic areas as snow play destinations in the winter.

Table 5-4 Current East Side Spring Mountains NRA Capacities

Facility Type	Current Capacity
Camping (individual)	134 sites
Camping (group)	3 sites
Picnicking (individual)	146 sites
Picnicking (group)	5 sites
Hiking trails	53 miles
Biking trails	184 miles
OHV use (Spring Mountains NRA-wide)	103 miles
Equestrian use	14 miles
Visitor Center	400 square feet
Designated snow play area	None

Source: PricewaterhouseCoopers, 2008.

Table 5-5 Estimated Quantities to Support Projected East Side Recreation Demand

Facilities	Capacities	Comments
Visitor center with bookstore	9,000 to 10,000 sq. ft.	Programming is key. Nature/Wildlife theme was assumed; estimated visitation approximately 115,000 to 120,000 annually
Exterior exhibits	1,000 to 2,000 sq. ft.	Extension of Visitor Center
Indoor meeting space	Small portion of VC	Provide a small flexible space for VC needs only
Retail space with rentals	1 retail/gift/sundry as part of VC	Retail as part of VC only. Rental business not viable
Food area	Seasonal vending carts and 1 cafe	Small café in VC plus seasonal carts
Plaza areas	40,000 sq. ft.	Needed, but square footage to be determined
Landscape and play space	40,000 sq. ft.	Play areas including water where children have numerous activities and tactile experiences preferred
Group picnic sites	1 site	1 group site for 50 people (replaces Cathedral Rock and Foxtail group picnic areas)
Commons	4.25 acres	Needed, but square footage to be determined
Parking	TBD	
Picnic Sites-individual/extended family	55-65 at MKC, 170-190 across eastside	Demand exists for 170-190 across the entire Spring Mountains NRA eastside by 2015
Picnic sites-group	1 site	Complements individual facilities, replaces Cathedral Rock and Foxtail picnic areas
Campground-individual RV/tent	150 at MKC, 240-260 across eastside	Demand exists for 240-260 sites across the Spring Mountains NRA eastside area by the end of the analysis period. New sites should be similar to a KOA style campground
Campground-small group RV/tent	1-2 site	Demand for small group camping is limited, but one or two small group campsites should be included to replace Mahogany Grove campground
Campground-large group	None	Limited demand for large group camping
Campground-equestrian	10-15 sites	Equestrian campground ideally located near Blue Tree trail system
Rim Trail w/overlook		Development of trails is a critical component of this scenario. Trails should be designed to accommodate varying skill levels. Market supportable trail mileage is as follows: Hiking 109 miles, Equestrian 65 miles, Mountain Biking 33 miles
Canyon Trail/Trailhead		Same comment as above
Hiking Trails/Trailhead		Same comment as above
Mountain Bike Trails/north of S.R. 157		Same comment as above
Mountain Bike Trails/south of Canyon		Same comment as above

Source: PricewaterhouseCoopers, 2008

Note: Capacities include both existing and new facilities.

2.2.6.5 Visitor Center, Retail Space, and Classroom Space

PwC qualified an annual estimate of 115,000 to 120,000 visitors for the proposed visitor center for Middle Kyle Canyon. This level of visitation assumes high quality interpretive experiences are provided, and that the visitor center would offer themes different from those at neighboring facilities (such as Hoover Dam Visitor Center). These visitation numbers are in the range of other area museums and visitor centers focused on serving local resident demand. It should be noted there are 17 similar comparable facilities in southern Nevada. Market research indicates that a visitor center facility of the size proposed under Scenario 4 would also provide support for a gift/book/sundry retail offering. Additionally, a facility of this size would typically require indoor meeting space to support the visitor center operations. However, no formal outdoor classrooms are needed. Qualitative market research indicates that as the scope of day use activities expands in Middle Kyle Canyon, the need for expanding the plaza/commons area as well as landscape and play space is required.

Based on current utilization, and projected regional population growth, there is demonstrated demand for additional individual picnic sites in Kyle Canyon. The addition of the nature/wildlife themed visitor center and expanded unique playground area will likely create additional, incremental picnic demand. As many as 170 to 190 sites may be needed by 2015. As with Scenario 3, if the Forest Service decides to reduce or eliminate the operations at Cathedral Rock, the current capacity of 72 sites would likely need to be replaced elsewhere in the MKC. However, there is unused capacity at the picnic areas in Lee Canyon and it may be preferable to encourage visitors to go there.

Based on current utilization and projected population growth, there appears to be demonstrated demand for additional individual campsites on the east side. Up to 240 to 260 sites may be needed by 2015 to accommodate existing and estimated future demand for the area. Approximately 25 percent to 50 percent of these sites should accommodate full size RVs with full hook ups.

Multiple data sources (NVUM, SCORP, and the Outdoor Industry Association [OIA] Recreational Use profiles) indicate that walking, hiking, and mountain biking/off road dirt biking are all activities with high levels of demand. As such, at a minimum, it appears that the trail mileage outlined under the MKC Framework Plan preferred option would have market support. Since this scenario incorporates the components of a traditional day use area (as outlined in Scenario #3), recreational trail use remains a high priority. In addition to the trails outlined, market research identified the desire for the creation of potentially three levels of mountain biking experiences. At the beginner's level, market research identified the desire for a family-friendly "learners track" for mountain biking. This would allow families with children and other inexperienced mountain bike riders the opportunity to try biking in the mountains on a trail that is less challenging. More experienced riders could take advantage of proposed outer- and inner-single track bike loops for cross-country riding. Finally, a downhill cycling course would be attractive on the mountain bike loop north of SR 157, or other nearby suitable location, where the addition of natural feature trail elements would provide for a challenging mountain biking course.

Estimated acreages for east side recreation facilities are provided in Table 5-6.

Table 5-6 New Recreation Facilities to Meet Future East Side Demand

Facility	Estimated Quantity
MKC Visitor Center and related facilities	20 acres
Picnic areas	36 acres
Trailheads	15 acres
Trails	50 miles
Future ski area	160 acres
Campgrounds	150 acres

Source: USDA Forest Service, 2008, Middle Kyle Canyon Conceptual Plans

Notes: Facilities in this table are aggregated compared to those in Table 5-4 to facilitate landscape analysis of potential effects from new recreation facilities on special status species.

2.2.7 Recreation Management Challenges and Opportunities

The foregoing sections illustrate existing conditions and capacities for recreation use on the Spring Mountains NRA. Section 2.2.1 is a discussion on RCM, which presents the attraction criteria that managers use when deciding where to develop recreation facilities and that visitors or users consider when deciding whether to visit a site. RCM results are presented for ten types of facilities. Capability is "theoretical," in that on the ground constraints, such as habitat for special status species, are not considered. The next section reports results from SMEs, which focus on current and future trends for recreation use in southern Nevada. The next section integrates findings from interviews with the SMEs along with other programmatic planning efforts for outdoor recreation throughout Nevada. Finally, Section 2.2.2 includes projections of future use, based on the current mix of recreation uses on the Spring Mountains NRA and based on types of facilities that are financially sustainable for the Forest Service. This discussion is followed by a section on the estimated capacities of facilities needed to meet that demand. These sections were based heavily on existing data collected either by ENTRIX or PwC. The following section is a qualitatively based discussion on challenges and opportunities the Forest Service will face in managing the Spring Mountains NRA for recreation over the next ten years. This section is more broadly based on information obtained on regional recreation trends affecting southern Nevada and southern California.

2.2.7.1 Management Limitations

Recreation program changes in response to recreation demand shifts or demand increases have been slowed by resource issues. Operations and Maintenance (O&M) funding for the Spring Mountains NRA have been steadily declining, and until recently, "no action" in terms of capital investment has been the norm. Allocated O&M funding limitations have heightened concerns for financial sustainability of the entire recreation program on the Spring Mountains NRA. In the future, O&M financial strategies must be considered in all new facility proposals.

2.2.7.2 Management of Snow Play Activities

The Forest Service currently has snow play activities at Foxtail and Lee Meadows. Snow play at Foxtail is managed by a concessionaire, and users are required to pay a fee, whereas at Lee Meadows, there is no concessionaire, and no fee is required. Anecdotal information for the Spring Mountains NRA indicate periods of peak recreation often follow periods of snowfall, especially on weekends or holidays. Since parking is allowed in multiple locations along State Highways 156, 157, and 158, snow play activities spread out in many locations along the highways resulting in reports of traffic congestion and unsafe interactions between vehicles and people.

Informal discussions with many local Mt. Charleston residents, local law enforcement officers, and Forest Service personnel indicate that snow play is perceived to create recurring management issues. Current proposals for east side and west side recreation improvements do not include any Forest Service strategies or facilities to better manage snow play. RCM identified 19,262 acres as either moderately or highly capable of supporting snow play, which implies potential options could exist to increase capacity for managed snow play. The Las Vegas Ski and Snowboard Resort (LVSSR) is proposing a snow play area as part of their new Master Plan. Additionally, Dr. Chavez indicated that in southern California specialized forms of snow play maybe increasing.

Besides proposals to provide snow play at the LVSSR, one potential management response is to maintain the existing snow play opportunities, given safety and resource impact issues associated with this activity, and not allow any expansion. This option could include

management strategies to better control parking and snow play along the highways to mitigate safety concerns.

Another option is to expand snow play, given potential demand and the amount of moderate and highly capable acres. These opportunities could be of a relatively unmanaged type such as at Lee Meadows, or it could highly regulated, with more facilities, amenities and fees, and managed by the LVSSR, the current concessionaire, or some other concessionaire. This option could also include restricting or eliminating shoulder parking along the highways to mitigate associated traffic congestion and safety issues. Finally, a third option is recognizing safety hazards and potential resource issues to eliminate snow play from the Spring Mountains NRA.

2.2.7.3 Additional OHV Route Designation

The Spring Mountains NRA is in the process of implementing the OHV route designation program. A motorized vehicle route map has been completed, many newly designated routes have been signed, and closure signs have been posted on the some of the routes that have been designated closed. However, how successful the designated route system will be in keeping motorists on system routes has yet to be evaluated, and there continues to be strong demand for new OHV trails throughout Nevada. OHV users tend to be well organized and vocal in advocating for new trails. There may be opportunities to expand the trail system on the west side by collaborating with BLM and OHV user groups, which would respond to Issue 4a from the Nevada Trails Plan. A system providing challenges and experiences that are more responsive to trail user demands could also be useful in keeping more riders on designated routes.

2.2.7.4 Responding to Changes in Visitor Ethnicity

Interviews with several SMEs (Chavez, Sheffield, and Weaver) indicated one trend in southern Nevada is increasing use of public lands for recreation by Latinos. Visitor research has established distinct differences in recreation site preferences and activity participation between Latino and Anglo visitors. One of the major differences is a tendency for Latinos to recreate in larger groups, thus requiring large group type sites. Conversely, PwC's findings indicate existing Spring Mountains NRA developed group sites continue to be underutilized. Concession and Forest Service staff observations indicate single-family picnic sites are often utilized by groups far larger than their design capacity. These observed patterns may be related.

Future development proposed as part of the MKC Framework Plan preferred option propose only limited future sites designed to accommodate large groups. For example, Table 5-4 shows there is one proposed, future group picnic site with a capacity of 50 people. The MKC Framework Plan preferred option has instead emphasized doubling the capacity of new single-family sites. While this group site capacity is consistent with demand evidenced by recent use data for existing Spring Mountains NRA group sites, macro demographic trends would indicate it may not be sufficient capacity to support Latinos or other ethnic groups engaged in extended family gatherings during peak demand period. Depending upon actual future trends in group sizes and use patterns, the Forest Service may want to be more responsive to changes in Latino visitation by designated larger group-type sites.

2.2.7.5 Facilitating Special Events

Interviews with Nevada State Parks staff indicated there is growing demand at Valley of Fire State Park for hosting various types of special events such as triathlons, OHV rallies, and weddings. On the Spring Mountains NRA, anecdotal evidence indicates there is growing demand for organized hikes by groups such as the Sierra Club. There are other types of special events such as the "pink jeep" tours, and occasional requests for filming movies or commercials. Conversations with State Park planners in California indicate there is high demand for special

events (boat races, marathons, environmental education and learning programs) at park units throughout California. It is likely that demand for special events will grow in southern Nevada the future, and the Forest Service has an opportunity to try to facilitate these events in a manner consistent with protection of biological resources. Common space proposed as part of the Middle Kyle facilities could provide a venue for community events that could enhance public appreciation and respect for the Spring Mountains NRA.

2.2.7.6 Geocaching

Geocaching is an activity on the rise on public lands. A recent survey on the Spring Mountains NRA found 33 geocaching devices. A draft geocaching management policy has been prepared and is under review. The draft policy language states there shall be no geocaching in the wilderness. However, there could still be opportunities for geocaching outside of wilderness areas on the Spring Mountains NRA. This type of activity may fall under the general category of facilitating special events. Depending upon how geocaching activities evolve and are or are not managed in the future, they could potentially become more of a source of adverse resource impacts and/or could become a means to engage new groups and visitors in discussions of environmental ethics and education.

2.2.7.7 Climbing

The Spring Mountains NRA has worked with climbing user groups to educate them about impacts to special status species. In 2006 a climbing route inventory was completed, and could allow the Forest Service to focus their management attention on these routes. One of the biggest challenges with managing climbing is addressing the number of braided trails to lead climbing routes. Another challenge is how to manage climbing in wilderness areas, which include many existing and potential routes. Guidelines for managing new routes and associated rock bolts, including permit requirements for establishing new bolted routes, have been proposed in the draft Rainbow Mountain and La Madre Mountain Wilderness Plan developed jointly by the BLM and Forest Service. Climbing routes and associated access trails inside and outside of wilderness can be expected to continue to grow in numbers as climbers' pioneer new routes. Potential permit requirements might slow or restrict that growth.

2.2.7.8 Environmental Education

The Spring Mountains NRA has implemented a number of environmental education efforts aimed at reducing impacts to species listed in the Clark County Multiple Species Habitat Conservation Plan (MSHCP). The Conservation Agreement lists 22 information and education (I&E) measures that could be used to reduce impacts, and the MSHCP lists four measures. The Forest Service has implemented most of the above-mentioned measures. There is a need for funding, and a need to build partnerships with other environmental education type groups, with various recreation user groups, and with the general public. After the Middle Kyle Canyon complex is completed, there may be upcoming opportunities to seek new funding and partnerships similar to what has been done with the San Bernardino National Forest Association.

2.2.7.9 Summary of Recreation Use on the Spring Mountains NRA

During the last five years, the Forest Service has collected extensive data on site occupancy and visitor preferences for recreation site amenities on the Spring Mountains NRA. The Forest Service has engaged several contractors to assist in preparing a west side management plan, an interpretive master plan, and a plan for Middle Kyle Canyon, all with the intent of meeting future recreation demand. Demand studies prepared by PwC are based on the current mix of recreation activities occurring on the Spring Mountains NRA and estimate future use for a 10-

year period. PwC's recommended quantities were developed to support changes in current recreation uses in a manner that is financially sustainable for the Forest Service. As discussed in Section 2.2.7, the Forest Service will still need to respond to other types of recreation uses and user groups, such as those that are emerging in southern Nevada and southern California and conceivably new trends that have not yet even been identified.

3.0 BIOLOGICAL ASSESSMENT

3.1 METHODS

As described above, the overall analytical approach was divided into the following general steps:

- Review available information,
- Determination of the spatial overlap between species and activities,
- Determination of the potential effect of activities on species,
- Determination of the benefits of established conservation measures on reducing the potential effects of activities, and
- Describe expected outcome and identify potential management recommendations
- These steps are illustrated in Figure 5-13.

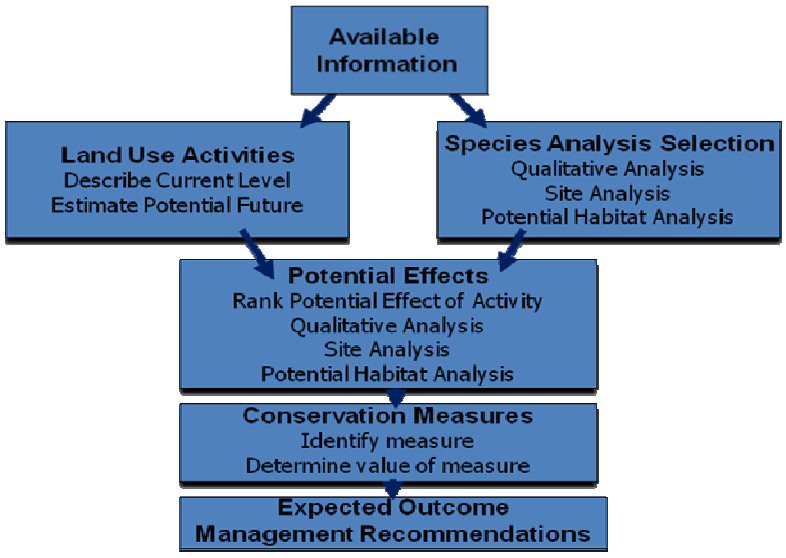

Figure 5-13. The general steps associated with the biological assessment for the Spring Mountains Landscape Analysis.

At the onset of the biological assessment, a workshop was developed in an effort to provide a basic understanding of the quantitative GIS platform based analysis used in this effort. A copy of the presentations from that workshop is included in Appendix 5B. It includes a set of step-by-step instructions for the analysis as well as provides examples of the output from the process. This section, in concert with Appendix 5B, describes the specific methods employed to conduct the analysis.

3.1.1 Levels of Analysis

We employed two approaches for assessing the potential interaction of land use activities and species conservation on the Spring Mountains NRA: 1) species/land use activity interaction (quantitative analysis), and 2) conservation status assessment (qualitative approach). The level of analysis for a species was linked to the quality of available data and information. Higher quality information allowed for a more intensive analysis. The quantitative approach used spatial data to describe existing land uses and habitats for approximately 54 special status species (Table 5-7). The quantitative analysis involved two data sets: 1) occurrence localities and 2) potential habitat. It then used information from the literature review on known impacts and best professional judgment to determine the potential effect of the various types of land uses, as well as the potential benefit of conservation measures that occur within the Spring Mountains NRA, on habitat for special status species. The conservation status assessment was based on the assessor's overall knowledge of the species or community that allowed them to weigh a variety of biological factors and threats to consider all pertinent information. A qualitative conservation status assessment was performed on all 59 species (Table 5-7). For those species with extremely limited or no occurrence data on the Spring Mountains NRA, a quantitative analysis was not conducted.

Table 5-7 Identification of the level of analysis for each species.

Note: Species are listed by the taxonomic names used in the CA and/or MSHCP followed by current common and scientific name if different (NatureServe 2008, ITIS 2008 and Bisby et al. 2008 for wildlife; USDA, NRCS 2008 for plants).

Species Name		Quantitative Analysis		Qualitative Analysis
CA/MSHCP taxonomy	Current Taxonomy	Potential Habitat Analysis	Occurrence Locality Analysis	
Invertebrate species (Springsnails)				
Spring Mountains springsnail (*Pyrgulopsis deaconi*)	Spring Mountains pyrg (*Pyrgulopsis deaconi*)		X	X
Southeast Nevada springsnail (*Pyrgulopsis turbatrix*)	Southeast Nevada pyrg (*Pyrgulopsis turbatrix*)		X	X
Invertebrate species (Butterflies)				
Spring Mountains checkerspot (*Chlosyne acastus robusta*)	Acastus checkerspot (*Chlosyne acastus robusta*)		X	X
Bret's blue *(Euphilotes battoides) inyomontana*)	Bernardino blue (*Euphilotes bernardino*)		X	X
Dark blue *(Euphilotes enoptes purpurea)*	Spring Mountains dark blue (*Euphilotes ancilla purpura*)		X	X
Morand's checkerspot *(Euphydryas anicia morandi*)	Morand's checkerspot (*Euphydryas chalcedona morandi*)		X	X
Spring Mountains comma skipper (*Hesperia colorado* ssp.)	Spring Mountains comma skipper (*Hesperia colorado mojavensis*)		X	X
Nevada admiral (*Limenitis weidemeyerii nevadae*)			X	X
Spring Mountains icarioides blue (*Icaricia icarioides austinorum*)	Spring Mountains icarioides blue (*Plebejus icarioides austinorum*)		X	X
Mt. Charleston blue *(Icaricia shasta charlestonensis*)	Mt. Charleston blue (*Plebejus shasta charlestonensis*)		X	X
Carole's silverspot (*Speyeria zerene carolae*)	Carole's fritillary (*Speyeria carolae*)		X	X
Invertebrate species (Insects)				
Charleston ant (*Lasius nevadensis*)				X

Table 5-7 Identification of the level of analysis for each species.

Note: Species are listed by the taxonomic names used in the CA and/or MSHCP followed by current common and scientific name if different (NatureServe 2008, ITIS 2008 and Bisby et al. 2008 for wildlife; USDA, NRCS 2008 for plants).

Species Name		Quantitative Analysis		Qualitative Analysis
CA/MSHCP taxonomy	Current Taxonomy	Potential Habitat Analysis	Occurrence Locality Analysis	
Mammal species (bats)				
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	Pale lump-nosed bat (*Corynorhinus townsendii pallescens*)		X	X
Allen's lappet-browed bat (*Idionycteris phyllotis*)	Allen's big-eared bat (*Idionycteris phyllotis*)		X	X
Silver-haired bat *Lasionycteris noctivagans*				X
Western small-footed myotis (*Myotis ciliolabrum*)			X	X
Long-eared myotis *Myotis evotis*			X	X
Fringed myotis *Myotis thysanodes*			X	X
Long-legged myotis *Myotis volans*			X	X
Mammal species (rodents)				
Palmer's chipmunk (*Tamias palmeri*)	Palmer's chipmunk (*Neotamias palmeri*)	X	X	X
Avian species (birds)				
Northern goshawk (*Accipiter gentilis*)		X	X	X
Flammulated owl (*Otus flammeolus*)		X	X	X
Reptilian species (snakes, lizards, tortoises)				
Western red-tailed skink (*Eumeces gilberti rubricaudatus*)	Western redtail skink (*Eumeces gilberti rubricaudatus*)			X
Plant species (Alpine and Subalpine)				
Charleston pussytoes (*Antennaria soliceps*)	Charleston Mountain pussytoes (*Antennaria soliceps*)	X	X	X
Jaeger whitlowgrass (*Draba jaegeri*)	Jaeger's draba (*Draba jaegeri*)	X	X	X
Charleston draba (*Draba paucifructa*)	Charleston Mountain draba (*Draba paucifructa*)	X	X	X
Charleston ivesia (*Ivesia cryptocaulis*)	Charleston Peak mousetail (*Ivesia cryptocaulis*)	X	X	X
Clokey silene (*Silene clokeyi*)	Clokey's catchfly (*Silene clokeyi*)	X	X	X
Charleston tansy (*Sphaeromeria compacta*)	Compact chickensage (*Sphaeromeria compacta*)	X	X	X
Charleston kittentails (*Synthyris ranunculina*)	Charleston Mountain kittentails (*Synthyris ranunculina*)	X	X	X
Plant species (Cliffs and Steep Slopes)				
Inch high fleabane (*Erigeron uncialis* ssp. *conjugans*)	Lone fleabane (*Erigeron uncialis* ssp. *conjugans*)		X	X
Clokey greasebush (*Glossopetalon clokeyi*)	Clokey's greasebush (*Glossopetalon clokeyi*)	X	X	X
Smooth dwarf greasebush (*Glossopetalon pungens* var. *glabrum*)	Dwarf greasebush (*Glossopetalon pungens*)		X	X
Rough dwarf pungent greasebush (*Glossopetalon pungens* var. *pungens*)	Dwarf greasebush (*Glossopetalon pungens*)		X	X
Jaeger ivesia (*Ivesia jaegeri*)	Charleston Peak mousetail (*Ivesia jaegeri*)	X	X	X
Plant species (Low Elevation)				
Black woolypod (*Astragalus funereus*)	Funeral Mountain milkvetch (*Astragalus funereus*)	X	X	X
Spring Mountains milkvetch (*Astragalus remotus*)			X	X
Clokey buckwheat (*Eriogonum heermannii* var. *clokeyi*)	Clokey's buckwheat (*Eriogonum heermannii* var. *clokeyi*)	X	X	X
Death Valley beardtongue (*Penstemon fruticiformis* ssp. *amargosae*)		X	X	X

Table 5-7 Identification of the level of analysis for each species.

Note: Species are listed by the taxonomic names used in the CA and/or MSHCP followed by current common and scientific name if different (NatureServe 2008, ITIS 2008 and Bisby et al. 2008 for wildlife; USDA, NRCS 2008 for plants).

Species Name		Quantitative Analysis		Qualitative Analysis
CA/MSHCP taxonomy	Current Taxonomy	Potential Habitat Analysis	Occurrence Locality Analysis	
Plant species (Mixed Conifer)				
Rough angelica (*Angelica scabrida*)	Charleston Mountain angelica (*Angelica scabrida*)	X	X	X
Rosy King sandwort (*Arenaria kingii* ssp. *rosea*)	King's rosy sandwort (*Arenaria kingii* ssp. *rosea*)	X	X	X
Clokey milkvetch (*Astragalus aequalis*)	Clokey's milkvetch (*Astragalus aequalis*)	X	X	X
Clokey eggvetch (*Astragalus oophorus* var. *clokeyanus*)	Egg milkvetch (*Astragalus oophorus* var. *clokeyanus*)	X	X	X
Clokey paintbrush (*Castilleja martinii* var. *clokeyi*)	Wavyleaf Indian paintbrush (*Castilleja applegatei* ssp. *martini*)	X	X	X
Clokey thistle (*Cirsium clokeyi*)	Whitespine thistle (*Cirsium clokeyi*)	X	X	X
New York Mountains catseye (*Cryptantha tumulosa*)	New York Mountain cryptantha (*Cryptantha tumulosa*)			X
Dicranoweisia moss (*Dicranoweisia crispula*)				X
Nevada willowherb (*Epilobium nevadense*)		X	X	X
Charleston goldenbush (*Ericameria compacta*)	Charleston Mountain goldenbush (*Ericameria compacta*)	X	X	X
Charleston pinewood lousewort (*Pedicularis semibarbata* var. *charlestonensis*)	Charleston lousewort (*Pedicularis semibarbata* var. *charlestonensis*)	X	X	X
Charleston beardtongue (*Penstemon leiophyllus* var. *keckii*)	Keck's beardtongue (*Penstemon leiophyllus* var. *keckii*)	X	X	X
Jaeger beardtongue (*Penstemon thompsoniae* ssp. *jaegeri*)	Jaeger's beardtongue (*Penstemon thompsoniae* ssp. *jaegeri*)	X	X	X
Hitchcock bladderpod (*Lesquerella hitchcockii*)	Hitchcock's bladderpod (*Lesquerella hitchcockii*)	X	X	X
Clokey mountain sage (*Salvia dorrii* var. *clokeyi*)	Purple sage (*Salvia dorrii* ssp. *dorrii* var. *clokeyi*)	X	X	X
Charleston grounddaisy (*Townsendia jonesii* var. *tumulosa*)	Jones' Townsend daisy (*Townsendia jonesii* var. *tumulosa*)	X	X	X
Charleston violet (*Viola purpura* var. *charlestonensis*)	Charleston mountain violet (*Viola charlestonensis*)	X	X	X
Plant species (Riparian and Springs)				
Upswept moonwort (*Botrychium ascendens*)	Trianglelobe moonwort (*Botrychium ascendens*)		X	X
Dainty moonwort (*Botrychium crenulatum*)	Scalloped moonwort (*Botrychium crenulatum*)		X	X
Slender moonwort (*Botrychium lineare*)	Narrowleaf moonwort (*Botrychium lineare*)		X	X

The occurrence locality assessment was conducted on all 54 species selected for a quantitative analysis (Table 5-7). This analysis was based on known occurrence localities on the Spring Mountains NRA. Occurrence localities refer to a mapped location of where a particular species was observed. These locations were represented by a point and/or a polygon, depending on the completeness of the recorded data, the precision of the mapping (i.e., degree of confidence that the mapped point or polygon occurrence accurately reflects its actual geographic location) as well as the thoroughness of species-specific surveys at that location.

The potential habitat analysis was performed on 30 species where the existing information could be used to produce a map that approximately represented the species potential habitat distribution on the Spring Mountains NRA. Potential habitat distribution maps were created for a given species using a combination of GIS-based habitat attributes (e.g., landform, elevation,

slope, soil type, precipitation, and vegetation community) derived from the collection of point and polygon occurrences for that species on the Spring Mountains NRA (Appendix 5D). These maps were used to estimate the potential distribution and size of areas where a species might occur based on their association with the attributes. The type of data available and used for analysis is summarized in Table 5-7, and included occurrence locality (point and polygon occurrence data), and potential habitat distribution.

3.1.2 Data Sources, Acquisition and Importation

PLANTS

- Nevada Natural Heritage Program (NNHP) occurrence data (July 29, 2005)
- Assorted biological monitoring reports 1995-2006

SPECIFIC PLANTS

- Summary of *Botrychium* sites from NNHP, Farrar (2002), pers. comm. Farrar (2003, 2008) and site specific surveys
- SWCA springs database
- Farrar 2003 & 2004 reports

INVERTEBRATES

BUTTERFLIES

- NNHP occurrence data
- Boyd et al. (2000)
- Boyd (2004 & 2005)
- Boyd and Austin (1999, 2001 & 2002)
- Weiss et al. (1995 & 1997)

SPRINGSNAILS

- NNHP occurrence data
- SWCA survey points
- SWCA springs database

MAMMALS

PALMER'S CHIPMUNK

- Potential habitat derived from info in Lowrey (2002) and Christopher Lowrey's draft model of potential habitat developed at the U.S. Geological Survey
- SWCA survey points

BATS

- SWCA survey points
- NNHP occurrence data
- Caves/Tunnels shapefile provided by USFS (all caves used as potential roost sites)
- Springs in O'Farrell 2002a, 2002b, 2006 reports
- Springs in Ramsey 1997 report

BIRDS

- Great Basin Bird Observatory (GBBO) Bird Atlas data
- GBBO Nevada Bird Count data
- Nevada Breeding Bird Atlas data
- Arsenault (2002) – Flammulated owl
- Miscellaneous reports/sightings provided by Karen Harville
- 2003-2006 Northern Goshawk Projects
- Peregrine falcon surveys (2004)
- Acoustic owl surveys (2005)

3.1.3 Determine the Spatial Area of Overlap (AO) between Species and Activities

3.1.3.1 Land Use Activity Groupings

The following is the list of activities evaluated:

- Horse and Burro Areas
  - within 0.25 mile of springs
  - 0.25 to 1 mile of springs
  - greater than 1 mile from springs
- Private Land and Buildings
- Linear Recreation Features
  - Closed Motorized Trails
  - Open Motorized Trails
  - Unpaved Roads

  - Non-system Non-motorized Trails
  - Low Use, High-Mile System Trails
  - High Use, Low-Mile System Trails
- Vegetation Management
  - Wildland Urban Interface areas
- Firewood Gathering
- Concentrated Use Areas
- Paved Roads
- Winter Recreation
  - Ski Area
  - Snow play Areas
- Developed Forest Service Areas:
  - Picnic Areas
  - Developed Canyon Trailheads
  - Trailheads Out of Developed Canyons
  - Forest Service Structures
  - Campgrounds

3.1.3.2 Species Occurrence/Habitat Determination

POINT LOCATION DISTRIBUTION ESTIMATES

Point location data were taken directly from or derived from the NNHP database or literature review sources and then expanded with a buffer. Some data, particularly for plants, were in polygon format, as a small round polygon most likely generated from point locations. The center of circles or center of polygons was calculated, and for all point data, a buffer was added for the Landscap Analysis. A buffer radius was assigned for each species or species group based on knowledge of their biology. For the bats, a 150-foot radius buffer (1.6 acres) surrounded each roost location. The flammulated owl had a 2.5-acre buffer for each point observation, and all other species had a 0.1-acre buffer for each point. The buffered areas were used for all analysis of overlap with activities, potential effects, and conservation measures.

POLYGON LOCALITY DISTRIBUTION ESTIMATES

Polygon locality data was provided by the NNHP database and was available for only the plant species. The data represents field delineations of areas with a plant species, as located with field Global Positioning System (GPS) units. No buffers were added to the NNHP polygon data.

The polygon data were analyzed for overlap with current and future activities, potential effects, and conservation measures.

POTENTIAL HABITAT DISTRIBUTION ESTIMATES

Polygons representing potential habitat were used for 30 species (Table 5-7). The polygons were created using a variety of GIS layers and attributes. The polygons were based on the following selection criteria:

- The frequency distribution of locality records represented a skewed distribution,
- Literature indicated a preference for a particular attribute, and
- Professional judgment of the interdisciplinary (ID) team suggested a preference for a particular attribute.

The resulting polygon provided an acceptable representation of the potential habitat based on professional judgment.

3.1.4 Potential Effects Determination

The Potential Effects Determination procedure was based on the relationship between the species, their habitat or location in question, and the extent and magnitude of relative potential impact specific to a species on lands within the Spring Mountains NRA. The potential effect determination approach was broken into the following components:

- Assignment of an Effect Index - the determination of a ordinal ranking of the potential magnitude of effect from alteration of habitat on a given species.
- Conversion of the magnitude of effect ranking – the ordinal ranking of the potential magnitude of effect was converted to a numerical value
- Incorporation of aggregate effects – the determination of a magnitude of an effect where the occurrence of several activities overlapped each other spatially.
- Calculation of potentially affected area/habitat - the summarization of the potential effect by activity and species, across the SMNRA landscape by multiplying the area of overlap between species habitat and activity with the magnitude of effect and/or aggregate magnitude of effect.
- Effects intensity distribution - a graphical and tabular illustration of the distribution of the magnitude of effect and/or aggregate magnitude of effect across the SMNRA.

The following sections detail the four major components of the potential effects determination.

ASSIGNMENT OF AN EFFECT INDEX

Development of the Effect Indices was a basic component of the analysis (Appendix 5B). The Effect Indices were developed for species or similar groups of species for each activity. The indices provided an estimate of the magnitude of potential effect associated with the structural component, operational activities, and maintenance from an activity.

BASIS FOR INDEX

Direct and indirect effects on species were generally analyzed for two areas associated with each activity: 1) the activity footprint, and 2) the Area of Influence for the activity. Direct effects included immediate effects of an activity on the species or its habitat. Such effects were typically considered direct “harm or harassment” to the individuals. Indirect effects were considered those that are caused by, or result from, the proposed action and are later in time, but still are reasonably certain to occur. In a management context, this would typically mean that activities are expected to affect species through an effect on habitat or through another mechanism such as disturbance during the nesting season from exposure to high levels of noise.

In addition to the type of impact, the likely severity, duration of occurrence, and the persistence of the effect must be considered in assessing risk to a species. The severity of the potential effect may vary. Some activities may cause an effect, but may have a less severe adverse effect on the population than mortality. The duration of an effect may be very brief, may be hours to days in length, or may be ongoing. Finally, the persistence describes the span of time over which an effect will occur. For most activity components (e.g., structural), most take will occur over the life of the facility (i.e., long-term), while other activities are temporary (i.e., less than one year) or short term (i.e., 2-5 years) in nature.

DETERMINING AN INDEX VALUE

For each species, a table that listed all of the activities that overlapped with the distribution for that species was developed (Appendix 5B). This table was used as a worksheet to assign an Effect Index for each activity, which was based on best available information in the literature and best professional judgment of the ID Team. In this manner, all available and appropriate information was used to assess, assign, and quantify the potential effect of activities on species.

The Effect Index worksheet was first divided into two general categories: 1) effects to individuals, and 2) effects to habitat. . Under effects to individuals, there were seven factors considered that could lead to potential harm. For each of these potential harm factors, an X was used on the worksheet to indicate that there was a nexus between that factor, the species being considered, and the particular activity. Effects to habitat considered 19 factors that could lead to potential degradation of habitat. Like the assessment evaluating harm to individuals, an X was used to indicate a nexus between a habitat effect factor, the species, and the activity being considered. If an X appeared next to a factor in the worksheet, associated text explained why there was a potential nexus and the magnitude or severity of the potential for effect on a species.

Once it was determined that an activity had a nexus and therefore a potential effect on a species, a judgment was made that assigned a potential magnitude effect value (score) for that activity. In general, activities with more factors that had a nexus between the activity and the species received a higher potential effect index value. Any activity with a nexus between harm to individuals, however, were weighted towards a higher potential index value. The range of values or scores for the magnitude of effect was: 1) N = no effect, TR = trace effect, L = low effect, M = medium effect, H = high effect, and TTL = total loss.

The Effects Index, as applied, was an ordinal, or ranking, of variable measuring effects. The objective of this ranking system was to score the effects of activities in a consistent way from place to place, from time to time, relative to one another. It was recognized that, for many of the species, it would be very difficult to quantify the impact of certain aspects of activities (perhaps even entire activities) in absolute terms. The Effects Index was therefore designed not as an interval or ratio variable. This system was simply a means for illustrating that X was worse than Y. For the purposes of this analysis, the magnitude of the potential effect included consideration of the value of conservation measures that are currently in place on the SMNRA. As a quality assurance check, the entire team reviewed the final rankings.

CONVERSION OF THE MAGNITUDE OF EFFECT INDEX

To facilitate a quantitative estimate of the potential effect of an activity on a species and/or their habitat, the ordinal values assigned to the magnitude of effects were converted to numeric values. The following scale was used:

- N = no detectable effect = 0,
- TR = trace effect = 0.05,
- L = low effect = 0.25,
- M = medium effect = 0.5,
- H = high effect = 0.75, and
- TTL = total loss = 1.0.

INCORPORATION OF AGGREGATE EFFECT VALUE

In estimating potentially affected habitat for activities on the SMNRA, the incorporation of the concept of cumulative effects was important. A literature review of cumulative impacts (Washington State DNR 2005) indicated that there was no straightforward method to assess cumulative effects in a quantitative way. Therefore, a weight of evidence approach was determined to be the most defensible. This approach has been applied to the Columbia River estuary ecosystem (Diefenderfer et al. 2005). In general, one can conclude there have been detectable cumulative impacts (end points) when the processes responsible for forming and maintaining habitat structure are impacted to a point where beneficial ecosystem functions and values are not longer measurable.

The incorporation of an cumulative effects concept, in this analysis, was limited to Spring Mountains NRA activities only. Therefore, we used the term “aggregate effect” to clarify that the analysis is an aggregation of effects associated with activities on the Spring Mountains NRA (appendix 5B). The extent and magnitude of an impact can be significantly increased when activities are concentrated (overlapping) in an area. To account for “additional impacts” not directly related to or accounted for in an individual activity we developed a mathematical to estimate of the effect associated with these overlapping activities. The following equation was used to calculate the aggregate magnitude of effect:

$$\text{Aggregate Magnitude of Effect (AME)} = ME_1/1 + ME_2/2 + Me_n/n$$

Where ME1 is the activity with the largest overlapping magnitude of effect, ME2 is the activity with the second largest overlapping magnitude of effect, and n represents the number of overlapping activities.

CALCULATION OF RELATIVE AREA POTENTIALLY AFFECTED

This was the summarization of potential activity effects, as indicated by area (acres/hectares) of potentially affected species habitat, across the landscape, and for species (Appendix 5B). This consisted of multiplying the magnitude of effect (ME) for an activity by the area of overlap (AO) for that activity. This also provided the incorporation of other estimations such as percent of species distribution that is potentially affected by Spring Mountains NRA activities in relation to that available across the landscape. The data summaries assist in determining: 1) what activities are having the greatest impacts on habitats and the species they support, 2) what activities are contributing to, or limiting recovery of, a species on a regional scale, and 3) what conservation measures should be emphasized for an activity, ecosystem, habitat, and species basis to encourage conservation.

EFFECTS INTENSITY DISTRIBUTION

As described above, potentially affected habitat was summarized by activity for each species across the Spring Mountains NRA. The potentially affected habitat summary was also provided by individual activity rather than combined activities. An important perspective for developing conservation strategies is to understand where potential affected habitat is greatest (or least) on a landscape scale when looking at the potential effect of activities combined. Therefore, effect intensity distribution data were used to illustrate or map the intensity of potential effects for Spring Mountains NRA managed lands.

Summing the effect intensity values (described above) for all activities derives the effect intensity distribution. The effect intensity values represent the relative potential effect across the Spring Mountains NRA. To illustrate the relative effect intensity on a map, the minimum and maximum values of effect intensity are divided into four ranges and assigned a symbol (or color). The symbol or color represents a value within a range (e.g., low medium, high) of potential effect intensity and associated with a value. The potential effect intensity is then illustrated on a map for the region.

3.1.5 Conservation Measures

Conservation measures were identified by consulting three primary sources of information:

- Conservation Agreement, 5 year report and analyses,
- USDA Forest Service General Management Plan amendment to the Humboldt-Toiyabe National Forest Land and Resource Management Plan, and
- Clark County Multiple Species Habitat Conservation Plan.

The conservation measures from the three source documents were organized in a spreadsheet (Appendix 5E). To facilitate their use in the analytical approach, conservation measures were classified into 12 broad categories, which included:

- Coordination (15 conservation measures)
- Fire and fuelwood planning (20 conservation measures)

- Habitat development (3 conservation measures)
- Habitat restoration (25 conservation measures)
- Increase recreation areas (6 conservation measures)
- Information and education (26 conservation measures)
- Limiting recreation development (13 conservation measures)
- Management and protection of species (1 conservation measure)
- Monitoring recreation use and effects (4 conservation measures)
- Resource protection (49 conservation measures)
- Restricting access to recreation sites (26 conservation measures)
- Species protection and monitoring (5 conservation measures)

These categories were further refined to eliminate redundancy and were classified into avoidance, minimization, mitigation, or research/monitoring type conservation measures:

- Coordination and planning
- Habitat measures
- Habitat restoration
- Resource protection
- Recreation management
- Information and education
- Research/monitoring/surveying

In the revised matrix, land use actions for which there is an overlap with Potential Habitat Distribution (PHD) impacts were rated for potential effects (PE), and conservation measures were applied to reduce the PE. Blank spaces within the revised matrix indicate no action effects. IMPLEMENTED (current) and NON-IMPLEMENTED (future) were considered in the application of conservation measures. Conservation measures are organized into four broad categories, and are defined below. However, the fourth category was not used in the quantitative analysis, but has been presented because the professional judgment of the ID team suggests these measures have value, but are not easily measured.

3.1.5.1 Avoidance

Avoidance conservation measures avoid the negative effect on an action and include two categories of current and future conservation measures: resource protection and recreation management. Resource protection conservation measures prevent impacts to species and habitats and include actions such as fencing. Recreation management conservation measures prevent impacts to habitats by altering visitor behavior and including actions such as closure orders, coordination with recreation user groups, limiting new bolted climbing routes, and

seasonal closure of caves. Metrics are: variable, acres, compliance with regulations, or closure orders. Spring Mountains NRA examples include:

- Conduct pre-activity surveys for the species of concern prior to any actions that may affect them, and design projects to avoid adverse effects. Ensure that surveys consider unique habitat components of the species of concern.

- Use temporary closures (roads, trails, dispersed areas) to protect important seasonal habitat for species of concern (animals, plants, and insects) in coordination with appropriate state and local agencies.

- Use fencing for protection only where no viable alternative exists.

- Protect habitat of the species of concern from dispersed recreation (e.g., heavy foot traffic, off-road vehicles, mountain bikes), and the adverse effects of wild horses and burros.

- Develop new trails and discourage trail use inside of biodiversity hotspots to avoid further adverse effects on special status species (both existing and future activities).

- Future trail alignments in the developed canyons will emphasize resource protections (future activities only).

- New facilities and roads will be sited to avoid vital populations or habitats of species of concern (future activities only).

- New roads, administrative facilities, and developed recreation sites other than low-impact facilities (trails, trailhead parking, signs, restrooms, etc.) will be outside a 100-yard buffer zone around known Clokey eggvetch and rough angelica populations or potential habitat, and outside biodiversity hotspots (defined as areas of particular diversity or sensitivity) (future activities only).

- Manage wild horses and burros in the Spring Mountains NRA to avoid damage to species of concern habitats, particularly in lower Lee Canyon, northwest Mt. Stirling, Wheeler Pass, Wheeler Wash, Wood Canyon, Carpenter Canyon, lower Deer Creek, and continue to quickly remove.

- Allow motorized vehicle use only on designated roads and trails, except for snowmobile use in approved areas when practical. Close washes to motorized use.

- Work cooperatively with Federal, state, local agencies, tribal governments, and others to increase public education and awareness of resource values and interpretation opportunities throughout the Spring Mountains NRA.

- Develop new relationships/partnerships and strengthen existing efforts with various user groups, hunters and trappers, and recreational residence associations (in developed canyons), to help manage the Spring Mountains NRA and protect resources.

- Ensure that restoration projects focus on protection and enhancement of the species of concern and do not inadvertently cause irretrievable damage to the habitats of the species of concern (e.g., open water for bats, mud puddles for butterflies).

- Prior to use of pesticides and other chemicals, determine potential impacts to the species of concern (e.g., butterflies, bats), and implement strategies to avoid impacts to those species.

3.1.5.2 Minimization

Minimization conservation measures reduce the magnitude of the effect of an action and include three categories of current and future actions: Information and Education (I&E), Coordination and Planning, and Habitat Enhancement Measures.

- I&E: Information and Education conservation measures are designed to inform visitors about species and habitats to guide behavior to minimize impacting them. Examples include signage, media, community meetings, and websites. Probably low effectiveness.

- Coordination/Planning: Coordination and Planning conservation measures include interagency planning and coordination with the purpose of protecting species and habitat such as weed control and wild horse management. Consider specific metrics.

- Species/Habitat Management Measures are conservation measures designed to minimize or reduce the effect of an action. Specific examples include minimizing clearing of undergrowth during construction of new facilities and designing new roads and motorized trails to maintain a minimum 0.5-mile distance from active or recently active.

Spring Mountains NRA examples include:

- Conduct pre-activity surveys for the species of concern prior to any actions that may affect them, and design projects to minimize adverse effects. Ensure that surveys consider unique habitat components of the species of concern.

- Protect habitat of the species of concern from dispersed recreation (e.g., heavy foot traffic, off-road vehicles, mountain bikes), and the adverse effects of wild horses and burros.

- General conservation measure to allow roads to remain open unless it causes unacceptable resource damage.

- Develop new trails and discourage trail use inside of biodiversity hotspots to avoid further adverse effects on special status species (both existing and future activities).

- Future trail alignments in the developed canyons will emphasize resource protections (future activities only).

- New facilities and roads will be sited to avoid vital populations or habitats of species of concern (future activities only).

- Develop and distribute information and education materials directed at specific user groups (climbers, cavers, mountain bikers, equestrians, OHV users, etc.) and the public at large emphasizing protection of riparian habitats, alpine areas, and other sensitive areas.

- Educate the public to the sensitivity of endemic species of the Spring Mountains NRA, the importance of diversity, the significance of the Spring Mountains' biodiversity, and how to recreate without impacting these resources.

- Wherever possible, select only locally native species for restoration, and where appropriate, use seed from the plant species of concern and endemic butterfly host plants.

3.1.5.3 Restoration

Restoration conservation measures are designed to enhance species or habitat. This could be to mitigate or replace habitat lost as a result of impacts of an action. Specific examples include relocating existing roads outside of washes, riparian areas, and 50-year floodplains, and implementing vegetation management and restoration plans in campgrounds and day use areas. Metrics are: acres planted or seeded, non-native and invasive species removed, and acres allowed to regenerate naturally. Spring Mountains NRA examples include:

- Enhance developed sites where feasible to restore resource or wildlife values where recreation use has adversely affected resources.

3.1.5.4 Research/Monitoring/Surveying

Research, monitoring, and/or surveying conservation measures are designed to provide status and trends for species and habitats that influence subsequent conservation measures. Adaptive management related actions fall under this category. A specific example is conducting research on the species of concern and ecological communities of the Spring Mountains NRA by prioritizing research needs and identifying funding sources. Metrics are: Surveys document new species populations; research on restoration techniques in numbers of individuals, etc.; monitoring populations to get trends and reasons for trends.

3.1.6 Quantification of the Value of Conservation Measures

Development of the Value Indices for conservation measures was a basic component of the analysis. The Value Indices were developed for each species (or similar groups of species) and each activity based on three categories of conservation measures: 1) avoidance, 2) minimization, and 3) mitigation. The indices provided an estimate of the magnitude of potential value at offsetting the potential effect.

For each species, a table that listed all of the activities and categories of conservation measures was generated (Appendix 5F). This table was the location for assignment of a Value Index, which was based on best available information in the literature and best professional judgment. Once it was determined that a conservation category had a nexus, an estimate was made that assigned a potential effect value (score) for each component. The range of values ranged from no effect to complete removal. The value of the conservation measure was used as a multiplier for the magnitude of effect. The ordinate rankings and associated numeric conversions included:

- T or completely eliminated the potential effect with a multiplier of 0.0,
- H or a high value at removing the potential effect or a multiplier of 0.25,
- M or a medium value at removing the potential effect with a multiplier of 0.5,
- L or a low value at removing the potential effect with a multiplier of 0.75,
- TR or a trace value at removing the effect with a multiplier of 0.95, and
- N or no value with a multiplier of 1.0.

3.1.7 Spring Mountains NRA Conservation Status Assessment: Qualitative Analysis

Determining which plants and animals are thriving and which are rare or declining is crucial for targeting conservation towards those species and habitats in greatest need. NatureServe and its natural heritage member programs have developed a consistent method for evaluating the relative imperilment of both species and ecological communities (Appendix 5F). These assessments lead to the designation of a conservation status rank. For plant and animal species these ranks provide an estimate of extinction risk, while for ecological communities they provide an estimate of the risk of elimination. There is currently no conservation status rank determined for Ecological Systems.

Status assessments are based on a combination of quantitative and qualitative information. Criteria for assigning ranks serve as guidelines, however, rather than arithmetic rules. The assessor's overall knowledge of the species or community allows them to weigh each factor in relation to the others, and to consider all pertinent information. The general factors considered in assessing species and ecological communities are similar, but the relative weight given to each factor differs. For each Spring Mountains NRA species evaluated, a modification of the NatureServe status assessment was completed and summarized in tabular format. The assessment was based on the professional knowledge and judgment and available information of the Landscape Analysis inter-disciplinary team.

For Spring Mountains NRA species, the following factors were considered in assessing conservation status:

- Species Characteristics
  - Endemicity
  - Environmental specificity
  - Intrinsic vulnerability
- Distribution and Abundance
  - Number of known sites or occurrences
  - Viability
  - Estimated population size
  - Known area of occupied habitat
- Population Trend
  - Known population trend
- Threats
  - Severity (Current)
  - Scope (Current)

- Immediacy (Current)
- Immediacy (Future Anticipated Change)

3.1.8 Species Characteristics

3.1.8.1 Endemicity

Describes the extent of the geographic range to determine degree of rarity.

- SME = Spring Mountains Ecosystem endemic, including public and private lands in Clark and Nye Counties.
- MDE = Mojave Desert Ecoregion endemic.
- Wide-ranging = Wide-ranging species with occurrences extending beyond above two areas.

3.1.8.2 Environmental Specificity

Observed, inferred, or suspected vulnerability or resilience of the species due to habitat preferences or restrictions or other environmental specificity or generality.

- Very narrow = Specialist species with scarce key requirements: e.g., specific habitat(s), substrate(s), food type(s), hosts, breeding/non-breeding microhabitats, or other abiotic and biotic factors used or required that are scarce rangewide and/or within the area of interest, and the population is expected to decline significantly if any key requirements become unavailable.
- Narrow = Specialist species with key requirements uncommon within the Spring Mountains NRA, but common within the generalized range of the species.
- Moderate = Generalist species with some scarce key requirements. Broad-scale, diverse, or general habitat(s) or other abiotic and/or biotic factors are used or required by the species, but some key requirements are scarce in the generalized range of the species (e.g., cliffs, alpine habitat, etc.)
- Broad = Generalist species with all key requirements common. The species can switch among foods or breeding habitats with no decline in the species.
- Unknown.

3.1.8.3 Intrinsic Vulnerability

The observed, inferred, or suspected degree to which intrinsic biological characteristics of the species (e.g., life history or behavior characteristics of a species such as reproductive rates, time to maturity, dormancy requirements, and dispersal patterns) make it vulnerable or resilient to natural or anthropogenic stresses or catastrophes. Here, such topics as population size, number of occurrences, area of occupancy, extent of occurrence, or environmental specificity are NOT considered; however, these are addressed in other assessment factors.

- Highly vulnerable = Species is slow to mature, reproduces infrequently, and/or has low fecundity so that populations are very slow (>20 years or 5 generations) to recover from decreases in abundance; or the species has low dispersal capability such that extirpated

populations are unlikely to become reestablished through natural recolonization (e.g., blackbrush).

- Moderately vulnerable = Species exhibits moderate age of maturity, frequency of reproduction, and/or fecundity such that populations generally tend to recover from decreases in abundance over a period of several years (5-20 years or 2-5 generations); or species has moderate dispersal capability such that extirpated populations generally become reestablished through natural recolonization.

- Not intrinsically vulnerable = Species matures quickly, reproduces frequently, and/or has high fecundity such that populations recover quickly (<5 years or 2 generations) from decreases in abundance; or species has high dispersal capability such that extirpated populations soon become reestablished through natural recolonization.

- Unknown

3.1.9 Distribution and Abundance

3.1.9.1 Number of Known Sites (Animals) or Occurrences (Plants)

Describes the number of known (documented) sites (for animals) or occurrences at >1 km separation (for plants) believed extant.

- 1-5 = 1-5 sites or occurrences

- 6-20 = 6-20 sites or occurrences

- 21-80 = 21-80 sites or occurrences

- 81-300 = 81-300 sites or occurrences

- 300 = > 300 sites or occurrences

- Unknown

3.1.9.2 Viability (% of Sites or Occurrences Likely to Persist for 20 Years)

Describes the estimated number of sites (for animals) or occurrences at >1 km separation (for plants) believed extant that have excellent or good viability (i.e., if the *current* condition, size, and landscape context for a species are likely to have at least a 95% probability of persistence for 20 -100 years or 5 generations). In other words, these assessments provide the likelihood that if *current* conditions prevail; an occurrence will persist for a defined period of time, typically 20-100 years. This evaluation will mainly be based on best professional judgment, as species viability analyses have not been conducted.

- No occurrences, populations or area with excellent or good viability or ecological integrity

- Very Small Proportion = <10% of occurrences, populations, or area with good viability of ecological integrity

- Small Proportion = 11-20%

- Moderate Proportion = 21-40%

- High Proportion = >40%
- U = Unknown

3.1.9.3 Estimated Population Size

Estimated currently naturally occurring wild population size (numbers of individuals).

- No individuals known extant
- 1 – 50 individuals
- 51 – 250 individuals
- 251-1,000 individuals
- 1,001 – 2,500 individuals
- 2,501 – 10,000 individuals
- 10,001 – 100,000 individuals
- 100,001 – 1,000,000 individuals
- 1,000,000 individuals
- Unknown

3.1.9.4 Known Area of Occupied Habitat

Known area of known occupied habitat.

- < 1 acres
- 2 - 5 acres
- 5 – 10 acres
- 10 – 50 acres
- 50 – 100 acres
- 100 – 250 acres
- 250 – 500 acres
- 500 – 1,000 acres
- 1,000 – 5,000 acres
- 5,000 – 25,000 acres
- >25,000 acres

- Unknown

3.1.10 Population Trend

3.1.10.1 Known Population Trend

Describes the observed, estimated, inferred, or suspected degree of change in the population size, extent of occurrence, area of occupancy, and/or number or condition of occurrences.

- >70% decline = Severe decline of population size, range, extent, area occupied, and/or number or condition of occurrences remaining
- 50–70% decline = Very rapid decline of population size, range, extent, area occupied, and/or number or condition of occurrences remaining
- 30–50% decline = Rapid decline of population size, range, extent, area occupied, and/or number or condition of occurrences remaining
- 10–30% decline = Moderate decline of population size, range, extent, area occupied, and/or number or condition of occurrences remaining
- +/- 10% change = Stable, unchanged or reasonable fluctuation within +/- 10%
- 10%+ increase = Increasing population
- Unknown

3.1.11 Threats

Describes the degree to which the species is observed, inferred, or suspected to be directly or indirectly threatened for the rangewide and Spring Mountains populations *or* both as appropriate. This field evaluates the impact of extrinsic threats, which are typically anthropogenic but may be natural. The impact of human activity may be direct (destruction of habitat) or indirect (invasive species introduction). Effects of natural phenomena (fire, hurricane, flooding, etc.) may be especially important when the species is concentrated in one location or has few occurrences.

Threats considerations apply to the present and future. Effects of past threats (if not continuing) should be addressed under the short-term or long-term trend factors.

Threats include habitat degradation/loss of habitat such as alien species or development; over-utilization from collecting or over-harvest; diseases due to non-native species (e.g., gypsy moth); natural threats such as stochastic events like weather, predation, fire, etc. on small populations. If there is a prominent threat, evaluate that for severity, scope, and immediacy. If there are several threats, the scope should represent the overall threat from all.

3.1.11.1 Severity (Current)

The level of damage to the species from the threat(s) that can be expected given the continuation of current circumstances and trends (including potential new threats).

- High = 75–100%; severe to total loss of population or destruction of species habitat, with effects essentially irreversible or requiring long-term recovery (>100 years)

- Moderate = 50–75% loss; major reduction of species population or long-term degradation or reduction of habitat, or ecological community in Spring Mountains NRA, requiring 50–100 years for recovery

- Low = 10–50% loss; low but nontrivial reduction of species population or reversible degradation or reduction of habitat, or ecological community in Spring Mountains NRA with recovery expected in 10–50 years)

- Negligible = 0–10% loss; essentially no reduction of population or degradation of habitat due to threats. Note that effects of locally sustainable levels of harvest from wild populations are generally considered negligible as defined here

- Unknown

3.1.11.2 Scope (Current)

The proportion of the species that can be expected to be affected by the threat(s) given the continuation of current circumstances and trends (including potential new threats).

- High = > 60% of total population, occurrences, or area affected by threat(s)

- Moderate = 20-60% of total population, occurrences, or area affected by threat(s)

- Low = 5-20% of total population, occurrences, or area affected by threat(s)

- Negligible = < 5% of total population, occurrences, or area affected by threat(s)

- Unknown

3.1.11.3 Immediacy (Current)

- High = Threat is happening now, or is imminent (e.g., within a year)

- Moderate = Threat is likely to occur within 2-5 years

- Low = Threat is likely occur within 5-20 years

- Negligible = Threat is not likely to occur within 20 years

- Unknown

3.1.11.4 Immediacy (Future Anticipated Change)

It is assumed that there is at least one (or more) threat(s) existing and ongoing that affects each species. Based on that assumption, immediacy evaluates whether there will be a new threat or a change in an existing threat within the noted timeframe.

- High = A new threat or change in existing threat is imminent (e.g., within a year)

- Moderate = To occur within 2-5 years

- Low = To occur within 5-20 years

- Negligible = To occur beyond 20 years
- Unknown

3.2 INVERTEBRATE RESULTS

3.2.1 Springsnails

Two species of springsnails were evaluated: 1) Southeast Nevada springsnail, and 2) Spring Mountains springsnail.

3.2.1.1 Quality of Existing Information

The distribution of springsnails in the Spring Mountains NRA is very limited (Chapter 3/4) given that there are very few sites where these species are known to occur on the Spring Mountains NRA. In combination with their biological requirements and life stage characteristics, it would be unreliable to use information contained within the existing GIS platform database to model potential habitat for these species on the Spring Mountains NRA. Therefore, we used point occurrence information for the quantitative analysis. Quality of data among sites influenced the qualitative and quantitative analysis. While delineation and quantification of springsnail habitat would be valuable, use of only point occurrence information for these analyses was not determined to be limiting for these species. It is unlikely that new occurrences of these springsnails will be discovered in the Spring Mountains NRA to significantly change the qualitative and quantitative analyses outlined below.

3.2.1.2 Quantitative Analysis

The total habitat area represented by point occurrence localities for the springsnails was 0.4 and 0.2 acres for the Southeast Nevada springsnail, and Spring Mountains springsnail, respectively (Table 5-8 and Appendix 5F-1). The amount of this area that overlapped with Spring Mountains NRA activities was 75 percent for the Southeast Nevada springsnail and 80 percent for Spring Mountains springsnail. Both species, therefore, tended to have the same relative measure of habitat overlapping with activities. There was no difference for these species between current and future activities; that is, none of the proposed future activities overlapped with the current point occurrence locations for these species. Horses and burros (<0.25 mile from spring/streams), CUAs (area of influence), private land, and the WUI are the activities with the most overlap (Appendix 5F-1). Land use activities (current and future) had the largest relative potential effect (without conservation measures) on the Southeast Nevada springsnail (Table 5-8). We estimated that all activities combined would reduce the relative value of habitat for this species by 54 percent, whereas, these same activities would reduce the relative value of the Spring Mountains springsnail habitat by 32 percent. The relative potential effect, therefore on both of this species is significant. Implementation of avoidance conservation measures would reduce the relative potential effects to the greatest extent for the Southeast Nevada springsnail. Mitigation measures (habitat restoration) would reduce the current potential effects on the Spring Mountains springsnail to 24 percent. These types of conservation measures, therefore, have the potential to provide the greatest benefit to this species.

Table 5-8 Quantitative results on the interaction between springsnails and all activities on the Spring Mountains NRA.

	Current Activities		Current and Future Activities Combined	
	Southeast Nevada Springsnail	Spring Mountains Springsnail	Southeast Nevada Springsnail	Spring Mountains Springsnail
Total Area (acres)				
Point Occurrence	0.40	0.20	0.4	0.2
Area of Activity Overlap				
Point Occurrence	75.00%	80.00%	75.00%	80.00%
Relative Potential Effect				
Point Occurrence	54.25%	32.50%	54.25%	32.50%
Relative Potential Effect With Avoidance Measures				
Point Occurrence	38.75%	26.00%	38.75%	26.00%
Relative Potential Effect With Minimization Measures				
Point Occurrence	43.25%	24.50%	43.25%	24.50%
Relative Potential Effect With Mitigation Measures				
Point Occurrence	45.25%	26.50%	45.25%	26.50%

The distribution of the intensity of the relative effect of all current and future activities on springsnails is summarized in Table 5-9 and illustrated on figures in Appendix 5F-1. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For both species, over 75 percent of the occurrences fall within areas where the intensity of effect reduces the relative value of habitat by a low to moderately high degree. None of the occurrences fall within an area where the relative habitat value would be reduced by a high to complete loss for the Spring Mountains springsnail. However, for the Southeast Nevada springsnail, approximately 11 percent falls within this category which can be attributed to the activity of horses and burros at springs (<0.25 mile from spring/streams). It is also important to note that implementation of conservation measures would not result in a change in the distribution of occurrences relative to the intensity of effect for the Spring Mountains springsnail. However, the implementation of avoidance and minimization measures could benefit the Southeast Nevada springsnail and would significantly shift the percentage of locations that would fall in the High to Loss of All Value areas into areas where the intensity of effect is reduced. Based on existing conservation measures, the purchase of private lands would provide the largest benefit to the Southeast Nevada springsnail. However, existing conservation measures may not be entirely adequate and additional conservation measures may need to be evaluated for other activities that affect this species.

Table 5-9 Distribution of the intensity of effect for all activities on springsnails on the Spring Mountains NRA.

	Southeast Nevada Springsnail		Spring Mountains Springsnail	
Relative Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.40		0.20	
No Measurable[1]	15.63%	15.63%	19.40%	19.40%
Low to Moderately High	73.71%	73.71%	80.60%	80.60%
High to Loss of all Value	10.66%	10.66%	0.00%	0.00%
Relative Potential Effect with Avoidance Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.40		0.20	
No Measurable	23.84%	23.84%	19.40%	19.40%
Low to Moderately High	74.94%	74.94%	80.60%	80.60%
High to Loss of all Value	1.23%	1.23%	0.00%	0.00%
Relative Potential Effect with Minimization Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.40		0.20	
No Measurable	25.06%	25.06%	19.40%	19.40%
Low to Moderately High	73.71%	73.71%	80.60%	80.60%
High to Loss of all Value	1.23%	1.23%	0.00%	0.00%
Relative Potential Effect with Mitigation Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.40		0.20	
No Measurable	17.20%	17.20%	19.40%	19.40%
Low to Moderately High	74.94%	74.94%	80.60%	80.60%
High to Loss of all Value	7.87%	7.87%	0.00%	0.00%

1. No measurable effect = aggregate potential effect reduces the relative value of habitat to a degree where it could not be measured.

Low to Moderate effect = aggregate potential effect reduces the relative value of habitat by between 0.06 and 74 percent.

High to loss of all Value = aggregate potential effect reduces the relative value of habitat by greater than 75 percent.

3.2.1.3 Qualitative Analysis

The scope of threats is high for both the Southeast Nevada and Spring Mountains springsnails given the number of threats affecting the restricted ranges of these species (Table 5-10). Severity of threats ranks from low to moderate. Current conditions for the Spring Mountains populations of the springsnails are ranked as low, but severity of threats is considered moderate for these species rangewide due to the anthropogenic threats at springs outside the Spring Mountains NRA. Populations are ranked as stable for both species in the Spring Mountains based on the persistence of populations (population numbers or size are not available). Rangewide, the Southeast Nevada springsnail is considered to be in moderate decline and the Spring Mountains Springsnail is thought to be declining rapidly due to extirpations outside the Spring Mountains NRA.

Table 5-10 Conservation status assessment for springsnails found on the Spring Mountains NRA.

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Southeast Nevada springsnail (Pyrgulopsis turbatrix)					
Reference Condition Spring Mountains	Stable	Low	High	Moderate	
Current Condition Spring Mountains	Stable	Low	High	Moderate	Moderate
Current Condition Rangewide	Moderate	Moderate	High	Moderate	Moderate
Spring Mountains springsnail (Pyrgulopsis deaconi)					
Reference Condition Spring Mountains	Stable	Negligible	High	Moderate	
Current Condition Spring Mountains	Stable	Low	High	Moderate	Moderate
Current Condition Rangewide	Rapid decline	Moderate	High	Moderate	Moderate

3.2.1.4 Species and Land Use Activity Interactions: Challenges

These species have limited distribution across their range, with the Spring Mountains springsnail being the most restricted. To this end, they are at risk of population decline for various threats as well as catastrophic events on the Spring Mountains NRA and rangewide. Given the moderate to rapid decline of these species across its range due to extirpations of populations outside the Spring Mountains NRA, the importance of minimizing threats and continuing long-term protection of the populations of both species on the Spring Mountains NRA is significant, and especially critical for the Spring Mountains springsnail given its restricted range. The analyses demonstrate that actions that affect spring habitat, such as horse and burro management and concentrated use, should be monitored and threats mitigated for or reduced where possible. Based on the analysis, existing conservation measures appear adequate for protection of these species on private lands through potential land acquisition; however, reevaluation and monitoring of conservation measures for other activities is warranted. Monitoring of these populations is essential due to their small size and the limited opportunity to detect change prior to population loss.

3.2.2 Butterflies

3.2.2.1 Quality of Existing Information

Distribution information on butterflies in the Spring Mountains NRA is limited (Chapters 3-4). The majority of data is occurrence localities with limited to no information regarding habitat (breeding, mating or feeding areas). In combination with their biological requirements and life stage characteristics, it would be unreliable to use information contained within the existing GIS platform databases to model potential habitat for these species on the Spring Mountains NRA. However, our analysis based on point locations provided useful information on the interaction between butterflies and activities on the Spring Mountains NRA. Additionally, incomplete data sets, relevancy of data to current conditions, quality of data among sites, and overlapping information for locations influenced both the quantitative and qualitative analysis.

3.2.2.2 Quantitative Analysis

The total habitat area represented by point occurrence localities for butterfly species ranged from 0.6 to 7.3 acres (Table 5-11, Appendix 5F-2). On average, 60% of the total area represented by occurrence localities for all butterfly species overlapped with Spring Mountains NRA activities. With the addition of future activities, the total average area represented by occurrence localities for butterfly species would overlap with Spring Mountains NRA activities by 65%. This analysis indicated that two species (Bret's blue and dark blue) were particularly vulnerable to Spring Mountains NRA activities. Essentially all of the occurrence area for Bret's

blue butterfly and over 75% of the occurrence area for the dark blue butterfly overlapped with land use activities. For the Bret's blue butterfly, this analysis is a symptom of limited occurrence localities. The relative value of habitat represented by occurrence localities for each of these species was reduced by at least 50 percent (Table 5-11). The primary potential effects to butterfly species is from horses and burros (<0.25 mile from spring/streams) and WUI (Appendix 5F-2).

Table 5-11 Quantitative results on the interaction between butterfly species and all activities on the Spring Mountains NRA based on point occurrence data.

	Bret's Blue Butterfly	*Carole's Silverspot Butterfly*	*Dark Blue Butterfly*	*Morand's Checkerspot Butterfly*	*Mount Charleston Blue Butterfly*	*Nevada Admiral*	*Spring Mountains Checkerspot Butterfly*	*Spring Mountains Comma Skipper*	*Spring Mountains Icarioides Blue Butterfly*
Total Area									
Current Activities	0.6	5.0	3.1	1.6	1.5	5.8	3.9	7.3	3.4
Current & Future Activities	0.6	5.0	3.1	1.6	1.5	5.8	3.9	7.3	3.4
Area of Activity Overlap									
Current Activities	99.95%	48.38%	74.48%	31.23%	54.64%	63.42%	61.25%	56.41%	55.56%
Current & Future Activities	99.95%	51.17%	75.44%	39.98%	61.30%	67.38%	67.40%	58.46%	59.38%
Relative Potential Effect									
Current Activities	49.98%	21.19%	51.59%	13.12%	25.32%	37.40%	33.83%	27.11%	30.57%
Current & Future Activities	49.98%	23.59%	51.91%	18.12%	33.98%	39.81%	36.90%	28.75%	32.34%
Relative Potential Effect With Avoidance Measures									
Current Activities	31.65%	15.79%	37.40%	8.12%	15.99%	23.95%	31.01%	17.80%	20.28%
Current & Future Activities	31.65%	16.99%	37.72%	11.87%	20.66%	25.50%	34.09%	19.17%	21.75%
Relative Potential Effect With Minimization Measures									
Current Activities	38.31%	20.39%	49.33%	11.87%	23.32%	28.78%	31.01%	21.36%	24.11%
Current & Future Activities	38.31%	22.59%	49.65%	16.87%	29.98%	30.67%	34.09%	22.87%	25.87%
Relative Potential Effects With Mitigation Measures									
Current Activities	38.31%	16.99%	39.33%	11.24%	21.99%	28.78%	32.55%	21.36%	24.11%
Current & Future Activities	38.31%	18.59%	39.66%	15.62%	29.32%	30.67%	35.37%	22.87%	25.87%

With conservation measures incorporated into the assessment, the effects are still high; however, the measures reduce the potential effects significantly. Avoidance measures were the most effective at reducing potential effects, while minimization and mitigation reduced effects to a similar degree with variation in their effectiveness by activity (Table 5-11). The implementation of avoidance measures could potentially reduce the relative potential effects to between 8 and 37 percent. Minimization measures reduced the current potential relative effects to between 12 and 49 percent. The mitigation measures reduced the potential effect to between 12 and 38 percent. Considering the conservation measures, the potential effects still exceed 30 percent. Further review of available conservation measures for butterflies is merited (Table 5-11).

The distribution of the intensity of the relative effect of all current and future activities on butterflies is summarized in Table 5-12 and illustrated on figures in Appendix 5F-2. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest

potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For all species, between 29 and 100 percent of the occurrences fall within areas where the intensity of effect reduces the relative value of habitat by a low to moderately high degree. Dark blue butterfly has the largest area where the intensity of effect would reduce the quality of habitat to a high degree and/or eliminate all habitat value (33%). It is also important to note that implementation of conservation measures would result in a change in the distribution of occurrences relative to the intensity of effect for most butterfly species. The most beneficial conservation measures, in this regard, would be avoidance and mitigation measures.

3.2.2.3 Qualitative Analysis

The severity of threats ranges from low to high, but most estimates are low for the butterfly species (Table 5-13). The scope of threats also ranges from low to high, but most estimates are moderate for species with a limited number of known occurrence localities. Estimates of known population trend vary across species. This trend is based on known occurrence localities, as population numbers and size are very limited or unknown for the majority of butterfly species. Six species appear relatively stable. Two are experiencing rapid decline (Mt. Charleston blue butterfly and Spring Mountains checkerspot butterfly). The metapopulation structure for these two species may account for a “boom and bust” characteristic among populations, and/or their microhabitat requirements are so poorly understood that interpretations regarding population trend is difficult. Overall, information is lacking for critical life history information for the majority of these butterfly species in the Spring Mountains NRA.

3.2.2.4 Species and Land Use Activity Interactions: Challenges

Population surveys and monitoring are necessary to obtain more detailed information on distribution and status of these butterfly species, particularly those with the most limited occurrence localities. A better understanding of the sources of population decline will be of value in the short term to address issues associated with rapidly declining species. Additionally, the effects of all identified threats on these species and additional potential mechanisms to effectively reduce threats should be investigated. For the Bret’s blue butterfly for which the occurrence localities are the most limited, the importance of the Spring Mountains NRA localities to the rangewide population should be determined before conducting additional surveys, performing life history studies, or targeting conservation measures to the species.

Detailed information on host plant interactions is critical for these butterfly species. This is particularly important given the difficulty typically associated with studying these species directly. Additionally, threats to the host species may be distinct from those directly or indirectly affecting the species, making it difficult to predict potential effects from a variety of sources and effectiveness of management actions.

Long-term monitoring is essential for all these butterfly species. However, analysis to establish the sensitivity of trend information is necessary to determine at what point declines can be assessed statistically. The quantitative analysis demonstrates that conservation measures can be implemented to benefit all the butterfly species. Again, even with consideration of the conservation measures, the potential effects still exceed 30 percent, which suggests that further review of available conservation measures for butterflies, beyond those currently considered or employed, is merited.

Table 5-12 Distribution of the intensity of effect for all activities on butterfly species on the Spring Mountains NRA.

Potential Effect	*Bret's Blue*		*Carole's Silverspot*		*Dark Blue*		*Morand's Checkerspot*		*Mount Charleston Blue*		*Nevada Admiral*		*Spring Mountains Checkerspot*		*Spring Mountains Comma Skipper*		*Spring Mountains Icarioides Blue*	
	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) / Point Occurrence	0.6		5		3.1		1.6		1.5		5.8		3.9		7.3		3.4	
No Measurable	0.00%	0.00%	50.15%	48.79%	5.78%	24.50%	68.75%	60.22%	45.67%	39.01%	23.12%	32.57%	38.67%	32.69%	42.49%	41.60%	40.45%	40.48%
Low to Moderately High	100.00%	100.00%	42.10%	41.45%	61.20%	42.47%	29.09%	36.46%	49.64%	49.83%	57.28%	45.52%	49.10%	55.08%	48.62%	47.49%	47.73%	47.15%
High to Loss of all Value	0.00%	0.00%	7.75%	9.76%	33.03%	33.03%	2.17%	3.32%	4.68%	11.16%	19.60%	21.91%	12.23%	12.23%	8.89%	10.91%	11.82%	12.38%

Potential Effect with Avoidance Measures

Total Area (acres) / Point Occurrence	0.6		5		3.1		1.6		1.5		5.8		3.9		7.3		3.4	
No Measurable	0.00%	0.00%	46.72%	48.79%	19.63%	24.50%	68.75%	60.22%	42.72%	39.01%	34.17%	32.57%	36.79%	32.69%	39.34%	41.60%	40.09%	40.48%
Low to Moderately High	100.00%	100.00%	48.38%	46.31%	74.01%	69.15%	31.25%	38.81%	54.33%	58.04%	63.44%	64.65%	50.99%	55.08%	56.45%	53.38%	55.38%	53.25%
High to Loss of all Value	0.00%	0.00%	4.90%	4.90%	6.35%	6.35%	0.00%	0.97%	2.95%	2.95%	2.40%	2.77%	12.23%	12.23%	4.21%	5.02%	4.53%	6.27%

Potential Effect with Minimization Measures

Total Area (acres) / Point Occurrence	0.6		5		3.1		1.6		1.5		5.8		3.9		7.3		3.4	
No Measurable	0.00%	0.00%	48.77%	48.79%	0.00%	24.50%	66.58%	60.22%	45.44%	39.01%	35.05%	32.57%	35.79%	32.69%	39.05%	41.60%	41.06%	40.48%
Low to Moderately High	100.00%	100.00%	43.48%	42.50%	67.97%	42.47%	31.25%	36.46%	51.02%	54.49%	61.21%	63.62%	52.06%	55.16%	54.48%	51.67%	52.38%	52.42%
High to Loss of all Value	0.00%	0.00%	7.75%	8.71%	33.03%	33.03%	2.17%	3.32%	3.54%	6.50%	3.74%	3.81%	12.15%	12.15%	6.48%	6.73%	6.56%	7.10%

Potential Effect with Mitigation Measures

Total Area (acres) / Point Occurrence	0.6		5		3.1		1.6		1.5		5.8		3.9		7.3		3.4	
No Measurable	0.00%	0.00%	49.38%	48.79%	18.52%	24.50%	68.75%	60.22%	44.30%	39.01%	35.05%	32.57%	35.79%	32.69%	39.05%	41.60%	41.06%	40.48%
Low to Moderately High	100.00%	100.00%	45.72%	46.24%	73.95%	67.97%	29.09%	36.46%	51.02%	53.34%	61.21%	63.62%	52.06%	55.16%	54.48%	51.67%	52.38%	52.42%
High to Loss of all Value	0.00%	0.00%	4.90%	4.97%	7.53%	7.53%	2.17%	3.32%	4.68%	7.65%	3.74%	3.81%	12.15%	12.15%	6.48%	6.73%	6.56%	7.10%

Table 5-13 Conservation status assessment for butterfly species found on the Spring Mountains NRA.

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Bret's blue butterfly (*Euphilotes bernardina inyomontana = E. battoides sp.)*					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	U	Low	Moderate	High	Low
Current Condition Rangewide	U	Low	Moderate	High	Low
Carole's silverspot butterfly (*Speyeria zerene carolae = S. carolae*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Dark blue butterfly (*Euphilotes ancilla purpura = E. enoptes purpurea*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate
Morand's checkerspot butterfly (*Euphydryas anicia morandi*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate
Mt. Charleston blue butterfly (*Icaricia shasta charlestonensis*)					
Reference Condition Spring Mountains	Decline	Moderate	High	High	
Current Condition Spring Mountains	Rapid decline	High	High	High	Moderate
Current Condition Rangewide	Rapid decline	High	High	High	Moderate
Nevada admiral (*Limenitis weidermeyerii nevadae*)					
Reference Condition Spring Mountains	U	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Spring Mountains checkerspot butterfly (*Chlosyne acastus robusta*)					
Reference Condition Spring Mountains	U	Moderate	Moderate	High	
Current Condition Spring Mountains	Rapid decline	Moderate	Moderate	High	Moderate
Current Condition Rangewide	Rapid decline	Moderate	Moderate	High	Moderate
Spring Mountains comma skipper (*Hesperia colorado* [= *comma*] *mojavensis*)					
Reference Condition Spring Mountains	U	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Spring Mountains icarioides blue butterfly (*Icaricia icarioides austinorum*)					
Reference Condition Spring Mountains	U	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low

3.2.3 Charleston Ant

3.2.3.1 Quality of Existing Information

Distribution data for the Charleston ant in the Spring Mountains NRA is very limited (Chapter 3/4) as systematic surveys have not been completed. Only one occurrence for this species is known.

3.2.3.2 Quantitative Analysis

Given the very limited life history information and occurrence data for this species, it would be unreliable to perform a quantitative analysis for this species on the Spring Mountains NRA.

3.2.3.3 Qualitative Analysis

The Charleston ant is known from only one occurrence with six nests observed in Upper Kyle Canyon on the east side of the Spring Mountains NRA. This species occupies subterranean nests in unshaded areas within coniferous forest habitats. The population trend for the species is unknown since systematic surveys for the species have not occurred and the one observation in 1956 has not been resurveyed. In addition, life history information for the Charleston ant is considerably lacking. The severity, scope, and immediacy of threats for the Charleston ant are high (Table 5-14, Appendix 5F-3), based on the fact that only one occurrence is known for the species and this occurrence is located in one of the two developed canyons on the east side of the Spring Mountains NRA. It has not been investigated through informal or formal study if there are direct threats affecting this species; however, there are a number of activities in the area of the observation with the potential to affect the species, including trails, trailheads, paved roads, and unpaved roads.

Table 5-14 Conservation status assessment for the Charleston ant located on the Spring Mountains NRA.

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Charleston ant (*Lasius nevadensis*)					
Reference Condition Spring Mountains	U	High	High	High	
Current Condition Spring Mountains / Rangewide	U	High	High	High	Moderate

3.2.3.4 Species and Land Use Activity Interactions: Challenges

As described above and in Chapters 3-4, the lack of information for the Charleston ant is the biggest challenge for this species. In order to appropriately manage and conserve this species, basic taxonomic and life history information, survey data, and threats information must be obtained.

3.3 MAMMAL RESULTS

3.3.1 Bats

There were six species of bats evaluated: Allen's lappet-browed bat, fringed myotis, long-eared myotis, long-legged myotis, pale Townsend's big-eared bat, and western small-footed myotis.

3.3.1.1 Quality of Existing Information

In general, distribution information on bats in the Spring Mountains NRA is limited (Chapters 3-4). For some bat species, a fair number of roost sites (especially those in caves and mines) are known in the Spring Mountains NRA, while a few bats have no known roost sites in the Spring Mountains NRA. Foraging habitat for all the bat species is unknown in the Spring Mountains NRA. In combination with their biological requirements and life stage characteristics, it would be unreliable to use information contained within the existing GIS platform database to model the potential habitat distribution for these species on the Spring Mountains NRA. However, our analysis based on point locations for roost sites provided useful information of the interactions between certain bats and activities on the Spring Mountains NRA. Additionally, incomplete data sets, relevancy of data to current conditions, quality of data among sites, and overlapping information for locations influenced the quantitative and qualitative analysis.

3.3.1.2 Quantitative Analysis

The total habitat area represented by point occurrence localities for bat species ranged from 43 to 61 acres (Table 5-15, Appendix 5F-4). On average, 65 percent of the total area represented by occurrence localities for all bat species overlapped with Spring Mountains NRA activities. With the addition of future activities, the total average area represented by occurrence localities for bat species would overlap with Spring Mountains NRA activities by 70 percent. This analysis indicated that all of the bat species were equally vulnerable to Spring Mountains NRA activities.

Table 5-15 Quantitative results on the interaction between bat species and all activities on the Spring Mountains NRA based on point occurrence data.

	Allen's lappet-browed bat	*Fringed myotis*	*Long-eared myotis*	*Long-legged myotis*	*Pale Townsend's big-eared bat*	*Western small-footed myotis*
Total Area						
Current Activities	43.18	43.18	56.16	56.16	61.03	44.80
Current and Future Activities	43.18	43.18	56.16	56.16	61.03	44.80
Area of Activity Overlap						
Current Activities	66.28%	66.28%	68.50%	67.06%	62.94%	67.50%
Current and Future Activities	70.03%	70.03%	74.13%	69.94%	65.59%	71.11%
Relative Potential Effect						
Current Activities	7.16%	7.16%	8.92%	10.52%	7.24%	7.95%
Current and Future Activities	10.93%	10.93%	13.85%	13.41%	9.90%	11.56%
Relative Potential Effect With Avoidance Measures						
Current Activities	6.14%	6.14%	7.50%	9.51%	3.65%	6.92%
Current and Future Activities	9.80%	9.80%	12.21%	12.32%	5.11%	10.42%
Relative Potential Effect With Minimization Measures						
Current Activities	6.14%	6.53%	8.30%	9.83%	3.65%	7.30%
Current and Future Activities	9.80%	10.19%	13.12%	12.64%	5.11%	10.80%
Relative Potential Effects With Mitigation Measures						
Current Activities	6.53%	6.14%	7.98%	9.51%	3.65%	6.92%
Current and Future Activities	10.19%	9.80%	12.80%	12.32%	5.11%	10.42%

However, the reduction in the relative value of habitat, represented by occurrence localities, for bat species was low, ranging from seven to ten percent for current activities and ten to 14 percent for current and future activities combined (Table 5-15). The primary land use activities potentially affecting bats were identified as caving, CUAs, horses and burros, and private land (Appendix 5F-4). The only future activity having a potential effect on the occurrence localities for

these bat species was the west side PO camping footprint. In general, the conservation measures reduced the potential effects to a low degree. Additionally, all three categories of conservation measures were equally effective at reducing the potential effect. With conservation measures, the effects are reduced for the long-eared myotis, pale Townsend's big-eared bat, and western small-footed myotis, but further review of existing or new conservation measures is merited.

The distribution of the intensity of the relative effect of all current and future activities on bats is summarized in Table 5-16 and illustrated on figures in Appendix 5F-4. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For current activities, approximately 80% of the point occurrence localities (roost sites) are distributed within an area where there would be no measurable effect on bat species. However, with the addition of future activities, over 60% of the point occurrence localities (roost sites) would be impacted to a low to moderately high degree. It is also important to note that implementation of conservation measures would result in little change in the distribution of occurrences relative to the intensity of effect for most bat species. Additionally, all categories of conservation measures were relatively equal at reducing the potential effects.

Table 5-16 Distribution of the intensity of effect for all activities on butterfly species on the Spring Mountains NRA.

	Allen's lappet-browed bat		*Fringed myotis*		*Long-eared myotis*		*Long-legged myotis*		*Pale Townsend's big-eared bat*		*Western small-footed myotis*	
Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	43.18		43.18		56.16		56.16		61.03		44.80	
No Measurable	81.11%	29.96%	81.11%	29.96%	77.93%	25.88%	72.95%	30.06%	78.76%	34.40%	78.18%	28.88%
Low to Moderate	16.77%	64.16%	16.77%	64.16%	19.24%	66.72%	23.80%	63.81%	19.54%	61.24%	19.63%	65.31%
High to Loss of all Value	2.12%	5.88%	2.12%	5.88%	2.83%	7.41%	3.24%	6.13%	1.70%	4.36%	2.19%	5.81%

Potential Effect with Avoidance Measures

Total Area (acres) Point Occurrence	43.18		43.18		56.16		56.16		61.03		44.80	
No Measurable	80.24%	29.96%	80.24%	29.96%	77.26%	25.88%	72.26%	30.06%	79.06%	34.40%	77.35%	28.88%
Low to Moderate	18.00%	64.52%	18.00%	64.52%	20.18%	66.99%	24.83%	64.14%	20.94%	65.57%	20.81%	65.66%
High to Loss of all Value	1.76%	5.52%	1.76%	5.52%	2.55%	7.13%	2.91%	5.80%	0.00%	0.02%	1.84%	5.46%

Potential Effect with Minimization Measures

Total Area (acres) Point Occurrence	43.18		43.18		56.16		56.16		61.03		44.80	
No Measurable	80.24%	29.96%	80.21%	29.96%	77.24%	25.88%	72.23%	30.06%	79.06%	34.40%	77.31%	28.88%
Low to Moderate	18.00%	64.52%	18.00%	64.49%	20.18%	66.97%	24.83%	64.11%	20.94%	65.57%	20.81%	65.62%
High to Loss of all Value	1.76%	5.52%	1.80%	5.55%	2.58%	7.16%	2.94%	5.83%	0.00%	0.02%	1.87%	5.49%

Table 5-16 Distribution of the intensity of effect for all activities on butterfly species on the Spring Mountains NRA.

	Allen's lappet-browed bat		*Fringed myotis*		*Long-eared myotis*		*Long-legged myotis*		*Pale Townsend's big-eared bat*		*Western small-footed myotis*	
Potential Effect with Mitigation Measures												
Total Area (acres) Point Occurrence	43.18		43.18		56.16		56.16		61.03		44.80	
No Measurable	80.21%	29.96%	80.24%	29.96%	77.26%	25.88%	72.26%	30.06%	79.06%	34.40%	77.35%	28.88%
Low to Moderate	18.00%	64.49%	18.00%	64.52%	20.18%	66.99%	24.83%	64.14%	20.94%	65.57%	20.81%	65.66%
High to Loss of all Value	1.80%	5.55%	1.76%	5.52%	2.55%	7.13%	2.91%	5.80%	0.00%	0.02%	1.84%	5.46%

3.3.1.3 Qualitative Analysis

The population trend for all species is stable in the Spring Mountains based on known occurrences or known roost sites increasing or persisting from the reference to current condition, as population numbers or size are not available (Table 5-17). The population trend for most bat species rangewide is stable; however, the current condition rangewide for fringed myotis is in moderate decline, and is unknown for the western small-footed myotis.

Table 5-17 Conservation status assessment for bat species found on the Spring Mountains NRA.

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Allen's lappet-browed bat (*Idionycteris phyllotis)*					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	Stable	Moderate	U	High	Low
Fringed myotis (*Myotis thysanodes*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Moderate decline	Moderate	Low	High	Low
Long-eared myotis (*Myotis evotis*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	Moderate
Long-legged myotis (*Myotis volans*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Moderate	Low	High	Low
Western small-footed myotis (*Myotis ciliolabrum*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	U	Moderate	Low	High	Low

For all bat species, the severity of threats is low for both the reference and current conditions for the Spring Mountains NRA due to the past and ongoing effort to protect roost locations. However, rangewide, the severity of threats for the current condition is moderate for Allen's lappet-browed bat, fringed myotis, pale Townsend's big-eared bat, and western small-footed myotis due to ongoing disturbances to and loss of roosting sites throughout their ranges. The scope of threats is low for all the bat species with the exception of Allen's lappet-browed bat and silver-haired bat, which are moderate in the Spring Mountains given that threats exist at the relatively few known occurrences of the species (and no known roost sites). Rangewide, the scope of threats for Allen's lappet-browed bat is unknown.

3.3.1.4 Species and Land Use Activity Interactions: Challenges

The percentage of overlap and effect of threats on these bat species is not high relative to other species groups given that the overall number of acres potentially occupied by these species is relatively small as acreages were based on known roost sites or occurrence localities. The overlap and effect of threats may have been comparable to other species groups if foraging habitat information was available for the bat species.

Monitoring of these populations, particularly roosting sites, is particularly important due to their relatively small size and therefore increased risk of loss; however, the majority of species are widely distributed and stable across their entire range. Potential effects of threats to the bat species and their habitats, most importantly to roosting sites, should be further assessed. Measures to reduce these impacts should be implemented and monitored.

3.3.2 Palmer's Chipmunk

3.3.2.1 Quality of Existing Information

Distribution information on the Palmer's chipmunk in the Spring Mountains NRA is fairly extensive compared to many of the other endemic species (Chapter 3-4). Our analysis was based on point locations that provided useful information of the interactions between the chipmunk and activities on the Spring Mountains NRA. Information contained within the existing GIS platform database was used to model potential habitat for this species on the Spring Mountains NRA. Potential habitat characteristics were derived from several intensive studies on this species. Where point occurrence data was utilized in the quantitative analysis, quality of data among sites and overlapping information for locations influenced the analysis.

3.3.2.2 Quantitative Analysis

The distribution of Palmer's chipmunk habitat was estimated at 12.8 acres based on point occurrence data and 35,859 acres based on potential habitat models (Table 5-18). The total area of overlap with Spring Mountains NRA activities ranged from 54 to 56 percent and 17 to 18 percent for current and future activities based on point occurrences and potential habitat estimates. The distribution of Palmer's chipmunk potential habitat overlapped 38 current and 16 future activities (Appendix 5F-5). Horses and burros (>0.25 mi from spring/stream), WUI and private land were the land use activities with the largest overlap.

Table 5-18 Quantitative results on the interaction between Palmer's chipmunk and all activities on the Spring Mountains NRA based on point occurrence data and the potential habitat distribution.

	Palmer's chipmunk	
Total Area (acres)	*Current Activities*	*Current and Future Activities*
Point Occurrence	12.84	12.84
Potential Habitat Estimate	35,859.02	35,859.02
Area of Activity Overlap		
Point Occurrence	54.52%	56.07%
Potential Habitat	16.69%	18.45%
Potential Effect		
Point Occurrence	48.05%	49.61%
Potential Habitat	6.14%	7.43%
Potential Effect With Avoidance Measures		
Point Occurrence	39.27%	40.85%
Potential Habitat	4.78%	5.75%
Potential Effect With Minimization Measures		
Point Occurrence	46.71%	48.27%
Potential Habitat	5.89%	7.12%
Potential Effects With Mitigation Measures		
Point Occurrence	46.71%	48.27%
Potential Habitat	5.89%	7.12%

The relative potential effect of the Spring Mountains NRA land use activities, when considered in aggregate, reduced the value of the known point occurrence localities by 48% for current activities and approximately 50% for current and future activities combined (Table 5-14). When considering potential habitat, approximately six percent of the value of habitat was lost with current activities and seven percent was lost with current and future combined. The primary activities affecting Palmer's chipmunk were WUI interactions, picnic areas, campgrounds, and paved roads. The relative potential effects from these specific activities are influenced by the overlapping information for occurrence localities that are concentrated in the developed east side canyons; however, this analysis still demonstrates that an important number of activities overlap in key habitat areas for the Palmer's chipmunk. In total, the addition of future activities had little effect on increasing the level of relative potential effect. However, the site selection for

where those individual future activities may occur (future ski area and west side PO camping footprint) could have important consequences to the Palmer's chipmunk.

When conservation measures are incorporated into the assessment, the relative potential effects are reduced somewhat. The greatest effect is through avoidance measures that reduces effects to 40 percent. Minimization and mitigation measures reduced the relative potential effect by only a small degree.

The distribution of the intensity of the relative effect of all current and future activities on Palmer's chipmunk is summarized in Table 5-19 and illustrated on figures in Appendix 5F-5. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. Based on the empirical point occurrence localities, over 42 percent of the area overlapped activities that reduced the value of habitat to the extent that it had little to no value. In contrast, the potential habitat analysis suggested that approximately

82 percent of the habitat distribution occurred in areas where there was no measurable effect. Again, avoidance measures seemed to have the highest success at improving the quality of habitat affected to the highest degree.

Table 5-19 Distribution of the intensity of effect for all activities on Palmer's chipmunk on the Spring Mountains NRA.

	Palmer's chipmunk	
Potential Effect	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	12.84	
No Measurable	27.17%	43.89%
Low to Moderate	30.60%	12.32%
High to Loss of all Value	42.23%	43.79%
Total Area (acres) Potential Habitat	35859.02	
No Measurable	82.40%	81.55%
Low to Moderate	15.22%	15.51%
High to Loss of all Value	2.38%	2.94%
Potential Effect with Avoidance Measures		
Total Area (acres) Point Occurrence	12.84	
No Measurable	32.17%	43.89%
Low to Moderate	46.92%	33.64%
High to Loss of all Value	20.91%	22.46%
Total Area (acres) Potential Habitat	35859.02	
No Measurable	82.75%	81.55%
Low to Moderate	16.25%	17.41%
High to Loss of all Value	0.99%	1.04%
Potential Effect with Minimization Measures		
Total Area (acres) Point Occurrence	12.84	
No Measurable	24.13%	43.89%
Low to Moderate	33.64%	12.32%
High to Loss of all Value	42.23%	43.79%
Total Area (acres) Potential Habitat	35859.02	
No Measurable	81.94%	81.55%
Low to Moderate	15.70%	15.52%
High to Loss of all Value	2.36%	2.93%
Potential Effect with Mitigation Measures		
Total Area (acres) Point Occurrence	12.84	
No Measurable	24.13%	43.89%
Low to Moderate	33.64%	12.32%
High to Loss of all Value	42.23%	43.79%
Total Area (acres) Potential Habitat	35859.02	
No Measurable	81.94%	81.55%
Low to Moderate	15.70%	15.52%
High to Loss of all Value	2.36%	2.93%

3.3.2.3 Qualitative Analysis

The number of known occurrences has increased from the reference to current condition likely due to the increase in surveys for the Palmer's chipmunk; however, the known population trend is in rapid decline for the current condition based on a decrease in population density (Table 5-20). It is important to note that this decrease in population density was documented in areas within the developed canyons of the Spring Mountains NRA that have significant use, such as in or near campgrounds, picnic areas and trails/trailheads (studies were not performed throughout the entire Spring Mountains NRA). Threats immediacy, severity and scope in the reference and current condition are all identified as low given the species distribution across the Spring Mountains NRA. However, as current studies and surveys further refine or define the characteristics that determine the species environmental specificity and intrinsic vulnerability, potential threats to those characteristics in high use areas could be significant to the Palmer's chipmunk.

Table 5-20 Conservation status assessment for Palmer's chipmunk on the Spring Mountains NRA.

	Known Population Trend	Threats - Severity	Threats - Scope	Threats - Immediacy	Threats - Anticipated Increase / Shift
Palmer's Chipmunk (*Neotamias palmeri*)					
Reference Condition Spring Mountains	U	Low	Low	Low	
Current Condition Spring Mountains / Rangewide	Rapid decline	Low	Low	Low	Low

3.3.2.4 Species and Land Use Activity Interactions: Challenges

The potential for rapid decline of chipmunk population densities suggests a need to further investigate specific cause/effect relationships, and reduce impacts from activities that pose the greatest threats including WUI, picnic areas, campgrounds, and paved roads. This assessment was supported by an important index in the quantitative analysis that demonstrated that loss of habitat value may occur from these activities for over 42 percent of the distribution of point occurrence localities. While some of this analysis may have been influenced by overlapping information for locations, it still demonstrates that an important number of activities overlap in key habitat areas for the Palmer's chipmunk. Population monitoring across the Spring Mountains NRA is essential to track the possibility of further decline of this species, and to determine whether a decline is occurring across the species entire range or in specific areas. As appropriate, various threat reduction measures and alternative management actions should be implemented and monitored for effectiveness.

3.4 BIRD RESULTS

Two bird species were included in this analysis: flammulated owl and northern goshawk.

3.4.1.1 Quality of Existing Information

In general, distribution information on birds in the Spring Mountains NRA is somewhat limited (Chapters 3-4). Surveys were conducted based on breeding territories and nesting sites, as well as acoustic surveys, and provided baseline information on these species. Surveys to determine the potential habitat distributions were also conducted. Information contained within the existing GIS platform database was used to model potential habitat for these species on the Spring Mountains NRA. Our analysis was based on both point locations and potential habitat and

provided useful information of the interactions between birds and activities on the Spring Mountains NRA.

3.4.1.2 Quantitative Analysis

The distribution of flammulated owl was estimated at 93.8 acres based on point occurrence data and 7,087 acres based on potential habitat models (Table 5-21, Appendix 5F-6). The distribution of northern goshawk was estimated at 1.1 acres based on point occurrence data and 9,019 acres based on potential habitat models (Table 5-19, Appendix 5F-5). For the flammulated owl, the estimates for the area of overlap were similar for the point occurrence and potential habitat estimates (27 and 23%, respectively). Whereas, these same measures for northern goshawk were drastically different (63 and 36%, respectively). The high level of overlap for northern goshawk based on empirical occurrence localities is worth noting. For both species, the addition of future activities had little effect at increasing the amount of overlap.

Table 5-21 Quantitative results on the interaction between bird species and all activities on the Spring Mountains NRA based on point occurrence and potential habitat data.

	Current Activities		Current and Future Activities	
	Flammulated owl	*Northern goshawk*	*Flammulated owl*	*Northern goshawk*
Total Area (acres)	1.0 hectare buffer	0.1 acre buffer	1.0 hectare buffer	0.1 acre buffer
Point Occurrence	93.80	1.10	93.80	1.10
Potential Habitat Estimate	7,086.51	9,019.05	7086.51	9019.05
Area of Activity Overlap				
Point Occurrence	27.71%	63.64%	27.71%	63.64%
Potential Habitat	23.09%	36.23%	23.46%	37.52%
Potential Effect				
Point Occurrence	15.96%	25.91%	15.96%	25.91%
Potential Habitat	6.98%	12.06%	7.27%	13.65%
Potential Effect With Avoidance Measures				
Point Occurrence	12.01%	10.36%	12.01%	10.36%
Potential Habitat	5.27%	4.89%	5.49%	5.59%
Potential Effect With Minimization Measures				
Point Occurrence	15.28%	20.55%	15.28%	20.55%
Potential Habitat	6.68%	9.64%	6.97%	10.98%
Potential Effects With Mitigation Measures				
Point Occurrence	15.28%	13.82%	15.28%	13.82%
Potential Habitat	6.68%	6.51%	6.97%	7.44%

The relative potential effects of current activities may be significant which considered the current implementation of some conservation measures (Table 5-21). There was a relative loss in value of 7% of 7,000 acres of potential habitat for flammulated owl and 12% of 9,000 acres of potential habitat for northern goshawk. The percentage of area potentially affected for occurrence locality estimates were higher than those for the potential habitat (16 and 26%, respectively). The estimates of the potential effect to flammulated owl, based on occurrence localities, tend to be more significant than the same metric for northern goshawk because the total occurrence area is significantly larger. It is also worth noting, that the addition of future activities did not increase the relative measure of the potential effect significantly for either

species. These relative potential effects are from numerous current activities with the significantly largest potential effect to these bird species being from the WUI.

The implementation of all existing conservation measures tended to create some beneficial reduction in the potential effect of the activities (Table 5-21). The avoidance conservation measures had the most pronounced effect. Furthermore, the northern goshawk tended to benefit more than the flammulated owl. The potential effects with avoidance measures ranged between ten and 12% of the occurrence locality areas and was approximately 5% for the potential habitat areas.

The distribution of the intensity of the relative effect of all current and future activities on birds is summarized in Table 5-22 and illustrated on figures in Appendix 5F-6. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For both species, as much as 60 to 70% of the occurrence localities and 60 to 90% of the potential habitat areas fall within locations where the intensity of effect had no measurable amount. However, the northern goshawk tended to be more vulnerable to the activities where 5% of the potential habitat and 15% of the occurrence localities fell within an area where the relative value of habitat was completely removed. Once again, avoidance measures tended to be the most beneficial at shifting the distribution of the intensity of effect. For northern goshawk, none of the occurrence localities or potential habitat fell within the area where all of the value was removed with avoidance measures in place. In this case, it is valuable to note the importance of the interaction between specific locations on the landscape, the activities that overlap these locations, and how they may tend to affect species.

Table 5-22 Distribution of the intensity of effect for all activities on bird species on the Spring Mountains NRA.

	Flammulated owl		*Northern goshawk*	
Relative Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	93.80		1.10	
No Measurable	71.78%	69.68%	58.61%	58.61%
Low to Moderately High	24.31%	25.28%	26.74%	26.74%
High to Loss of all Value	3.92%	5.04%	14.65%	14.65%
Total Area (acres) Potential Habitat	7086.51		9019.05	
No Measurable	87.16%	76.54%	79.57%	62.48%
Low to Moderately High	11.16%	21.58%	16.29%	31.79%
High to Loss of all Value	1.68%	1.88%	4.14%	5.73%
Relative Potential Effect with Avoidance Measures				
Total Area (acres) Point Occurrence	93.80		1.10	
No Measurable	70.17%	69.68%	64.31%	64.31%
Low to Moderately High	27.55%	27.46%	35.69%	35.69%
High to Loss of all Value	2.28%	2.86%	0.00%	0.00%

Table 5-22 Distribution of the intensity of effect for all activities on bird species on the Spring Mountains NRA.

	Flammulated owl		*Northern goshawk*	
Relative Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Potential Habitat	7086.51		9019.05	
No Measurable	86.86%	76.54%	80.09%	62.48%
Low to Moderately High	12.15%	22.42%	19.91%	37.52%
High to Loss of all Value	0.99%	1.04%	0.00%	0.00%
Relative Potential Effect with Minimization Measures				
Total Area (acres) Point Occurrence	93.80		1.10	
No Measurable	70.60%	69.68%	62.01%	62.01%
Low to Moderate	25.48%	25.51%	32.31%	32.31%
High to Loss of all Value	3.92%	4.81%	5.67%	5.67%
Total Area (acres) Potential Habitat	7086.51		9019.05	
No Measurable	86.88%	76.54%	78.13%	62.48%
Low to Moderately High	11.46%	21.60%	18.90%	33.89%
High to Loss of all Value	1.66%	1.86%	2.97%	3.63%
Relative Potential Effect with Mitigation Measures				
Total Area (acres) Point Occurrence	93.80		1.10	
No Measurable	70.60%	69.68%	64.19%	64.19%
Low to Moderately High	25.48%	25.51%	35.69%	35.69%
High to Loss of all Value	3.92%	4.81%	0.12%	0.12%
Total Area (acres) Potential Habitat	7086.51		9019.05	
No Measurable	86.88%	76.54%	79.74%	62.48%
Low to Moderately High	11.46%	21.60%	19.91%	37.01%
High to Loss of all Value	1.66%	1.86%	0.35%	0.51%

3.4.1.3 Qualitative Analysis

Both species were considered stable in reference and current Spring Mountain assessments based on an increase or persistence of known nesting occurrences, although the number of sites for the northern goshawk on the Spring Mountains NRA is very restricted compared to the flammulated owl (Table 5-23). The northern goshawk is currently considered stable rangewide, but the status rangewide for flammulated owl is unknown.

The scope of threats is moderate for the flammulated owl in the Spring Mountains due to the majority of occurrences in locations with human activity, and is moderate rangewide due to habitat loss from logging and other uses. The severity of threats is considered moderate for northern goshawk rangewide due to habitat loss from logging and other uses, which are not applicable to the Spring Mountains NRA.

Table 5-23 Conservation status assessment for bird species found on the Spring Mountains NRA.

	Known Population Trend	Threats - Severity	Threats - Scope	Threats - Immediacy	Threats - Anticipated Increase / Shift
Flammulated owl (*Otus flammeolus)*					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	U	Low	Moderate	High	Low
Northern goshawk (*Accipiter gentilis*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Moderate	Low	High	Low

3.4.1.4 Species and Land Use Activity Interactions: Challenges

The area of overlap and potential effect, which considered currently implemented conservation measures, is greater for northern goshawk but the total area is extremely small compared to that for the flammulated owl. Additionally, implementation of conservation measures reduces effects to about the same amount overall and the effects per unit area are therefore similar.

Monitoring of both these species is particularly important due to their relatively small size and therefore increased risk of loss, particularly for the northern goshawk. Additionally, potential effects of threats should be further assessed, including determination of cause/effect relationships, in particular, those potential effects from the WUI, CUAs, and trails. Measures to avoid or reduce important threats should be implemented, as the analysis demonstrated that avoidance measures would have the most pronounced benefit for these species. This quantitative analysis complements the species life history, as avoidance of human disturbance during nesting season can maintain or increase reproductive success. This is most important for the northern goshawk given its limited nesting occurrences on the Spring Mountains NRA.

3.5 REPTILE RESULTS

3.5.1 Western Red-tailed Skink

3.5.1.1 Quality of Existing Information

Distribution data for the western red-tailed skink in the Spring Mountains NRA is very limited (Chapters 3-4) as systematic surveys have not been completed. Only four incidental sightings have been recorded at two locations in Kyle and Lee canyons on the east side of the Spring Mountains NRA.

3.5.1.2 Quantitative Analysis

Given the very limited life history information and occurrence data for this species, it would be unreliable to perform a quantitative analysis for this species on the Spring Mountains NRA.

3.5.1.3 Qualitative Analysis

Given the species distribution across its range in the southwest United States and Baja California, it is highly likely that more occurrences of the western red-tailed skink would be recorded in the Spring Mountains NRA if surveys were conducted (Table 5-24, Appendix 5F-7).

The species prefers rocky areas or areas with logs or leaf cover near permanent or intermittent streams and it primarily inhabits pinyon-juniper and riparian habitats near water.

Specific threats to the western red-tailed skink have not been identified due to the limited information on the distribution of the species in the Spring Mountains NRA. In the developed east side canyons, there are a number of activities in the area of the sightings with the potential to affect the species, including WUI, paved roads, unpaved roads, and private lands. Based on these potential activities and other potential threats (anthropogenic or natural), the severity of threats is low, and the scope of threats is moderate for the western red-tailed skink in the Spring Mountains NRA (Table 5-24).

Table 5-24 Conservation status assessment for the western red-tailed skink located on the Spring Mountains NRA.

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Western red-tailed skink *(Eumeces gilberti rubricaudatus)*					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	U	Low	Moderate	High	Low
Current Condition Rangewide	U	U	U	U	U

3.5.1.4 Species and Land Use Activity Interactions: Challenges

As described above and in Chapters 3-4, the lack of information for the western red-tailed skink is the biggest challenge for this species. In order to appropriately manage and conserve this species, life history information, survey data, and threats information must be obtained for this species on the Spring Mountains NRA.

3.6 PLANT RESULTS

3.6.1 Alpine/Subalpine Plants

We included six species in the Alpine/Subalpine species group: Charleston draba, Charleston ivesia, Charleston kittentails, Charleston pussytoes, Charleston tansy, Clokey silene, and Jaeger whitlowgrass. These species comprise the rare plant component of the alpine and subalpine plant communities. The alpine habitat is limited to the peak of Mount Charleston.

3.6.1.1 Quality of Existing Information

Distribution information on alpine and subalpine plants in the Spring Mountains NRA is well-documented (Chapter 3/4). These species are part of the high elevation plant community that is monitored every three years. In general, the numbers of occurrences for each species is low, but reflect the known, limited distribution of these species. Information contained within the existing GIS platform database was used to model the potential habitat distribution for these species on the Spring Mountains NRA. Precision and accuracy of the potential habitat models reflect the current understanding of species distribution, but depend on the availability and quality of the existing data sets. Our analysis was based on occurrence locations (point and polygon data) and potential habitat distributions and provided useful information of the interactions between these high elevation plants and activities on the Spring Mountains NRA. Point and polygon data may represent multiple visits or records of the same location causing some bias in the data.

3.6.1.2 Quantitative Analysis

For the alpine species, the total potential habitat is limited for these species ranging from Charleston ivesia (212 acres) and Clokey silene (393 acres) to Charleston kittentails (3,500 acres) and Jaeger whitlowgrass (4,258 acres) (Table 5-25, Appendix 5F-8). The area from occurrence localities also limited for this group of species (Table 5-25). Charleston ivesia had the largest spatially documented distribution on 128 acres. Overlap with current land use activities occurred in all species (Table 5-25). Based on occurrence localities, Charleston tansy, Clokey silene, and Charleston ivesia tended to have the largest areas of overlap. Overlap with potential habitat was greatest for Charleston tansy (9%), Clokey silene (5%), and Charleston ivesia (4%) with current activities with the remaining two species below 5%. Analysis of potential habitat would represent the level of activities occurring within the limited alpine habitats. With the addition of future activities, the average percentage of area that overlapped of occurrence localities with activities increases substantially for all species (Table 5-26). Under this scenario, Charleston tansy, Charleston kittentails, and Charleston draba tended to have the largest areas of overlap for occurrence localities. Overlap with potential habitat was greatest for Charleston tansy (9%), Charleston draba (8%), and Charleston kittentails (8%). This was due to the future ski area and campground activities.

The relative potential effect of current activities tended to be lower increasing with future activities (Tables 5-25 and 5-26). Based on occurrence localities, the species with the greatest relative potential effect from current activities were Charleston tansy and Jaeger whitlowgrass and lowest for Charleston draba (Table 5-25). Relative potential effects for current activities for potential habitat were highest for Charleston tansy and Charleston ivesia Based on occurrence localities, the relative potential effect increases with future activities with the largest values for Charleston tansy and Charleston kittentails. Based on potential habitat, relative potential effects also increased for current and future activities with Charleston draba (4%) and Charleston kittentails (4%). While the potential effect of future activities on alpine species are relatively low, the effect may be significant due to the limited nature and vulnerability of the habitat.

Based on occurrence localities as well as potential habitat, the current activities potentially affecting alpine species to the highest degree were high mileage system trails and private land (Appendix 5F-8). Few activities overlap with this group of species; whereas, the future activities potentially affecting alpine species to the highest degree are the future campgrounds and future ski area (Appendix 5F-6).

The implementation of conservation measures to their full potential would be successful at reducing the potential effects of both current and future activities (Tables 5-25 and 5-26). Avoidance measures were the most effective at reducing potential effects, while minimization and mitigation reduced effects to a similar degree with variation in their effectiveness by activity (Tables 5-25 and 5-26). This may result in part because that ongoing implementation of conservation measures was incorporated into the ranking of the potential effect, reducing the impact of existing activities for high mileage trails (Appendix 5F-8). Conservation measures potentially implemented in the future would include measures for private land activity (purchase). Avoidance conservation measures addressed placement of new developments and activities and did not necessarily address existing activities such as trails. For example, avoidance measures in the future ski area development could reduce the relative potential effect to alpine species.

The distribution of the intensity of the relative effect of all current and future activities on alpine plants is summarized in Table 5-27 and detailed in Appendix 5F-8. This analysis provides an

indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduce the relative quality of habitat to the largest degree. Very little habitat (<1 percent) will experience complete loss. For current activities, generally over 80% of the distribution of occurrence localities and potential habitat fell within areas where the intensity of effect was not measurable. This implies that current protection measures are successful for these special status species for ongoing land use activities. The effect of the additional future activities was illustrated by this analysis as well. Based on occurrence localities, Charleston kittentails was affected to the largest degree. Once again, the implementation of conservation measures tended to be successful by reducing the amount of area where all of the relative habitat value would be eliminated. Avoidance measures tended to be the most successful at reducing the effect.

3.6.1.3 Qualitative Analysis

Threats are currently occurring in the known distribution of the species over some portion of the range (Table 5-28). The severity is low for all species in this group since most occurrences have continued to persist with ongoing impacts. The scope of threats is generally moderate (50-75% of the element occurrences) and habitat is affected by some activity. The threats may change in the future due to private land activity and climate change. The trend for these species is generally stable based on monitoring and observations of the species and alpine habitat. Charleston draba is the one species not consistently found in alpine monitoring. However, changes in trend can occur quickly due to the fragile nature of alpine systems. The reference condition for Spring Mountains populations of Charleston kittentails indicated a 10–30 percent decline historically but stable for the current condition. The horses were thought to be a risk to this species in Lee Canyon; however, the horses have been removed from this area. Conditions at some of the high elevation springs have improved or were considered stable.

3.6.1.4 Species and Land Use Activity Interactions: Challenges

The percentage of overlap and effect of threats on these species is not high relative to other species groups. However, the overall number of acres potentially occupied by these species is also relatively small and the alpine habitat is fragile and slow to recover. These species and their habitats have been impacted by land use activities, but are also susceptible to effects of climate change and catastrophic events due to their small size.

Most species are impacted by current land use activities of high mileage trail systems and private land. Ongoing implementation of conservation measures was incorporated into the ranking of the potential effects. The conservation measures, especially associated with dispersed use, trails, and wild horses, have already reduced some of the impacts of existing activities. Development of additional conservation measures would be necessary to further reduce the effect of the activities as well as further implementation of conservation measures that may be effective in reducing impacts. Conservation measures related to private land have not been implemented for this group of species, but may be effective in the future.

The greatest relative potential effect for this group of species was the future ski area and future campground activities. Avoidance measures were effective in reducing the effect from these activities. However, future campgrounds in the subalpine and alpine habitats would likely be designated dispersed use areas or backcountry camping experiences in the wilderness areas. Traditional developed campgrounds would probably not be built in these habitats, reducing potential impacts to the system. There are specific conservation measures for the future development of the ski area of influence and footprint. Implementation of these conservation measures would be critical to this group of species in avoiding potentially large effects. These

species would typically occur in Three Springs and the higher elevations. It is unknown how many of the species would be directly impacted by any proposed activities.

Monitoring of these populations is particularly important due to their relatively small size and therefore increased risk of loss. Measures to reduce these impacts should be implemented and monitored. Information of species distribution in the ski area would aid in making informed decisions to minimize impacts from ski area activities.

Table 5-25 Alpine-Subalpine Plants Results Current Activities

	Charleston draba	*Charleston ivesia*	*Charleston kittentails*	*Charleston pussytoes*	*Charleston tansy*	*Clokey silene*	*Jaeger whitlowgrass*
Total Area							
Point Occurrence	1.8	NA	2.59	2.49	0.30	0.20	1.29
Polygon Occurrence	54.83	127.5	61.3	NA	118.4	3.9	13.4
Potential Habitat Estimate	2,497.28	212.35	3500.43	2676.24	905.03	392.69	4257.59
Area of Activity Overlap							
Point Occurrence	0.00%	NA	4.25%	6.03%	0.00%	0.00%	12.37%
Polygon Occurences	0.00%	16.79%	1.63%	NA	21.02%	17.07%	6.50%
Potential Habitat	1.43%	4.14%	1.25%	1.35%	8.85%	4.68%	1.33%
Potential Effect							
Point Occurrence	0.00%	NA	1.04%	1.61%	0.00%	0.00%	3.71%
Polygon Occurences	0.00%	4.39%	0.00	NA	5.53%	4.25%	1.93%
Potential Habitat	0.56%	1.26%	0.46%	0.52%	2.34%	1.18%	0.40%
Potential Effect With Avoidance Measures							
Point Occurrence	0.00%	NA	0.31%	0.68%	0.00%	0.00%	2.63%
Polygon Occurences	0.00%	1.65%	0.00	NA	2.00%	1.07%	1.35%
Potential Habitat	0.46%	0.90%	0.36%	0.43%	0.89%	0.40%	0.25%
Potential Effect With Minimazation Measures							
Point Occurrence	0.00%	NA	1.01%	1.37%	0.00%	0.00%	2.32%
Polygon Occurences	0.00%	3.91%	0.29%	NA	5.02%	4.25%	1.16%
Potential Habitat	0.39%	0.78%	0.33%	0.37%	2.08%	1.13%	0.29%
Potential Effects With Mitigation Measures							
Point Occurrence	0.00%	NA	1.04%	1.49%	0.00%	0.00%	3.02%
Polygon Occurences	0.00%	4.16%	0.39%	NA	5.30%	4.25%	1.55%
Potential Habitat	0.44%	1.03%	0.37%	0.41%	2.22%	1.17%	0.35%

Table 5-26 Alpine-Subalpine Plants Results, Current and Future Activities

	Charleston draba	*Charleston ivesia*	*Charleston kittentails*	*Charleston pussytoes*	*Charleston tansy*	*Clokey silene*	*Jaeger whitlowgrass*
Total Area							
Point Occurrence	1.8	NA	2.59	2.49	0.30	0.20	1.29
Polygon Occurrence	54.83	127.55	61.25	NA	118.41	3.93	13.39
Potential Habitat Estimate	2,497.28	2676.24	4257.59	212.35	392.69	905.03	3500.43
Area of Activity Overlap							
Point Occurrence	6%	NA	9.28%	18.09%	33.50%	0.00%	20.10%
Polygon Occurences	34.36%	16.79%	34.45%	NA	21.02%	17.07%	6.50%
Potential Habitat	8.46%	4.14%	7.91%	6.62%	8.89%	4.75%	3.64%
Potential Effect							
Point Occurrence	2.50%	NA	2.32%	10.61%	24.79%	0.00%	9.43%
Polygon Occurences	2.50%	4.39%	18.51%	NA	5.53%	4.25%	1.93%
Potential Habitat	4.06%	1.26%	3.79%	3.09%	2.35%	1.21%	1.53%
Potential Effect With Avoidance Measures							
Point Occurrence	0.34%	NA	0.62%	2.93%	6.03%	0.00%	5.41%
Polygon Occurences	5.18%	1.65%	13.79%	NA	2.00%	1.07%	1.35%
Potential Habitat	1.37%	0.90%	1.28%	1.04%	0.90%	0.42%	0.59%
Potential Effect With Minimazation Measures							
Point Occurrence	1.06%	NA	1.97%	8.12%	18.76%	0.00%	6.65%
Polygon Occurences	15.52%	3.91%	13.79%	NA	5.02%	4.25%	1.16%
Potential Habitat	3.02%	0.78%	2.82%	2.31%	2.09%	1.15%	1.14%
Potential Effects With Mitigation Measures							
Point Occurrence	1.06%	NA	1.97%	8.24%	18.76%	0.00%	7.34%
Polygon Occurences	15.52%	4.16%	13.94%	N/A	5.30%	4.25%	1.55%
Potential Habitat	3.07%	1.03%	2.87%	2.35%	2.23%	1.19%	1.20%

Table 5-27 Alpine-Subalpine Plants Results Intensity of Effect

Potential Effect	***Charleston draba***		***Charleston ivesia***		***Charleston kittentails***		***Charleston pussytoes***		***Charleston tansy***		***Clokey silene***		***Jaeger whitlowgrass***	
	Current Activities	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**
Total Area (acres) Point Occurrence	1.79		NA		2.59		2.49		0.30		0.20		1.29	
No Measurable		94.42%			95.77%	90.69%	93.93%	81.93%		66.50%			87.47%	79.78%
Low to Moderate		5.58%			4.23%	9.31%	5.95%	17.95%		33.50%			11.80%	19.50%
High to Loss of all Value		0.00%			0.00%	0.00%	0.12%	0.12%		0.00%			0.72%	0.72%
Total Area (acres) Polygon Occurrence	54.83		127.55		61.25		NA		118.41		3.93		13.39	
No Measurable		65.64%	83.20%	83.20%	98.36%	65.55%			78.97%		82.93%		93.53%	
Low to Moderate		34.36%	16.54%	16.54%	1.54%	34.35%			20.77%		17.07%		6.06%	
High to Loss of all Value		0.00%	0.26%	0.26%	0.10%	0.10%			0.26%		0.00%		0.41%	
Total Area (acres) Potential Habitat	2497.28		212.35		3500.43		2676.24		905.03		392.69		4257.59	
No Measurable	98.57%	91.54%	95.86%	95.86%	98.75%	93.38%	98.65%	92.09%	91.15%	91.11%	95.33%	95.24%	98.67%	96.36%
Low to Moderate	1.39%	8.42%	3.86%	3.86%	1.22%	6.58%	1.31%	7.87%	8.72%	8.75%	4.66%	4.73%	1.29%	3.57%
High to Loss of all Value	0.04%	0.05%	0.28%	0.28%	0.03%	0.04%	0.03%	0.04%	0.13%	0.14%	0.02%	0.02%	0.05%	0.07%
Potential Effect with Avoidance Measures														
Total Area (acres) Point Occurrence	1.79		NA		2.59		2.49		0.30		0.20		1.29	
No Measurable		94.42%			95.77%	90.69%	93.93%	81.93%		66.50%			87.47%	79.78%
Low to Moderate		5.58%			4.23%	9.31%	6.07%	18.07%		33.50%			12.53%	20.22%
High to Loss of all Value		0.00%			0.00%	0.00%	0.00%	0.00%		0.00%			0.00%	0.00%
Total Area (acres) Polygon Occurrence	54.83		127.55		61.25		NA		118.41		3.93		13.39	
No Measurable		65.64%	83.20%	83.20%	98.36%	65.55%			78.97%		82.93%		93.53%	
Low to Moderate		34.36%	16.80%	16.80%	1.64%	34.45%			21.03%		17.07%		6.47%	
High to Loss of all Value		0.00%	0.00%	0.00%	0.00%	0.00%			0.01%		0.00%		0.00%	
Total Area (acres) Potential Habitat	2497.28		212.35		3500.43		2676.24		905.03		392.69		4257.59	
No Measurable	98.57%	91.54%	95.86%	95.86%	98.75%	93.38%	98.65%	92.09%	91.15%	91.11%	95.33%	95.24%	98.67%	96.36%
Low to Moderate	1.43%	8.46%	4.12%	4.12%	1.25%	6.62%	1.35%	7.91%	8.85%	8.89%	4.67%	4.76%	1.33%	3.64%
High to Loss of all Value	0.00%	0.00%	0.02%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Potential Effect with Minimization Measures														
Total Area (acres) Point Occurrence	1.79		NA		2.59		2.49		0.30		0.20		1.29	
No Measurable		94.42%			95.77%	90.69%	93.93%	81.93%		66.50%			87.47%	79.78%
Low to Moderate		5.58%			4.23%	9.31%	5.95%	17.95%		33.50%			11.80%	19.50%
High to Loss of all Value		0.00%			0.00%	0.00%	0.12%	0.12%		0.00%			0.72%	0.72%
Total Area (acres) Polygon Occurrence	54.83		127.55		61.25		NA		118.41		3.93		13.39	
No Measurable		65.64%	83.20%	83.20%	98.36%	65.55%			78.97%		82.93%		93.53%	
Low to Moderate		34.36%	16.54%	16.54%	1.54%	34.35%			20.77%		17.07%		6.06%	
High to Loss of all Value		0.00%	0.26%	0.26%	0.10%	0.10%			0.26%		0.00%		0.41%	
Total Area (acres) Potential Habitat	2497.28		212.35		3500.43		2676.24		905.03		392.69		4257.59	
No Measurable	98.57%	91.54%	95.86%	95.86%	98.75%	93.38%	98.65%	92.09%	91.15%	91.11%	95.33%	95.24%	98.67%	96.36%
Low to Moderate	1.39%	8.42%	3.86%	3.86%	1.22%	6.59%	1.31%	7.87%	8.72%	8.75%	4.66%	4.73%	1.29%	3.59%
High to Loss of all Value	0.04%	0.04%	0.28%	0.28%	0.03%	0.04%	0.03%	0.04%	0.13%	0.14%	0.02%	0.02%	0.05%	0.06%

Table 5-27 Alpine-Subalpine Plants Results Intensity of Effect

Potential Effect	***Charleston draba***		***Charleston ivesia***		***Charleston kittentails***		***Charleston pussytoes***		***Charleston tansy***		***Clokey silene***		***Jaeger whitlowgrass***	
	Current Activities	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**	**Current Activities**	**Current & Future Activities**
Potential Effect with Mitigation Measures														
Total Area (acres) Point Occurrence	1.79		NA		2.59		2.49		0.30		0.20		1.29	
No Measurable		94.42%			95.77%	90.69%	93.93%	81.93%		66.50%			87.47%	79.78%
Low to Moderate		5.58%			4.23%	9.31%	5.95%	17.95%		33.50%			11.80%	19.50%
High to Loss of all Value		0.00%			0.00%	0.00%	0.12%	0.12%		0.00%			0.72%	0.72%
Total Area (acres) Polygon Occurrence	54.83		127.55		61.25		NA		118.41		3.93		13.39	
No Measurable		65.64%	83.20%	83.20%	98.36%	65.55%			78.97%		82.93%		93.53%	
Low to Moderate		34.36%	16.54%	16.54%	1.54%	34.35%			20.77%		17.07%		6.06%	
High to Loss of all Value		0.00%	0.26%	0.26%	0.10%	0.10%			0.26%		0.00%		0.41%	
Total Area (acres) Potential Habitat	2497.28		212.35		3500.43		2676.24		905.03		392.69		4257.59	
No Measurable	98.57%	91.54%	95.86%	95.86%	98.75%	93.38%	98.65%	92.09%	91.15%	91.11%	95.33%	95.24%	98.67%	96.36%
Low to Moderate	1.39%	8.42%	3.86%	3.86%	1.22%	6.59%	1.31%	7.87%	8.72%	8.75%	4.66%	4.73%	1.29%	3.59%
High to Loss of all Value	0.04%	0.04%	0.28%	0.28%	0.03%	0.04%	0.03%	0.04%	0.13%	0.14%	0.02%	0.02%	0.05%	0.06%

Table 5-28 NatureServe Alpine-Subalpine Plants Summary Table

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Charleston draba (*Draba paucifructa*)	**Charleston draba (*Draba paucifructa*)**				
Reference Condition Spring Mountains	Moderate decline	Low	Low	High	
Current Condition Spring Mountains	Moderate decline	Low	Low	High	Low
Current Condition Rangewide	Moderate decline	Low	Low	High	Low
Charleston Pussytoes (*Antennaria soliceps)*					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate
Jaeger Draba (*Draba jaegeri*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	Stable	Low	Moderate	High	Low
Charleston Ivesia (*Ivesia cryptocaulis*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	NA
Current Condition Spring Mountains	Stable	Low	Low	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	Moderate
Clokey Silene (*Silene clokey*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate
Charleston Tansy (*Sphaemeria compacta*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate
Charleston Kittentails (*Synthyris ranunculina*)					
Reference Condition Spring Mountains	10-30% Decline	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Moderate	High	Moderate

3.6.2 Cliffs and Steep Slopes Plants

Five species are included in the cliffs and steep slopes species group: Clokey greasebush, inch high fleabane, Jaeger ivesia, smooth dwarf greasebush, and smooth pungent greasebush.

3.6.2.1 Quality of Existing Information

Distribution data for plants utilizing cliffs and steep slopes in the Spring Mountains NRA are limited (Chapters 3 and 4). Species located in cliffs and steep slope habitats are difficult to survey due to the relatively inaccessible nature of their vertical structure. Additionally, the density of many of these species is relatively low. Information contained within the existing GIS platform database was used to model potential habitat for two species within the Spring Mountains NRA as it was determined that modeling potential habitat would provide a better representation of the distribution of these two species as opposed to merely using point localities. Our analysis was based upon point localities for four of the species, and point and polygon locations for the Jaeger ivesia that provided information of the interactions between these steep slope and cliff-dwelling plants and activities on the Spring Mountains NRA.

3.6.2.2 Quantitative Analysis

For the species associated with cliffs and steep slopes, the number of documented sites and occupied areas are small. The total habitat area (acres) represented by point occurrence localities ranged from 0.1 (smooth pungent greasebush) to 1.38 (Jaeger ivesia); habitat area represented by polygon occurrence localities was 60.2 acres for Jaeger ivesia; potential habitat (acres) ranged from 119 (Clokey greasebush) to 30,150 (Jaeger ivesia) (Table 5-29, Appendix 5F-9).

Based on point localities, the percentage of area that overlapped with current, and current and future activities ranged from zero for Clokey greasebush to 100 percent for smooth dwarf greasebush and smooth pungent greasebush (Table 5-29 and Table 5-30). Based on potential habitat, the percentage of area that overlapped with both current and future activities was about ten percent for Clokey greasebush and Jaeger ivesia.

Based on point locations, there was no relative potential effect from both current and future activities for Clokey greasebush and smooth pungent greasebush (Tables 5-29 and 5-30). The relative potential effect ranged from eight to nearly 13 percent for inch high fleabane and smooth dwarf greasebush for current, and 18 percent for Jaeger ivesia. These values increased when considering current and future activities (Table 5-30). While these relative percentages may be considered low for other plant species, this relative potential effect from overlapping activities is moderate for these species given their limited distribution and specialized habitat. Based on potential habitat, the relative potential effect from current and future activities for Clokey greasebush and Jaeger ivesia is low (<2%). For inch high fleabane, the current activity potentially affecting the species is CUAs (often associated with climbing routes) for known occurrences. Private lands were the only current activity potentially affecting the smooth dwarf greasebush. For known occurrences, current WUI, paved roads, and picnic area activities potentially affected Jaeger ivesia. Finally, future low mileage system trails would have a minor effect on inch high fleabane and Jaeger ivesia (Appendix 5F-9).

The implementation of conservation measures to their full potential would be successful at reducing the potential effects of both current and future activities (Tables 5-29 and 5-30). Avoidance measures were the most effective at reducing potential effects, while minimization and mitigation reduced effects to a similar degree with variation in their effectiveness by activity (Tables 5-29 and 5-30). For example, the relative potential effect from private lands to smooth

dwarf greasebush could be reduced by half through avoidance measures such as acquisition and protection of the species habitat, or preservation of habitat if the private land were developed.

The distribution of the intensity of the relative effect of all current and future activities on cliff s and steep slopes plants is summarized in Table 5-31 and illustrated in Appendix 5F-9. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. Based on point localities, three species (inch high fleabane, Jaeger ivesia, smooth dwarf greasebush) have 50 to 83 percent of the occurrences falling within areas where the intensity of effect from current and future activities will not measurably reduce the relative value of habitat. Furthermore, 17 to 50 percent of the occurrences for these three species fall within areas where the intensity of effect reduces the relative value of habitat by a low to moderately high degree. Very little habitat will experience high to complete loss, except for Jaeger ivesia when as much as ten percent of the relative habitat area would be affected. For potential habitat, greater than 90 percent of acres for the Clokey greasebush and Jaeger ivesia occur in areas where the intensity of effect from current and future activities will not measurably reduce the relative value of habitat.

For Clokey greasebush, inch high fleabane, and smooth dwarf greasebush, full implementation of the conservation measures did not provide any change in the distribution of occurrences relative to the intensity of effect. This may be because there are no specific conservation measures for the inch high fleabane. For Clokey greasebush, this is likely attributed to having only conservation measures that are targeted at one location for the species as opposed to all occurrence localities. For the Jaeger ivesia, avoidance and minimization measures typically provide a minor reduction of the effect of activities to the relative habitat area, and mitigation measures tended to provide the most reduction in impacts to habitat for this species.

3.6.2.3 Qualitative Analysis

Current information for these species is lacking as well as documentation of the known sites. Impacts are documented at occurring in the cliff habitat where climbing is known to occur. The severity of threats is low for all species (Table 5-32) given that a large number of threats (anthropogenic and natural) do not tend to affect cliffs and steep slopes habitat. The scope of the threats varied by species. The scope of threats is low for Clokey greasebush, which is based on presumed distribution of habitat (larger area than when based on point localities), as well as the fact that much of the distribution falls into wilderness areas where cliffs and steep slopes habitat is less accessible and threats tend to be lower. The scope of threat is low for inch high fleabane because this species is widely distributed, as is Jaeger ivesia, which is ranked as moderate. The scope of threats is high for smooth pungent and smooth dwarf greasebushes due to their limited distribution.

3.6.2.4 Species and Land Use Activity Interactions: Challenges

As noted above, distribution data for plants utilizing cliffs and steep slopes in the Spring Mountains NRA are limited. Survey and monitoring data are necessary to obtain an assessment of the status for all cliffs and steep slopes plant species: beginning with Clokey greasebush, smooth dwarf greasebush, and smooth pungent greasebush, and followed by inch high fleabane and Jaeger ivesia. Effects related to CUA activities (including areas associated with climbing) were noted as a primary activity causing effects inch high fleabane; however, the cause/effect relationship between effects of particular threats such as rock climbing should be more fully assessed. Additionally, reevaluation of existing conservation measures (e.g., those

targeting Robber's Roost) and developing new conservation measures to reduce effects and provide conservation for these species is necessary.

Table 5-29 Cliff and Steep Slopes Plants Results Current Activities

	Clokey greasebush	*Inch high fleabane*	*Jaeger Ivesia*	*Smooth dwarf greasebush*	*Smooth pungent greasebush*
Total Area					
Point Occurrence	0.60	0.60	1.38	0.20	0.10
Polygon Occurrence	NA	NA	60.2	NA	NA
Potential Habitat Estimate	119.35	NA	30,150.51	NA	NA
Area of Activity Overlap					
Point Occurrence	0.00%	16.75%	43.44%	100.51%	99.95%
Polygon Occurrences	NA	NA	35%	NA	NA
Potential Habitat	9.78%	NA	9.25%	NA	NA
Potential Effect					
Point Occurrence	0.00%	8.38%	17.95%	12.56%	0.00%
Polygon Occurrences	NA	NA	14.40%	NA	NA
Potential Habitat	1.59%	NA	1.15%	NA	NA
Potential Effect With Avoidance Measures					
Point Occurrence	0.00%	7.87%	16.94%	6.03%	0.00%
Polygon Occurrences	NA	NA	12.88%	NA	NA
Potential Habitat	0.83%	NA	0.92%	NA	NA
Potential Effect With Minimization Measures					
Point Occurrence	0.00%	6.37%	16.94%	12.56%	0.00%
Polygon Occurrences	NA	NA	13.29%	NA	NA
Potential Habitat	1.56%	NA	1.14%	NA	NA
Potential Effects With Mitigation Measures					
Point Occurrence	0.00%	8.38%	17.09%	12.56%	0.00%
Polygon Occurrences	NA	NA	13.11%	NA	NA
Potential Habitat	1.59%	NA	1.14%	NA	NA

Table 5-30 Cliff and Steep Slopes Plants Results Current and Future Activities

	Clokey greasebush	*Inch high fleabane*	*Jaeger Ivesia*	*Smooth dwarf greasebush*	*Smooth pungent greasebush*
Total Area					
Point Occurrence	0.60	0.60	1.38	0.10	0.20
Polygon Occurrence	NA	NA	60.2	NA	NA
Potential Habitat Estimate	119.35	NA	30,150.51	NA	NA
Area of Activity Overlap					
Point Occurrence	0.00%	33.50%	57.92%	99.95%	100.51%
Polygon Occurences	NA	NA	35%	NA	NA
Potential Habitat	9.86%	NA	10.05%	NA	NA
Potential Effect					
Point Occurrence	0.00%	12.73%	19.84%	0.00%	12.56%
Polygon Occurences	NA	NA	14.41%	NA	NA
Potential Habitat	1.59%	NA	1.29%	NA	NA
Potential Effect With Avoidance Measures					
Point Occurrence	0.00%	10.89%	18.24%	0.00%	6.03%
Polygon Occurences	NA	NA	12.89%	NA	NA
Potential Habitat	0.83%	NA	1.04%	NA	NA
Potential Effect With Minimazation Measures					
Point Occurrence	0.00%	9.72%	18.39%	0.00%	12.56%
Polygon Occurences	NA	NA	13.30%	NA	NA
Potential Habitat	1.56%	NA	1.19%	NA	NA
Potential Effects With Mitigation Measures					
Point Occurrence	0.00%	12.73%	18.97%	0.00%	12.56%
Polygon Occurences	NA	NA	13.12%	NA	NA
Potential Habitat	1.59%	NA	1.25%	NA	NA

Table 5-31 Cliffs and Steep Slopes Plants Intensity of Effect

	Clokey greasebush		*Inch high fleabane*		*Jaeger Ivesia*		*Smooth dwarf greasebush*		*Smooth pungent greasebush*	
Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.60		0.60		1.38		0.10		0.20	
No Measurable			83.19%	66.52%	60.30%	42.06%			50.00%	
Low to Moderate			16.66%	33.11%	29.99%	48.08%			50.00%	
High to Loss of all Value			0.15%	0.37%	9.71%	9.86%			0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		60.25		NA		NA	
No Measurable					61.69%	65.09%				
Low to Moderate					31.08%	27.68%				
High to Loss of all Value					7.23%	7.23%				
Total Area (acres) Potential Habitat	119.35		NA		30150.51		NA		NA	
No Measurable	93.65%	90.14%			96.65%	89.95%				
Low to Moderate	6.34%	9.85%			3.11%	9.80%				
High to Loss of all Value	0.01%	0.01%			0.24%	0.25%				

Potential Effect with Avoidance Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.60		0.60		1.38		0.10		0.20	
No Measurable			83.03%	66.52%	60.30%	42.06%			50.00%	
Low to Moderate			16.81%	33.32%	30.24%	48.48%			50.00%	
High to Loss of all Value			0.15%	0.15%	9.46%	9.46%			0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		60.25		NA		NA	
No Measurable					60.73%	65.09%				
Low to Moderate					32.77%	28.42%				
High to Loss of all Value					6.50%	6.50%				
Total Area (acres) Potential Habitat	119.35		NA		30150.51		NA		NA	
No Measurable	93.65%	90.14%			96.63%	89.95%				
Low to Moderate	6.35%	9.86%			3.23%	9.90%				
High to Loss of all Value	0.00%	0.00%			0.14%	0.15%				

Table 5-31 Cliffs and Steep Slopes Plants Intensity of Effect

	Clokey greasebush		*Inch high fleabane*		*Jaeger Ivesia*		*Smooth dwarf greasebush*		*Smooth pungent greasebush*	
Potential Effect with Minimization Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.60		0.60		1.38		0.10		0.20	
No Measurable			83.19%	66.52%	57.99%	42.06%			50.00%	
Low to Moderate			16.66%	33.11%	32.31%	48.08%			50.00%	
High to Loss of all Value			0.15%	0.37%	9.71%	9.86%			0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		60.25		NA		NA	
No Measurable					60.79%	65.09%				
Low to Moderate					32.06%	27.76%				
High to Loss of all Value					7.15%	7.15%				
Total Area (acres) Potential Habitat	119.35		NA		30150.51		NA		NA	
No Measurable	93.65%	90.14%			96.66%	89.95%				
Low to Moderate	6.34%	9.85%			3.11%	9.81%				
High to Loss of all Value	0.01%	0.01%			0.23%	0.24%				

Potential Effect with Mitigation Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.60		0.60		1.38		0.10		0.20	
No Measurable			83.19%	66.52%	61.18%	42.06%			50.00%	
Low to Moderate			16.66%	33.11%	32.31%	51.26%			50.00%	
High to Loss of all Value			0.15%	0.37%	6.52%	6.67%			0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		60.25		NA		NA	
No Measurable					65.36%	65.09%				
Low to Moderate					32.06%	32.33%				
High to Loss of all Value					2.58%	2.58%				
Total Area (acres) Potential Habitat	119.35		NA		30150.51		NA		NA	
No Measurable	93.65%	90.14%			96.69%	89.95%				
Low to Moderate	6.34%	9.85%			3.11%	9.86%				
High to Loss of all Value	0.01%	0.01%			0.19%	0.19%				

Table 5-32 Cliffs and Steep Slopes Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Clokey greasebush (*Glossopetalon clokeyi*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Inch high fleabane (*Erigeron uncialis spp. conjugans*)					
Reference Condition Spring Mountains	U	Low	Low	High	
Current Condition Spring Mountains	U	Low	Low	High	Low
Current Condition Rangewide	U	Low	Low	High	Low
Jaeger Ivesia (*Ivesia jaegeri*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	Stable	Low	Moderate	High	Low
Smooth dwarf greasbush (*Glossopetalon pungens var. glabrum*)					
Reference Condition Spring Mountains	U	Low	HIgh	High	
Current Condition Spring Mountains	U	Low	High	High	Low
Current Condition Rangewide	U	Low	HIgh	High	Low
Smooth pungent greasebush (*Glossopetalon pungens var. pungens*)					
Reference Condition Spring Mountains	U	Low	High	High	
Current Condition Spring Mountains	U	Low	High	High	Low
Current Condition Rangewide	U	Low	Low	High	Low

3.6.3 Low Elevation Plants

Four species are included in the low elevation plants species group: black woollypod, Clokey buckwheat, Death Valley beardtongue, and Spring Mountains milkvetch.

3.6.3.1 Quality of Existing Information

Distribution data for plants associated with low elevation habitats in the Spring Mountains NRA is limited (Chapter 3/4). The distribution of these species is not well known and systematic surveys have not been completed for black woollypod, Clokey buckwheat, and Spring

Mountains milkvetch on the Spring Mountains NRA. In general, the number of occurrences for each species is extremely low on the Spring Mountains NRA. Information contained within the existing GIS platform database was used to model potential habitat for these species on the Spring Mountains NRA, except for Spring Mountains milkvetch. Our analysis was based on point locations for all the species, plus polygon locations for the Death Valley beardtongue, which provided useful information of the interactions between these low elevation plants and activities on the Spring Mountains NRA.

3.6.3.2 Quantitative Analysis

For the plant species associated with low elevation habitats, the total habitat area (acres) represented by point occurrence localities ranged from 0.2 for black woollypod and Clokey buckwheat, 0.3 for Spring Mountains milkvetch to 0.9 for Death Valley beardtongue. Habitat area represented by polygon occurrence localities was 85 acres for Death Valley beardtongue and was not available for the remaining species. Potential habitat ranged from 5,435 acres for Clokey buckwheat, 7,080 for Death Valley beardtongue, to 9,763 for black woollypod (Table 5-33, Appendix 5F-10).

The percentage of area that overlapped with activities ranged from 50 to 100 percent, with Death Valley beardtongue and Clokey buckwheat having the largest areas of overlap of occurrences and habitat versus activities (Table 5-33). This can be attributed to the activities that overlap with the species. The activities, WUI and horse and burro, have the largest number of acres that impact the relatively small amount of low elevation plant habitat on the Spring Mountains NRA.

The potential effect of current activities tended to be low to moderate (Tables 5-33 and 5-34). Relative potential effects ranged from 17 percent for Spring Mountains milkvetch to 46 percent for Clokey buckwheat for current activities. Current activities potentially affecting low elevation plant species to the greatest degree are horse and burro use, which affects all low elevation plant species; paved roads, which affects Clokey buckwheat; unpaved roads, which affects black woollypod; and activities in the WUI, which affects Clokey buckwheat and Spring Mountains milkvetch (Appendix 5F-10). For low elevation plant species, future activities are not estimated to contribute additional effects to those currently occurring from activities; however, this is likely due to the limited occurrence data (Table 5-34). Systematic surveys could locate low elevation plants in areas that overlap with future activities.

The implementation of conservation measures to their full potential would provide limited success in reducing the potential effects of current activities of the low elevation species group (Tables 5-33 and 5-34). This may result in part because that ongoing implementation of conservation measures was incorporated into the ranking of the potential effect, reducing the impact of existing activities for WUI and horse and burro use (Appendix 5F-10). Avoidance conservation measures addressed placement of new developments and activities and did not necessarily address existing activities such as paved and unpaved roads. In addition, many of the conservation measures are not targeted to these low elevation plant species or their habitat.

The distribution of the intensity of the relative effect of all current activities on low elevation plants is summarized in Table 5-35 and illustrated in Appendix 5F-10. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. The majority (60 to 70%) of the habitat and a large percentage (34 to 100%) of point localities affected for all low elevation plant species will continue to experience low to moderate effects after the implementation of conservation measures. Black woollypod and Clokey buckwheat have 16 and 19 percent of the occurrences respectively falling within areas

where the intensity of effect from current activities will reduce the relative value of habitat at a high level or complete loss. Given the limited distribution of these two species at this time, this could indicate a substantial loss of habitat. If avoidance measures were to be implemented for the black woollypod, the intensity of effect for 16 percent of occurrences would shift into the low or moderate level.

3.6.3.3 Qualitative Analysis

Current information is lacking for the low elevation species on the Spring Mountain NRA. The Spring Mountains milkvetch and Clokey buckwheat are restricted endemics that occurs in habitat with a number of threats (Appendix 5F-10). For the black woollypod and Death Valley beardtongue in the Spring Mountains, these species occur over a wider range but have limited occurrences and a number of threats in the Spring Mountains. The scope of threats varied from moderate to high. Threats include the risk of fire and increased risk of invasion from cheatgrass and other invasive annual weeds. Horse use in these habitats has been reduced through recent gathers.

3.6.3.4 Species and Land Use Activity Interactions: Challenges

Inventory and monitoring data for the Spring Mountains NRA are needed for all species. This is particularly important for the Spring Mountains milkvetch, which is a restricted endemic species and considered the most at risk. Determining the importance of the population in the Spring Mountains to the entire range would be important for Clokey buckwheat, which is relatively rare across its range. The Spring Mountains NRA provides a disjunct population of black woollypod and small portion of the habitat for Death Valley beardtongue. Horse and burro, CUAs, WUI paved roads, and unpaved roads activities pose a threat to the low elevation plant species. Implementation and monitoring (when appropriate) of measures to reduce threats and provide information with respect to the effect of various threats on population status are necessary for these species. In addition, existing conservation measures should be reevaluated or new conservation measures determined to provide sufficient conservation of these species in the Spring Mountains NRA, again, most importantly for the Spring Mountains milkvetch.

Table 5-33 Low Elevation Plants Results Current Activities

	Black woollypod	***Clokey buckwheat***	***Death Valley beardtongue***	***Spring Mountains milkvetch***
Total Area				
Point Occurrence	0.20	0.20	0.90	0.30
Polygon Occurrence	NA	NA	84.69	NA
Potential Habitat Estimate	9,762.84	5,434.77	7,079.91	NA
Area of Activity Overlap				
Point Occurrence	50.25%	100.51%	100.51%	67.01%
Polygon Occurences	NA	NA	100.00%	NA
Potential Habitat	62.82%	75.06%	70.81%	NA
Potential Effect				
Point Occurrence	30.65%	46.23%	40.20%	16.75%
Polygon Occurences	NA	NA	40.30%	NA
Potential Habitat	16.66%	21.87%	21.12%	NA
Potential Effect With Avoidance Measures				
Point Occurrence	24.12%	45.73%	37.97%	16.75%
Polygon Occurences	NA	NA	38.43%	NA
Potential Habitat	16.41%	21.22%	20.69%	NA
Potential Effect With Minimazation Measures				
Point Occurrence	27.14%	40.71%	30.15%	14.74%
Polygon Occurences	NA	NA	30.35%	NA
Potential Habitat	12.74%	17.02%	15.94%	NA
Potential Effects With Mitigation Measures				
Point Occurrence	30.65%	46.23%	40.20%	16.75%
Polygon Occurences	NA	NA	40.10%	NA
Potential Habitat	16.66%	21.24%	21.01%	NA

Table 5-34 Low Elevation Plants Results Current and Future Activities

	Black woollypod	***Clokey buckwheat***	***Death Valley beardtongue***	***Spring Mountains milkvetch***
Total Area				
Point Occurrence	0.20	0.20	0.90	0.30
Polygon Occurrence	NA	NA	84.69	NA
Potential Habitat Estimate	9,762.84	5,434.77	7,079.91	NA
Area of Activity Overlap				
Point Occurrence	50.25%	100.51%	100.51%	67.01%
Polygon Occurences	NA	NA	100.00%	NA
Potential Habitat	62.82%	75.06%	70.81%	NA
Potential Effect				
Point Occurrence	30.65%	46.23%	40.20%	16.75%
Polygon Occurences	NA	NA	40.30%	NA
Potential Habitat	16.66%	21.87%	21.12%	NA
Potential Effect With Avoidance Measures				
Point Occurrence	24.12%	45.73%	37.97%	16.75%
Polygon Occurences	NA	NA	38.43%	NA
Potential Habitat	16.41%	21.22%	20.69%	NA
Potential Effect With Minimazation Measures				
Point Occurrence	27.14%	40.71%	30.15%	14.74%
Polygon Occurences	NA	NA	30.35%	NA
Potential Habitat	12.74%	17.02%	15.94%	NA
Potential Effects With Mitigation Measures				
Point Occurrence	30.65%	46.23%	40.20%	16.75%
Polygon Occurences	NA	NA	40.10%	NA
Potential Habitat	16.66%	21.24%	21.01%	NA

Table 5-35 Low Evaluation Plants Intensity of Effect

	Black woollypod		Clokey buckwheat		Death Valley beardtongue		Spring Mountains milkvetch	
Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.20		0.20		0.90		0.30	
No Measurable	50.00%		0.00%		0.00%		33.33%	
Low to Moderate	34.03%		81.37%		100.00%		66.67%	
High to Loss of all Value	15.97%		18.63%		0.00%		0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		84.69		NA	
No Measurable					0.00%			
Low to Moderate					99.86%			
High to Loss of all Value					0.55%			
Total Area (acres) Potential Habitat	9762.84		5434.77		7079.91		NA	
No Measurable	37.16%	35.30%	24.73%	22.54%	29.16%	27.93%		
Low to Moderate	62.34%	63.31%	73.53%	75.22%	70.67%	71.75%		
High to Loss of all Value	0.50%	1.40%	1.73%	2.24%	0.17%	0.32%		

Potential Effect with Avoidance Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.20		0.20		0.90		0.30	
No Measurable	50.00%		0.00%		0.00%		33.33%	
Low to Moderate	50.00%		81.37%		100.00%		66.67%	
High to Loss of all Value	0.00%		18.63%		0.00%		0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		84.69		NA	
No Measurable					0.00%			
Low to Moderate					100.00%			
High to Loss of all Value					0.14%			
Total Area (acres) Potential Habitat	9762.84		5434.77		7079.91		NA	
No Measurable	37.08%	35.30%	24.37%	22.54%	29.13%	27.93%		
Low to Moderate	62.71%	64.43%	74.57%	76.27%	70.81%	72.01%		
High to Loss of all Value	0.20%	0.27%	1.06%	1.19%	0.06%	0.07%		

Potential Effect with Minimization Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.20		0.20		0.90		0.30	
No Measurable	50.00%		0.00%		0.00%		33.33%	
Low to Moderate	34.03%		81.37%		100.00%		66.67%	
High to Loss of all Value	15.97%		18.63%		0.00%		0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		84.69		NA	
No Measurable					0.00%			
Low to Moderate					99.86%			
High to Loss of all Value					0.14%			
Total Area (acres) Potential Habitat	9762.84		5434.77		7079.91		NA	
No Measurable	37.18%	35.30%	24.94%	22.54%	29.19%	27.93%		
Low to Moderate	62.34%	63.88%	73.53%	75.83%	70.67%	71.88%		
High to Loss of all Value	0.48%	0.82%	1.53%	1.62%	0.14%	0.19%		

Potential Effect with Mitigation Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.20		0.20		0.90		0.30	
No Measurable	50.00%		0.00%		0.00%		33.33%	
Low to Moderate	34.03%		81.37%		100.00%		66.67%	
High to Loss of all Value	15.97%		18.63%		0.00%		0.00%	
Total Area (acres) Polygon Occurrence	NA		NA		84.69		NA	
No Measurable					0.00%			
Low to Moderate					99.97%			
High to Loss of all Value					0.45%			
Total Area (acres) Potential Habitat	9762.84		5434.77		7079.91		NA	
No Measurable	37.16%	35.30%	24.73%	22.54%	29.16%	27.93%		
Low to Moderate	62.34%	63.78%	74.32%	76.33%	70.80%	71.97%		
High to Loss of all Value	0.50%	0.92%	0.95%	1.13%	0.04%	0.11%		

Table 5-36 Low Elevation Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Black woollypod (*Astragalus funereus*)					
Reference Condition Spring Mountains	U	Low	Moderate	Low	
Current Condition Spring Mountains	U	Low	Moderate	Low	Low
Current Condition Rangewide	U	Low	Moderate	Moderate	Low
Clokey buckwheat (*Eriogonum heermannii var. clokeyi*)					
Reference Condition Spring Mountains	U	Low	Moderate	Moderate	
Current Condition Spring Mountains	U	Low	Moderate	Moderate	Low
Current Condition Rangewide	U	Moderate	High	Moderate	U
Death Valley beardtongue (*Penstemon fruticiformis spp. amargosae*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	U	U	U	U	U
Spring Mountains milkvetch (*Astragalus remotus*)					
Reference Condition Spring Mountains	U	Moderate	High	High	
Current Condition Spring Mountains	U	Moderate	High	High	Low
Current Condition Rangewide	U	Moderate	High	High	Low

3.6.4 Mixed Conifer Plants

We included 17 species in the mixed conifer plant species group analysis: Charleston beardtongue, Charleston goldenbush, Charleston grounddaisy, Charleston pinewood lousewort, Charleston violet, Clokey eggvetch, Clokey milkvetch, Clokey mountain sage, Clokey paintbrush, Clokey thistle, dicranoweisia moss, Hitchcock bladderpod, Jaeger beardtongue, Nevada willowherb, New York Mountains catseye, rosy King sandwort, and rough angelica. This is a diverse group of species based on distribution and habitat. Some species such as Clokey mountain sage, Charleston grounddaisy, and Charleston violet occur over a wide elevation range in pinyon-juniper woodlands, mixed conifer forests, and subalpine forests while other species are found at lower elevations including rough angelica, rosy king sandwort, Clokey milkvetch, and Clokey eggvetch. Most species are found in forested habitats or openings in forested habitats. However, Charleston beardtongue is found in open meadows and gravelly areas at higher elevations. Nevada willowherb, Charleston goldenbush and Hitchcock bladderpod are typically found on steep slopes while rough angelica, Clokey thistle and Charleston draba are associated with moist habitats.

3.6.4.1 Quality of Existing Information

The level of distribution information varies for the species in the mixed conifer group in the Spring Mountains NRA from Clokey eggvetch and rough angelica with extensive surveys, to Nevada willowherb with limited surveys and no current information (Chapters 3-4). Information contained within the existing GIS platform database was used to model potential habitat for these species on the Spring Mountains NRA. Precision and accuracy of the potential habitat models reflect the current understanding of species distribution, but depend on the availability and quality of the existing data sets. Additionally, our analysis was based on occurrence (point and polygon data) locations that provided useful information of the interactions between these plants and activities on the Spring Mountains NRA. Point and polygon data may represent multiple visits or records of the same location causing some bias in the data. Distribution information is very limited for the dicranoweisia moss. For New York Mountains catseye, the spatial data does not accurately reflect the distribution of the species in the Spring Mountains NRA. Therefore, for New York Mountains catseye and dicranoweisia moss, only a qualitative analysis was considered.

3.6.4.2 Quantitative Analysis

Overall, for the mixed conifer group, all the species except for Nevada willowherb had overlapping land use activities. Charleston grounddaisy, Charleston pinewood lousewort, Charleston violet, Clokey eggvetch, Clokey milkvetch, Jaeger beardtongue, and rough angelica had the greatest overlap with activities within this group for current activities and current and future activities (Tables 5-37 and 5-38). Overlap with potential habitat for current and current and future activities was the greatest for Clokey eggvetch (74%), Clokey milkvetch (68%), Charleston grounddaisy (57%), Jaeger beardtongue (48%), and Charleston violet (38%).

Based on occurrence localities, the species with the largest relative potential effects from current and future activities were Clokey eggvetch, Clokey milkvetch, rough angelica, Jaeger beardtongue, and Charleston pinewood lousewort (Tables 5-37 and 5-38). Similar relative potential effects from 13 to 24 percent were also seen for potential habitat with Clokey eggvetch, Clokey milkvetch, Charleston grounddaisy, Jaeger beardtongue, and Charleston violet. Charleston grounddaisy, Charleston pinewood lousewort, and Clokey milkvetch also have potential effects from many different types of activities compared to other species in this group (Appendix 5F-11).

Based on occurrence localities, the current activities potentially affecting mixed conifer plant species to the highest degree were horses and burros (>1.0 mile from spring/stream), WUI and CUAs (Appendix 5F-11). For potential habitat, horses and burros (>1.0 mile from spring/stream) had the largest relative potential effect; whereas, the future activities potentially affecting mixed conifer plant species to the highest degree were the future ski area as well as the west side PO camping (Appendix 5F-11). For the species with the greatest relative potential effect from activities, horses and burros (>1.0 mile from spring/stream), paved road footprint and to a lesser degree firewood gathering had the greatest effect for Clokey milkvetch; horses and burros (>1.0 mile from spring/stream) and WUI had the greatest effect for Clokey eggvetch. Effects on rough angelica were mostly attributed to the picnic area and WUI activities.

The implementation of conservation measures to their full potential would not significantly reduce the potential effects of both current and future activities (Tables 5-37 and 5-38). This may result in part from the fact that ongoing implementation of conservation measures were incorporated into the ranking of the potential effects (Appendix 5C). These conservation measures, therefore, have already reduced the impact of existing activities including horse and burro and WUI activities that have the greatest relative potential effect. Additional

implementation of the existing conservation measures is unlikely to substantially further reduce the effect of these activities. Avoidance conservation measures addressed placement of new developments and activities, but did not necessarily address existing facilities. For example, avoidance measures in the future ski area development could reduce the relative potential effect to Charleston draba. Avoidance measures could also reduce the relative potential effects to Clokey eggvetch and Clokey milkvetch from development of west side campgrounds. Minimization measures tended to be the most effective at reducing potential effects for current activities, while avoidance measures tended to be the most valuable at reducing potential effects for current and future activities combined. Mitigation measures generally did not reduce the effects of activities generally due to the lack of existing conservation measures for mitigation or habitat restoration (Tables 5-37 and 5-38).

The distribution of the intensity of the relative effect of all current and future activities on mixed conifer plants is summarized in Table 5-39 and illustrated in Appendix 5F-11. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For ten out of the 16 species evaluated, current activities generally fell within areas where the intensity of effect was not measurable for both occurrence localities and potential habitat. This implies that current protection measures are successful for a majority of these species for ongoing land use activities. For the remaining six species (Charleston grounddaisy, Charleston violet, Clokey eggvetch, Clokey milkvetch, rough angelica and Jaeger beardtongue) the relative potential effects tended to be larger. The area within the high to loss of all value categories was notable for these species except Charleston grounddaisy. The distribution of acres in the high to loss of all value categories increased for the future activities with Clokey eggvetch, Clokey milkvetch, and Jaeger beardtongue. Avoidance measures reduced the intensity of effect for Clokey eggvetch and Clokey milkvetch for future activities. Minimization and mitigation reduced the intensity of effect Jaeger beardtongue and rough angelica. The conservation measures did not tend to be very successful at reducing the amount of area where all of the relative habitat value would be eliminated from current activities.

3.6.4.3 Qualitative Analysis

Threats are currently occurring in the known distribution of the species over some portion of the range (Table 5-40). Severity is often low for most species in this group since most occurrences have continued to persist with the ongoing impacts except for Nevada willowherb and Clokey eggvetch. The scope of threats is generally moderate (50-75% of the element occurrence) and habitat is affected by some activity, while threats are high for rosy king sandwort and Clokey eggvetch and low for Charleston goldenbush, Clokey thistle, and Hitchcock bladderpod. Charleston goldenbush, Clokey thistle, and Hitchcock bladderpod tend to be found on steep slopes, into the subalpine environments, and appear to be doing better than other species in this group. The threat rankings are unknown for populations' rangewide for Charleston violet, Clokey paintbrush, and Nevada willowherb since information on populations outside the Spring Mountains is lacking. Clokey paintbrush is only tracked in Nevada. Other threats considered included the effects of fire suppression on vegetation and those impacts from horses outside of horse and burro territories. Changes in threats may increase with implementation of fuel projects or vegetation management projects.

Table 5-37 Mixed Conifer Plants Results Current Activities

	Charleston beardtongue	*Charleston goldenbush*	*Charleston grounddaisy*	*Charleston pinewood lousewort*	*Charleston violet*	*Clokey eggvetch*	*Clokey milkvetch*	*Clokey mountain sage*	*Clokey paintbrush*	*Clokey thistle*	*Hitchcock bladderpod*	*Jaeger beardtongue*	*Nevada whillowherb*	*Rosy king sandwort*	*Rough angelica*
Total Area															
Point Occurrence	2.1	0.9	1.3	1.2	1.7	1.9	1.3	0.5	3.5	2.7	2.4	1.4	0.5	1.2	0.8
Polygon Occurrence	137.53	122.29	1,048.85	202.27	537.79	23.13	291.33	437.66	124.16	5.05	9.75	350.86	NA	114.77	126.79
Potential Habitat Estimate	11,663.91	5,552.58	31,429.19	24,227.66	22,668.94	6,455.41	46,156.67	19,308.38	32,817.55	6,838.12	15,412.43	68,177.69	2,865.28	20,679.37	1,845.49
Area of Activity Overlap															
Point Occurrence	22.02%	18.98%	19.33%	34.34%	36.06%	53.96%	57.44%	10.05%	13.21%	13.77%	17.17%	47.38%	0.00%	35.18%	56.54%
Polygon Occurrences	3.85%	12.31%	55.47%	48.75%	30.05%	57.46%	74.83%	38.36%	16.84%	10.50%	13.95%	17.52%	NA	17.49%	44.80%
Potential Habitat	4.28%	5.69%	56.93%	14.50%	37.35%	73.74%	67.63%	17.32%	9.61%	2.46%	4.97%	47.62%	4.85%	9.05%	22.21%
Average of all metrics	10.05%	12.33%	43.91%	32.53%	34.49%	61.72%	66.63%	21.91%	13.22%	8.91%	12.03%	37.51%	2.43%	20.57%	41.18%
Potential Effect															
Point Occurrence	9.09%	5.25%	5.10%	15.91%	9.10%	19.15%	21.57%	3.42%	6.86%	4.50%	7.96%	16.58%	0.00%	10.55%	23.24%
Polygon Occurrences	1.30%	4.89%	15.53%	20.63%	11.93%	14.88%	28.95%	14.60%	5.68%	3.11%	5.65%	8.56%	NA	8.32%	17.04%
Potential Habitat	1.48%	2.09%	15.28%	4.84%	11.81%	21.72%	18.04%	4.92%	3.27%	0.76%	1.80%	12.82%	1.42%	2.84%	8.77%
Average of all metrics	3.96%	4.08%	11.97%	13.79%	10.95%	18.58%	22.85%	7.65%	5.27%	2.79%	5.14%	12.65%	0.71%	7.24%	16.35%
Potential Effect With Avoidance Measures															
Point Occurrence	7.66%	3.69%	4.72%	14.24%	7.51%	15.92%	20.80%	2.41%	6.17%	3.09%	6.11%	16.22%	0.00%	9.97%	21.99%
Polygon Occurrences	0.91%	3.81%	14.87%	16.56%	9.01%	14.27%	25.84%	13.14%	4.53%	2.18%	4.52%	7.49%	NA	6.89%	14.92%
Potential Habitat	1.14%	1.67%	14.88%	4.34%	10.76%	20.98%	17.71%	4.56%	2.96%	0.61%	1.50%	12.55%	1.10%	2.53%	7.42%
Average of all metrics	3.23%	3.06%	11.49%	11.71%	9.09%	17.06%	21.45%	6.70%	4.56%	1.96%	4.05%	12.09%	0.55%	6.46%	14.78%
Potential Effect With Minimization Measures															
Point Occurrence	8.14%	4.02%	3.87%	12.56%	8.57%	15.92%	18.01%	2.81%	6.35%	3.91%	6.95%	15.00%	0.00%	9.13%	18.59%
Polygon Occurrences	0.87%	3.96%	11.95%	18.42%	10.07%	14.27%	23.91%	12.12%	4.62%	2.50%	5.51%	7.28%	NA	7.19%	15.70%
Potential Habitat	1.26%	1.95%	11.79%	4.15%	9.68%	17.41%	13.78%	3.93%	2.79%	0.61%	1.58%	9.86%	1.33%	2.40%	8.18%
Average of all metrics	3.42%	3.31%	9.20%	11.71%	9.44%	15.87%	18.57%	6.29%	4.58%	2.34%	4.68%	10.71%	0.67%	6.24%	14.16%
Potential Effects With Mitigation Measures															
Point Occurrence	8.14%	5.25%	5.10%	13.40%	9.10%	18.25%	21.57%	3.42%	6.43%	4.50%	7.96%	15.44%	0.00%	10.55%	21.48%
Polygon Occurrences	1.10%	4.87%	15.52%	20.22%	11.74%	14.53%	28.80%	14.60%	5.64%	3.11%	5.65%	8.56%	NA	7.16%	16.06%
Potential Habitat	1.37%	2.01%	15.25%	4.75%	11.68%	21.21%	18.03%	4.89%	3.16%	0.72%	1.68%	12.81%	1.40%	2.77%	8.01%
Average of all metrics	3.53%	4.04%	11.96%	12.79%	10.84%	18.00%	22.80%	7.64%	5.08%	2.78%	5.10%	12.27%	0.70%	6.83%	15.18%

Table 5-38 Mixed Conifer Plants Results Current and Future Activities

	Charleston beardtongue	*Charleston goldenbush*	*Charleston grounddaisy*	*Charleston pinewood lousewort*	*Charleston violet*	*Clokey eggvetch*	*Clokey milkvetch*	*Clokey mountain sage*	*Clokey paintbrush*	*Clokey thistle*	*Hitchcock bladderpod*	*Jaeger beardtongue*	*Nevada whillowherb*	*Rosy king sandwort*	*Rough angelica*
Total Area															
Point Occurrence	2.1	0.9	1.3	1.2	1.7	1.9	1.3	0.5	3.5	2.7	2.4	1.4	0.5	1.2	0.8
Polygon Occurrence	137.53	122.29	1,048.85	202.27	537.79	23.13	291.33	437.66	124.16	5.05	9.75	350.86	NA	114.77	126.79
Potential Habitat Estimate	11,663.91	5,552.58	31,429.19	24,227.66	22,668.94	6,455.41	46,156.67	19,308.38	32,817.55	6,838.12	15,412.43	68,177.69	2,865.28	20,679.37	1,845.49
Area of Activity Overlap															
Point Occurrence	27%	18.98%	19.33%	34.34%	36.06%	65.07%	57.99%	10.05%	18.67%	21.22%	25.55%	54.56%	0.00%	35.18%	56.54%
Polygon Occurrences	3.90%	12.31%	55.47%	49.33%	30.74%	57.46%	75.02%	38.37%	16.87%	10.50%	13.95%	23.63%	NA	17.49%	44.80%
Potential Habitat	5.88%	7.73%	57.12%	15.30%	38.42%	74.10%	68.10%	17.82%	11.17%	4.69%	7.18%	48.54%	5.00%	10.39%	23.25%
Average of all metrics	12.19%	13.01%	43.97%	32.99%	35.07%	65.54%	67.04%	22.08%	15.57%	12.14%	15.56%	42.24%	2.50%	21.02%	41.53%
Potential Effect															
Point Occurrence	12.92%	5.25%	5.10%	15.91%	9.10%	29.15%	21.73%	3.42%	9.65%	9.72%	12.90%	23.40%	0.00%	10.55%	23.24%
Polygon Occurrences	1.32%	4.89%	15.53%	21.00%	12.76%	14.88%	35.65%	14.67%	5.69%	3.11%	5.65%	13.57%	NA	8.32%	17.04%
Potential Habitat	2.27%	3.39%	16.10%	5.39%	12.56%	24.10%	19.09%	5.27%	4.18%	1.85%	2.94%	13.92%	1.48%	3.60%	9.61%
Average of all metrics	5.50%	4.51%	12.24%	14.10%	11.47%	22.71%	25.49%	7.78%	6.50%	4.89%	7.16%	16.97%	0.74%	7.49%	16.63%
Potential Effect With Avoidance Measures															
Point Occurrence	8.61%	3.69%	4.72%	14.24%	7.51%	23.33%	20.87%	2.41%	6.89%	4.39%	7.37%	20.25%	0.00%	9.97%	21.99%
Polygon Occurrences	0.92%	3.81%	14.87%	16.82%	9.39%	14.27%	28.39%	13.16%	4.70%	2.18%	4.52%	10.29%	NA	6.89%	14.92%
Potential Habitat	1.37%	2.22%	15.20%	4.61%	11.13%	21.41%	18.15%	4.72%	3.29%	0.94%	1.82%	13.04%	1.11%	2.79%	7.77%
Average of all metrics	3.63%	3.24%	11.59%	11.89%	9.34%	19.67%	22.47%	6.77%	4.96%	2.50%	4.57%	14.52%	0.56%	6.55%	14.89%
Potential Effect With Minimization Measures															
Point Occurrence	11.01%	4.02%	3.87%	12.56%	8.57%	23.75%	18.09%	2.81%	8.47%	7.82%	10.68%	20.32%	0.00%	9.13%	18.59%
Polygon Occurrences	0.88%	3.96%	11.95%	18.69%	10.70%	14.27%	30.80%	12.17%	4.62%	2.50%	5.51%	11.20%	NA	7.19%	15.70%
Potential Habitat	1.86%	2.93%	12.41%	4.57%	10.26%	19.24%	14.76%	4.20%	3.47%	1.43%	2.43%	10.70%	1.38%	2.96%	8.76%
Average of all metrics	4.58%	3.63%	9.41%	11.94%	9.84%	19.09%	21.22%	6.39%	5.52%	3.92%	6.21%	14.07%	0.69%	6.43%	14.35%
Potential Effects With Mitigation Measures															
Point Occurrence	10.53%	5.25%	5.10%	13.40%	9.10%	25.13%	21.73%	3.42%	8.56%	8.41%	11.64%	21.03%	0.00%	10.55%	21.48%
Polygon Occurrences	1.12%	4.87%	15.52%	20.53%	12.35%	14.53%	33.57%	14.65%	5.65%	3.11%	5.65%	12.59%	NA	7.16%	16.06%
Potential Habitat	1.96%	2.99%	15.84%	5.18%	12.28%	22.30%	18.80%	5.16%	3.85%	1.55%	2.54%	13.63%	1.45%	3.34%	8.68%
Average of all metrics	4.54%	4.37%	12.15%	13.04%	11.24%	20.65%	24.70%	7.74%	6.02%	4.36%	6.61%	15.75%	0.73%	7.02%	15.41%

Table 5-39 Mixed Conifer Plants Intensity of Effect

	Charleston beardtongue		***Charleston goldenbush***		***Charleston grounddaisy***		***Charleston pinewood lousewort***		***Charleston violet***		***Clokey eggvetch***		***Clokey milkvetch***		***Clokey mountain sage***		***Clokey paintbrush***		***Clokey thistle***		***Hitchcock bladderpod***		***Jaeger beardtongue***		***Nevada whillowherb***		***Rosy king sandwort***		***Rough angelica***	
Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	2.09		0.90		1.29		1.19		1.69		1.89		1.29		0.50		3.48		2.69		2.39		1.39		0.50		1.19		0.80	
No Measurable	77.98%	73.21%	80.77%		80.49%		65.25%		64.16%		45.37%	35.09%	42.52%	41.97%	88.95%		85.44%	81.35%	86.37%	78.96%	82.80%	74.47%	48.10%	45.73%			64.92%		35.69%	
Low to Moderate	18.80%	23.56%	18.68%		19.24%		34.49%		35.84%		51.83%	51.54%	51.46%	52.01%	10.37%		10.18%	14.26%	13.46%	20.87%	14.56%	22.89%	44.80%	40.06%			34.63%		51.20%	
High to Loss of all Value	3.22%	3.22%	0.55%		0.27%		0.25%		0.00%		2.80%	13.37%	6.01%	6.01%	0.68%		4.38%	4.38%	0.17%	0.17%	2.65%	2.65%	7.11%	14.21%			0.44%		13.11%	
Total Area (acres) Polygon Occurrence	137.53		122.29		1048.85		202.27		537.79		23.13		291.33		437.66		124.16		5.05		9.75		350.86		NA		114.77		126.79	
No Measurable	96.14%	96.10%	87.69%		44.39%		50.73%	50.68%	69.78%	69.26%	42.54%	42.54%	23.89%	24.98%	61.15%	61.64%	83.16%	83.13%	89.57%		86.10%		82.31%	76.37%			79.84%		54.78%	
Low to Moderate	3.49%	3.53%	11.17%		54.75%		45.45%	45.48%	28.13%	27.87%	57.13%	57.13%	70.02%	56.97%	35.76%	35.16%	15.70%	15.73%	9.77%		13.28%		15.74%	19.15%			17.10%		41.13%	
High to Loss of all Value	0.37%	0.37%	1.14%		0.86%		3.81%	3.84%	2.09%	2.87%	0.33%	0.33%	6.10%	18.05%	3.10%	3.20%	1.14%	1.15%	0.66%		0.62%		1.95%	4.49%			3.06%		4.09%	
Total Area (acres) Potential Habitat	11663.91		5552.58		31429.19		24227.66		22668.94		6455.41		46156.67		19308.38		32817.55		6838.12		15412.43		68177.69		2865.28		20679.37		1845.49	
No Measurable	95.60%	94.12%	94.07%	92.27%	42.98%	42.88%	85.23%	84.70%	62.19%	61.58%	25.25%	25.90%	32.30%	31.90%	82.59%	82.18%	90.16%	88.83%	97.54%	95.31%	94.92%	92.82%	52.32%	51.46%	95.11%	95.00%	90.85%	89.61%	77.57%	76.75%
Low to Moderate	4.07%	5.54%	5.35%	7.11%	56.53%	55.59%	13.84%	14.30%	36.00%	36.26%	72.09%	68.18%	67.19%	66.53%	17.05%	17.40%	9.23%	10.54%	2.37%	4.58%	4.75%	6.83%	47.35%	47.45%	4.77%	4.88%	8.82%	10.04%	19.92%	20.19%
High to Loss of all Value	0.33%	0.34%	0.58%	0.62%	0.50%	1.53%	0.93%	1.00%	1.81%	2.17%	2.65%	5.92%	0.51%	1.57%	0.37%	0.41%	0.61%	0.63%	0.09%	0.11%	0.33%	0.34%	0.33%	1.09%	0.12%	0.12%	0.33%	0.35%	2.51%	3.06%

Potential Effect with Avoidance Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	2.09		0.90		1.29		1.19		1.69		1.89		1.29		0.50		3.48		2.69		2.39		1.39		0.50		1.19		0.80	
No Measurable	76.59%	73.21%	80.77%		80.49%		65.25%		64.16%		45.41%	35.06%	42.52%	41.97%	88.95%		83.56%	81.35%	86.37%	78.96%	82.14%	74.47%	48.10%	45.73%			64.68%		35.69%	
Low to Moderate	20.38%	23.76%	18.68%		19.24%		34.75%		35.84%		54.12%	64.41%	51.46%	52.01%	10.37%		12.10%	14.30%	13.63%	21.04%	17.20%	24.88%	44.80%	40.06%			35.08%		51.81%	
High to Loss of all Value	3.03%	3.03%	0.55%		0.27%		0.00%		0.00%		0.48%	0.53%	6.01%	6.01%	0.68%		4.34%	4.34%	0.00%	0.00%	0.66%	0.66%	7.11%	14.21%			0.24%		12.50%	
Total Area (acres) Polygon Occurrence	137.53		122.29		1048.85		202.27		537.79		23.13		291.33		437.66		124.16		5.05		9.75		350.86		NA		114.77		126.79	
No Measurable	96.14%	96.10%	87.60%		44.46%		50.51%	50.68%	69.62%	69.26%	42.52%	42.54%	22.21%	24.98%	60.44%	61.64%	83.15%	83.13%	89.57%		86.10%		82.26%	76.37%			79.84%		54.00%	
Low to Moderate	3.86%	3.90%	12.17%		55.34%		47.84%	47.67%	29.74%	30.07%	57.46%	57.44%	74.56%	71.45%	38.03%	36.83%	16.76%	16.79%	10.43%		13.90%		16.83%	22.28%			17.49%		42.82%	
High to Loss of all Value	0.00%	0.00%	0.23%		0.20%		1.65%	1.65%	0.64%	0.66%	0.02%	0.02%	3.23%	3.58%	1.53%	1.53%	0.08%	0.08%	0.00%		0.00%		0.91%	1.35%			2.67%		3.17%	
Total Area (acres) Potential Habitat	11663.91		5552.58		31429.19		24227.66		22668.94		6455.41		46156.67		19308.38		32817.55		6838.12		15412.43		68177.69		2865.28		20679.37		1845.49	
No Measurable	95.58%	94.12%	94.05%	92.27%	42.90%	42.88%	85.15%	84.70%	61.99%	61.58%	25.09%	25.90%	32.22%	31.90%	82.54%	82.18%	90.12%	88.83%	97.52%	95.31%	94.89%	92.82%	52.27%	51.46%	95.11%	95.00%	90.82%	89.61%	77.06%	76.75%
Low to Moderate	4.21%	5.67%	5.57%	7.35%	56.85%	56.83%	14.18%	14.63%	36.81%	37.19%	72.78%	71.82%	67.54%	67.81%	17.25%	17.60%	9.40%	10.70%	2.45%	4.65%	4.89%	6.96%	47.58%	48.36%	4.85%	4.96%	8.98%	10.19%	21.27%	21.56%
High to Loss of all Value	0.20%	0.20%	0.38%	0.38%	0.26%	0.28%	0.67%	0.67%	1.20%	1.23%	2.13%	2.28%	0.24%	0.29%	0.21%	0.22%	0.48%	0.48%	0.03%	0.03%	0.21%	0.21%	0.15%	0.18%	0.04%	0.04%	0.20%	0.20%	1.67%	1.69%

Potential Effect with Minimization Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	2.09		0.90		1.29		1.19		1.69		1.89		1.29		0.50		3.48		2.69		2.39		1.39		0.50		1.19		0.80	
No Measurable	76.59%	73.21%	80.77%		80.49%		65.25%		64.16%		43.78%	35.05%	42.52%	41.97%	88.95%		84.64%	81.35%	86.37%	78.96%	82.80%	74.47%	46.06%	45.74%			64.92%		42.86%	
Low to Moderate	20.19%	23.56%	18.68%		19.24%		34.49%		35.84%		54.21%	57.63%	51.46%	52.01%	10.37%		10.98%	14.26%	13.46%	20.87%	14.56%	22.89%	46.86%	46.95%			34.63%		55.07%	
High to Loss of all Value	3.22%	3.22%	0.55%		0.27%		0.25%		0.00%		2.01%	7.32%	6.01%	6.01%	0.68%		4.38%	4.38%	0.17%	0.17%	2.65%	2.65%	7.09%	7.31%			0.44%		2.07%	
Total Area (acres) Polygon Occurrence	137.53		122.29		1048.85		202.27		537.79		23.13		291.33		437.66		124.16		5.05		9.75		350.86		NA		114.77		126.79	
No Measurable	96.14%	96.10%	87.69%		44.53%		51.01%	50.68%	69.95%	69.26%	42.54%	42.54%	25.17%	24.98%	61.64%	61.64%	83.16%	83.13%	89.57%		86.10%		82.48%	76.37%			79.84%		53.97%	
Low to Moderate	3.49%	3.53%	11.17%		54.75%		45.50%	45.83%	28.13%	28.70%	57.26%	57.27%	70.02%	58.03%	35.76%	35.74%	15.70%	15.73%	9.77%		13.28%		15.74%	20.97%			17.10%		42.51%	
High to Loss of all Value	0.37%	0.37%	1.13%		0.72%		3.48%	3.50%	1.92%	2.04%	0.20%	0.20%	4.81%	16.99%	2.60%	2.62%	1.14%	1.15%	0.66%		0.62%		1.78%	2.67%			3.06%		3.52%	
Total Area (acres) Potential Habitat	11663.91		5552.58		31429.19		24227.66		22668.94		6455.41		46156.67		19308.38		32817.55		6838.12		15412.43		68177.69		2865.28		20679.37		1845.49	
No Measurable	95.60%	94.12%	94.05%	92.27%	43.02%	42.88%	85.21%	84.70%	62.21%	61.58%	25.19%	25.90%	32.35%	31.90%	82.60%	82.18%	90.12%	88.83%	97.54%	95.31%	94.92%	92.82%	52.35%	51.46%	95.11%	95.00%	90.84%	89.61%	77.69%	76.75%
Low to Moderate	4.10%	5.57%	5.39%	7.17%	56.54%	56.55%	13.90%	14.40%	36.08%	36.63%	72.34%	71.07%	67.19%	66.63%	17.06%	17.46%	9.29%	10.58%	2.39%	4.61%	4.77%	6.86%	47.35%	48.12%	4.77%	4.88%	8.84%	10.07%	20.06%	20.95%
High to Loss of all Value	0.31%	0.31%	0.56%	0.56%	0.45%	0.57%	0.89%	0.90%	1.71%	1.79%	2.48%	3.03%	0.46%	1.47%	0.35%	0.36%	0.59%	0.59%	0.07%	0.08%	0.31%	0.31%	0.30%	0.41%	0.12%	0.12%	0.32%	0.32%	2.25%	2.31%

Table 5-39 Mixed Conifer Plants Intensity of Effect

	Charleston beardtongue		***Charleston goldenbush***		***Charleston grounddaisy***		***Charleston pinewood lousewort***		***Charleston violet***		***Clokey eggvetch***		***Clokey milkvetch***		***Clokey mountain sage***		***Clokey paintbrush***		***Clokey thistle***		***Hitchcock bladderpod***		***Jaeger beardtongue***		***Nevada whillowherb***		***Rosy king sandwort***		***Rough angelica***	
Potential Effect with Mitigation Measures							Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	2.09		0.90		1.29		1.19		1.69		1.89		1.29		0.50		3.48		2.69		2.39		1.39		0.50		1.19		0.80	
No Measurable	76.15%	73.21%	80.77%		80.49%		65.25%		64.16%		45.37%	35.05%	42.52%	41.97%	88.95%		86.09%	81.35%	86.37%	78.96%	82.80%	74.47%	46.06%	45.80%			64.92%		38.99%	
Low to Moderate	20.63%	23.56%	18.68%		19.24%		34.49%		35.84%		52.15%	57.14%	51.46%	52.01%	10.37%		10.98%	15.71%	13.46%	20.87%	14.56%	22.89%	46.86%	51.69%			34.63%		55.07%	
High to Loss of all Value	3.22%	3.22%	0.55%		0.27%		0.25%		0.00%		2.49%	7.81%	6.01%	6.01%	0.68%		2.94%	2.94%	0.17%	0.17%	2.65%	2.65%	7.09%	2.51%			0.44%		5.94%	
Total Area (acres) Polygon Occurrence	137.53		122.29		1048.85		202.27		537.79		23.13		291.33		437.66		124.16		5.05		9.75		350.86		NA		114.77		126.79	
No Measurable	96.14%	96.10%	87.66%		44.35%		50.80%	50.68%	69.54%	69.26%	42.54%	42.54%	23.91%	24.98%	61.15%	61.64%	83.14%	83.13%	89.57%		86.10%		82.31%	76.37%			82.51%		53.75%	
Low to Moderate	3.49%	3.53%	11.25%		54.79%		45.67%	45.76%	28.38%	28.01%	57.26%	57.27%	70.12%	59.69%	35.76%	35.24%	15.77%	15.78%	9.77%		13.28%		15.74%	20.06%			17.10%		43.66%	
High to Loss of all Value	0.37%	0.37%	1.09%		0.86%		3.54%	3.57%	2.08%	2.73%	0.20%	0.20%	5.97%	15.34%	3.10%	3.13%	1.09%	1.10%	0.66%		0.62%		1.95%	3.58%			0.39%		2.60%	
Total Area (acres) Potential Habitat	11663.91		5552.58		31429.19		24227.66		22668.94		6455.41		46156.67		19308.38		32817.55		6838.12		15412.43		68177.69		2865.28		20679.37		1845.49	
No Measurable	95.69%	94.12%	94.05%	92.27%	43.00%	42.88%	85.38%	84.70%	62.41%	61.58%	25.92%	25.90%	32.31%	31.90%	82.65%	82.18%	90.30%	88.83%	97.53%	95.31%	95.00%	92.82%	52.34%	51.46%	95.15%	95.00%	90.92%	89.61%	77.58%	76.75%
Low to Moderate	4.10%	5.66%	5.39%	7.17%	56.55%	56.52%	13.92%	14.58%	36.12%	36.82%	72.35%	71.80%	67.21%	67.30%	17.06%	17.51%	9.30%	10.76%	2.40%	4.61%	4.77%	6.95%	47.35%	48.07%	4.77%	4.92%	8.84%	10.14%	20.94%	21.69%
High to Loss of all Value	0.21%	0.22%	0.56%	0.56%	0.45%	0.60%	0.70%	0.72%	1.47%	1.61%	1.74%	2.30%	0.48%	0.80%	0.29%	0.30%	0.40%	0.41%	0.06%	0.07%	0.22%	0.23%	0.30%	0.47%	0.09%	0.09%	0.24%	0.25%	1.48%	1.57%

Table 5-40 Mixed Conifer Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Charleston beardtongue (*Penstemon leiophyllus var. keckii*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	Stable	Low	Moderate	High	Low
Charleston draba (*Draba paucifructa*)					
Reference Condition Spring Mountains	Moderate decline	Low	Low	High	
Current Condition Spring Mountains	Moderate decline	Low	Low	High	Low
Current Condition Rangewide	Moderate decline	Low	Low	High	Low
Charleston goldenbush (*Ericameria compacta*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Charleston grounddaisy (*Townsendia jonesii var. tumulosa*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	U
Charleston pinewood lousewort (*Pedicularis semibarbata var. charlestonensis*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Charleston violet (*Viola charlestonensis*)					
Reference Condition Spring Mountains	Stable	Low	High	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	U	U	U	U	U
Clokey eggvetch (*Astragalus oophorus var. clokeyanus*)					
Reference Condition Spring Mountains	Rapid decline	Low	High	High	
Current Condition Spring Mountains	Moderate decline	Low	High	High	Moderate
Current Condition Rangewide	Moderate decline	Low	Moderate	High	Moderate
Clokey milkvetch (*Astragalus aequalis*)					
Reference Condition Spring Mountains	Stable	Moderate	Moderate	High	
Current Condition Spring Mountains	Stable?	Moderate	Moderate	High	Moderate

Table 5-40 Mixed Conifer Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Current Condition Rangewide	Stable?	Moderate	Moderate	High	Moderate
Clokey mountain sage (*Salvia dorrii var. clokeyi*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	U
Clokey paintbrush (*Castilleja martinii var. clokeyi*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Moderate	High	Moderate
Current Condition Rangewide	U	U	U	U	U
Clokey thistle (*Cirsium eatonii var. clokeyi*)					
Reference Condition Spring Mountains	Stable	Low	Low	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Low
Current Condition Rangewide	Stable	Low	Low	High	Low
Hitchcock bladderpod (*Physaria hitchcockii var. hitchcockii*)					
Reference Condition Spring Mountains	Stable	Low	Moderate	High	
Current Condition Spring Mountains	Stable	Low	Low	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	Moderate
Jaeger beardtongue (*Penstemon thompsoniae spp. jaegeri*)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	U	Low	Moderate	High	Moderate
Current Condition Rangewide	U	Low	Low	High	Moderate
Nevada willowherb (*Epilobium nevadense*)					
Reference Condition Spring Mountains	U	Moderate	Moderate	Moderate	
Current Condition Spring Mountains	U	Moderate	Moderate	Moderate	Low
Current Condition Rangewide	U	U	U	U	Low
New York Mountains catseye (Cryptantha tumulosa)					
Reference Condition Spring Mountains	U	Low	Moderate	High	
Current Condition Spring Mountains	U	Low	Moderate	High	Moderate
Current Condition Rangewide	Stable	Low	Low	High	Moderate

Table 5-40 Mixed Conifer Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Rosy king sandwort (*Arenaria kingii spp. rosea*)					
Reference Condition Spring Mountains	Stable	Low	High	High	
Current Condition Spring Mountains	Stable	Low	High	High	Low
Current Condition Rangewide	Stable	Low	High	High	Low

Current trends are considered stable for most species with the exception of Charleston draba and Clokey eggvetch, which are considered to be experiencing moderate decline. Clokey eggvetch appears to consist of a few core populations with several small populations. The small populations have not been observed every year and impacts occur in all large, core populations. Trend data are completely unknown for Jaeger beardtongue and Nevada willowherb due to the lack of current information on condition or status. Estimates of trend were generally based on observations and professional opinions. For most species, trend is difficult to determine due to a lack of monitoring, lack of well-documented distributions, and annual variations in populations.

3.6.4.4 Species and Land Use Activity Interactions: Challenges

The species in the mixed conifer group can be divided into several categories. Combining both the qualitative and quantitative data, the species can be grouped by their distribution through the mixed conifer habitats. Clokey eggvetch, Nevada willowherb, and Charleston draba are the most restrictive in their distribution while Clokey milkvetch, Jaeger beardtongue, Clokey mountain sage, Clokey thistle, Charleston violet, and Charleston grounddaisy have a wider distribution.

Most species are impacted by current land use activities except for Nevada willowherb. Ongoing implementation of conservation measures was incorporated into the ranking of the potential effects, effectively maximizing their benefit. These conservation measures, therefore, have already reduced the impact of existing activities. This is especially true for horse and burro and WUI activities that have the greatest relative potential effect. Development of additional conservation measures would be necessary to further reduce the effect of these activities. Overall, effort toward monitoring and implementation of conservation measures may be most valuable for isolated populations of Clokey eggvetch, Clokey milkvetch, and rough angelica

Many species have a wider distribution throughout the mixed conifer system on the Spring Mountains and are impacted by many activities. Most conservation measures are directed toward minimizing current recreational activities and avoiding future impacts from recreational activities. However, the greatest effect for this group of species are wide ranging activities such as horse and burro management at the lower elevations of the mixed conifer system and WUI. Changes in vegetation dynamics and distribution have influenced these species. Management of vegetation and disturbance processes (fire) may be the biggest issue for these species in the future in both occurrence localities and potential habitat. Understanding the habitat requirements and interactions with vegetation communities will be critical to developing future conservation measures for these species.

Management issues and conservation measures may be different for restricted species. For example, Clokey eggvetch and Clokey milkvetch are restricted in its distribution on the Spring

Mountains NRA and potential habitat and has one of the greatest relative potential effects from land management activities. Clokey eggvetch and Clokey milkvetch are found in small, isolated populations that increase the risk of population loss to even small catastrophic events. Collection of information to better understand the causes of decline in the Clokey eggvetch is therefore warranted. These species may be fire dependent. Data to determine to what extent this species requires fire for long-term persistence is necessary. Populations of rough angelica tend to vary annually and can be found in dense patches of plants in some years. However, the distribution of rough angelica is limited to the east side of the Spring Mountains as is rosy king sandwort. Firewood collecting or other activities altering downed wood may impact Dicranoweisia moss.

Although several species are restricted in their global distribution, the species are well-distributed within the Spring Mountains NRA. Charleston goldenbush and Clokey thistle tend to be found on steep slopes, subalpine environments, and appear to be doing better than other species in this group. Charleston pinewood lousewort, Clokey mountain sage, and Hitchcock bladderpod are found throughout the mixed conifer habitats. New York Mountains catseye is also believe to be common in a variety of habitat throughout its elevation range, however, documentation is lacking. New York Mountains catseye is more widely distributed in California.

Relatively good survey data are available for rough angelica, Clokey milkvetch, Clokey thistle, and Clokey eggvetch. However, a better understanding the distribution and habitat for wide ranging species in this species group including Charleston grounddaisy, Charleston violet, and Jaeger beardtongue is needed. Accurate documentation of the distribution of rare plant species within ongoing activities is important to continue understanding ongoing impacts. Little is known about the distribution and current status of Nevada willowherb and the dicranoweisia moss. A better understanding of the distribution, the habitat, and impacts occurring is needed to develop appropriate conservation measures beyond avoiding habitat.

3.6.5 Riparian and Springs Plants

Three species are included in the riparian and springs plant species group: dainty moonwort, slender moonwort, and upswept moonwort

3.6.5.1 Quality of Existing Information

In general, the distribution off riparian and springs plants in the Spring Mountains NRA is very limited (Chapter 3/4). These species occur in a very specific habitat type and few locations are known to exist on the Spring Mountains NRA. In combination with their biological requirements and life stage characteristics, it would be unreliable to use information contained within the existing GIS platform database to model potential habitat for these species on the Spring Mountains NRA. However, our analysis based on point locations provided useful information of the interactions between moonworts and activities on the Spring Mountains NRA.

3.6.5.2 Quantitative Analysis

For the plant species associated with riparian and springs habitat, the total habitat area (acres) represented by point occurrence localities ranged from 0.3 (slender moonwort) to 0.99 (dainty moonwort) (Table 5-41, Appendix 5F-12).

The percentage of area that overlapped with activities ranged from 17 to 50 percent (Table 5-41) with slender moonwort having the largest area of overlap. With the addition of future activities, the average percentage of area that overlapped with activities ranged from 27 to 50 percent (Table 5-42). Slender moonwort had the largest area of overlap.

Based on point occurrence data, the relative potential effect from current activities ranged from six percent (dainty moonwort) to 17 percent (slender moonwort) and for future activities from 13 percent (dainty moonwort) to 17 percent (slender moonwort). Compared to plant species in other groups and given the restricted range of these riparian and springs plants, these levels of relative potential effect are fairly moderate. Trails, private land, and WUI activities are the primary current effects, while the primary potential effect from future activities is from the ski area (Appendix 5F-12). The relative potential effect for current and future activities included the current implementation of conservation measures.

The implementation of conservation measures to their full potential would have little to marginal success at reducing the potential effects to these species from both current and future activities (Tables 5-41 and 5-42). Avoidance, minimization, and mitigation measures would only provide a minor reduction of potential effects from current activities for all three species, with the exception of avoidance measures for slender moonwort when a marginal reduction would be realized. For future activities, minimization and mitigation measures would provide little success at reducing potential effects to all three species, yet avoidance measures would successfully reduce potential effects for the species, particularly for the dainty and upswept moonworts (Tables 5-41 and 5-42).

The distribution of the intensity of the relative effect of all current and future activities on riparian and springs plants is summarized in Table 5-43 and illustrated in Appendix 5F-10. This analysis provides an indication of where on the landscape the aggregation of activities has the greatest potential effect; that is, where the combinations of activities reduces the relative quality of habitat to the largest degree. For all three species, over 70 percent of the occurrences fall within areas where the intensity of effect from current and future activities will not measurably reduce the relative value of habitat. Furthermore, 14 to 30 percent of the occurrences fall within areas where the intensity of effect reduces the relative value of habitat by a low to moderately high degree. Very little habitat (<1 percent) will experience complete loss. It is important to note that existing conservation measures would result in very slight to no change in the distribution of occurrences for all three species relative to the intensity of effect. This may result in part from the fact that ongoing implementation of conservation measures were incorporated into the ranking of the potential effects (Appendix 5F-12). These conservation measures, therefore, have already reduced the impact of existing activities.

3.6.5.3 Qualitative Analysis

Threats are occurring thoughout most of the sites with moonwort species (Table 5-44). Threats include recreation use, modifications of springs, management of Three Springs, and horse use. All these sites are outside of designated horse territories, however, horse have only been removed from Lee Canyon recently. Upswept moonwort and dainty moonwort are currently stable in the Spring Mountains NRA due to their occurrence in wilderness areas where land use activities are relatively low and monitoring documents that the species are persisting. Slender moonwort is experiencing rapid decline in the Spring Mountains NRA due to ongoing, serious impacts at one of three known occurrences.

3.6.5.4 Species and Land Use Activity Interactions: Challenges

The limited distribution of these riparian and springs plant species makes them particularly susceptible in the Spring Mountains to both human-induced threats and catastrophic events. Continued monitoring of these small populations is necessary to detect changes in status that may lead to rapid population decline. Trails, private land, and WUI interactions pose threats for all three species. The footprint of the potential future ski area affects both upswept and dainty moonwort. Conservation measures have been implemented to reduce impacts of social trails.

Monitoring the effectiveness of these measures and the success of restoration actions at Mummy Springs is necessary.

Table 5-41 Riparian and Springs Plants Results Current Activities

	Dainty moonwort	*Slender moonwort*	*Upswept moonwort*
Total Area			
Point Occurrence	0.99	0.30	0.90
Area of Activity Overlap			
Point Occurrence	17.09%	50.25%	18.98%
Potential Effect			
Point Occurrence	5.73%	17.42%	6.37%
Potential Effect With Avoidance Measures			
Point Occurrence	3.82%	12.06%	4.24%
Potential Effect With Minimazation Measures			
Point Occurrence	5.13%	16.08%	5.70%
Potential Effects With Mitigation Measures			
Point Occurrence	5.73%	17.42%	6.37%

Table 5-42 Riparian and Springs Plants Results Current and Future Activities

	Dainty moonwort	*Slender moonwort*	*Upswept moonwort*
Total Area			
Point Occurrence	0.99	0.30	0.90
Area of Activity Overlap			
Point Occurrence	27.14%	50.25%	30.15%
Potential Effect			
Point Occurrence	13.27%	17.42%	14.74%
Potential Effect With Avoidance Measures			
Point Occurrence	3.82%	12.06%	4.24%
Potential Effect With Minimazation Measures			
Point Occurrence	10.75%	16.08%	11.95%
Potential Effects With Mitigation Measures			
Point Occurrence	11.36%	17.42%	12.62%

Table 5-43 Riparian and Springs Plants Summary of Intensity of Effects

	Dainty moonwort		***Slender moonwort***		***Upswept moonwort***	
Potential Effect	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.99		0.99		0.90	
No Measurable	83.07%	73.07%	84.87%		81.19%	70.07%
Low to Moderate	16.57%	26.57%	14.86%		18.41%	29.52%
High to Loss of all Value	0.36%	0.36%	0.27%		0.40%	0.40%
Potential Effect with Avoidance Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.99		0.99		0.90	
No Measurable	83.07%	73.07%	84.87%		81.19%	70.07%
Low to Moderate	16.93%	26.93%	14.86%		18.81%	29.93%
High to Loss of all Value	0.00%	0.00%	0.27%		0.00%	0.00%
Potential Effect with Minimization Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.99		0.99		0.90	
No Measurable	83.07%	73.07%	84.87%		81.19%	70.07%
Low to Moderate	16.93%	26.93%	14.86%		18.81%	29.93%
High to Loss of all Value	0.00%	0.00%	0.27%		0.00%	0.00%
Potential Effect with Mitigation Measures	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities	Current Activities	Current & Future Activities
Total Area (acres) Point Occurrence	0.99		0.99		0.90	
No Measurable	83.07%	73.07%	84.87%		81.19%	70.07%
Low to Moderate	16.57%	26.57%	14.86%		18.41%	29.52%
High to Loss of all Value	0.36%	0.36%	0.27%		0.40%	0.40%

Table 5-44 Riparian and Springs Plants Conservation Status

	Known Population Trend	Threats - severity	Threats - scope	Threats - immediacy	Threats - Anticipated Increase / Shift
Dainty Moonwort (*Botrychium crenulatum*)					
Reference Condition Spring Mountains	Moderate decline	Moderate	High	High	
Current Condition Spring Mountains	Stable	Low	High	High	Moderate
Current Condition Rangewide	Moderate decline	Moderate	High	High	Moderate
Slender Moonwort (*Botrychium lineare*)					
Reference Condition Spring Mountains	Severe decline	High	High	High	
Current Condition Spring Mountains	Rapid decline	Moderate	High	High	Moderate
Current Condition Rangewide	Rapid decline	Moderate	High	High	Moderate
Upswept Moonwort (*Botrychium ascendens*)					
Reference Condition Spring Mountains	Moderate decline	Moderate	High	High	
Current Condition Spring Mountains	Stable	Low	High	High	Moderate
Current Condition Rangewide	Stable	Low	High	High	Moderate

4.0 RESOURCE MANAGEMENT CHALLENGES

The largest resource management challenge for the Spring Mountains NRA is balancing the maintenance of the unique biological characteristics of the Spring Mountains ecosystem with the demand for recreational use. Most of the imperiled species have been affected by land use activities to some degree. It is important to note that the major components of ecosystem are still functional. It is clear, however, that the structure of the ecosystem has been altered. This alteration may ultimately affect the key ecosystem functions. As mentioned earlier, the central goal of a conservation management strategy is often to create a self-sustaining ecosystem that is resilient to perturbation without further assistance. Conservation strategies aim to reverse the losses of biodiversity and the degradation of ecosystems that have occurred through time as humans have affected landscapes. For the Spring Mountains NRA, there is a suite of land use activities (WUI, private lands, and horse and burro management areas) not driven by recreation demands, which have a significant potential effect on biological resources. These uses ultimately influence where and to what degree recreation use may be managed on the Spring Mountains NRA.

4.1 CHALLENGES OF PRESERVING BIODIVERSITY

The aggregated effect of all activities across all species is a clear indication of those species most vulnerable to land use activities on the Spring Mountains NRA. Additionally, key elements of the conservation status assessment provide additional information on those species most vulnerable to Spring Mountains NRA land use activities. This information, in concert, provides valuable insight for identifying resource management challenges on the Spring Mountains NRA. In an effort to highlight some of these challenges, the following is a series of observations for the biological resources of the Spring Mountains NRA organized with a general overview than by individual species group.

The quantitative analysis indicated that many of the species have large overlaps with current land use and recreational activities. The distribution of five species overlapped with current land use activities by 100 percent. These species (Clokey buckwheat, Death Valley beardtongue, smooth pungent greasebush, Bret's blue butterfly, and smooth dwarf greasebush) have three or fewer occurrence localities on the Spring Mountains NRA. The distribution of 19 species overlapped with current land use activities by 60 percent for a variety of taxa groups and habitat types. The qualitative analysis also evaluated the scope or extent of threats. Nine species were characterized as having a threat scope that was ranked high (60% of total population, occurrences, or area affected by threats): Spring Mountains springsnail, Southeast Nevada springsnail, Mt. Charleston blue butterfly, Smooth dwarf greasebush, Smooth pungent greasebush, Spring Mountains milkvetch, Clokey eggvetch, King's rosy sandwort, and Dainty moonwort. Twenty-four species were characterized as having a threat scope that was ranked moderate (20-60% of total population, occurrences, or area affected by threats). The qualitative analysis indicated greater extent of threats to more species because the analysis considered other land use activities and threats not considered in the quantitative analysis such as plant community changes from fire suppression and wildland fire.

Current implementation of conservation measures reduces but does not eliminate the impact of the activities. Even for the three species with 100% overlap with activities, the potential effects are reduced through the current implementation of conservation measures. The relative value of habitat for three species was reduced by 50 percent (one springsnail and two butterflies) by current land use activities. The relative value of habitat for 15 species was reduced by over 20 percent by current land use activities: both springsnails, all butterflies except one, Palmer's

chipmunk, and four mixed conifer plant species. Avoidance measures were generally the most successful conservation measure for current activities.

Even with the large overlap with activities, the majority of species are presumed stable in the Spring Mountains NRA with implementation of current conservation measures. However, six species were categorized as declining on the Spring Mountains NRA: Mt. Charleston blue butterfly, Spring Mountains checkerspot butterfly, Palmer's chipmunk, slender moonwort, Clokey eggvetch and Charleston draba. The Mt. Charleston blue butterfly, Spring Mountains checkerspot butterfly, slender moonwort, and Clokey eggvetch are restricted endemics and occur in areas with multiple land use activities. More information is needed to evaluate the trend and the causes for any decline for Charleston draba and Palmer's chipmunk across the entire Spring Mountains.

4.1.1 Individual Species Groups

4.1.1.1 Springsnails (Pyrgs)

- These species have limited distribution across their range with the Spring Mountains springsnail being the most restricted.

- Rangewide, the Southeast Nevada springsnail is considered to be in moderate decline and the Spring Mountains springsnail is thought to be declining rapidly due to extirpations outside the Spring Mountains NRA, however, populations on the Spring Mountains NRA appear to be stable.

- Due to the limited distribution and high overlap with activities, these species are at risk of population decline from various threats as well as catastrophic events on the Spring Mountains NRA and rangewide. On the Spring Mountains NRA, the activities with the greater overlap are horses and burros (<0.25 mile from spring/streams), CUAs (area of influence), private land, and the WUI. The species are currently stable on the Spring Mountains NRA; however, to prevent future loss, population trends should be monitored, activities in and near habitat should be monitored, and threats should be mitigated.

4.1.1.2 Butterflies

- Distribution information, particularly data with a spatial component, for some butterflies in the Spring Mountains NRA is limited. Furthermore, there is limited to no information regarding habitat preferences (breeding, mating or feeding areas) and host plant interactions.

- Information on the potential effects of threats on these species and the potential mechanisms to effectively reduce threats is lacking. In addition, threats to the host species may be distinct from those directly or indirectly affecting the species. The quantitative analysis documented that on average, 60% of the total area represented by occurrence localities for all butterfly species overlapped with Spring Mountains NRA activities. Wide-ranging activities – horses and burros (<0.25 mile from spring/streams) and WUI – had the largest potential effects to butterfly species.

- Existing Spring Mountains NRA conservation measures for butterflies may not be sufficient to protect the long-term viability of these species.

4.1.1.3 Charleston Ant

- Distribution data for the Charleston ant in the Spring Mountains NRA is very limited with only one known occurrence for this species. Basic taxonomic and life history information, survey data, and threats information is needed.

- A quantitative analysis of the effects of Spring Mountains NRA land use activities could not be performed for this species; however, a qualitative analysis concluded that the severity, scope and immediacy of threats for the Charleston ant are high, but mainly based on the lack of distribution data and activities occurring near the known location.

4.1.1.4 Bats

- Distribution information for some bat species in the Spring Mountains NRA is limited, while for other bats it is well known; however, for most species, knowledge regarding roosting locations and foraging habitat is generally limited or unknown in the Spring Mountains NRA.

- All of the bat species were equally vulnerable to Spring Mountains NRA activities. On average, 65 percent of the total area represented by occurrence localities for all bat species overlapped with Spring Mountains NRA activities. The primary land use activities potentially affecting bats were identified as caving, CUAs, horses and burros, and private land. However, the severity of threats for all bat species is low in the Spring Mountains due to past and ongoing efforts to protect caves, mines and other potential roost locations,

- The population trend for all species is stable in the Spring Mountains based on known occurrences or known roost sites increasing or persisting from the reference to current condition. Monitoring of populations on the Spring Mountains NRA, especially roost locations, is important due to their relatively small numbers and therefore increased risk of loss.

- The severity of threats rangewide for several of the bat species is moderate; however, the majority of species are widely distributed and stable across their entire ranges..

4.1.1.5 Palmer's Chipmunk

- Distribution information on the Palmer's chipmunk in the Spring Mountains NRA is fairly extensive compared to many of the other endemic species.

- Studies at locations near campgrounds and picnic areas indicate that the known population trend is in rapid decline based on a decrease in population density. This rapid decline suggests a need to further investigate specific cause/effect relationships between these activities and the species. Furthermore, population trend for the Palmer's chipmunk across the Spring Mountains NRA is essential to track the possibility of further decline of this species or determine if the decline is localized.

- Based on the quantitative analysis, land use activities that pose the greatest threats include WUI, picnic areas, campgrounds, and paved roads. As appropriate, various threat reduction measures and alternative management actions should be implemented and monitored for effectiveness.

4.1.1.6 Birds

- The northern goshawk is currently considered stable rangewide, but the status rangewide for flammulated owl is unknown;

- The quantitative analysis indicated that the relative potential effects of current activities may be significant. Two wider-ranging activities, WUI and CUAs, as well as trails had the largest relative potential effects to the bird species. Threats to the bird species, particularly northern goshawk, should be further assessed, including determination of cause/effect relationships from the WUI, CUAs, and trails. If appropriate, implementation of additional measures to avoid or reduce important threats would be valuable.

- Monitoring of the bird species, especially the northern goshawk, is important due to their relatively small numbers on the Spring Mountains NRA and therefore increased risk of loss.

4.1.1.7 Western Red-tailed Skink

- Distribution data for the western red-tailed skink in the Spring Mountains NRA is very limited. The lack of life history information and occurrence data for this species prevented a reliable quantitative analysis of the effects of Spring Mountains NRA land use activities on this species.

- Specific threats to the western red-tailed skink have not been identified due to the limited information on the distribution of the species in the Spring Mountains NRA. In the developed east side canyons, there are a number of activities in the area of the sightings with the potential to affect the species, including WUI, paved roads, unpaved roads, and private lands.

- In order to appropriately manage and conserve this species, life history information, survey data, and threats information on the Spring Mountains NRA is important to obtain for this species.

4.1.1.8 Alpine/Subalpine Plants

- Distribution information on alpine and subalpine plants in the Spring Mountains NRA is well documented; however, distribution information is needed for the LVSSR permit area. These species are endemic to the Spring Mountains Range and have limited available habitat.

- The trend for these species is generally stable based on monitoring and observations of the species and alpine habitat with implementation of current conservation measures. Monitoring of the alpine habitat and these rare species is particularly important due to the relatively small size and therefore increased risk of loss. Changes in current use and conditions of this habitat should be evaluated for effect to these species.

- The percentage of overlap and effect of threats on these species is not high relative to other species groups, but increases with the addition of future activities. The current activity potentially affecting alpine species to the highest degree was high mileage system trails and private land. Continual removal of horses should benefit this group of species. Generally, the implementation of current conservation measures have been successful in reducing the potential effect of activities. Additional conservation measures are needed for private lands.

- The future activity potentially affecting alpine species to the highest degree is future ski area development and addition specific conservation measures are needed to avoid the potentially large effects.

4.1.1.9 Cliffs and Steep Slopes Plants

- Distribution data for plants utilizing cliffs and steep slopes in the Spring Mountains NRA are limited. Species located in cliffs, steep slopes habitat are difficult to survey due to the relatively inaccessible nature of their vertical structure, and the density of many of these species is relatively low. These plants have a specialized habitat and limited distribution.

- Assessment of the activities is difficult due to the limited number of documented sites except for Jaeger ivesia. However, the results indicate activities overlapped with this habitat and had potential effects even with the implementation of some conservation measures.

- Effects related to CUA activities (including areas associated with climbing) were noted as a primary activity causing effects to one of these plant species; however, the cause/effect relationship between effects of particular threats such as rock climbing should be more fully assessed. Jaeger ivesia was potentially affected by current WUI, paved roads, and picnic area activities.

- Survey and monitoring data are necessary to obtain an assessment of the status for all the cliff and steep slopes plant species: beginning with Clokey greasebush, smooth dwarf greasebush, and smooth pungent greasebush, and followed by inch high fleabane and Jaeger ivesia.

4.1.1.10 Low Elevation Plants

- Distribution and condition data for plants associated with low elevation habitats in the Spring Mountains NRA is limited. The Spring Mountains milkvetch is a restricted endemic that occurs in habitat with a number of threats as well as Clokey buckwheat.

- The percentage of area that overlapped with activities ranged from 50 to 100 percent. Current activities potentially affecting low elevation plant species to the greatest degree are horse and burro use, paved roads, unpaved roads, and activities in the WUI. With the current implementation of the conservation measures, the potential effects of the current activities were reduced. Further implementation of conservation measures to their full potential would provide limited success in reducing the potential effects of current activities. The potential loss of habitat was greatest for black woolly pod and Clokey buckwheat.

- Inventory and monitoring data for the Spring Mountains NRA are needed for all species. Existing conservation measures should be reevaluated or new conservation measures determined to provide sufficient conservation of these species in the Spring Mountains NRA once we have a better understand of populations and their current condition.

4.1.1.11 Mixed Conifer Plants

- The species in the mixed conifer group vary in their distribution, habitats, and abundance in the Spring Mountains NRA. The level of distribution information varies for the species from Clokey eggvetch and rough angelica with extensive surveys to Nevada willowherb with limited surveys lacking current information. Accurate documentation of the

distribution of rare plant species with ongoing activities is important to continue understanding ongoing impacts.

- Overall, for the mixed conifer group, all the species except for Nevada willowherb have a wide variety overlapping land use activities. The greatest effect for this group of species are wide ranging activities such as horse and burro management (both in and outside of territories), CUAs, and vegetation management including WUI. Understanding the habitat requirements and interactions with vegetation communities will be critical to developing future conservation measures.

- The species with the largest relative potential effects from land management activities were Clokey eggvetch, Clokey milkvetch, rough angelica, Jaeger beardtongue, and Charleston pinewood lousewort. However, Clokey eggvetch and Clokey milkvetch have restricted distributions with small, isolated patches. Combined with the large relative effects from management activities, Clokey eggvetch and Clokey milkvetch would have the highest need for additional conservation measures and protection.

- A better understanding of the distribution, habitat, and impacts occurring is needed to develop appropriate conservation measures beyond avoiding habitat Ongoing implementation of conservation measures was incorporated into the ranking of the potential effects, effectively maximizing their benefit The implementation of conservation measures to their full potential would not significantly reduce the potential effects of management activities.

4.1.1.12 Riparian and Spring Plants

- In general, distribution of riparian and spring plants in the Spring Mountains NRA is very limited to a specific habitat – spring systems. Slender moonwort is most at risk based on degraded conditions at one of the three sites.

- The percentage of area that overlapped with activities ranged from 17 to 50 percent. Trails, private land and the WUI activities are the primary current effects. The primary potential effect from future activities is from the ski area. The levels of relative potential effect of land use activities on these species is fairly moderate even given the implementation of current conservation measures.

- The limited distribution of these riparian and springs plant species makes them particularly susceptible in the Spring Mountains to both human-induced threats and catastrophic events. Continued monitoring of these small populations is necessary to detect changes in status that may lead to rapid population decline.

4.2 SPECIES/HABITAT/HUMAN USE INTERACTION

The following sections summarize the potential effects on special status species habitat by each current and future land use activity. The potential effects are summarized only on an activity-by-activity basis. The potential effects for AOI and footprints were evaluated individually, so there was not a cumulative evaluation of effects for a given activity. Aggregate effects resulting from multiple land use activities are summarized in Section 3 on species. Potential effects are reported as percentages of a species' habitat for point, polygon, and PHD, and are depicted as bar graphs in figures in Section 3. For each land use activity, a summary is provided with the number of species for which there are potential effects, the range of values in percentages for potential effects, and the species with the highest potential effect. Low potential effects are

those with less than five percent of habitat affected, relatively low effects are those with greater than five and less than ten percent of habitat affected, and moderate effects are those greater than ten percent and less than 20 percent of the habitat affected. Then, a summary of current conservation measures (for current activities only) is provided along with suggestions for future conservation measures.

Current land use activities showed a wide range of potential effects. The WUI, CUAs, unpaved roads, non-system trails, and high mileage trails land uses are widely dispersed across the Spring Mountains NRA and have potential to affect the greatest number of species. Of significance is that WUI and CUAs encompass the largest areas and have the likelihood to affect the most species. The other three land uses occupy relatively smaller areas, yet still demonstrate the potential to affect a high number of species.

Despite having the largest coverage area of any land use activity (164,489 acres), horse and burro management areas also had potential effects on fewer species than the top five land use and recreation activities. The potential effects associated with this land use near a spring/stream (less than one-quarter mile) were in the high category, while for greater than one mile they were in the moderate category but affected a wider range of species.

In contrast, the ski area, snow play areas, developed camping, and picnic areas occur in a limited number of areas and had potential effects on much lower numbers of species. While the number of species to be affected is much lower for these four recreation activities when compared to the five land use activities above, these four recreation land uses fall within much smaller areas and potential effects to particular species (with limited ranges) in a smaller area can be significant, such as the Mt. Charleston blue butterfly and rough angelica.

Compared to current activities, future recreation activities showed potential effects on fewer species. Most of the future recreation activities on the West Side of the Spring Mountains NRA did not have potential effects or only had trace potential effects on any species. Many future developments such as Middle Kyle are planned in locations outside of areas with high density of species. For West Side PO camping, larger areas were proposed and analyzed than would actually be implemented to allow more flexibility to minimize impacts to natural resources. To some degree, the lower number of overlapping species might be indicative of incomplete species data incorporated in the analysis since some of these potential new activity locations have not been surveyed to the same intensities as existing activity sites. In the case of the future ski area expansion, additional species data have been accumulated that indicates potentially greater overlap between habitats and activities than was shown in this analysis.

Land use activities for which future conservation measures are needed include the WUI, CUAs, high mileage trails, unpaved roads, and horse and burro management areas. These are all activities which are widely dispersed across the Spring Mountains NRA and which have potential effects on multiple species that additional proactive measures could further reduce.

4.2.1 Current Land Use Activities

4.2.1.1 Trailhead Outside of Developed Canyons Footprint and AOI

- Potential effects occur for one plant species, Clokey paintbrush, and those effects are low (0.1%)

- Current conservation measures include limiting site creep through the use of boulders, kiosk signage at Griffith Trailhead to discourage motorized use beyond the trailhead, and successful restoration measures on user-created routes.

- With continued implementation of current conservation measures, additional measures are not needed.

4.2.1.2 Unpaved Road Footprint and AOI

- Potential effects occur for 16 plant species and 18 wildlife species. Effects are generally low for plants (0-4%) with the exception of effect on black woollypod, which is moderate (16% on the footprint) Potential effects on wildlife species are relatively low (0-6%); the highest effect is on Northern goshawk (6%)

- Current conservation measures include recent implementation of the motorized vehicle use map to keep users on designated routes, road maintenance guidelines to stay within the road prism (road footprint plus drainage ditches), and stormwater control. These measures have been reasonably effective but additional future conservation measures are needed.

4.2.1.3 Wildland Urban Interface

- Potential effects occur for 20 plant species and 14 wildlife species. Effects are low to moderate for plants (0-12.5%) with the largest effects for Clokey eggvetch, Clokey buckwheat, and rough angelica. Effects are low to moderate for wildlife (0-8%), with the exception of Palmer's chipmunk, which is high (35%).

- Many current conservation measures have been implemented for WUI treatments, including flag and avoid known plant populations, hand treatments, and monitoring of treatment effects, nest surveys and limited operation periods for bird species, snag retention, and butterfly/larval host plant mapping

- Monitoring of WUI treatments may lead to future conservation measures

4.2.1.4 Private Building AOI and Footprint

- Potential effects occur for two plant species and three wildlife species and are low (less than 2%)

- There are no current conservation measures and low potential for implementing future conservation measures

4.2.1.5 Ski Area AOI and Footprint

- Potential effects occur for three plant species and all six butterfly species and are low (less than 4%). These findings do not include the results of recent surveys which indicate they might not be representative of the full magnitude of the potential effects.

- Current conservation measures include: erosion control, flag and avoid measures, habitat surveys, and restoration projects. These conservation measures have been less than fully effective.

4.2.1.6 Snow Play

- Potential effects occur for three plant species and six wildlife species, including four butterflies. All effects are in the low range.
- Current conservation measures include a minimum snow cover requirement in concessionaire managed areas
- Future conservation measures could include temporary closures during periods of low snow, implement a minimum snow cover requirement in Lee Meadows, and implement education programs, particularly for Lee Meadows.

4.2.1.7 Trailhead in Developed Canyons AOI and Footprint

- Potential effects occur for five plant and one wildlife species and are low (less than 1 percent).
- Current conservation measures include limiting site creep by the use of boulders to define size of parking lots, kiosks containing information and education, and Spring Mountains NRA regulations.

4.2.1.8 Paved Road AOI and Footprint

- Potential effects occur for 11 plant species and 11 wildlife species, including all six butterfly species. Most effects are low, with the exception of Clokey buckwheat (18%) and Palmer's chipmunk (5.5%)
- Current conservation measures include control of invasive species and providing designated vehicle pullouts so visitors do not disturb habitat. A future conservation measure would be better management of traffic and roadside parking.

4.2.1.9 Picnic Area AOI and Footprint

- Potential effects occur for six plant species and nine wildlife species, six of which are butterfly species. These effects range from low to moderate, with the greatest effects for rough angelica (9%) and Palmer's chipmunk (8.2%)
- Current conservation measures policy include keeping vehicles on paved surfaces, adding physical barriers to direct vehicle and pedestrian traffic, providing educational materials (don't pick flowers, no firewood cutting), and butterfly larval host plant mapping.

4.2.1.10 Private Land

- Potential effects occur for 22 plant species and 17 wildlife species. These effects range from low to moderate levels, with the highest effects for smooth pungent greasebush (13%), moonwort species (about 10%), Bret's blue butterfly 8%, Palmer's chipmunk 5%, and Southeast Nevada springsnail 13%
- Current conservation measures include working with private landowners to conduct weed control, and acquisitions of key private parcels.
- Future conservation measures could include implementing an outreach and education program with private landowners.

4.2.1.11 Non-System Trail AOI and Footprint

- Potential effects occur for 16 plant species and 14 wildlife species and are low for all species (0-4%). The highest plant species effect is for rough angelica (1.8%); the highest wildlife effect is for the Northern goshawk (4%).

- Current conservation measures include closing some trails, and conducting educational nature hikes. Future conservation measures could include more physical barriers and closures, and designating system trails to relocate traffic to less sensitive areas.

4.2.1.12 Motorized Trail (open) AOI and Footprint

- Potential effects occur for five plant species and 11 wildlife species and are low (0-1.2%). The highest potential plant species effect (1.2%) is for Jaeger beardtongue; the highest wildlife species effect is for Mount Charleston blue butterfly.

- Current conservation measures include posting signs, publishing a motorized vehicle use map, and implementing environmental education measures to keep users on the routes

4.2.1.13 Motorized Trail (closed) AOI and Footprint

- Potential effects occur for eight plant species and seven wildlife species and are low (0-1.5%). For plant species, the highest effect is for Jaeger beardtongue; the highest wildlife species effect is for Southeast Nevada springsnail.

- Current conservation measures prohibited motorized travel on all closed routes but future conservation measures are needed to assure the effectiveness of those prohibitions.

4.2.1.14 Low Mileage Trail AOI and Footprint

- Potential effects occur for nine plant species and 14 wildlife species and they are low (0-3%). The highest plant species effect is for rough angelica and the highest wildlife species effect is for flammulated owl.

- Current conservation measures include educational hikes, signage to stay on trails, backcountry rangers to monitor, restore degraded areas along the trail

- Future conservation measures are needed

4.2.1.15 Horses and Burros >1 mile from Springs/Streams

- Potential effects occur for 12 plant species and eight wildlife species and they are low to moderate (0-13%). The highest plant species effects are for Charleston grounddaisy, black woollypod, and Clokey buckwheat; the highest wildlife species effect fo for the Nevada springsnail (7%)

- Future conservation measures need to be developed

4.2.1.16 Horses and Burros <0.25 mile from Springs/Streams

- Potential effects occur for three plant species and 11 wildlife species. Potential effects range from low to high for both plant and wildlife species (0-37.5%). The highest plant

effects are for Death Valley beardtongue (28%); high wildlife effects are for springsnails (25-37.5%) and dark blue butterfly (29%).

- Current conservation measures include fencing. Future conservation measures need to be developed

4.2.1.17 Horses and Burros >0.25 mile to 1 mile from Springs/Streams

- Potential effects occur for seven plant species and eight wildlife species and those effects are low to medium for plant species and low for wildlife species. The greatest effects for plants are for Death Valley beardtongue (10%); the highest effect for wildlife is for Bret's blue butterfly (4%)

- There are no current conservation measures Future conservation measures need to be developed

4.2.1.18 High Mileage System Trail AOI and Footprint

- Potential effects occur for 21 plant species and eight wildlife species and are low (0-5%). For plant species, the highest effects are for moonwort species; the highest wildlife effect is for Mount Charleston blue butterfly (1%).

- Current conservation measures signage includes signage at trailheads, educational hikes, fencing, and interpretive signing

4.2.1.19 Forest Service Structure AOI and Footprint

- Potential effects occur for two plant species and seven wildlife species and are low (less than 4%). The highest plant effect is for Charleston pinewood lousewort (2.8%); the highest wildlife effect is for Northern goshawk (4%).

- There are no current conservation measures. Future conservation measures need to be developed

4.2.1.20 Firewood Gathering Areas

- Potential effects occur for nine plant species and nine wildlife species and are low (0-5%). The highest plant effect is for Clokey milkvetch; the highest wildlife effects are for Spring Mountains icarioides blue, Spring Mountains checkerspot, and Carole's silverspot butterflies

- Current conservation measures include: Forest Service personnel cut and gather firewood for the public, areas selected for firewood are outside of special status species areas, and firewood gathering season is during season when plants are dormant (fall-winter). No future conservation measures appear to be needed since current conservation measures are relatively effective

4.2.1.21 Concentrated Use AOI and Footprint

- Potential effects occur for 16 plant species and 16 wildlife species and these effects range from low to medium (0-12%). The highest plant effect is for inch high fleabane (8.2%) and the highest wildlife effect is for Southeast Nevada springsnail (12%).

- Current conservation measures include: site delineation to avoid continual increases in site size, fencing in areas with springsnails and bats, some site closures and restoration actions, and preventing access to CUA's via OHV route closures or motorized travel prohibitions. Future conservation measures are needed

4.2.1.22 Climbing Area

- Low potential effects occur for one plant species, Jaeger ivesia (0.8%); no wildlife species are affected.

- Current conservation measures include education about special status plants. Future conservation measures could include developing wilderness plans that establish permit systems to manage the number of bolted routes.

4.2.1.23 Caves/Tunnels

- No plant species are affected; Low potential effects occur for six bat species (1-2%)

- Current conservation measures include some complete closures and bat gates on some of the mines.

4.2.1.24 Developed Camping

- Potential effects occur for four plant species and seven wildlife species and are low except for Palmer's chipmunk, which is a moderate effect (7%). The highest plant effect is for rosy king sandwort (3%).

- Current conservation measures include traffic barriers to restrict vehicle access, selling firewood in campgrounds to prevent firewood gathering, regulations to prevent cutting of green trees, visitor education, limiting the extent of reconstruction of existing campgrounds, providing for chipmunk escape routes from excavation areas, and the closure of Kyle Canyon RV site. Future conservation measures may not need to be developed.

4.2.2 Future Land Use Activities

4.2.2.1 Future Campground AOI and Footprint

- Low potential effects would occur for three wildlife species--Palmer's chipmunk and two butterfly species.

4.2.2.2 Future EEA AOI and Footprint

- Low potential effects would occur for four butterfly species (0-5%). The highest potential effect would be for the Mount Charleston blue butterfly.

4.2.2.3 Future Foot Bridge AOI and Footprint

- There are no potential effects

4.2.2.4 Future High Mileage System Trail AOI and Footprint

- Trace potential effects would occur for one plant species, Clokey milkvetch

4.2.2.5 Future Low Mileage System Trail AOI and Footprint

- Low potential effects would occur for one plant species, Clokey paintbrush (1%), and eight wildlife species--Palmer's chipmunk and seven butterfly species.

4.2.2.6 Future Picnic AOI and Footprint

- No potential effects would occur for any species

4.2.2.7 Future Ski Area AOI and Footprint

- Potential effects would occur for ten plant species and two wildlife (butterfly) species. Plant species effects would be low to moderate (less than 9%); wildlife species effects would be low (0-3%). The highest plant species effect would be for Charleston pussytoes at nine percent, upswept moonwort would be second at eight percent. The highest wildlife species effect would be for both Morand's checkerspot and Mount Charleston blue butterfly (3%).

4.2.2.8 Future Trailhead AOI and Footprint

- Low potential effects would occur for five species (less than 1%). The highest potential effect would be for Morand's checkerspot butterfly (1%)

4.2.2.9 Future Visitor Center AOI and Footprint

- No potential effects would occur for any species

4.2.2.10 West Side PO Camping AOI and Footprint

- Low potential effects would occur for three plant species (0-5.2%) and 11 wildlife species. The highest plant species effect would be for Jaeger beardtongue (5.2%); the highest wildlife effects would be for the Spring Mountains checkerspot and the Spring Mountains icarioides blue butterfly (2%)

4.2.2.11 West Side PO Major Trailhead AOI and Footprint

- No potential effects would occur for any species.

4.2.2.12 West Side PO Minor Trailhead AOI and Footprint

- No potential effects would occur for any species.

4.2.2.13 West Side PO Motorized Trails AOI and Footprint

- Trace potential effects would occur for three wildlife species.

4.2.2.14 West Side PO Non-Motorized Trails AOI and Footprint

- A trace potential effect would occur for the flammulated owl

Any conservation measures developed to address potential effects from future recreation development should be avoidance measures to the extent possible. Given the high number of potential effects that fall into the "Trace" category, relocating the facilities and trails may be a reasonable option to pursue. Relocating facilities or trails can be aided by applying the RCM and searching for other areas of at least moderate or high capability to support the facility or trail

in question. Additional information on recommended potential future conservation measures may be found in Chapter 6.

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