



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Las Vegas Field Office

4701 N. Torrey Pines Drive  
Las Vegas, Nevada 89130-2301

In Reply Refer To:  
NV-05200-4700

July 10, 2003

Dear Interested Party:

Enclosed is a copy of the Red Rock Herd Management Area (HMA) Appropriate Management Level Evaluation. This evaluation document establishes appropriate numbers of wild horses and burros for the Red Rock HMA and was prepared in accordance with the Record of Decision for the Approved Las Vegas Resource Management Plan and Final Environmental Impact Statement (October 1998), and the Proposed General Management Plan and Final Environmental Impact Statement for the Red Rock Canyon National Conservation Area (December 2000).

As a result of this evaluation, the following document is enclosed for your review and comment. The 15-day review period begins July 11, 2003, so please submit your comments to Gary McFadden at the above address by July 26, 2003. At the end of the 15-day comment period, an Environmental Assessment (EA) will be prepared. If you are interested in receiving a copy of this EA, please notify Gary McFadden in writing at the above address.

Thank you for your continuing interest in the Las Vegas Field Office's Wild Horse and Burro Program.

Sincerely,

John Jamrog  
Assistant Field Manager for  
Recreation and Renewable Resources

Enclosures:

1. Red Rock Herd Management Area Appropriate Management Level Evaluation.

**RED ROCK HERD MANAGEMENT AREA  
APPROPRIATE MANAGEMENT LEVEL  
EVALUATION REPORT**  
Bureau of Land Management Las Vegas Field Office

**July 2003**

**1.0 Introduction**

Since passage of the Wild Free-Roaming Horse and Burro Act in 1971 (and its implementing regulations), the Bureau of Land Management (BLM) and the United States Forest Service (USFS) have been responsible for the stewardship of wild horses and burros on designated public lands (P.L. 92-195). This stewardship responsibility requires the agencies to provide for viable, healthy herds while ensuring balanced management of the range resources upon which they depend. Over the years, decisions regarding allocation of forage and water resources on public lands have been hotly debated. Competing and conflicted interests of those who advocate for, or derive benefits from, public lands, such as environmentalists, ranchers, wild horse advocacy groups, hunters, and recreationists, require federal agencies to carefully consider the needs of multiple stakeholders when developing land use plans and issuing land use decisions. Further, the National Environmental Policy Act (NEPA) requires federal agencies to follow a formal process of public participation in their decision-making functions (P.L. 91-190). This report contains information necessary to inform BLM resource management decisions regarding appropriate numbers of wild horses and burros in the Red Rock Herd Management Area (HMA). Copies of the report will be made available to interested stakeholders as part of BLM's multiple use decision process.

**1.1 Background**

The BLM defines Appropriate Management Level (AML) for wild horses and burros as the optimum number of animals to be managed within a specific HMA that will support achievement of multiple use resource management objectives, while maintaining a thriving, natural ecological balance within the region. Establishing AMLs through a formal evaluation process is a national priority for BLM. HMAs cannot be placed on national herd gather schedules until a formal AML is established using actual monitoring data in accordance with BLM policy. At the local level, conducting formal evaluations and setting AMLs for wild horse and burro herds is also necessary to determine whether or not the BLM Las Vegas Field Office (LVFO) is accomplishing multiple use resource management objectives for public land use in accordance with the *Las Vegas Resource Management Plan (RMP) (October 1998)*; the *Interim General Management Plan Red Rock Canyon National Conservation Area (June 1995)*; and the *Proposed General Management Plan and Final Environmental Impact Statement for Red Rock Canyon National Conservation Area (December 2000)*.

Since the 1989 Interior Board of Land Appeals (IBLA) ruling directing wild horse and burro herd numbers to be set using actual monitoring data, BLM has implemented a policy of establishing "monitoring based" AMLs using the best available data. The process of setting AMLs utilizes a range of established resource monitoring techniques combined with the land use planning process. As with other federal land use planning efforts, full disclosure and public participation in accordance with NEPA is part of the AML decision process. The AML recommended as a result of this evaluation will be presented to stakeholders and other interested publics for review and comment. Comments received during the review period will be considered by BLM prior to issuance of a final AML decision.

## **1.2 Replacing Estimated AML**

The 1998 RMP identified estimated AMLs for all HMAs under the jurisdiction of the LVFO. In accordance with the RMP planning process, these estimates served as temporary management targets. Estimated AMLs were derived from the best available data. Estimated AMLs are intended to be replaced by AMLs calculated from resource monitoring data collected over several years. BLM policy recommends that AML evaluations be accomplished using 3-5 year data cycles. Annual range utilization data are used to monitor the condition of vegetative resources in response to grazing pressure and other events of recent occurrence within the HMA. Annual monitoring data, taken over time, are used to evaluate long term conditions and trends within the HMA and to formally set AMLs.

The estimated AML for the Red Rock HMA identified in the 1998 RMP was 50 horses and 50 burros. This AML evaluation document is the first formal analysis of long-term monitoring data to determine optimum numbers of wild horses and burros for the Red Rock HMA. The AML proposed in this document is based upon the evaluation of forage utilization and use pattern mapping data corresponding to the years 1995, 1996, 1997 and 1999. Forage utilization data are not available for the year 1998 and were, therefore, not included in this analysis. Data from the other four years are evaluated in comparison with multiple use resource management objectives, as defined in the 1998 RMP.

## **1.3 Future AML Evaluations**

Monitoring data from 2000, 2001 and 2002 are not yet available for inclusion in this evaluation. As such, the BLM recognizes that this evaluation does not include range monitoring data reflecting impacts of recent drought years. However, current range conditions, projections of future drought impacts, and BLM's current drought management policy recommendations have been taken into consideration in the development of the proposed AML for this evaluation period.

The next formal AML evaluation report is scheduled to be completed in 2005, and will include monitoring data from the five-year period 2000-2004. Any future adjustments to AML would be based upon the results of ongoing and future range and herd monitoring studies; baseline resource inventory studies; Ecological Site Inventory data; analysis of competing resource uses or conflicts; changes in resource management objectives and/or consultation and coordination with interested or

affected stakeholders. In addition, AML may need to be adjusted to address HMA-specific management objectives as these are developed as part of a future comprehensive wild horse and burro Population Management Plan for the Red Rock HMA.

## **2.0 RELATIONSHIP OF AML TO RESOURCE MANAGEMENT PLAN OBJECTIVES**

This document evaluates forage utilization patterns and other resource conditions within the HMA as these relate to resource management objectives established for wild horses and burros, wildlife, riparian, and other resources in the RMP. Table 1 lists the RMP resource management objectives relevant to this AML evaluation. The LVFO is committed to meeting the resource management objectives identified in the RMP. The process of setting AMLs based on actual monitoring data meets RMP objectives (WHB-1; WHB-1-a and WHB-1-c) and supports others (see Table 1). If, after establishing AML, monitoring studies or other management programs indicate that RMP objectives are not being met, then management actions/decisions will be modified to bring activities in line with the RMP. One of the RMP objectives is to limit utilization of current year's production by wild horses and burros on key perennial forage species within the HMA to 50% for grasses and 45% for shrubs and forbs. By limiting forage allocation to 45%-50%, it is expected that other resource management objectives, including wildlife habitat, rangeland health and watershed health will be maintained.

## **3.0 LOCATION OF THE RED ROCK HMA**

The Red Rock HMA is located in southern Nevada approximately 20 miles west of the center of metropolitan Las Vegas (see Appendix 1, Figure 1). Comprised of 164,684 acres of public land, the HMA is easily accessible from State Routes 159 and 160. The boundaries of the HMA were established based upon herd use patterns within the historic range of resident wild horses and burros. Approximately half of the HMA is located within the Red Rock Canyon National Conservation Area (NCA), with portions extending beyond the NCA south to the town of Good Springs, Nevada. Most of the HMA's eastern boundary is bordered by Las Vegas urban development, while a majority of the western boundary is defined by the Spring Mountain Range Escarpment and the administrative boundaries of the Humboldt-Toiyabe National Forest. The city of Pahrump, Nevada is located within approximately 15 miles of the HMA's western boundary. The town of Blue Diamond; Bonnie Springs Ranch and Spring Mountain Ranch State Park are also within the HMA boundary.

**Table 1. RMP Resource Management Objectives Related to AML for Wild Horse and Burro Management**

<b>Affected Resource</b>	<b>RMP Objective</b>	<b>Description</b>	<b>Role of AML</b>
<b>Wild Horses &amp; Burros</b>	WHB-1	<i>In HMAs not constrained by desert tortoise restrictions, manage for healthy, genetically viable herds of wild horses and/or burros in a natural, thriving ecological balance with other rangeland uses.</i>	Meets Objective
	WHB-1-a	<i>Establish AMLs within each HMA.</i>	Meets Objective
	WHB-1-c	<i>Limit utilization of current year's production by wild horses and burros on key perennial forage species within the HMA to 50% for grasses and 45% for shrubs and forbs.</i>	Meets Objective
<b>Fish, Wildlife, and Special Status Species*</b>	FW-1	<i>Maintain or improve approximately 869,800 acres of current and potential bighorn sheep habitat toward full ecological potential. Through management and habitat enhancement projects, allow desert bighorn sheep populations to reach levels consistent with the carrying capacity of their habitat, and consistent with other BLM policy. Make adjustments to the population estimates as needed, based on results of monitoring.</i>	Supports Objective
	FW-1-a	<i>Maintain and improve bighorn sheep habitat by maintaining existing water developments, constructing additional water developments, and <b>protecting/improving springs, seeps and riparian habitat</b>, consistent with BLM policy for the management of wilderness study areas* in the following areas: Arrow Canyon/Elbow Range; South Spring/Bird Spring Range; Gold Butte/Virgin Mountains; Muddy Mountains; Spring range; Eldorado/Newberry Range; Specter Range/Last Chance Range/Bare Mountains McCullough Range/Highland Range/Crescent Peak. <b>Limit competition between bighorn, livestock, and wild horses and burros around spring sources by providing separate water sources for each type of user.</b> When possible, provide water at the source for wildlife. <b>If new data indicate that improvements are needed in other areas, do not limit activities to the areas listed above.</b></i>	Supports Objective
	FW-3	<i>Support viable and diverse native wildlife populations by providing and maintaining sufficient quality and quantity of food, water, cover, and space to satisfy needs of wildlife species using habitats on public land.</i>	Supports Objective
	SS-1	<i>Manage Special Status Species habitat at the potential natural community or desired plant community, according to the need of the species.</i>	Supports Objective
	SS-2	<i>Manage habitat to further sustain the populations of Federally listed species so they would no longer need protection of the Endangered Species Act. Manage habitats for non-listed special status species to support viable populations so that future listing would not be necessary.</i>	Supports Objective

	SS-3	<i>Manage desert tortoise habitat to achieve the recovery criteria defined in the Tortoise Recovery Plan (USFWS 1994) and ultimately to achieve delisting of the desert tortoise.</i>	Supports Objective
<b>Water Resources</b>	WT-3	<i>Ensure availability of adequate water to meet management objectives including the recovery and/or re-establishment of Special Status Species.</i>	Supports Objective
<b>Riparian Resources</b>	RP-1	<i>Provide widest variety of vegetation and habitat for wildlife, fish, and watershed protection; ensure that all riparian areas are in proper functioning condition by achieving an advanced ecological status, except where resource management objectives require an earlier successional stage. Manage vegetation consistent with VG-1.</i>	Supports Objective
	RP-1-c	<i>Ensure that the minimum requirement of Proper Functioning Condition on all riparian areas is maintained or achieved.</i>	Supports Objective
<b>Vegetation Resources</b>	VG-1	<i>Maintain or improve the condition of vegetation on public lands to a Desired Plant Community or to a Potential Natural Community.</i>	Supports Objective
<b>Soil Resources</b>	SL-1	<i>Reduce erosion and sedimentation while maintaining or where possible enhancing soil productivity through the maintenance and improvement of watershed conditions.</i>	Supports Objective
<b>Recreation</b>	RC-1	<i>Ensure that a wide range of recreation opportunities are available for recreation users in concert with protecting the natural resources on public lands that attract users.</i>	Supports Objective

\* Special Status Species include all plant and animal species that are Federally listed as "threatened or endangered" under the Endangered Species Act of 1973, as amended, Candidate species under the Endangered Species Act, State listed species, or species otherwise identified by the BLM State Director.

## **4.0 EXISTING ENVIRONMENT**

As recently as 1990, lands within Red Rock Canyon NCA and the HMA were considered a rural retreat, attracting locals and tourists seeking day trip excursions from urbanized development. With the completion of the Summerlin Parkway in the early 1990's and other improved road networks, the HMA is now only 20 minutes from downtown Las Vegas. Today, rapid expansion of the communities of Summerlin, the Lakes, and others, along with the associated growth of commercial and residential services, has pushed urban Las Vegas to the doorstep of Red Rock Canyon NCA and the HMA. This once rural area now experiences heavy traffic flows along State Routes 159 and 160 from commuters and tourists, and receives approximately 1.2 million visitors each year. According to the U.S. Census, Clark County grew from 741,459 residents in 1990 to 1,375,765 in 2000, representing an 85.5% increase in growth. Long-term population growth projections by the University of Nevada Las Vegas Center for Business and Economic Research indicate the population will continue to increase rapidly over the next several decades with an estimated 2,120,940 residents by 2015.

The tremendous influx of people to the region has resulted in a corresponding increase in recreational demands on the public lands within the NCA and HMA. Because of sparse, erratic precipitation, wide variations in temperature and delicately balanced species interactions, desert systems are considered fragile and subject to permanent degradation if not properly managed. Surface disturbances caused by excavation, trail use or off-highway vehicle travel can take as long as 100 years to recover dependent upon degree of soil compaction and level of restoration effort. Therefore, decisions regarding resource allocation and access to desert lands must be carefully weighed against long term and cumulative resource damage.

### **4.1 Meteorological Conditions**

The Red Rock HMA is within the Mojave Desert ecosystem and is characterized by low precipitation levels, cool winters, and hot summers. Table 2 shows the monthly climate summary compiled from data collected by the Western Regional Climate Center located at Spring Mountain Ranch State Park (elevation 3,778 ft) within the NCA/HMA boundary. These data provide a 29-year baseline from which to compare current climatic conditions. Evapo-transpiration is high with average air temperatures ranging from 30 °F in the winter to summer temperatures in excess of 97 °F in July. Although desert systems are typically characterized by less than 4 inches of rain per year, a majority of the Red Rock HMA is located at elevations above 3,500 feet (ft), resulting in higher levels of precipitation. Average annual precipitation for the HMA is 12.76 inches. Average monthly precipitation levels range from a low of 0.16 inches in June to a high of 2.23 inches in March. Most precipitation occurs during the winter and early spring months (December-March) and in late summer (July-August). The driest months are typically May, June, September and October.

**Table 2. Average Monthly Climate Summary 1961-1990**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>Average Max Temperature (°F)</b>	52.7	57.3	63.5	72.2	80.5	91.8	97.1	94.0	87.2	76.6	60.9	54.6	74.2
<b>Average Min. Temperature (°F)</b>	30.4	34.0	39.8	46.0	53.2	64.0	70.8	67.8	59.3	48.5	36.5	31.0	48.6
<b>Average Total Precipitation (in)</b>	1.64	1.93	2.23	0.84	0.33	0.16	1.09	1.84	0.44	0.37	0.86	1.03	12.76

\*From Western Regional Climate Center Station #266691, Spring Mountain Ranch State Park, Nevada.

Tables 3 and 4 show average annual precipitation and temperature data for the HMA during the AML evaluation period (1995-1999) and the years 2000-2002, respectively.

**Table 3. Average Annual Precipitation and Temperature Data for Red Rock HMA (1995 –1999)**

Year	Annual Precipitation	High Temperature (°F)	Low Temperature (°F)
1995	12.28	71.82	45.31
1996	8.85	75.98	48.75
1997	8.87	74.50	47.18
1998	17.65	71.01	44.24
1999	6.67	75.88	46.92
<b>Average Values</b>	<b>10.86</b>	<b>73.84</b>	<b>46.48</b>

\*From Western Regional Climate Center Station #266691, Spring Mountain Ranch State Park, Nevada.

**Table 4. Average Annual Precipitation and Temperature Data for Red Rock HMA (2000 – 2002)**

Year	Annual Precipitation	High Temperature (°F)	Low Temperature (°F)
2000	8.87	72.96	48.32
2001	10.75	75.97	46.46
2002	2.28	75.36	46.92
<b>Average Values</b>	<b>7.30</b>	<b>74.76</b>	<b>47.23</b>

\*From Western Regional Climate Center Station #266691, Red Rock Canyon State Park, Nevada



During the evaluation period (1995-1999), average temperatures were slightly lower than the 29-year average, while precipitation was 2.1 inches below normal, representing a 15% decrease. During the 2000-2002 period, average temperatures were slightly above normal. Precipitation data for the years 2000 and 2001 appear to be consistent with values corresponding to the evaluation period; however, a severe drought during 2002 resulted in a dramatic decrease in precipitation. The area registered only 2.28 inches total annual precipitation, representing an almost 82% decrease from the 29-year average. In reviewing precipitation data from the years 1977 through 2002 (Appendix 2), average annual precipitation has ranged from a low of 2.28 inches in 2002 to a high of 23.89 inches in 1983. A drought in 1989, resulting in annual precipitation of 2.34 inches, was the only other year since 1977 that annual precipitation fell below 6 inches. Eight years out of the past 26 years (approximately 30%) have registered annual precipitation less than 8 inches.

Although range resource data from the years 2000-2002 are not included in the long-term monitoring data used to prepare this evaluation report, short-term drought conditions have a direct and sometimes prolonged affect on water resource availability and forage plant condition. As such, these factors have been taken into consideration for purposes of determining the AML established in this document. According to the National Weather Service, as of the date of this document, southern Nevada remains in "severe drought" status. Precipitation data from the Red Rock weather station for the year 2003, through the month of April, indicate cumulative annual precipitation to be 4.63 inches. These data may be an early indication that the HMA will experience closer to average precipitation in 2003.

Meteorological and range monitoring data for the years 2000 through 2004 will be analyzed in conjunction with the next AML evaluation scheduled to occur in 2005.

#### **4.2 Soils and Land Forms**

The HMA is comprised of mountainous areas and lowlands. The mountains lay in a north to south direction with variable slopes and aspects. Slopes in the valleys vary from 0% to 40% with the majority at about 5% to 9%. Wild horses and burros typically do not use areas with slopes greater than 30%. Elevations range from 8,754 feet (ft) on La Madre Mountain (just outside the HMA) to approximately 2,500 ft in the outer boundary areas. The following information on soils was taken from the Proposed General Management Plan and Final Environmental Impact Statement for Red Rock Canyon National Conservation Area, December 2000:

*"Under arid conditions, rocks tend to break down by disintegration rather than by decomposition. Mechanical breakdown (spalling) is more common than chemical action. As a result, mountains are covered with a thin veneer of rock fragments. Cloudbursts and showers sweep large quantities of this material into ravines and valleys, forming alluvial fans of the coarser material. Finer grained sediments are washed into the lowlands. Wind-blown sand is also common, with the greatest accumulations found in the lower valleys.*

*Organic matter in most desert soils is far less than the average 3 to 5 percent by weight contained in soils formed in humid regions. Even in a wet year when spring annuals are abundant, much of the vegetal matter is oxidized by the summer heat before it can be turned into humus. A gravelly*

*surface, referred to as 'desert pavement,' can be found in many areas. This surface is stable and resistant to erosion. The sparse cover of vegetation does little to reduce wind and water velocities. During the high-intensity, short duration thunderstorms that are common in the region, raindrop impact tends to destroy soil aggregates, enhance sheet and rill erosion, and encourage considerable transportation by splashing. A hard crust often develops upon drying. This crust impedes seedling emergence, greatly reduces infiltration for the next storm, and limits the possibilities for vegetative shielding which, by absorbing the energy of rain impact, prevents the loss of both water and soil and reduces degranulation to a minimum."*

Wild horses and burros travel and congregate in small bands of animals (5-8). Their daily feeding and watering habits result in the creation of well-used trails within the HMA. Soil disturbance and compaction along these trails prevent desert plants from re-establishing. Horse and burro trails are often adopted by other off-road recreational users, such as hikers, cyclists and motorcycle riders. As the trails become more widely used, they become wider and deeper and in some cases become unusable to the animals. This evolution, and in some case proliferation, of trails has created conflicts for multiple-use managers. In the NCA, motorized and mechanized vehicles are strictly regulated to designated roads and trails. Within the HMA outside of the NCA, motorized and mechanized vehicles are restricted to "existing roads, trails and dry washes". However, without official designation, the definition and enforcement of the "existing trails" requirement becomes more difficult, as wild horses and burros may continue to create new trails in response to changing conditions.

#### **4.3 Vegetation, Ecological Sites and Condition Assessment**

The term "ecological site" refers to a classification system used to define land types based on their potential to sustain specific plant communities. The potential to sustain various plant communities will vary from site to site depending on the physical characteristics of the area, including soil chemistry, precipitation, geology and elevation. The ecological sites and corresponding plant species that dominate the landscape of the HMA are listed in Table 5. The HMA primarily consists of sites dominated by desert shrubs, with low percentages of perennial herbaceous plants. Short-lived ephemeral-type forbs and grasses may be periodically abundant when favorable climatic conditions result in "desert bloom". Joshua trees, Spanish daggers and other cactus and succulents are also common. Wild horses and burros forage on the following key grass and browse species: Galleta grass, Indian Ricegrass, *Stipa* spp., White Bursage, Winter Fat, Spiny Menodora.

The purpose of an ecological condition assessment is to help the resource manager predict the extent and direction of changes that may occur in a plant community as a result of applying specific treatments or management actions, such as grazing. The impact of land uses, including grazing, on range resources can be better evaluated when the condition of areas being monitored can be

compared to known ecological sites. Ecological condition assessments yield an ecological expression of the relative degree to which the types, proportions and quantities of plants in the present plant community resemble that of the site's *potential natural community* (PNC). PNC is defined as the stable biotic community that would become established on an ecological site under present environmental conditions if all successional stages were completed in the absence of human interference.

Locations selected to measure ecological condition must be representative of the key areas used to describe larger geographic units and must also include, where appropriate, sites supporting unique features such as springs, seeps and canyons. Though it is recognized that wild horses and burros roam freely throughout the HMA, certain areas (key areas) are used more heavily than others due to factors such as limited water distribution, geographical barriers and urban interface (see Appendix 1, Figure 1). For purposes of this evaluation, key areas in the Red Rock HMA are locations regularly used by horses and burros and are generally located between three-quarters of a mile to almost two miles from relatively reliable water sources. By monitoring key areas, the resource manager will obtain an estimation of the use occurring overall within the HMA. Long-term (15-20 years) ecological condition monitoring provides the resource manager with feedback on the trends in vegetative community response to treatments and actions. If BLM management objectives for range health are consistently not achieved in the key areas, then management actions and/or treatments must be modified, such as reducing grazing pressure by reducing the number of grazing animals.

**Table 5. General Ecological Sites and Associated Vegetation**

<b>Ecological Site Name</b>	<b>Annual Precipitation (inches)</b>	<b>Dominant Plant Species</b>
Coarse Gravelly Loam	5-7	Blackbrush ( <i>Coleogyne ramossissima</i> ), Big Galleta ( <i>Hilaria rigida</i> ), Spiny Menodora ( <i>Menodora spinescens</i> ), Winterfat ( <i>Cerotoides lanata</i> )
Shallow Gravelly Loam and Slope	7-9	Blackbrush, Big Galleta, Black Grama ( <i>Bouteloua eriopoda</i> )
Shallow Gravelly Loam	8-10	Blackbrush, Desert Needlegrass ( <i>Stipa speciosa</i> )
Shallow Gravelly Loam	5-7	Blackbrush, Big Galleta
Shallow Gravelly Slope	5-7	Blackbrush
Shallow Limestone and Slope	5-8	Blackbrush
Limy Fan	5-7	Big Galleta, Creosote Bush ( <i>Larrea tridentata</i> ), White Bursage ( <i>Ambrosia dumosa</i> )
Gravelly Fan	5-7	White Bursage, Big Galleta

In the fall of 1999 and spring of 2000, an interdisciplinary team of BLM personnel established four key areas within the HMA to assist in monitoring the utilization of key forage species by horses and burros and to determine changes to vegetation over time that may occur from grazing activity. The four established key areas, Potosi Springs, Wilson Tank, Mud Springs, and South Loop Road were selected based on their "representativeness" of herd use occurring over larger range areas. Maps 2-5 illustrate wild horse and burro grazing use (forage utilization) patterns in the HMA relative to established key areas. These use pattern maps are used to calculate the overall range condition and to determine the percentage of forage utilization. The approximate center of each key area is represented on the map by a large colored dot. Each key area encompasses a radius approximately 5-8 miles in all directions from the center of the dot. These use pattern maps are evaluated by BLM to determine grazing impacts to range resources and performance in meeting resource management objectives.

#### **4.4 Grazing Enclosures and Vegetative Trend Monitoring**

Grazing enclosures allow resource managers to better understand impacts of management actions on ecological sites within the HMA. Enclosures are constructed of fencing materials designed to keep wild horses and burros out, while allowing access for most wildlife species. Four 1-acre grazing enclosures were constructed in the HMA between 1990 and 1991 to monitor wild horse and burro impacts to vegetation by comparing the condition and trend in grazed versus ungrazed areas within three ecological sites (Appendix 1, Figure 1). The four enclosures are identified as Mud Spring (#1), Burn Site (#2), and Kern River Seeding Blondie (#3) and Kern River Seeding Whistle (#4).

Vegetative trend data is considered long term information (15+ years), and will be used in future evaluations to verify if limits established for forage utilization are sufficient to meet plant physiological requirements and vegetation resource management objectives. Baseline trend and condition studies were conducted inside and outside of the four enclosures at the time of establishment. The frequency of occurrence of all plant species within 200 nested plots was recorded to measure vegetation change at each study location. Parallel frequency plots were established at each key area to allow one of the duplicate plots at each key area to be fenced to exclude wild horse and burro use. This approach allows a direct side-by-side comparison over time of the status of the vegetative trend between the grazed and the ungrazed plots. Baseline ecological site, ecological condition, trend, and vegetative cover data have been recorded for each enclosure. These data will be compared to future trend monitoring data to determine changes over time. The results of the baseline monitoring studies are displayed in Table 6.

In late 2002, enclosures #3 and #4 were removed to accommodate the installation of the Kern River II natural gas pipeline. The LVFO will construct two new enclosures within the HMA in 2003.

#### **4.5 Water/Riparian Resources & Key Use Areas**

Water and associated riparian resources are especially important in desert ecosystems and are, typically, the limiting factor in species distribution and abundance. Sound conservation practices must be implemented to maintain the integrity and viability of water/riparian resources for the

**Table 6. Ecological Sites, Condition, and Trend Data for Enclosures 1-4.**

Enclosure	Ecological Site	Aspect Vegetation	Ecological Condition	Vegetative Trends	Vegetative Cover	Location
<b>Mud Spring #1</b> (Established May 1, 1990)	Coarse Gravelly Loam 5-7 30XB107NV	Blackbrush Big Galleta Winterfat Spiny Menodora	Late Seral	No Apparent Trend or Static	Inside Enclosure 29.3%	Within 1 mile of Mud Springs
				No Apparent Trend or Static	Outside Enclosure 30.6%	
<b>Burn Site #2</b> (Established May 3, 1990)	Shallow Gravelly Loam 8-10 29XY077NV	Cheatgrass Red Brome Brittle Brush ( <i>Encilia actoni</i> )	Early Seral (Burned 1980, 1993)	Downward Trend Due to another fire in June 1993	Inside Enclosure 3%	Adjacent to SR 160 near the Goodsprings Road
					Outside Enclosure 5.7%	
<b>Kern River Seeding Blondie #3</b> (Established Dec. 1991)	Shallow Limestone Slope 5-8 30XB030NV	Blackbrush	Seeding Inside Early Seral	Upward	13.8%	In Wildhorse Valley on the Kern River Natural Gas Pipeline
			Seeding Outside Early Seral	Upward	9%	
			Native Inside PNC	No Apparent Trend or Static	39%	
			Native Outside PNC	No Apparent Trend or Static	28%	
<b>Kern River Seeding Whistle #4</b> (Established Dec. 1991)	Coarse Gravelly Loam 5-7 30XB107NV	Blackbrush Big Galleta Winterfat Spiny Menodora	Seeding Inside Early Seral	Upward	16%	In Wildhorse Valley on the Kern River Natural Gas Pipeline
			Seeding Outside Early Seral	Upward	9%	
			Native Inside PNC	No Apparent Trend or Static	39%	
			Native Outside PNC	No Apparent Trend or Static	28.60%	

health of the desert ecology. Management practices, including allocation of water/riparian resources to wildlife, wild horses and burros, riparian vegetative communities and recreational users must be consistent with resource management objectives identified in the RMP (see Table 1).

Seeps and springs are located throughout the HMA. Figure 2 (Appendix 1) illustrates the locations of the primary springs within the HMA, relative to four established wild horse and burro key use areas. Tables 7-9 summarize physical and biological information associated with the primary springs occurring within each key use area. BLM is still in the process of inventorying spring resources within the NCA and HMA. These tables include current information on elevation, estimated flow rates, Proper Functioning Condition (PFC) status, presence of endemic species and information related to the presence/absence of fences and diversions. A brief description of each spring, including information on biological species of interest, is contained in Appendix 3.

As a result of the dramatic decrease in precipitation in 2002, many springs within the Red Rock HMA had reduced flow and forage growth was retarded. Severe reductions in spring flows resulted in horses and burros concentrating at spring sources. Reductions in water sources also restricted animal forage patterns to areas in the immediate vicinity of reliable water, resulting in overgrazing and shortages of forage within access to water. These conditions threatened the survival of wild horses. Burros in the HMA fared better than the horses due to their ability to forage on more diverse plant species and their adaptation to desert conditions. As a result, in June 2002, the BLM LVFO conducted emergency gathers of wild horses from the Red Rock HMA as well as other HMAs in southern Nevada. Although an attempt was made to gather all horses from the Red Rock HMA, approximately 25 horses could not be captured and were left on the range. Of the 60 horses gathered, 32 were shipped to BLM holding facilities in Ridgecrest, California and 26 were held at the BLM Oliver Ranch facility in Red Rock Canyon NCA, pending improvements to range conditions. These animals will remain in temporary holding until a final AML decision is issued and range conditions improve to allow their release. The final AML decision resulting from this evaluation will determine the number of horses ultimately released from Oliver Ranch back to the HMA.

#### 4.6 Wildlife Resources

Some limited use by big game wildlife species (Bighorn Sheep, deer, elk) occurs within the HMA. Utilization studies reflect general utilization by all species inhabiting the area, including wild horses and burros, deer, bighorn sheep, rabbits and other herbivorous wildlife. The allocation of a maximum of 50% grasses and 45% forbs and shrubs to wild horses and burros was established to help ensure adequate resources were provided to wildlife populations. Common reptilian wildlife expected to occur within the project area include: the western whiptail (*Cnemidophorus tigris*), zebra-tail lizard (*Callisaurus draconoides*), side-blotched lizard (*Uta stansburiana*), long-nose leopard lizard (*Gambelia wislizenii*), Great Basin collared lizard (*Crotaphytus insularis bicinctores*), red coachwhip (*Masticophis flagellum piceus*), gopher snake (*Pituophis catenifer*), speckled rattlesnake (*Crotalus mitchelli*). Common avifauna in the HMA include: black-throated sparrow (*Amphispiza belli*), black-tailed gnatcatcher (*Poiloptila nigriceps*), northern mockingbird (*Mimus polyglottos*), Common raven (*Corvus corax*), and red-tailed hawk (*Buteo jamaicensis*). Other common wildlife include the Coyote (*Canis latrans*), desert cottontail (*Sylvilagus auduboni*), black-tailed jackrabbit (*Lepus californicus*), Kit fox (*Vulpes macrotus*).

**Table 7. South Loop Key Area Water Sources**

Spring Name	Elevation (feet)	Fenced	Diversion	Proper Functioning Condition (PFC)	Sensitive/ Endemic Species	Horses/ Burros (H/B)	Water Hauled	HMA Status	Flow Rate (gpm)
Red Spring	3620	Yes	-	PFC	<i>Pyrgulopsis sp.</i> <i>Calochortus sp.</i>	B	-	Out	7.5
Calico Spring	3920	-	-	PFC	<i>Arctomecon sp.</i>	B	-	Out	0.5
Ash Spring	3740	-	-	PFC	-	B	-	In	1.0
La Madre Spring	5550	-	-	PFC	<i>Pyrgulopsis sp.</i>	-	-	In	1.5
South Fork Spring	5680	-	-	PFC	-	-	-	In	7.9
First Creek	4080	-	-	PFC	<i>Angelica sp.</i>	H & B	-	In	10
Lost Creek Spring	4480	-	-	PFC	<i>Pyrgulopsis sp.</i> <i>Angelica sp.</i>	-	-	In	49
Pine Creek	4200	-	-	PFC	<i>Angelica sp.</i>	H & B	-	In	25
Oak Creek	4220	-	-	PFC	<i>Angelica sp.</i>	H & B	-	In	30
Willow Spring	4510	Yes	Spring source is a cemented trough	Functional at-risk with upward trend	<i>Pyrgulopsis sp.</i>	-	-	In	4.5
White Rock Spring	4760	-	Water piped from source to trough	Non-functioning	-	-	-	In	0.5

**Table 8. Wilson Tank Key Area Water Sources**

Spring Name	Elevation (feet)	Fenced	Diversion	Proper Functioning Condition (PFC)	Sensitive/Endemic Species	Horses/Burros (H/B)	Water Hauled	HMA Status	Flow Rate (gpm)
Tunnel Spring		-	90% of flow is piped to trough	Non-functioning	-	H	Yes	In	1.0
Bird Spring		-	90% of flow is piped to trough	Non-functioning	-	H	Yes	In	0.1

**Table 9. Mud Springs Key Area Water Sources**

Spring Name	Elevation (feet)	Fenced	Diversion	Proper Functioning Condition (PFC)	Sensitive/Endemic Species	Horses/Burros (H/B)	Water Hauled	HMA Status	Flow Rate (gpm)
Mormon Green II	3720	-	-	PFC	-	H & B	-	In	.2
Mormon Green I	3600	-	-	PFC	-	H & B	-	In	1.1
Wheeler Camp Spring	3550	Yes	Spring is partially piped from source	PFC	-	H & B	-	In	16
Lone Grapevine	4200	Yes	Portion of spring is piped to a trough	PFC	-	H & B	-	In	0.5
Shovel Spring	4340	Yes	-	Functional at-risk with upward trend	-	H & B	-	In	0.5
Lone Willow Spring		-	-	Non-functioning	-	H & B	-	In	0.1
Mud I	3862	Yes	Portion of spring is piped to a trough	Non-functioning	-	H & B	Yes	In	1.5
Mud II	3790	-	-	Non-functioning	-	H & B	-	In	0.03



The only federally-listed species per the Endangered Species Act that may occur within the project areas are the threatened desert tortoise (*Gopherus agassizii*) and the threatened phoenapepila bird. Other sensitive species that may occur within the HMA are: chuckwalla (*Sauromalus obesus*), banded Gila monster (*Heloderma suspectum cinctum*), and Spring Mountain spring snail (*Pyrgulopsis deaconi*).

#### 4.7 Wild Horses and Burros

Wild horses and burros are present year round within the HMA. As a result of population growth and increased tourism, direct human interactions with horses and burros and indirect interactions from recreational uses within the HMA have increased substantially in recent years. The development of the Red Rock Canyon Country Club, increased visitation in the north side of Cottonwood Valley, Spring Mountain State Park, and Bonnie Springs Ranch and development in the town of Blue Diamond and Calico Basin have all resulted in increased human/animal interactions.

Aerial census data from 1995 and 1997 are presented in Table 10. Normally, the number of animals sited (actual visual) were increased by a factor of 50% (adjusted values) to compensate for observer error. For example, for horses surveyed in 1995:

$$41 \text{ horses} \times 50\% (0.5) = 20.5 \text{ horses}$$

$$41 \text{ horses} + 20.5 = 61.5 \text{ horses (rounded up to 62).}$$

For burros, the actual census data in 1995 were adjusted using the Lincoln-Petersons Index. This adjustment factor is used in conjunction with a BLM-approved mark/recapture technique. This technique was used in only one survey year because it is costly and significantly more dangerous to perform.

**Table 10. Actual and Adjusted Aerial Census Numbers for Wild Horses and Burros**

Date	Horses		Burros		Total	
	Actual	Adjusted	Actual	Adjusted	Actual Total	Adjusted Total
Sep-95	41	62	125*	134*	166	196
Sep-97	42	63	62	93	104	156

\*Lincoln-Peterson Index was used to find actual population numbers for burros in 1995.

Table 11 provides information on the numbers of horses and burros gathered and removed from the HMA since 1987. A total of 177 burros and 52 horses were removed from the HMA in response to emergency drought conditions, a reduction in water availability or to address nuisance animal problems. In addition to BLM removals, 88 horses and burros have been reported killed since 1990 as a result of collisions with vehicles. Accurate data on the death numbers due to natural causes are not available.

**Table 11. Red Rock HMA Animal Gather/Removal History**

<b>Year</b>	<b>Number Burros</b>	<b>Number Horses</b>
1987	0	0
1988	11	0
1992	1	0
1993	20	0
1996	106	15
2000	39	10
2002	0	27
<b>Total</b>	<b>177</b>	<b>52</b>

#### **4.8 Livestock Use**

The area of evaluation has been closed to livestock grazing for over 30 years.

#### **4.9 Recreational Use**

Over half of the HMA is within the popular Red Rock Canyon NCA, which receives over 1.2 million visitors each year. Most of the remainder of the HMA falls within the designated Las Vegas Valley and Jean/Roach Lake Special Recreation Management Areas. These areas allow for extensive off-highway vehicle use. Designated roads and trails within the NCA support motor touring, mountain biking, hiking, and recreational horseback riding. Competitive and non-competitive events are also permitted.

Other forms of recreation include: horse endurance events, commercial and casual trail rides, mountain biking, hiking, hunting, rock climbing and hounding, commercial motorized OHV guided tours, and amateur and professional photography. In addition, commercial still photography, video, and major motion picture filming are common activities.

#### **4.10 Wilderness Resources**

Portions of the HMA are within the boundaries of two recently established Wilderness Areas, La Madre Mountain and Rainbow Mountain. These Wilderness Areas were designated by Public Law 107-282, the Clark County Conservation of Public Land and Natural Resources Act of 2002. Wild horses and burros do not typically use these areas. Regulations governing wilderness management restrict the use of motorized and non-motorized vehicles. Other restrictions apply to the general use of mechanized equipment within wilderness areas; however, allowances have been made to provide for the use of aircraft or other vehicles for the management of wildfires, wildlife, and wild horses and burros by State and federal agencies. Allowable recreational activities include: hiking, horseback riding, bird watching, backpacking, photography, camping, and hunting/fishing pursuant

to State regulations. The level and type of allowable uses will be addressed in wilderness management plans to be developed for these areas over the next several years.

## **7.0 ANALYSIS, INTERPRETATION AND EVALUATION OF MONITORING DATA**

### **7.1 Introduction**

Various monitoring studies are employed to determine AML and whether RMP objectives are being met within the HMA. Data from monitoring studies are used to determine if any changes in management actions are required to achieve a thriving ecological balance. These studies include animal census, key forage plant utilization and use pattern mapping, evaluation of ecological condition, and vegetative trend studies. All monitoring studies are established and conducted in conformance with BLM's Nevada Rangeland Monitoring Handbook (September, 1984).

In the interim, actions proposed to alleviate spatial distribution conflicts with recreation, urban encroachment and water availability will be addressed with public input in accordance with the BLM's wild horse and burro program and NEPA policy. Some actions are already being addressed, such as moving a parking area, restoring mountain bike paths in Cottonwood Valley, and drilling new wells to improve herd distribution and forage use.

There were several small areas of heavy use within the HMA (see Appendix 1, Figures 3-6). The use pattern maps show that wild horse and burro numbers are not excessive, however, there are problems with spatial needs and distribution of animals in the HMA due to limited water availability.

The HMA has sufficient forage and cover for the animals currently present, however, plant composition is less than optimum (see Table 6). Another limiting factor for wild horses and burros is spatial, as the HMA has severe urban interface problems. Wild horses and burros are in competition with recreationists for adequate space to forage, foal, and conduct normal animal behavior.

### **7.2 Forage Utilization**

Grazing use (% utilization) of several key forage species is estimated and recorded along transects within the key areas, as well as, several other locations throughout the HMA. This recorded data, along with additional ocular estimates, are grouped into use patterns that are delineated on a map of the HMA. These use patterns are represented by six use categories: (1) no measurable use, (2) slight, (3) light, (4) moderate, (5) heavy, and (6) severe. These categories correspond to use levels of approximately 0%, 10%, 30%, 50%, 70% and 90%, respectively. These are the midpoints of respective ranges of use (0%-20%; 20%-40%, etc.) Data from use pattern mapping conducted between 1995 and 1999 are summarized in Table 12 and displayed on Figures 3-6 (Appendix 1).

Areas that were not included in the survey for that particular year are also depicted. Most of the areas not surveyed are portions of the HMA that are currently not utilized by wild horses and burros. This may be due to disbursement of water sources or natural geographic barriers that restrict

movement into these areas. Approximately 2,272 acres of the HMA were not included in the use pattern calculations because they are located in areas with slopes of 30% or greater. Wild horses and burros seldom utilize hillsides with slopes of 30% or greater. An additional 1,522 acres were not included in the use calculations because the relative distance to water excludes use of these areas by wild horses and burros (see Tables 5 and 6, and Appendix 1, Figures 3-6).

**Table 12. Use Pattern Mapping for the HMA (in Acres and Percent of HMA Surveyed).**

Year		No Use	Slight	Light	Moderate	Heavy	Severe	Acres Not Measured
1999	Acres	0	69,501	12,609	8,712	984	0	69,084
	Percent	0%	42%	8%	5%	1%	0%	42%
1997	Acres	0	71,257	10,759	8,577	1,214	0	69,083
	Percent	0%	43%	7%	5%	1%	0%	42%
1996	Acres	43,897	22,521	9,332	12,333	3,722	0	69,085
	Percent	27%	14%	6%	7%	2%	0%	42%
1995	Acres	50,075	25,319	1,573	15,716	2,234	0	65,973
	Percent	30%	15%	1%	10%	1%	0%	40%

\*Total acreage for the HMA = 164,684 acres.

\*\*Total acreage not included because slope is 30% or greater = 2,272 acres (1% of HMA).

\*\*\* Total acreage not suitable for utilization because of distance from water = 1,522 acres (1% of HMA).

### 7.3 Calculation of AML

Transects recorded each year that fall within the key areas boundaries are used in calculating weighted utilization for key areas. When use pattern mapping was only available for a particular year, the pattern(s) mapped in each key area were substituted for transect data for that year. The highest average reading for any one key species along any transect was used to derive the "Actual Percent Weighted Utilization" for each key area. This figure is used to calculate the AML for each key area. Using the highest reading for any key species rather than an average of all key species is a conservative approach for estimating forage utilization. This conservative approach was adopted to help ensure animal and habitat health during drought conditions and to allow estimation error to benefit resource protection. Actual Percent Weighted Utilization for key areas is shown in Table 13.

**Table 13. Actual Percent Weighted Utilization for Key Areas Within Red Rock HMA.**

Grazing Year	Estimated Percent Weighted Utilization For All Key Species For Key Areas Within The Red Rock HMA			
	Potosi Springs	Wilson Tank	Mud Springs	South Loop Road
1999	60%	59%	60%	60%*
1998	Data Missing From This Year			
1997	26%	39%	24%	50%
1996	30%*	70%*	50%*	50%*
1995	30%*	68%	56%	50%*

**\*Percentages are estimates calculated from actual use pattern maps and not from data sheets.**

Analysis of forage utilization for 1995-1999 (Table 13) indicates an AML of 62 horses and 117 burros. The mathematical "Desired Stocking Rate Equation", published in BLM Technical Reference 4400-7, Appendix 2, pages 54-56, was used to calculate AML:

Actual Wild Horse and Burro Use	=	Desired AML
Actual % Utilization		Desired % Utilization

Annual percent weighted utilization figures from Table 13 were used as "Actual % Utilization" in the equation. Animal numbers used to represent "Actual Wild Horse & Burro Use" for each key area, were estimated from aerial census data (Table 3), field observations, and historical gather data for each year.

The Desired AML for each year was then averaged for each key area to come up with the Desired AML for that key area. Desired AMLs for each of the key areas were then summed to calculate a total AML for the HMA. The results of this analysis appear in Table 14.

For example, using the data presented in Table 14 to calculate Desired AML for horses at the Wilson Tank key area for the year 1999, the equation is set up as follows:

"Actual Wild Horse & Burro Use" = 54 horses

"Actual % Utilization" = 59% or 0.59

"Desired % Utilization" = 50% or 0.50 (from Section 2.0; RMP Objective WHB-1-c)

54 horses	=	<b>46 horses</b>
0.59		0.50

Using simple algebra it is calculated that the Desired AML for the Wilson Tank key area during the year 1999 for horses is 46.

The AML based on the average of all gathered data from each key area for the years 1995-1999 was found to be 62 horses and 117 burros (Table 14). These data, taken in conjunction with other information contained in this document, indicate the desired AML for the Red Rock Canyon HMA to be 62 horses and 117 burros.

**Table 14. Calculation of Desired AML for the Red Rock HMA.**

Grazing Year	Key Areas	Actual Wild Horse & Burro Use		Desired % Utilization	Actual % Utilization		Desired AML	
		Horses	Burros		Horses and Burros	Horses	Burros	Horses
1995	Potosi Spring	0	15	0.5	0	0.3	0	25
	Wilson Tank	32	0	0.5	0.68	0	24	0
	Mud Spring	30	20	0.5	0.56	0.56	28	18
	South Loop Rd.	0	99	0.5	0	0.5	0	99
1996	Potosi Spring	0	16	0.5	0	0.3	0	27
	Wilson Tank	47	0	0.5	0.7	0	34	0
	Mud Spring	10	10	0.5	0.5	0.5	10	10
	South Loop Rd.	0	51	0.5	0	0.5	0	51
1997	Potosi Spring	1	18	0.5	0.26	0.26	2	35
	Wilson Tank	48	0	0.5	0.39	0	62	0
	Mud Spring	14	12	0.5	0.24	0.24	29	25
	South Loop Rd.	0	63	0.5	0	0.5	0	63
1999*	Potosi Spring	1	22	0.5	0.6	0.6	1	18
	<i>Wilson Tank</i>	<i>54</i>	0	<i>0.5</i>	<i>0.59</i>	0	<i>46</i>	0
	Mud Spring	17	0	0.5	0.6	0	14	0
	South Loop Rd.	0	115	0.5	0	0.6	0	96
Average Desired AML for the Four Key Species for the Years of 1995-1999:					Potosi Spring		1	26
					Wilson Tank		41	0
					Mud Spring		20	13
					South Loop Road		0	77
<b>Desired AML for the Red Rock HMA is:</b>							<b>62</b>	<b>117</b>

\* Data highlighted in bold italics are used to illustrate an example calculation of AML.

### 8.0 FUTURE WILD HORSE AND BURRO MANAGEMENT

Once AML is established, a four-year gather cycle will be implemented. During the first AML gather animals will be gathered down to a level 40% below AML for Wild horses and burros. The populations will then be allowed to increase to AML over the four-year evaluation cycle. This policy is used for BLM in the state of Nevada and has been established from population modeling done by the University of Nevada Reno with Nevada wild horse and burro population data. This

model assumes a 50/50 split of males and females, with a 20% recruitment rate. Also, in support of National Wild Horse and Burro Program objectives, the LVFO is planning to include the Red Rock wild horse herd in fertility control trials in the near future. If implemented, this program will provide for a slower growth rate in the herd.

### **8.1 Future Monitoring and Adjustments to AML**

Monitoring data (i.e., utilization, trend, condition, and use pattern mapping) will be collected at established key areas annually. In the near future, an Ecological Site Inventory will be conducted. Also, trend and condition studies will be included for all key areas. This will assist in the evaluation of resource data in future AML evaluations. Any changes in management objectives could also result in studies being added. Census data will be collected on a three-year cycle with the next census to be conducted in 2004 or 2005. Monitoring studies will be conducted throughout the gather cycle to confirm the existing AML; as well as, identify the need for any additional studies.

BLM is committed to managing viable populations of wild, free-roaming horses and burros on the public lands while maintaining the integrity of other resource values for conservation and multiple use management is a challenging task.

Though data gathered thus far on ecological condition and trend are premature and inconclusive, there is no indication, at this time, that trend or condition would be negatively impacted with the implementation of this AML for wild horse and burro herds in the Red Rock HMA.

Water is a limiting factor, which has resulted in distribution problems causing some small areas to sustain heavy use. This current evaluation addresses these conditions and adjusts the target populations accordingly. Small numbers of wildlife also inhabit the HMA. Forage utilization estimates include use by other wildlife species.

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*"Spring Mountains Ecosystem: Vulnerability of Spring-Fed Aquatic and Riparian Systems to Biodiversity Loss,"* Sada, D.W. and J.L. Nachlinger, October 15, 1996.

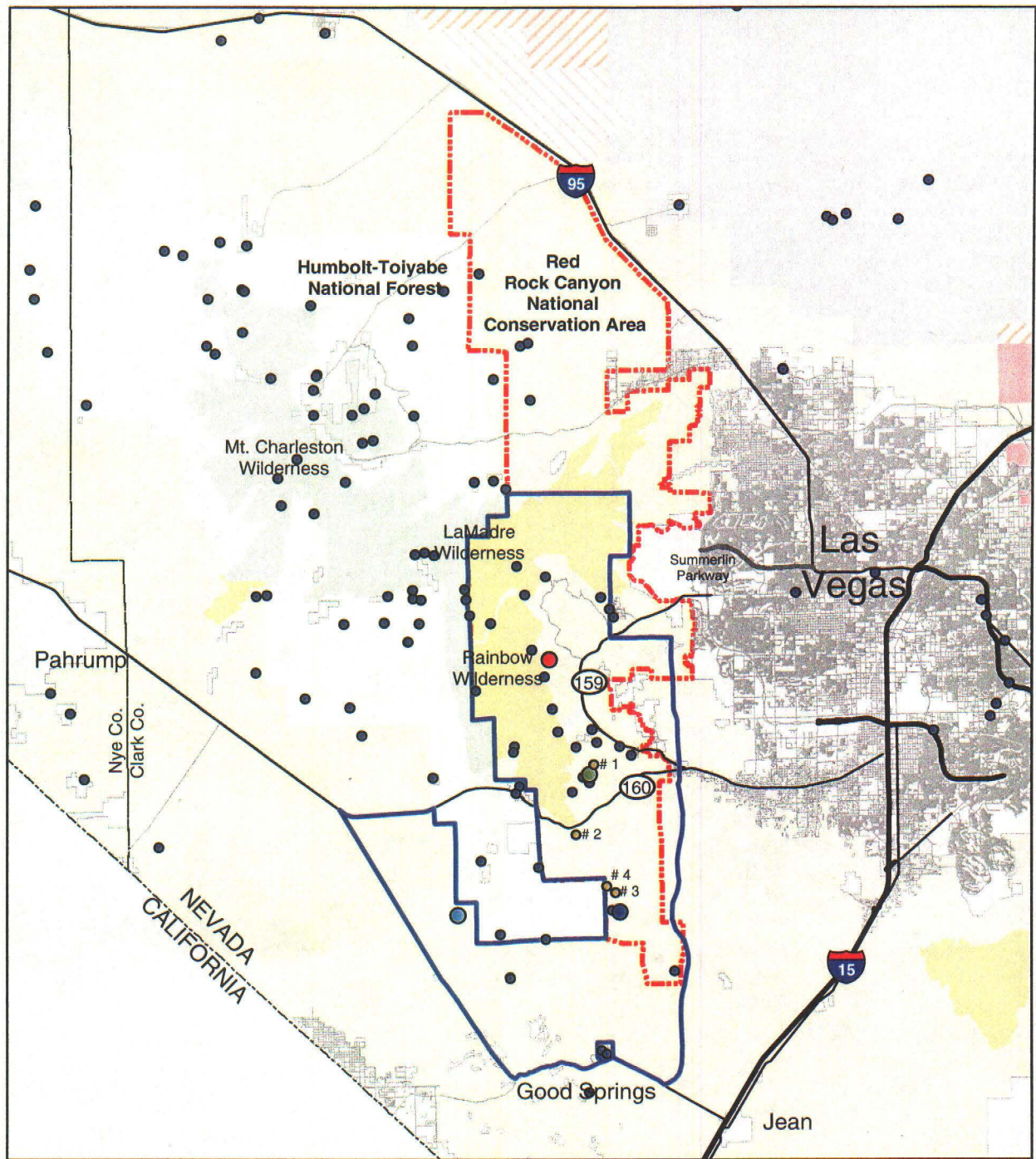
*"Spring Mountains Ecosystem: Vulnerability of Spring-Fed Aquatic and Riparian Systems to Biodiversity Loss: Part II, Springs Surveyed in 1997,"* Sada, D.W. and J.L. Nachlinger, May 15, 1998.



Appendix 1

Figures Illustrating Red Rock Herd Management Area

# Figure 1: Locations of Red Rock HMA, Grazing Enclosures and Key Use Areas



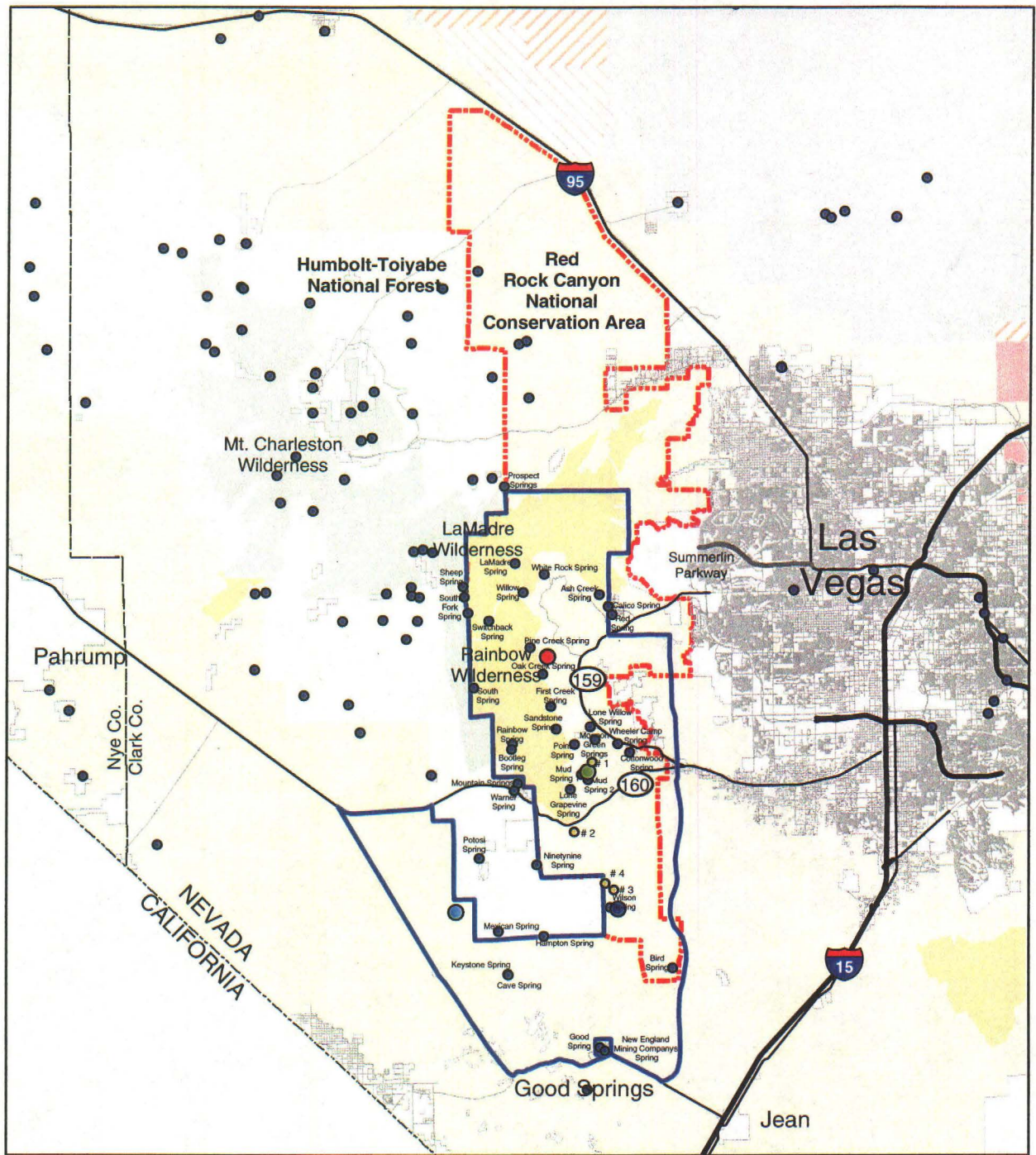
**Legend**

<b>Key Use Areas:</b>	<b>Grazing Enclosures:</b>	
● South Loop Road	● #1 Mud Springs	0 3 6 9 12 15 Miles
● Mud Springs	● #2 Burn Site	⬆ North ⬆
● Wilson Tank	● #3 Kern River Seeding Blondie	⬆ South ⬆
● Potosi Springs	● #4 Kern River Seeding Whistle	
● Springs	▨ Nellis Air Force Range/USFWS	
▬ Red Rock Herd Management Area	▨ Nellis Air Force Range	▨ BLM Wilderness
▬ Red Rock Canyon National Conservation Area	▨ Indian Reservation	▨ USFS
▬ State/ County Line	▨ Private	▬ Interstate Highway
▨ Public land	▨ Nellis Air Force Base	▬ U.S. Route
▨ Humboldt-Toiyabe National Forest	▨ State of Nevada	▬ State Route
▨ National Wildlife Refuge		▬ County road
		▬ Streets

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# Figure 2: Locations of Seeps and Springs in the Red Rock HMA



- Key Use Areas:**
- South Loop Road
  - Mud Springs
  - Wilson Tank
  - Potosi Springs
  - Springs
  - Red Rock Herd Management Area
  - Red Rock Canyon National Conservation Area
  - State/ County Line
  - Public land
  - Humboldt-Toiyabe National Forest
  - National Wildlife Refuge

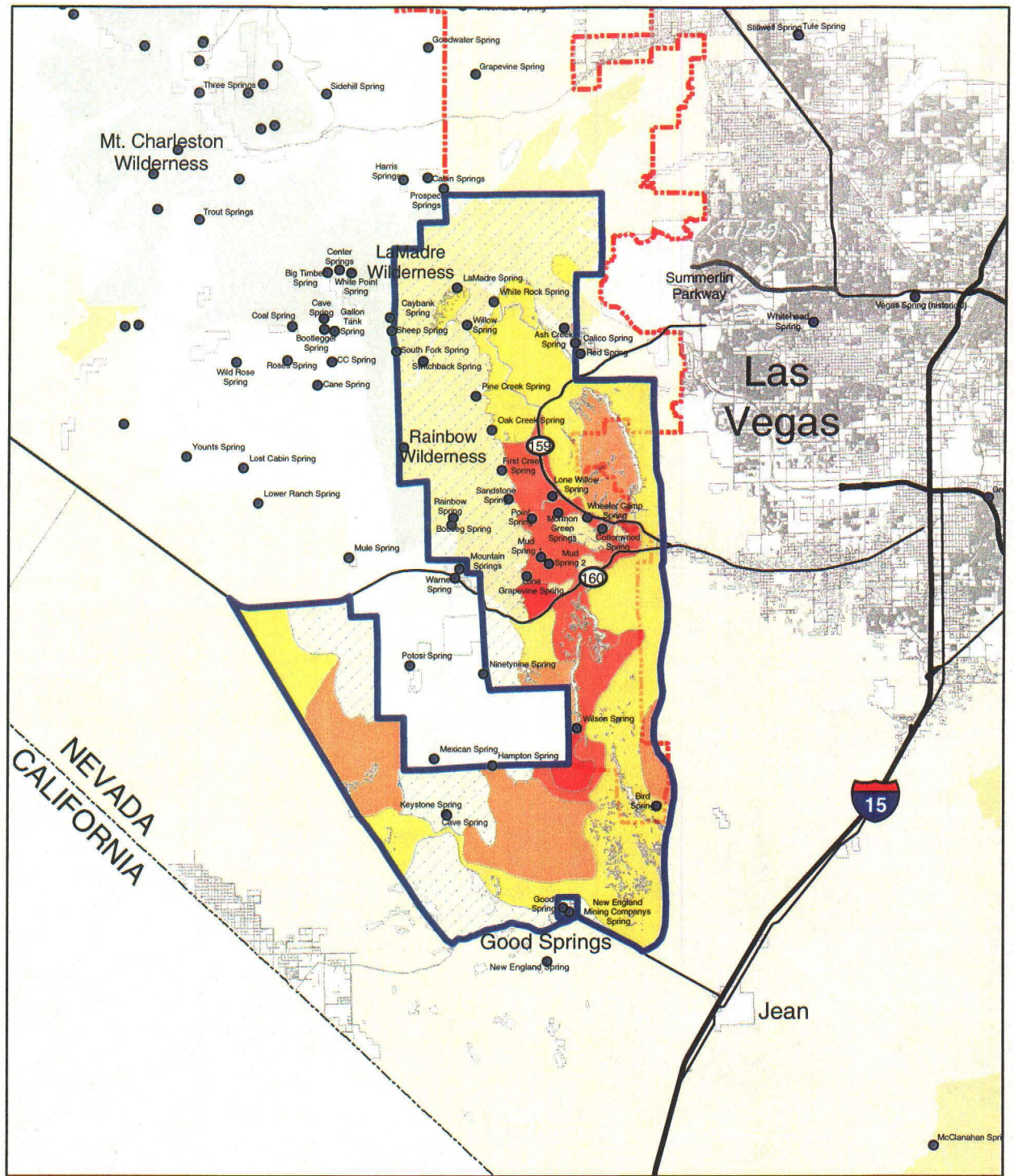
- Grazing Enclosures:**
- #1 Mud Springs
  - #2 Burn Site
  - #3 Kern River Seeding Blondie
  - #4 Kern River Seeding Whistle
  - Nellis Air Force Range/USFS
  - Nellis Air Force Range
  - Indian Reservation
  - Private
  - Nellis Air Force Base
  - State of Nevada

- BLM Wilderness
- USFS
- Interstate Highway
- U.S. Route
- State Route
- County road
- Streets

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# Figure 3: 1995 WH&B Use Pattern



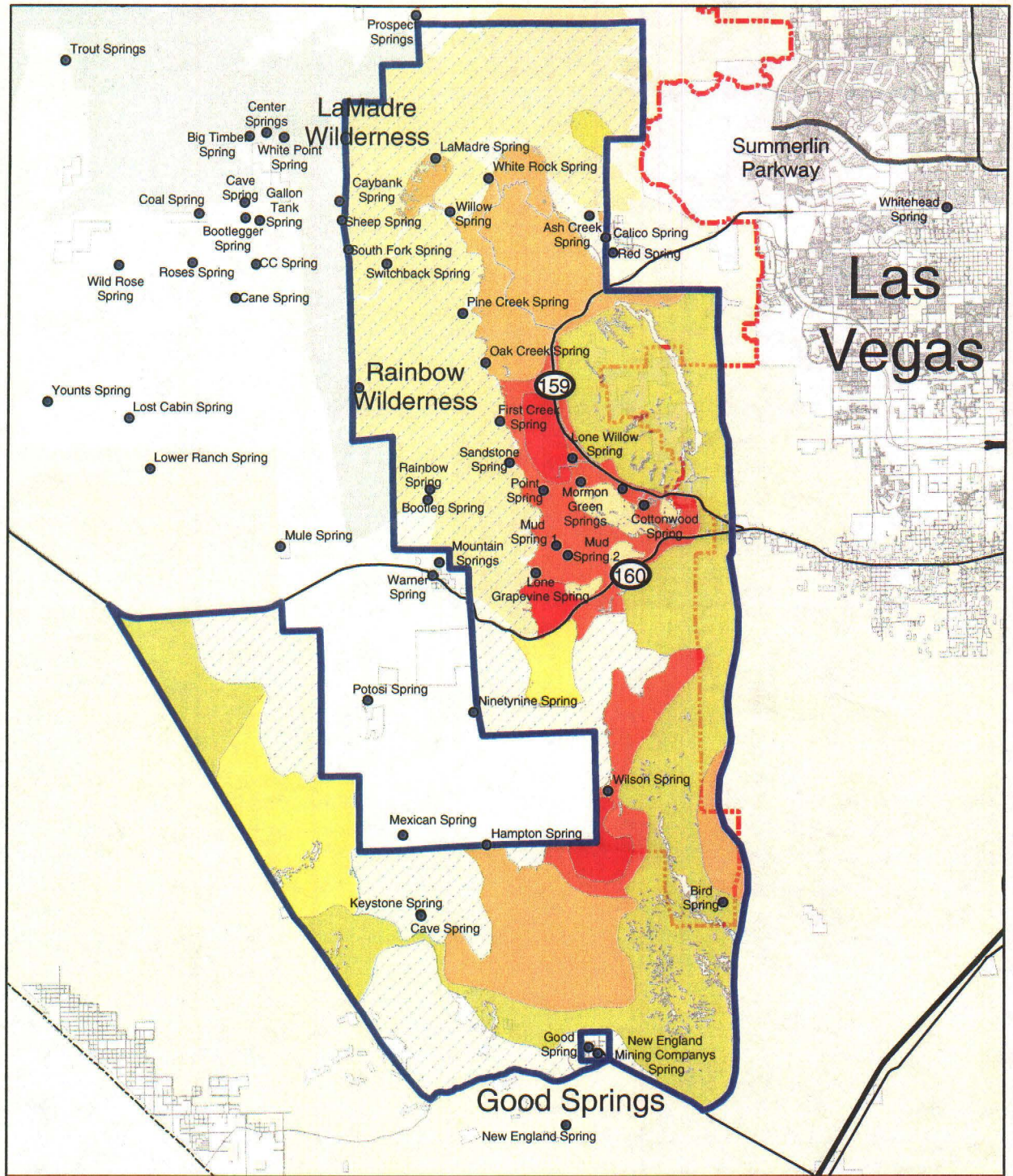
**Legend**

Heavy	Springs	BLM Wilderness
Moderate	Red Rock Herd Management Area	USFS Wilderness
Slight	Red Rock Canyon National Conservation Area	Private
Light	State/ County Line	Interstate Highway
No Measureable Use	Public land	U.S. Route
Not Measured	Humbolt-Toiyabe National Forest	State Route
Unsuitable/ Greater than 30% Slopes		County road



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# Figure 4: 1996 WH&B Use Pattern



**USE LEVEL**

- Heavy
- Moderate
- Slight
- Light
- No Measureable Use
- Not Measured
- Unsuitable/  
Greater than 30% Slopes

**Legend**

- Springs
- Red Rock Herd Management Area
- Red Rock Canyon National Conservation Area
- State/ County Line
- Public land
- Humboldt-Toiyabe National Forest



- BLM Wilderness
- USFS Wilderness
- Private
- Interstate Highway
- U.S. Route
- State Route
- County road

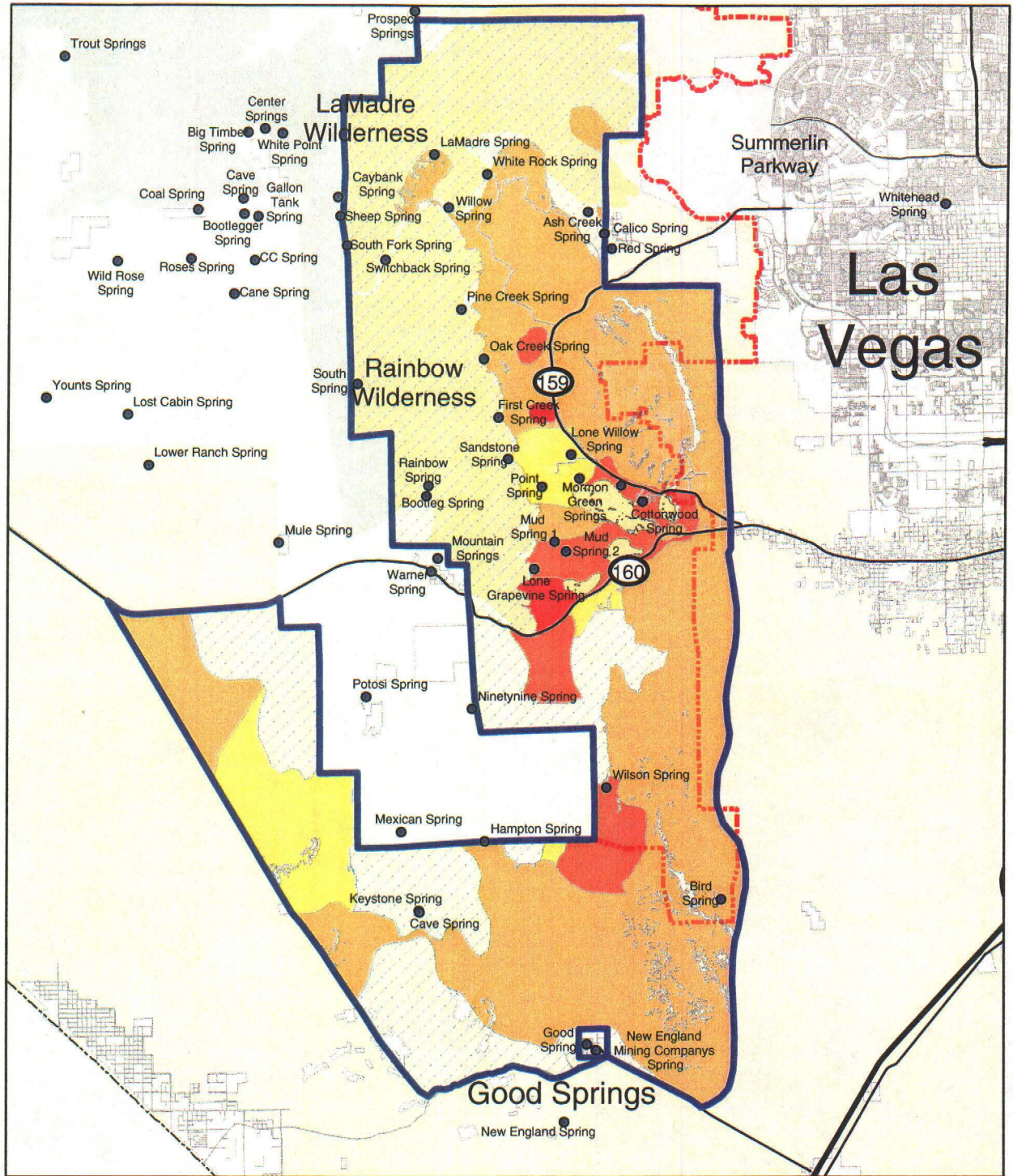
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# Figure 5: 1997 WH&B Use Pattern



- USE LEVEL**
- Heavy
  - Moderate
  - Slight
  - Light
  - No Measureable Use
  - Not Measured
  - Unsuitable/  
Greater than 30% Slopes

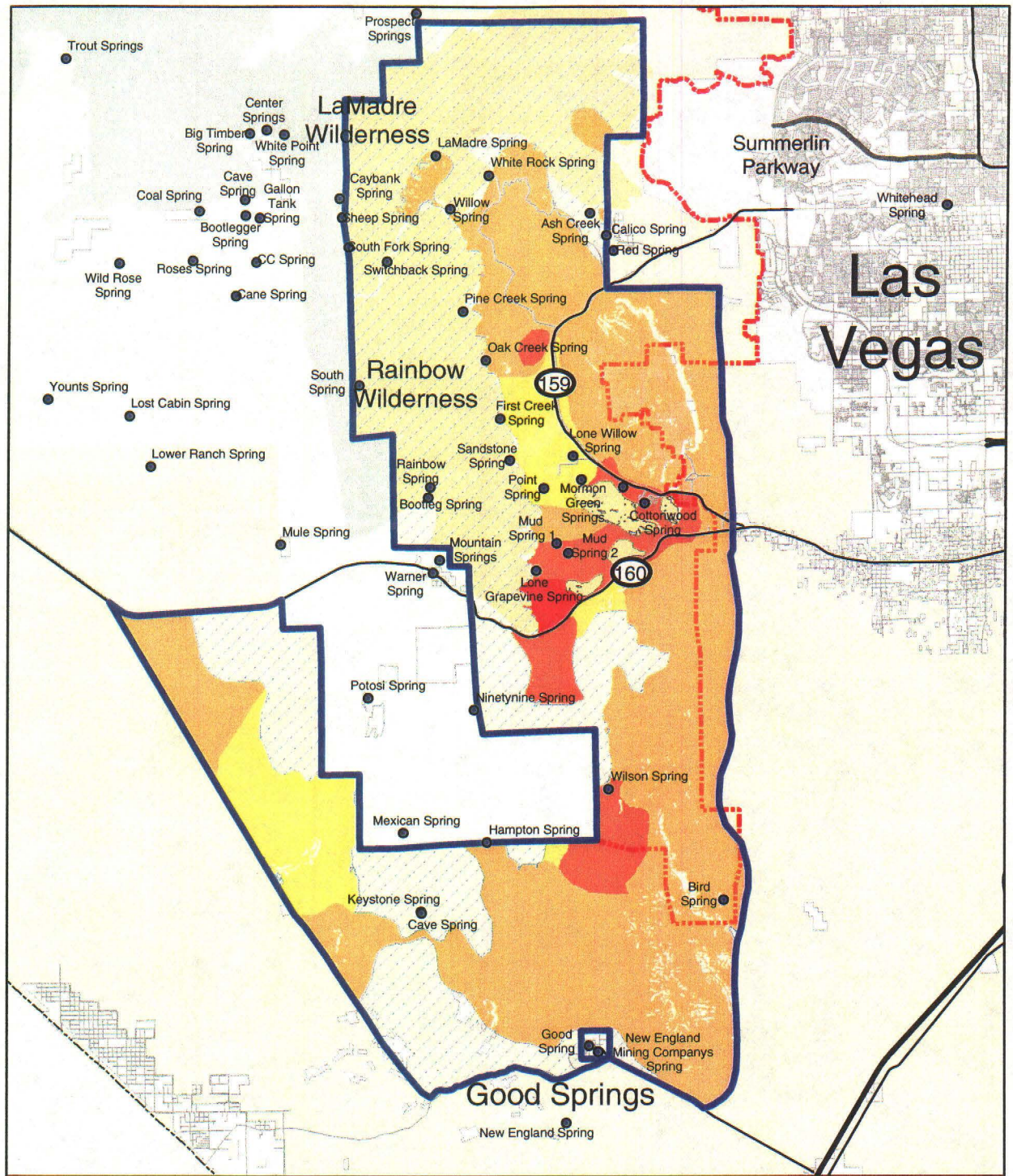
- Legend**
- Springs
  - Red Rock Herd Management Area
  - Red Rock Canyon National Conservation Area
  - State/ County Line
  - Public land
  - Humboldt-Toiyabe National Forest

- BLM Wilderness
- USFS Wilderness
- Private
- Interstate Highway
- U.S. Route
- State Route
- County road



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

# Figure 6: 1999 WH&B Use Pattern



**USE LEVEL**

- Heavy
- Moderate
- Slight
- Light
- No Measureable Use
- Not Measured
- Unsuitable/  
Greater than 30% Slopes

- Springs
- Red Rock Herd Management Area
- Red Rock Canyon National Conservation Area
- State/ County Line
- Public land
- Humboldt-Toiyabe National Forest



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- Interstate Highway
- U.S. Route
- State Route
- County road

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**United States Department of the Interior**  
Bureau of Land Management  
Las Vegas Field Office

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Appendix 2

Monthly Total Precipitation for Red Rock Canyon



# RED ROCK CANYON ST PK, NEVADA

## Monthly Total Precipitation (inches)

(266691)

File last updated on Apr 29, 2003

\*\*\* Note \*\*\* Provisional Data \*\*\* After Year/Month 200212

a = 1 day missing, b = 2 days missing, c = 3 days, ..etc.,

z = 26 or more days missing, A = Accumulations present

Long-term means based on columns; thus, the monthly row may not sum (or average) to the long-term annual value.

MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5

Individual Months not used for annual or monthly statistics if more than 5 days are missing.

Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1977	0.00 z	0.00 z	0.00 z	0.00 z	1.03	0.22	0.68	2.27	0.89	0.45	0.08	2.54	8.16
1978	3.27	3.21	4.27	3.21	0.70	0.00	0.06	0.48	0.20	0.70	1.82	0.00 z	17.92
1979	4.34	0.89 b	3.09	0.05	0.23	0.00	1.59	2.27	0.00	0.00	0.09	0.32	12.87
1980	4.67	4.58	2.53	0.23	0.65	0.00	2.74	0.07	0.00 b	0.07	0.00	0.00	15.54
1981	0.83	0.35	3.42	0.48	0.77	0.00	0.00	0.44	0.91	0.85	1.19	0.00	9.24
1982	1.70 a	0.80	2.77	1.38	0.33	0.00	2.21	3.45	0.49	0.47 a	1.38	2.89	17.87
1983	2.53	2.12 a	4.88 a	0.82	0.13	0.00	0.10	8.96	0.64	0.60	1.49	1.62	23.89
1984	0.00	0.00 z	0.00 z	0.06	0.00	0.00	3.60	3.00	0.02	0.10	2.65	3.00 c	12.43
1985	0.86	0.03 b	0.00 z	0.48	0.16	0.00	2.60	0.35	0.88	0.01	1.44	0.08	6.89
1986	0.80	1.53	6.95	0.00	0.00	0.00	0.68	0.00	0.14	0.41	0.00 z	0.00	10.51
1987	0.82	0.00 b	0.77	1.21	0.03	0.50	0.94	0.35	0.20	0.95	2.37	1.41 a	9.55
1988	1.91	0.13	0.00	1.93	0.29 a	0.07	0.44	2.29	0.13	0.00	0.77	0.00 a	7.96
1989	0.24	0.99	1.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.34
1990	1.08	1.64	0.03	0.10	0.22	0.55	1.90	1.03	0.84	0.00	0.06	0.00	7.45
1991	0.00	0.85	4.13 a	0.00	0.06	0.14	0.21	0.36 a	0.21	0.00	0.63	0.71	7.30
1992	1.42 a	4.06	7.09	0.05	0.06	0.00	0.56	0.00	0.00	1.86	0.00	1.40	16.50
1993	5.70 c	5.24	0.68 a	0.00	0.10	0.51	0.00	0.22	0.00	0.04	0.50	0.75	13.74
1994	0.12	1.76	0.69	0.15 a	0.11	0.00	0.29	0.00	0.78	0.00	1.01	1.44	6.35
1995	5.56 a	1.24	3.07	0.28	0.45	0.13	0.00 z	1.13	0.00	0.00	0.00	0.42	12.28
1996	0.03	4.67	0.25	0.00	0.58	0.00	0.00	0.00	0.00	0.57	1.53	0.95	8.58
1997	2.63	0.57	0.00	0.00	0.00	0.08	0.26	0.46	3.53	0.12	1.13	0.09	8.87
1998	0.66	7.31	2.79	0.47	1.45	0.85	0.14	1.15	2.12	0.44	0.20	0.07 b	17.65
1999	0.00 z	0.29	0.02	1.98	0.09	0.45	2.66	0.02	1.16	0.00	0.00	0.00	6.67
2000	0.25 a	5.22 a	0.59	0.57	0.05	0.00 z	0.00	0.88	0.00	1.25	0.00	0.06 a	8.87
2001	2.57	3.15	0.78	1.32	0.00	0.00	1.46	0.57	0.00	0.19	0.51	0.20	10.75
2002	0.24	0.04	0.22	0.10	0.00	0.00	1.68 a	0.00 z	0.02	1.04 a	0.13	1.02 a	4.49
2003	0.00	2.93	0.75 m	0.95 l	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	2.93

Period of Record Statistics

MEAN	1.69	2.14	2.18	0.59	0.29	0.14	0.99	1.19	0.51	0.39	0.76	0.76	11.56
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S.D.	1.78	2.03	2.18	0.82	0.37	0.24	1.08	1.91	0.80	0.48	0.80	0.94	5.37
SKEW	1.03	0.89	0.87	1.70	1.62	1.65	0.88	2.92	2.42	1.37	0.80	1.18	0.57
MAX	5.70	7.31	7.09	3.21	1.45	0.85	3.60	8.96	3.53	1.86	2.65	3.00	23.89
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.34
NO YRS	25	25	23	25	26	25	25	25	26	26	25	25	17

Appendix 3

Information on Springs in the Red Rock Canyon NCA

## Springs in Red Rock Canyon NCA and their Relation to Horse and Burro Management

### Red Spring (Fenced)

Red Spring is located in Calico Basin at an elevation of 3620'. The spring run below the source is approx. 1000' in length with an average discharge of 7.5 gallons per minute. The majority of the spring and its run are fenced, however the spring source is not. There is a population of *Calochortus striatus* (Mariposa lily) found at the upper end of the spring and *Pyrgulopsis deaconi* (Spring Mountain spring snail) is found at the source. There are heavy impacts from burro around the outside of the fence enclosure as well as at the source. This spring is not in the Red Rock Canyon NCA HMA. There is also heavy recreational use in the area that impacts the spring source. Current conditions at the spring are as follows:

- PFC
- Restoration plan in progress
- Burro impacts are heavy at the spring source
- Heavy visitor use
- High bank stability with a high % ground cover
- High % emergent cover
- Located outside of the current BLM HMA

### Calico Spring (Not fenced)

Calico Spring is located in Calico Basin at an elevation of 3920' and has no protective fencing. The spring run below the source is approx. 300' with an average discharge of 0.5 gallons per minute. There is a small population of *Arctomecon meriamii* (White bearpoppy) on the north facing slopes of the spring. On 4-18-2002, a rare aquatic lichen (*Dermatocarpon luridum*), was found within the spring itself. Impacts from burro grazing is light. Calico Spring may become dry in extreme drought conditions. Current conditions at the spring are as follows:

- PFC
- A recreational trail parallels the banks of the spring
- Burro impacts are light
- Moderate visitor use
- High bank stability with a high % ground cover
- High % emergent cover
- Located outside of the current BLM HMA

### Ash Spring (Not fenced)

Ash Spring is located in Calico Basin at an elevation of 3740'. The stream run below the spring can be greater than 1000' in length with an average discharge of 1 gallon per minute. There is no protective fencing at the spring source or its run. There is a population of *Calochortus striatus* (Mariposa lily) found at the upper end of the spring. A portion of the spring is located within the BLM HMA and is frequented by burros. This water source is also used by *Orvis canadensis* (Big horn sheep). In recent years the OHV use at this site has increased, causing resource damage. Large portions of Ash Spring may go dry in extreme drought conditions. Current conditions at this spring are as follows:

- **PFC**
- Portion of spring is within the HMA
- Burro impacts are light
- OHV impacts are increasing
- High bank stability with a high % ground cover
- High % emergent cover

#### White Rock Spring (Not fenced)

White Rock Spring is located off of the scenic loop drive at an elevation of 4760'. The spring consists of a pipe, taped underground at the source, delivering water to a cemented receiving trough at a rate of 0.5 gallons per minute. There is no protective fencing at the spring as well as no grazing from horse or burro. *Orvis canadensis* use this spring as a water source and *Bufo punctatus* (red spotted toad) breed in the spring tank. White Rock Spring has historically had a population of introduced gold fish. There have been many unsuccessful attempts to eradicate them from the spring. Current conditions at the spring are as follows:

- **Non-functioning condition**
- Spring is restricted to cement trough
- Introduced gold fish population
- Moderate visitor use
- No impacts due to horse or burro
- No bank stability and no ground cover
- Low % emergent cover

#### La Madre Spring (Not fenced)

La Madre Spring is located off of Rocky Gap road which is off of the scenic loop drive at an elevation of 5550'. The stream run below the spring is greater than 2000' with an average discharge of 1.5 gallons per minute. Approximately half way down from the source is a small dam that forms a pool. There is no protective fencing as well as no grazing from horse or burro. *Orvis Canadensis* use the spring as a water source, *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in the pool. There is a population of the endemic *Pyrgulopsis turbatrrix* (Spring mountain spring snail) found from the source to the pool. A hiking trail runs adjacent to the stream and there is moderate impact from recreational users. Current conditions at the spring are as follows:

- **PFC**
- Small cement dam
- There is a current study to identify sensitive butterfly species at this spring.
- No impacts due to horse or burro
- Low visitor use
- High bank stability with a high % ground cover
- High % emergent cover

### South Fork Spring (Not fenced)

South Fork Spring is located off of Rocky Gap Road off of the scenic loop drive at an elevation of 5680'. The stream run below the spring is greater than 2000' with an average discharge of 7.9 gallons per minute. There is no protective fencing as well as no grazing from horse or burro.

*Orvis Canadensis* use the spring as a water source, *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. *Angelica scabrida* (Rough angelica) is found from the source to where the stream cuts the road. A hiking trail runs adjacent to the stream and there is slight impact from recreational users. Current conditions at the spring are as follows:

- **PFC**
- There is a current study to identify sensitive butterfly species at this spring.
- No impacts due to horse or burro
- Low visitor use
- High bank stability with a high % ground cover
- High % emergent cover

### Willow Spring (Fenced)

Willow Spring is located off of the scenic loop drive at an elevation of 4510'. The spring source is piped to a cemented basin that over flows and forms a small stream with an average discharge of 4.5 gallons per minute. A portion of the spring is fenced for protection from visitors impacts, there are no horse or burro impacts and *Orvis Canadensis* use the spring as a water source. Prior to the fencing project (1998, Tim Rash), populations of both *Pyrgulopsis turbatrix* and *Pyrgulopsis deaconi* were thought to have been extirpated. On May 15, 2002 Patrick Putnam confirmed that a *Pyrgulopsis sp.* population had survived and was present. The area is a popular picnic spot and is heavily impacted by recreational users. Current conditions at the spring are as follows:

- **Functioning at-risk with an upward trend**
- Spring source is piped to a cement basin
- No impacts due to horse or burro
- High visitor use
- Moderate bank stability with a moderate % ground cover
- High % emergent cover

### Lost Creek Spring (Fenced)

Lost Creek Spring is located off of the scenic loop drive at an elevation of 4480'. The stream run below the spring is greater than 1000' in length and has an average discharge of 49 gallons per minute. A portion of the stream is fenced to alleviate visitor impacts and a viewing boardwalk was built in 2001 (Tim Rash). A large population of *Pyrgulopsis turbatrix* are found in the boardwalk area of the stream. *Angelica scabrida* (Rough angelica) is found along the upper portions of the creek. There is no impact from horse or burro at this site. A very popular hiking trail parallels the stream to its waterfall. Current conditions at the spring are as follows:

- **PFC**
- No impacts due to horse or burro

- High visitor use
- High bank stability with high % ground cover
- High percent emergent cover

#### Pine Creek (Not fenced)

Pine Creek is located off of the scenic loop drive at an elevation of 4200'. The stream run below the spring is greater than 2000' and has an average discharge of 25 gallons per minute. There is no protective fencing and only moderate impacts from horse and burro. *Orvis Canadensis* use the spring as a water source, *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. *Angelica scabrida* (Rough angelica) is found along the upper portions of the creek. A very popular hiking trail parallels the stream and visitors commonly can be found recreating along its banks. Current conditions at the spring are as follows:

- PFC
- Moderate impacts from horse and burro use
- High visitor use
- High bank stability with high % ground cover
- High percent emergent cover

#### Oak Creek (Not fenced)

Oak Creek is located off of the scenic loop drive at an elevation of 4220'. The stream run below the spring is greater than 2000' and has an average discharge of 30 gallons per minute. There is no protective fencing and only moderate impacts from horse and burro. *Orvis Canadensis* use the spring as a water source, *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. *Angelica scabrida* (Rough angelica) is found along the upper portions of the creek. A very popular hiking trail parallels the stream and visitors commonly can be found recreating along its banks. Current conditions at the spring are as follows:

- PFC
- Moderate impacts from horse and burro use
- High visitor use
- High bank stability with high % ground cover
- High percent emergent cover

#### First Creek (Not fenced)

First Creek is located off of HWY 159, past the exit to the scenic loop drive, at an elevation of 4080'. The stream run below the spring is greater than 2000' and has an average discharge of 10 gallons per minute. There is no protective fencing and only moderate impacts from horse and burro. *Orvis Canadensis* use the spring as a water source, *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. *Angelica scabrida* (Rough angelica) is found along the upper portions of the creek. There is a population of *Pyrgulosis turbatrix* at the spring source that may be in danger due to the introduction of *Pasifastacus lenisculus* (Crayfish). The crayfish population is currently only in the lower portion of the stream and not at the source. A popular hiking trail parallels the stream and visitors commonly can be found recreating along its banks. Current conditions at the spring are as follows:

- **PFC**
- Presence of introduced predator species (*Pasifastacus lenisculus*)
- Moderate impacts from horse and burro use
- High visitor use
- High bank stability with high % ground cover
- High percent emergent cover

#### **Lone Willow Spring (Not Fenced)**

Lone Willow Spring is located off of Bonnie Springs road, a quarter of a mile from the junction of Bonnie Springs road and HWY 159 at an elevation of 4000'. The spring is unfenced and appears as a seep with a discharge of less than 0.1 gallons per minute. The area is heavily impacted by horse and burros. There are no known sensitive species associated with this spring. The current conditions at the spring are as follows:

- **Non-functioning condition**
- High impacts from horse and burro
- Low visitor use
- Low bank stability with low % ground cover
- Low percent emergent cover

#### **Mormon Green II Spring (Not Fenced)**

Mormon Green II Spring is located off of HWY 159 behind Oliver Ranch at an elevation of 3720'. The stream run below the spring is greater than 2000' with an average discharge of 1.1 gallons per minute. There is no protective fencing and only moderate impacts from horse and burro. *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. The current conditions at the spring are as follows:

- **PFC**
- Moderate impacts from horse and burro
- Low visitor use
- High bank stability with high % ground cover
- Moderate percent emergent cover

#### **Mormon Green I Spring (Not fenced)**

Mormon Green I Spring is located off of HWY 159 behind Oliver Ranch at an elevation of 3600'. The stream run below the spring is less than 600' with an average discharge of 0.2 gallons per minute. There is no protective fencing and only moderate impacts from horse and burro. *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. The current conditions at the spring are as follows:

- **PFC**
- Moderate impacts from horse and burro
- Low visitor use
- High bank stability with high % ground cover
- Moderate percent emergent cover



### Wheeler Camp Spring (Fenced)

Wheeler Camp Spring is located off of HWY 159 east of the Oliver Ranch turnoff at an elevation of 3550'. The stream run below the spring is less than 200' with an average discharge of 16 gallons per minute. The spring source and most of its run are fenced. The lower portion has been left open to serve as a water source for horse and burro. *Bufo punctatus* and *Pseudacris regilla* (Chorus frog) breed in pools along its run. The current conditions at the spring are as follows:

- PFC
- Slight impacts from horse and burro
- Low visitor use
- High bank stability with high % ground cover
- High percent emergent cover

### Mud I Spring (Fenced)

Mud Spring I is located at an elevation of 3862' and was fenced in 1996. The spring brook length is approx. 200' with a discharge of 1.5 gallons per minute. The associated riparian area was heavily grazed and trampled by horse and burro prior to the fencing project. Current conditions at the spring are as follows:

- Approx. 70% of riparian area is fenced
- Spring source is **not** fenced
- A portion of the spring flow is diverted to a trough downstream.
- **Non-Functioning Condition**
- Low bank stability with low % ground cover
- Low percent emergent cover

### Mud II Spring (Not fenced)

Mud Spring II is located at an elevation of 3790' and is not fenced. The spring and riparian area are heavily impacted by horse and burro. The spring is located in a wash and is subject to flash floods resulting in a scouring of the riparian area. Current conditions at Mud Spring II are as follows:

- Spring flow is represented by small seeps resulting in small pooled areas
- **Non-Functioning Condition**
- Low bank stability with low % ground cover
- Low percent emergent cover

### Lone Grapevine Spring (Not Fenced)

Lone Grapevine Spring is located at an elevation of 4037' and was fenced in 1996. The associated riparian area was heavily grazed by horses prior to fencing project. Current conditions at the spring are as follows:

- Approx. 50% of riparian area is fenced

- A portion of the spring flow is diverted to a trough down hill from spring source
- **Proper Functioning Condition**
- High bank stability with high % ground cover
- High % emergent cover

#### **Shovel Spring (Fenced)**

Shovel Spring is located at an elevation of 4029' and was fenced in 1997. The spring was heavily grazed by horse and burro prior to the fencing project. Current conditions at the spring are as follows:

- \* Entire riparian area is fenced
- \* **Functional-at risk with an upward trend.**
- \* Low bank stability with a Low % ground cover
- \* High % emergent cover

#### **Tunnel Spring (Not fenced)**

Tunnel Spring is piped from the source to a head box and than to a guzzler. There is no associated riparian area. The guzzler is used by horses. The approximate flow rate of the spring is 1 gallon per minute. Current conditions at the spring are as follows:

- **Non-functioning condition**
- **Some horse activity**

#### **Bird Spring (Not fenced)**