



APPENDIX F
ARIZONA LAND HEALTH
EVALUATION FOR THE SDNM

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APPENDIX F

ARIZONA LAND HEALTH EVALUATION FOR THE SONORAN DESERT NATIONAL MONUMENT

F.1 INTRODUCTION

The purpose of this land health evaluation (LHE) is to gauge whether the Arizona Standards for Rangeland Health (Standards) are being achieved on the Sonoran Desert National Monument (SDNM) and, where they are not, to determine whether livestock grazing is the causal factor. An evaluation is not a decision document but a standalone report that clearly records the analysis and interpretation of the available inventory and monitoring data. As part of the land health-assessment process desired plant community (DPC) objectives were established for the biological objects of the Monument, i.e., special-status species habitat. The DPC objectives will assure that soil conditions and ecosystem function described in Standards 1 and 3 are met — or will make significant progress toward meeting Standards 1 and 3.

The Secretary of the Interior approved the “Arizona Standards for Rangeland Health and Guidelines for Grazing Administration” (Standards and Guidelines) in April 1997. The decision record, signed by the BLM Arizona State Director in April 1997, provides for full implementation of the Standards and Guides in BLM resource-management plans (RMPs) in Arizona. These Standards and Guidelines are now referred to as Land Health Standards. (See Arizona Rangeland Health Standards and Guidelines for Grazing Administration in this document.) Land health standards are measurable and attainable goals for the desired condition of the biological resources and physical components and characteristics of desert ecosystems found within the Monument.

The evaluation:

- Ascertain whether standards are being achieved, not achieved, and whether significant progress is being made towards achievement of the land health, and
- Determine whether livestock grazing is a significant factor causing non-achievement where it is ascertained that land health standards are not being achieved.

F.2 MONUMENT PROFILE

F.2.1 MONUMENT DESCRIPTION

The SDNM was established by proclamation in 2001 by the President of the United States under authority of section 2 of the Antiquities Act of June 8, 1906 (34 Stat. 225, 16 USC 431) (See **Attachment 2**, SDNM Presidential Proclamation). The Monument is located south of the city of Buckeye, Arizona, and east of the town of Gila Bend, Arizona, in Maricopa and Pinal counties. It covers approximately 486,400 acres and is part of the National Landscape Conservation System managed by the Bureau. The proclamation required three allotments (Santa Rosa, South Vekol and Vekol) and portions

of two other allotments (Big Horn and Table Top) south of Interstate 8 (I-8) be closed to livestock use upon expiration of their permits. This resulted in 155,900 acres being closed to livestock grazing south of I-8 by 2009. In 1941, 78,000 acres (formerly known as Area “A”) were withdrawn for the Barry M. Goldwater Range (BGR) for military purposes. It was later returned to the BLM and was not reopened to grazing use. Currently, 233,900 acres are unavailable to livestock use within the Monument. The portions of the six allotments north of I-8 currently open to livestock use are the focus of this evaluation (see **Map F-1**, SDNM Location and Grazing Allotments).

The SDNM Proclamation requires the BLM to determine whether livestock grazing is compatible with protecting the objects of the SDNM on the 252,500 acres currently open to livestock use north of I-8, with protecting the objects of the SDNM. The proclamation specifically states: “[G]razing on Federal lands north of I-8 shall be allowed to continue only to the extent that the Bureau of Land Management determines that grazing is compatible with the paramount purpose of protecting the Monument objects identified in this proclamation.” This LHE will be part of a larger document that will analyze the compatibility of grazing on the Monument. A resource management plan (RMP) and environmental impact statement (EIS) addresses the full array of rangeland management alternatives for livestock grazing.

F.2.2 PHYSICAL DESCRIPTION OF THE SDNM

F.2.2.1 **Grazing Allotments within the SDNM**

The following is a general description of the size and location of the allotments within the Monument north of I-8. See **Table F-1**, SDNM Grazing Allotments, Acreage of Public Lands and Permitted Use North of Interstate 8, for land status and allotment acreages and **Map F-1**, SDNM Location and Grazing Allotments for the location of the allotments within the SDNM.

Table F-1
SDNM Grazing Allotments, Acreage of Public Lands and Permitted Use North of Interstate 8

Allotment	Rangeland Classification	Allotment Number	Public Land Acres	% of Public Land Acres*	Permitted Use (AUMs*)
Big Horn	Perennial-Ephemeral	03009	92,204	95%	2,812**
Beloat	Perennial-Ephemeral	03007	33,600	26%	776
Conley	Perennial-Ephemeral	03018	77,708	88%	3,403
Hazen	Perennial-Ephemeral	03042	31,926	75%	886
Lower Vekol	Perennial-Ephemeral	03053	15,409	71%	826
Arnold	Ephemeral	03004	1,609	7%	0
Totals				N/A	

*Inventory data and water availability was used to determine forage location and availability when prorating acres and AUMs inside and outside the Monument.

** This figure represents the prorated remaining portion of the Big Horn allotment after 53,144 acres south of I-8 were made unavailable in 2008.

Big Horn

The Big Horn allotment (92,204 acres) is in the western portion of the Monument and lies east of Gila Bend. The northern boundary of the allotment is the North Maricopa Mountains, and the southern boundary is I-8. The western boundary of the allotment is State Highway 85 (SR 85), and the eastern boundary is 2 miles west of the Vekol Valley interchange. The Big Horn allotment contains the most acreage of the six allotments being evaluated. It ranges in elevation from 780 feet to 3,182 feet.

Beloat

The Beloat allotment (33,600 acres) is located in the Rainbow Valley area. Approximately one quarter of the allotment lies within the boundary of the Monument. The allotment's northern boundary is the El Paso natural gas pipeline. The North Maricopa Mountains are the southern boundary. It ranges in elevation from just over 1,100 feet near the El Paso gas line to 2,493 feet on Sheep Mountain.

Conley

The Conley allotment (77,708 acres) is located at the southern end of Rainbow and Mobile valleys. It lies south of the Beloat allotment, with the Maricopa Mountains on the west and the Palo Verde Mountains on the east. The southern boundary is the South Maricopa Mountains. Approximately 60 percent of the entire allotment lies within the Monument boundary. It ranges in elevation from 1,260 feet near Waterman Wash to 3,182 feet in the North Maricopa Mountains.

Hazen

The Hazen allotment (31,926 acres) lies on the northwest side of the Monument. The Gila River is the western boundary, while the eastern boundary runs through the middle of the North Maricopa Mountains. The northern boundary is the gas pipeline, and the southern boundary is the fence along the northern boundary of the Big Horn allotment. Approximately 50 percent of the entire allotment lies within the Monument boundary. It ranges in elevation from 800 feet on the Gila River to 2,493 feet on Sheep Mountain.

Lower Vekol

The Lower Vekol allotment (15,409 acres) comprises only a small portion of the Monument on the east side. It stretches from I-8 on the south to the Haley and Booth Hills on the north. The western portion, which lies mainly in the Monument, is in the South Maricopa Mountains. It ranges in elevation from around 1,600 feet near Vekol Wash to 2,600 feet in the Maricopa Mountains.

Arnold

The Arnold Allotment (1,609 acres) has only a small portion within the north end of the SDNM. The northern boundary of the allotment in the SDNM is the gas pipeline, and the southern and western boundaries are the Hazen allotment. The allotment is bordered by the Beloat allotment on the east.

F.2.2.2 Climate

Precipitation

Precipitation data was collected from the National Oceanic and Atmospheric Administration (NOAA) from two stations: Gila Bend and Maricopa. The 20-year average annual precipitation for the Gila Bend area is approximately 6.28 inches. The 20-year average for the Maricopa area is 7.63 inches.

Temperature

Winter temperatures are mild, with the few recorded freezing days lasting for short periods of time only. Summertime temperatures are hot, with many days in June and July exceeding 105 degrees Fahrenheit. Frost-free days range from 280 days in major river valleys with cold air drainage to 320-350 days in uplands.

F.2.2.3 Soils

Winter temperatures are mild, with the few recorded freezing days lasting for short periods of time only. Summertime temperatures are hot, with many days in June and July exceeding 105 degrees Fahrenheit. Frost-free days range from 280 days in major river valleys with cold air drainage to 320 to days in uplands.

The Gunsight-Rillito-Denure Map Unit (map unit s399 in **Map F-2**, SDNM Soils) occurs on the fan terraces and is deep, somewhat excessively drained, and nearly level to moderately steep loamy soils. These soils are deeply dissected by drainages. The ecological sites associated with these soils are limy fan, limy upland deep, and sandy wash.

The Quilotosa-Rock Outcrop-Momoli Map Unit (map unit s293 in **Map F-2**) occurs on upper fan terraces, hills, and mountains. They are shallow to deep, excessively drained, nearly level to steep, very gravelly loamy soils and rock outcrops. It is mostly granitic mountains and hills. Ecological sites associated with these soils are limy upland and granitic hills.

The Mohall-Dateland Map Unit (map unit s283 in **Map F-2**) occurs on fan terraces and basin floors. They are deep, well drained, nearly level, loamy soils dissected by drainageways. Ecological sites associated with these soils are limy fan, limy upland deep, sandy wash, and Loamy Swale.

The Gunsight-Chuckawalla Unit (map unit s288 in **Map F-2**) is only a small portion of the Monument near Gila Bend. It occurs on fan terraces dissected by drainageways. They are deep, well drained, loamy soils. The Chuckawalla soil is characterized by desert pavement on fan terrace summits between drainages. The ecological sites associated with these soils are limy fan, limy upland deep, and sandy wash.

F.2.2.4 Watersheds

The SDNM lies within portions of the Santa Cruz River and the Lower Gila River Watersheds. Sub watersheds include the Vekol Valley, Rainbow Valley, and the Gila Bend units.

F.2.2.5 Water Quality

There are no Section 303d Water Quality Limited Stream Segments within the Monument.

F.2.3 BIOLOGICAL RESOURCES

F.2.3.1 Vegetation

The vegetation existing on any given area of land is a product of two kinds of site factors. One is the combination of soil, topography, and climate that determines the moisture, temperature, and nutrient relationships of the site. The other is the natural and land-use history of the location over time. These factors may include a combination of plant invasions, climatic changes, fire, disease, animal influences (including grazing animals and predators, as well as insects, soil organisms, and birds), and human impacts (including livestock grazing, clearing, reseeding, burning, wood cutting, seed harvest, or other influences, not only since European settlement but extending back to the beginnings of human occupation).

Changes in vegetation due to environmental factors or management practices may result in various stable states of vegetation that may not have the potential to return to the “original” condition. Thus, the vegetation has entered a different relatively stable state. This is called the state and transition concept (Westoby et al. 1989). In some cases, changes may not be reversible by removing grazing, or the removal of grazing may lead to a buildup of fine fuels from ephemeral years that could result in catastrophic fires in plant communities that are not fire-adapted.

The SDNM has three major plant communities: the creosote- bursage desert scrub, the palo verde-mixed cactus, and the ephemeral wash plant communities. Each of these communities is described below along with the Natural Resources Conservation Service’s (NRCS) associated ecological sites.

An ecological site is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community.

Creosote- Bursage Desert Scrub (Limy Fan and Limy Upland Deep Ecological Sites)

This community is generally in the lower elevations of the Monument on desert flats and valley bottoms. Primarily creosote (*Larrea tridentata*) in the flats with minor amounts of shrubs such as triangle-leaf bursage (*Ambrosia deltoidea*) and white or range ratany (*Krameria grayi* or *erecta*) and scattered trees such as little-leaf Palo verde (*Parkinsonia microphylla*) and ironwood (*Olneya tesota*). This community is associated with the limy fan and limy upland deep 7- to 10-inch precipitation zone ecological sites. It comprises approximately 36 percent of the area covered by the Monument. During periods of above average precipitation these ecological sites can produce up to several thousands of pounds per acre of ephemeral forage in the form of annual grasses and forbs.

Palo Verde-Mixed Cactus (Granitic Hills and Limy Upland Ecological Sites)

This vegetative community generally occupies the mountain slopes and upper bajadas. It is a mix of palo verde, ironwood, and varied shrub species such as triangle-leaf bursage, white bursage (*Ambrosia dumosa*), range ratany and white ratany, and a mixed variety of cactus including cholla species (*Cylindropuntia spp.*), Engelmann’s hedgehog (*Echinocereus engelmannii*), and barrel cactus (*Ferocactus spp.*).

Ocotillos (*Fouquieria splendens*) also occur in this community. This community is associated with granitic hills and limy upland 7- to 10-inch precipitation zone ecological sites. It comprises approximately 42 percent of the Monument with the majority from the granitic hills.

The highest densities of saguaros (*Carnegiea gigantea*), referred to as the “saguaro forest,” are found primarily within these ecological sites.

Ephemeral Wash (Sandy Wash Ecological Site)

This site occurs in larger drainageways that dissect bajadas and desert flats throughout the Monument. In some cases, the drainage is braided and covers a large surface area. It is a multi-layered community that contains trees, large shrubs, small shrubs, and forbs. Trees include blue palo verde (*Parkinsonia florida*), ironwood, and desert willow (*Chilopsis linearis*). Common shrubs include wolfberry (*Lycium spp.*), desert lavender (*Hyptis emoryi*), burrobush (*Hymenoclea salsola*), and bricklebush (*Brickellia coulteri*). This community is associated with the sandy wash ecological sites. It comprises approximately 16 percent of the Monument. During periods of above average precipitation, these ecological sites can produce several thousands of pounds of ephemeral forage per acre.

F.2.3.2 Major Land Resource Areas

The Monument lies within two different major land resource areas (MLRA): The 40-4 MLRA Lower Sonoran Desert Shrub and the 40-2 MLRA Middle Sonoran Desert Shrub. An MLRA is a broad geographic area that is characterized by a particular pattern of soils, climate, water resources, vegetation, and land use. Each MLRA is further divided into ecological sites. The ecological sites in the Monument are identified in the plant community descriptions above.

F.2.3.3 Wildlife Resources

Threatened and Endangered Species

Lesser Long-Nosed Bat

The lesser long-nosed bat was listed as endangered in September 1988 without critical habitat (USFWS 1988). The lesser long-nosed bat consumes high energy nectar, pollen, and fruit produced by a variety of columnar cacti including saguaro and agaves. The migratory nature of the lesser long-nosed bat allows it to take advantage of the seasonal availability of these cacti and agave species. Cactus flowers and fruit are available during the spring and early summer; agave flowers are available from July through October (BLM unpublished documentation on file).

Lesser long-nosed bats are efficient fliers and are known to fly considerable distances from roost sites to foraging sites. Foraging areas are areas with sufficient food resources within 40 miles of a roost site. (See **Map F-3, SDNM Wildlife**). Using this criterion, approximately 57,170 acres in the South Maricopa Mountains Wilderness and the Booth Hills contain suitable foraging habitat.

The terms and conditions of the biological opinion (BO) for the Lower Gila South RMP (BLM 1998) require that the BLM “maintain current levels of food plants for the bat” and that “grazing levels will not be increased until it is known that sufficient food plants exist and are being sustained.”

Special Status and Sensitive Species

Cactus Ferruginous Pygmy-Owl

The cactus ferruginous pygmy owl (CFPO) was listed as endangered under the Endangered Species Act (ESA) on March 10, 1997. Critical habitat was designated in 1999 but did not include lands within the SDNM. Following a number of lawsuits, the CFPO was de-listed in 2006 (FR 73 (106) 31418-31424). In 2008, the US Fish and Wildlife Service (USFWS) received a petition to again list the CFPO under the ESA based on additional information. The USFWS is actively considering the petition. Currently, the BLM considers the CFPO a special status species.

The cactus ferruginous pygmy-owl has not been documented on the Monument, but potential and suitable habitat does occur in several locations throughout the Monument, primarily in the bajadas, the larger drainages, and several larger livestock waters (dirt tanks). These livestock waters are also important for other wildlife species.

The vegetation around four of the larger livestock waters on Conley and Beloit allotments were identified as potential CFPO habitat. Other livestock waters found on the Big Horn, Lower Vekol, and other allotments were assessed for CFPO habitat and did not meet the requirements. A few of the larger livestock waters surrounded by dense vegetation, such as mesquite (*Prosopis velutina*), may also be considered suitable habitat. Suitable habitat for this species lies within uplands and washes of the Arizona upland subdivision below the 4,000 foot elevation (USFWS 1997). Suitable habitat patches are areas greater than 3 acres in size and consist of braided wash systems and other densely vegetated areas. Suitable habitat consists of dense thickets of vegetation such as palo verde, ironwood, mesquite, acacia (*Acacia spp.*), and saguaro. It contains a diversity of species and structures of shrubs, cacti, and trees instead of single or very scattered individuals and contains trees greater than 6 inches in diameter, and saguaro cacti with cavities. The structural height of vegetation is usually evenly divided in volume or density between herbaceous ground cover and low shrubs, medium-sized shrubs, and trees. Unsurveyed areas are considered to be suitable cactus ferruginous pygmy-owl habitat when they include the attributes described above. Surveys were conducted throughout the SDNM in 2001 and south of I-8 in 2004, following the protocol developed by the Arizona Game and Fish Department (AGFD 2000). No pygmy-owls were detected during those survey efforts.

Sonoran Desert Tortoise

The Sonoran Desert tortoise was listed by the USFWS as a candidate species in November 2010. It has 152,743 acres of Category I, 22,756 acres of Category II and 4,058 acres of Category III habitat within the Monument north of Interstate-8. (See **Map F-3.**) Tortoise habitat is associated with the upper bajadas and ridges (limy upland ecological sites) and rocky slopes (granitic hills ecological sites). Tortoises will also use caliche caves in washes associated with the upper bajadas for burrows as well as using the washes as travel ways.

Tucson Shovel-Nosed Snake

The Tucson shovel-nosed snake (Stebbins 1985, Crother 2000) was recently petitioned for listing as an endangered species by the Center for Biological Diversity. The Tucson shovel-nosed subspecies is considered regionally vulnerable by The Nature Conservancy (TNC 2004) because much of its formerly occupied habitat has been altered and appears to be no longer inhabited. It has a restricted distribution, known only from a small area in Arizona in portions of Pinal, Maricopa, and Pima counties. This taxon is considered regionally vulnerable because much of its lowland, valley floor habitat within its restricted

range has been cleared or severely impacted by agricultural and urban development. The greatest abundance of the Tucson shovel-nosed snake in its entire range is thought to be west of Mobile on the SDNM (P. Rosen, personal comm.).

The shovel-nosed snake is found in areas with soft sandy loams; loose soil; fine, wind-blown sands (such as in washes); and occasionally on rocky hillsides with pockets of sand among rocks (Stebbins 1985, Pima County 2001, TNC 2004). The snake requires these deep valley fill soils for burrowing and nesting. The western shovel-nosed snake utilizes the soil substrate around creosote bush as foraging habitat (Pima County 2001). Creosote bush also serves as escape habitat (Stebbins 1985, Pima County 2001).

According to information collected by TNC (2004) the Tucson shovel-nosed snake was found at sites with soils that had a high percentage (ranging from 49 to 85 percent) of fine sand, silt, and clay (classified as sandy loams, loamy sands, gravelly-sandy loams, and silty-sandy loams; P. Rosen, personal comm.). The Tucson shovel-nosed snake was found in areas on the SDNM that correspond to creosote bush-bursage desert scrub and xeroriparian scrub (ephemeral wash) natural communities.

Desert Bighorn Sheep

This BLM and state sensitive species has approximately 177,000 acres of habitat within the Monument north of I-8. (See **Map F-3**.) Desert bighorn have been documented from all the mountain ranges on the SDNM. Important features of desert bighorn habitat are cliffs, rocky outcrops, and talus slopes which are used as escape terrain. Desert bighorn are closely associated with palo verde-mixed cacti-mixed scrub vegetation communities on rocky slopes, mountain uplands, and rock outcrops (granitic hills ecological site). However, desert bighorn sheep move seasonally between the uplands and bajadas and travel across desert valleys between mountain ranges.

Desert bighorn forage on green and dried, grasses and forbs, as well as on shoots and flowers of prickly pear (*Opuntia polyacantha*), cholla cactus, and succulents (for example, barrel cactus, agaves). Grasses, including big galleta (*Pleuraphis rigida*), are important in the northern and eastern part of their range and are favored when available. Browse becomes more important in the fall and winter and in the southern and western part of bighorn's range. Other important browse species include acacia, palo verde, ironwood, mesquite, fairy duster (*Calliandra eriophylla*), Mormon tea (*Ephedra spp.*), and desert mistletoe (*Phoradendron californicum*).

Population estimates for the Sand Tank Mountains and the North and South Maricopa Mountains have been low due to drought conditions from the mid-1990s.

General Wildlife

Wildlife species that populate the various vegetative communities within the SDNM allotments include, mule deer, coyote, javelina, mountain lion, bobcat, gray fox, kit fox, badger, chuckwalla, rosy boa, western diamondback, mourning doves, white-winged doves, Gambel's quail, and various other reptile, bat, and non-game species.

F.2.4 SPECIAL MANAGEMENT AREAS

F.2.4.1 Wilderness

Two wilderness areas occur within the evaluation area. (See **Map F-1.**) The North Maricopa Wilderness area lies on the north end of the SDNM. It is approximately 63,200 acres in size. The South Maricopa Wilderness area lies just north of I-8 in the central portion of the SDNM and is approximately 60,100 acres in size. Both of these wilderness areas provide good to outstanding opportunities for primitive recreation but are easily accessed via roads and trails.

F.2.4.2 Juan Bautista de Anza National Historic Trail (NHT)

The Juan Bautista de Anza NHT, designated in 1990, is a 1,200-mile historic trail corridor extending from Mexico to California. The NHT commemorates the 1775–1776 land route that Spanish commander Juan Bautista de Anza took in an effort to establish a mission and presidio near San Francisco Bay. Within the SDNM, this one-mile wide trail corridor is located north of I-8 and runs east-west through the entire Monument. Although this trail has no known surviving trail signature on the ground, certain segments of the trail that traverse the SDNM are considered to be among the best-preserved corridor segments and most representative of the historic trail corridor conditions. A total of 17 miles traverse the Conley and Big Horn allotments (See **Map F-1.**).

Areas around Gap Tank, North Tank, and North Tank Well all lay within the historical setting of the Juan Bautista de Anza NHT, the Butterfield Overland Stage Route, and the Mormon Battalion Trails. Driving livestock and people along this trail historically is the action that blazed the original Anza trail, as well as the Butterfield and the Mormon Battalion Trails. Approximately 10 acres of these trails that converge around the historical North Tank are affected by past and current concentrated livestock use. As a result of the findings of this Land Health Evaluation and the Compatibility Analysis (Appendix E), mitigation measures, including not allowing water facilities or supplements to be located within ¼ mile of the NHTs, have been recommended to reduce impacts of current livestock grazing around North Tank on the Conley Allotment. This does not preclude any protective measures deemed necessary to protect future cultural resource discoveries within the SDNM allotments.

F.2.5 RECREATIONAL RESOURCES

The SDNM provides opportunities for both motorized and non-motorized recreation. Off-highway vehicle use is restricted to the existing road and trail system. There are several developed recreation sites within the Monument boundaries. Unauthorized OHV use does occur off-road, mostly in the larger ephemeral washes and congregation areas. The extent of the impacts this use has on the vegetative community and wildlife habitat has been steadily increasing in recent years.

F.2.6 VISUAL RESOURCES

The BLM manages public lands to protect scenic values. The agency developed the visual resource management (VRM) program to assess and maintain these values. The VRM process is used to evaluate the scenic quality and lessen the effects of development on the land. The Monument contains VRM

Classes I through IV. Class I areas are afforded the highest protection of visual resources, whereas Class IV areas are afforded the least.

F.2.7 CULTURAL RESOURCES

A class I literature search was completed, as per BLM manual section 8110.2.A.2. This review identified previous surveys and known archeological sites or traditional cultural places within the allotment boundaries.

Known rock art sites are situated in rough, rocky areas where it is extremely unlikely for livestock to access. Only one out of the 22 known artifact scatter sites north of Interstate 8 shows physical disturbance due to grazing activities. All other known cultural sites, including lithic quarries, Vekol Wash, and Table Top Mountain bajadas, are located south of Interstate 8 and are no longer subject to grazing activities. Additionally, there are no known sites that have been identified as properties of traditional importance by Native American tribes or other related groups. However, this does not preclude any protective measures deemed necessary to protect future cultural resource discoveries within the SDNM allotments.

F.3 GRAZING MANAGEMENT

F.3.1 GRAZING HISTORY

Livestock grazing in Gila Bend and the surrounding areas began to occur in the late 1700s with a few Indian rancherias where livestock were confined to the flood plains of the Gila River. At the time, the river was the only available reliable water source that could support livestock. Livestock use of the drier valleys and mountains did not occur in the area until the drilling of wells and development of dirt stock tanks in the early 1900s. The first of these was a dirt stock tank developed around 1900 in the Little Rainbow Valley just north of the Monument boundary. The first wells in the area were drilled in Rainbow Valley around 1910 to 1912, one of which was north of Mobile and provided some livestock access to water within what is now the Monument boundary. At this time, the only waters in the Vekol Valley consisted of a couple of dirt charcos that provided temporary water for cattle from the Tohono O'odham people. Ranching operations began in the Sand Tank Mountains area in 1917. The first water sources for livestock there included two hand-dug wells, Lost Horse Tank (earthen) and the development of natural water sources in Sand Tank Mountains at Sand Tanks and Mesquite Tanks.

The Vekol Valley was not developed for additional livestock use until the 1920s and 1930s (Robinett 1997).

In 1934, Congress passed the Taylor Grazing Act to authorize livestock grazing on public domain lands. A Division of Grazing was established in the Department of Interior to administer the provisions of the Taylor Grazing Act. The Phoenix Grazing District Office opened in 1938 and consisted of two federal employees and a Grazing Advisory Board, comprised of ranchers from Buckeye, Casa Grande, Arlington, and Tucson. Their job was to establish livestock grazing allotments, set livestock numbers, and issue grazing permits in the Maricopa Grazing District No. 3 (Collins 2006).

Even as far back as the 1930s, it was recognized that winter-spring seasonal and ephemeral use was the most practicable time for livestock use in southwestern Arizona. The June 28, 1939 edition of “The Grazing Bulletin” stated,

District No. 3 . . . is comprised principally of desert ranges, which, in favorable years, produce a very heavy crop of annual vegetation and at such times, will carry great numbers of cattle. While there is considerable yearling stocking in this district, for the most part it will be heavy seasonable stocking during favorable winter and spring seasons.

Major organizational changes occurred in 1946, when the Grazing Service was merged with the General Land Office (GLO) to form a new agency: the US Bureau of Land Management. In addition to administering grazing, the BLM’s duties now included classifying land, approving mining and homestead entries, issuing right-of-way permits, etc. Throughout the 1950s and 1960s, several more reorganizations took place, and boundaries were occasionally redrawn (Collins 2006).

BLM lands in the Phoenix District are still leased under the authority of the Taylor Grazing Act, but the significance of the “Maricopa Grazing District” has faded away, largely because of two reasons (Collins 2006):

- In 1968, the BLM issued a “Livestock Grazing: Ephemeral Range” order, and the Phoenix District soon reclassified many of its allotments as “Ephemeral.” This Special Ephemeral Rule changed the pattern of livestock use in most of the desert areas of the Phoenix District from yearlong use to sporadic springtime use.
- Beginning in the early 1970s, the District Grazing Advisory Boards were phased out, and BLM assumed a stronger role in managing livestock on public lands on Section 3 grazing permits (inside the Maricopa Grazing District) and on Section 15 grazing leases (public lands outside the Maricopa Grazing District).

Additionally, the 1970s saw the passage of several Acts, such as the Archaeological Resource Protection Act (ARPA), the Endangered Species Act, the National Environmental Policy Act (NEPA), and the Federal Land Policy and Management Act (FLPMA) that dramatically changed how many federal agencies operated, including the BLM (see **Appendix B**, Applicable Laws, Regulations, and Policies for more information on laws, polices, and regulations that guide BLM actions on public lands).

F.3.2 CURRENT MANAGEMENT

From 1973 to 1976, the allotments in the SDNM were classified as perennial/ephemeral rangelands with the exception of the Arnold Allotment, which was classified as ephemeral only. Perennial-ephemeral range produces perennial forage each year and periodically provides additional ephemeral vegetation. In a year of abundant moisture and favorable climatic conditions, annual forbs and grasses add materially to the total grazing capacity.

The permitted use for the allotments is identified in **Table F-I**. Permitted use is defined in animal unit months (AUMs) which means the amount of forage necessary for the sustenance of one cow, or its equivalent, for a period of one month. Ephemeral use may be authorized in accordance with policy established by Arizona BLM Instruction Memorandum (IM) AZ-94-018 and the Ephemeral Guidelines for

Livestock Grazing Management. (See **Appendix L**, Guidelines for Grazing Administration.) Ephemeral ranges lie within the general southwest desert region extending primarily into southern Arizona, southern California, and southern Nevada, and include portions of the Mojave, Sonoran, and Chihuahuan deserts. Ephemeral range does not consistently produce forage but periodically provides annual vegetation suitable for livestock grazing. In years of abundant moisture and other favorable climatic conditions, a large amount of forage may be produced (from 400 to 2,000 lbs. per acre air dry weight). Favorable years are highly unpredictable, and the season is usually short-lived. Operators adjust livestock numbers voluntarily or as requested by the BLM when faced with drought, fire, etc. Active preference AUMs are adjusted throughout the grazing year (March 1 to February 28) in response to drier periods or to take advantage of ephemeral forage during wetter periods.

F.3.3 TERMS AND CONDITIONS OF THE CURRENT PERMITS

All of the allotments grazing permits contain the standard terms and conditions listed below in accordance with provisions of the grazing regulations.

- Grazing permits or lease terms and conditions and the fees charged for grazing use are established in accordance with all the provisions of the grazing regulations now or hereafter approved by the Secretary of the Interior.
- They are subject to cancellation, in whole or in part, at any time because of:
 - Noncompliance by the permittee/lessee with rules and regulations,
 - Loss of control by the permittee/lessee of all or a part of the property upon which it is based,
 - A transfer of grazing preference by the permittee/lessee to another party,
 - A decrease in the lands administered by the BLM within the allotments described, and
 - Repeated, willful unauthorized grazing use.
- They are subject to the terms and conditions of allotment management plans if such plans have been prepared. Allotment management plans must be incorporated in permits or leases when completed.
- Those holding permits or leases must own or control and be responsible for the management of livestock authorized to graze.
- The permittee's/lessee's case file is available for public inspection as required by the Freedom of Information Act.
- Grazing permits or leases are subject to the nondiscrimination clauses set forth in Executive Order 11246 of September 24, 1964, as amended. A copy of this order may be obtained from the authorized officer.

- Livestock use that is different from that authorized by a permit or lease must be applied for prior to the grazing period and must be filed with and approved by the authorized officer before grazing use can be made.
- Billing notices are issued which specify fees due. Billing notices, when paid, become a part of the grazing permit or lease. Grazing use cannot be authorized during any period of delinquency in the payment of amounts due, including settlement for unauthorized use.
- Grazing fee payments are due on the date specified on the billing notice and must be paid in full within 15 days of the due date, except as otherwise provided in the grazing permit or lease. If payment is not made within that time frame, a late fee (the greater of \$25 or 10 percent of the amount owed but not more than \$250) will be assessed.
- No member of or delegate to Congress or the Resident Commissioner after his election or appointment, either before or after he has qualified, or during his continuance in office or officer, agent, or employer of the Department of the Interior, other than members of advisory committees appointed in accordance with the Federal Advisory Committee Act (5 USC App. 1) and Sections 309 of the Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.) shall be admitted to any share or part in a permit or lease or derive any benefit to arise therefrom; and the provisions of Section 3741 Revised Statutes (41 USC 22; 18 USC Section 431-433, and 43 CFR Part 7), enter into and form a part of a grazing permit or lease, so far as the same may be applicable.

Other terms and conditions:

- When forage conditions warrant, livestock grazing may be authorized upon application to utilize an ephemeral forage crop pursuant to federal grazing regulations, special management requirements, and other guidance.

F.4 PLANNING AND ENVIRONMENTAL DOCUMENTS

The following documents provide resource condition objectives for public lands within the SDNM allotments. These objectives were used in the development of the desired resource conditions and DPC objectives for the Monument.

- Lower Gila South Resource Management Plan (RMP) and Environmental Impact Statement (EIS) (1988).
- Resource objectives from the Strategy for Desert Tortoise Habitat Management on Public Lands in Arizona (TP), 1990.

F.5 RANGELAND MANAGEMENT PROGRAMS OBJECTIVES

F.5.1 BLM OBJECTIVES

The BLM's objectives for rangeland management are to carry out the intent of the Taylor Grazing Act of 1934, as amended and supplemented, the Federal Land Policy and Management Act of 1976, and the

Public Rangelands Improvement Act of 1978. This is: 1) to periodically and systematically inventory public lands and their resources and their present and future use projected through land use planning processes; 2) to manage public lands on the basis of multiple use and sustained yield; 3) to manage public lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; 4) where appropriate, to preserve and protect certain public lands in their natural condition; 5) to provide food and habitat for fish and wildlife and domestic animals; 6) to provide for outdoor recreation and human occupancy and use; and 7) to manage, maintain and improve the condition of the public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process.

Title 43 Code of Federal Regulations (CFR) Part 4100 regulations govern grazing administration for public rangelands. Among other things, the regulations in CFR Part 4180 require the implementation of land health standards and guidelines for livestock grazing management to achieve the fundamentals of land health. The regulations at 43 CFR 4100 require that permits and leases include terms and conditions that ensure conformance with subpart 4180, Fundamentals of Rangeland Health.

The Taylor Grazing Act of 1934 provides for two types of authorized use (1) A grazing permit that is a document that authorizes use of the public lands within an established grazing district. A grazing district defines the specific area within which the public lands are administered in accordance with Section 3 of the Taylor Grazing Act; (2) A grazing lease is a document authorizing use of the public lands outside an established grazing district. Public lands outside grazing-district boundaries are administered in accordance with Section 15 of the Taylor Grazing Act.

A permit or lease will include:

- The number and kind of livestock;
- The period(s) of use;
- The allotment(s) to be used; and
- The amount of use, in animal unit months (AUMs).

The Special Ephemeral Rule, published December 7, 1968 allows a variance to the mandatory stipulations above. An ephemeral permit or lease does not specify number and kind of livestock, period of use, or the amount of use in AUMs. The rule establishes that on applicable grazing lands, livestock grazing is feasible when certain climatic conditions create favorable conditions for grazing, primarily on annual vegetation. When these conditions occur, and the permittee or lessee applies for grazing use, the BLM determines the amount and period of authorized use. Such use is authorized when forage is available and there is a high probability that the forage will continue to be available through the period applied for and authorized.

Other terms and conditions may be specified in grazing permits or leases, which will assist in achieving management objectives, provide for proper range management or assist in the orderly administration of the public rangelands. These terms and conditions, which are not all inclusive, are contained at 43 CFR 4130.3.

Terms and conditions for grazing permits and leases must be in conformance with resource management objectives and program constraints, as identified in land use plans.

BLM allotments in Arizona are classified as perennial, ephemeral, or perennial-ephemeral. These classifications correspond to the following types of designated rangelands:

- Perennial - rangeland which consistently produces perennial forage to support a year round livestock operation.
- Ephemeral - rangelands that do not consistently produce enough forage to sustain a year round livestock operation but may briefly produce unusual volumes of forage to accommodate livestock grazing. There is a special rule for ephemeral range.
- Perennial-Ephemeral – rangelands that produce perennial forage every year and periodically provide additional ephemeral vegetation. In a year of abundant moisture and favorable climatic conditions, annual forbs and grasses add materially to the total grazing capacity.

F.5.2 SDNM DESIRED FUTURE CONDITIONS

Manage livestock grazing to provide forage for multiple uses while maintaining healthy ecosystems and protecting the Monument’s biological and cultural resources.

F.5.3 SDNM LAND HEALTH OBJECTIVES BY ECOLOGICAL SITE

The land health standards are evaluated by polygons that represent ecological sites. The “health” of different kinds of rangeland must be judged by standards specific to the potential of the ecological site (see section Ecological Site-Level Desired Plant Community Objectives). The land health standards and subsequent objectives were quantified to address the objects of the Monument. (See **Table F-2**, Land Health Objectives by Monument Object.) The Monument objects are defined at the landscape level, while biological indicators for the objects were identified at the site-specific level.

Ecological sites within the BGR and Area A were used as comparison areas to help AB quantify the resource-condition objectives because the areas have not been open to livestock grazing since the 1940s and meet the desired resource conditions for wildlife habitat and other resource values at the landscape level. Only the data that could be correlated to ecological sites present in both the BGR/Area A and the allotments north of I-8 were used as comparison data.

Table F-2
Land Health Objectives by Monument Object

Biological Indicator	Applicable Standards
Monument Object: Functioning Desert Ecosystem	
See Monument Object: Saguaro Cactus Forest	
See Monument Object: Vegetation Communities	
Habitat for a wide range of wildlife species (See Monument Object: Wildlife)	

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
Monument Object: Diversity of Plant and Animal Species	
Woodland assemblages	Does not occur north of I-8. Occurs in the higher peaks of Table Top and Sand Tank Mountains.
Palo Verde-Mixed Cacti Vegetation Community	Land Health Standard 1: Assessments of Soil/Site Stability and Hydrologic Function on Granitic Hills and Limy Upland Ecological Sites.
	Land Health Standard 3: Vegetative Canopy Cover Objective for the Limy Upland and Granitic Hills Ecological Sites. Palatable Shrub Composition Objective for the Limy Upland Ecological Sites.
Monument Object: Saguaro Cactus Forests	
Saguaro cactus and nurse plants	Land Health Standard 1: Assessments of Soil/Site Stability and Hydrologic Function on Granitic Hills and Limy Upland Ecological Sites – provides suitable soil and hydrologic conditions for saguaros and nurse plants.
	Land Health Standard 3: Vegetative Canopy Cover Objectives for the Limy Upland and Granitic Hills Ecological Sites - provides vegetative cover of nurse plants.
	Land Health Standard 3: Saguaro Recruitment Objectives for the Limy Upland and Granitic Hills Ecological Sites.
Monument Object: Sand Tank Mountains	
Sand Tank Mountains	Mountain range not in analysis area (located south of I-8)
Monument Object: Scientific Analysis of Plant Species and Climates in Past Eras	
Packrat middens	Ancient middens occur in dry caves and rock shelters where they are protected from moisture. Livestock do not generally utilize areas with dry caves and rock shelters due to steep, rocky and rough terrain.
Kofa Mountain barberry	Does not occur north of I-8
Arizona Rosewood	Does not occur north of I-8
Junipers	Does not occur north of I-8
Monument Object: Vegetation Communities: Creosote-Bursage, Desert Grassland, and Desert Washes	
Creosote-Bursage Vegetation Community (Map F-2)	Land Health Standard 1: Assessments of Soil/Site Stability and Hydrologic Function on Limy Fan, Limy Upland Deep, and/or Sandy loam deep Ecological Sites.
	Land Health Standard 3: Vegetative Canopy Cover Objectives and Composition Objectives for the Limy Fan, Limy Upland Deep, and/or Sandy loam deep Ecological Sites.
Desert Washes	Land Health Standard 1: Assessments of Soil/Site Stability and Hydrologic Function on Sandy wash and Loamy swale Ecological Site
	Land Health Standard 3: Vegetative Canopy Cover and Palatable Shrub Composition Objectives for the Sandy Wash ecological site, and Vegetative Canopy Cover and Perennial Grass Composition

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
	Objectives for the Loamy Swale ecological site.
Desert Grassland	Does not occur north of I-8
Monument Object: Wildlife*	
Sonoran Desert Tortoise, Desert Bighorn Sheep, Red-Backed Whiptail Lizard, Elf Owl, Western Screech Owl, Mule Deer	Land Health Standard 3: Assessments of Soil/Site Stability and Hydrologic Function on Granitic Hills and Limy Upland Ecological Sites (Palo verde-Mixed Cacti Vegetation Community).
	Land Health Standard 3: Vegetative Canopy Cover Objectives for the Limy Upland and Granitic Hills Ecological Sites.
	Land Health Standard 3: Palatable Shrub Plant Species Composition Objective for the Limy Upland Ecological Site.
Mule Deer, Elf Owl, Western Screech Owl, Cactus Ferruginous Pygmy Owl (<i>not identified in the proclamation</i>)	Land Health Standard 1: Assessments of Soil/Site Stability and Hydrologic Function on Sandy Wash Ecological Site.
	Land Health Standard 3: Vegetative Canopy Cover and Palatable Shrub Composition Objectives for the Sandy Wash ecological site, and Vegetative Canopy Cover and Perennial Grass Composition Objectives for the Loamy Swale ecological site, and for Potential Cactus Ferruginous Pygmy Owl (CFPO) Habitat in the Sandy Wash Ecological Site.
Sonoran Pronghorn	Does not occur in the Monument.
Javelina	Occurrence of this species north of I-8 in SDNM is unconfirmed.
Mountain Lion	Evaluation of Palo verde-Mixed Cacti Vegetation and Washes Communities (Granitic Hills, Limy upland and Sandy wash ecological sites) addresses suitable habitat for prey species (i.e. mule deer, Bighorn sheep, rodents, etc.).
Gray Fox	Evaluation of all vegetative communities addresses suitable habitat for prey species (i.e. quail, birds, rodents, lizards, etc.).
Bobcat	Evaluation of all vegetative communities addresses suitable habitat for prey species (i.e. quail, birds, rodents, lizards, etc.).
Lesser Long-Nosed Bat (see above)	Evaluation of saguaro cactus forests conditions and applicable ecological sites evaluates habitat needs within SDNM, north of I-8, for this species.
California Leaf-Nosed Bat	Evaluation of all vegetative communities addresses suitable forage habitat.
	No known roost sites on SDNM (Hinman and Snow, eds.). Forage (insects) area could occur in the Monument.
Cave Myotis Bat	Evaluation of all vegetative communities addresses suitable forage habitat.
	No known roost sites on SDNM (Hinman and Snow, eds.). Forage (insects) area could occur in the Monument.

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
Elf Owl (see above)	Evaluation of Palo verde-Mixed Cacti Vegetation and Washes Communities (Granitic Hills, Limy upland and Sandy wash ecological sites) addresses suitable forage habitat.
Western Screech Owl (see above)	Evaluation of Palo verde-Mixed Cacti Vegetation and Washes Communities (Granitic Hills, Limy upland and Sandy wash ecological sites) addresses suitable forage habitat (i.e. small birds, rodents, lizards, insects etc.).
Red-Backed Whiptail Lizard (see above)	Evaluation of Palo verde-Mixed Cacti Vegetation Community (Granitic Hills and Limy upland ecological sites) addresses the habitat needs for this species.
Sonoran Green Toads	Located in Vekol valley spreader dikes and stock tanks outside SDNM north of I-8.
Monument Object: Archaeological and Historic Sites	
Rock art sites	Three rock art sites are known to exist on the grazing allotments within the SDNM north of I-8. These sites are all in rocky, upland settings and are not situated in areas of concentrated livestock use. These sites do not exhibit evidence of damage from livestock, livestock-management activities, or range improvements, because the petroglyphs and associated artifacts are on large, boulder-strewn hillsides and knolls that it would be extremely unlikely for livestock to access.
Lithic quarries	All sites identified in existing information are located south of I-8 and are no longer subject to grazing activities.
Scattered Artifacts	<p>A total of 22 of the 41 sites located north of I – 8 on the SDNM are listed as artifact scatters. Of these 22 artifact scatters, 19 sites have characteristics that would make them eligible for the National Register of Historic Places (NRHP). None of these known artifact scatters are located within areas of concentrated livestock use.</p> <p>Of the 19 artifact scatters that have the characteristics that would make them eligible for the NRHP, five sites have been documented by the recording archaeologist as having been affected by grazing. On three of these sites, the documentation merely mentions grazing generally as an effect, usually among other effects, with no further information tied to indicators of disturbance to that site. There is no documentation as to whether any artifacts or features had been disturbed by grazing.</p> <p>Two sites were documented with specific indicators of the type and level of disturbance. One site was documented as having “moderate trampling and denudation of vegetation.” This was cited as a factor that leads to gradual erosion. However, the photographs of the site in this documentation do not show that this is the case. The</p>

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
	<p>photograph shows Sonoran Desert vegetation with typical densities. This photo shows that the ground surface is stable and is not subject to erosion.</p> <p>The other site was documented as being disturbed because of “three well-defined livestock trails that cut across a potential ancient trail near the northwest end of the site, and general grazing impacts and gradual erosion.” The line of sight can follow the line of travel and the profile of the probable prehistoric trail in several places. Artifacts and features have not been disturbed by the livestock trails. The livestock trails are distinct and visible in this area due to their distance to a water development (Bosque Well). This well is roughly 0.75 mile away from the site. Livestock trails have disturbed roughly 0.4 percent of the ground surface of this site.</p>
Vekol Wash	Located south of I-8.
Table Top Mountain bajadas	Located south of I-8.
Juan Bautista de Anza NHT	<p>While no visible physical remnants remain of this historic trail, later trails utilized the same corridor used by Anza. The historic trail corridor, as identified by the National Park Service, varies in width depending on the information found in the diaries. The historic setting of this trail is an area 3 miles wide, or up to the visual horizon, whichever is less. The livestock water developments in the area -- Gap Tank, Conley Tank, North Tank, and North Tank Well -- all lie within this historic setting.</p> <p>The line of sight for a trail user is undisturbed as one can see where the trail corridor continues ahead. This trail is 1,200 miles long -- from the border with modern Mexico to the San Francisco Bay area -- with roughly 17 miles within the SDNM. Of the four water developments on the SDNM where livestock usage is concentrated, the area at North Tank is the only one where effects from grazing activities disturbs the setting. The area where livestock use has reduced the vegetation is about 10 acres in size, amounting to 1,300 linear feet of the trail corridor.</p> <p>The Anza NHT story involves driving 1,000 head of livestock and 300 people mounted on horseback along this trail when it was originally used. Thus, livestock may be viewed as compatible with authentic Anza NHT setting.</p>
Mormon Battalion Trail	The Mormon Battalion Trail is an historic route with well documented physical features and attributes. It has the characteristics that would make it eligible for the NRHP. This trail experiences direct disturbance from the congregation of livestock at

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
	<p>North Tank. The area of direct impact amounts to about 800 linear feet of trail signature from trampling the trail ruts, berms, and vegetation that grows along the berms. The Mormon Battalion Trail is about 1,850 miles long, 17 miles of which are within the SDNM boundaries. The area at North Tank where direct effects from grazing activities disturbs the setting is about 10 acres in size.</p>
Butterfield Overland Stage Route	<p>The Butterfield Overland Stage Route, like the Mormon Battalion Trail, is a historic route with well documented physical features and attributes. It has the characteristics that would make it eligible for the NRHP. Several other historic sites are associated with this historic route within the SDNM. This trail experiences direct disturbance from the congregation of livestock at North Tank. The area of direct disturbance amounts to approximately 800 linear feet of trail signature from trampling the trail ruts, berms, and vegetation that grows along the berms. The Butterfield Overland Stage Route is about 2,800 miles long, 17 miles of which is located within the SDNM boundaries. The area at North Tank where direct impacts from grazing activities disturbs the setting is about 10 acres in size.</p>
Butterfield Overland Stage Route	<p>The Butterfield Overland Stage Route, like the Mormon Battalion Trail, is a historic route with well documented physical features and attributes. It has the characteristics that would make it eligible for the NRHP. Several other historic sites are associated with this historic route within the SDNM. This trail experiences direct disturbance from the congregation of livestock at North Tank.</p> <p>The area of direct disturbance amounts to approximately 800 linear feet of trail signature from trampling the trail ruts, berms, and vegetation that grows along the berms. The Butterfield Overland Stage Route is about 2,800 miles long, 17 miles of which is located within the SDNM boundaries. The area at North Tank where direct impacts from grazing activities disturbs the setting is about 10 acres in size.</p>
Other Archaeological & Historic sites	<p>A total of 14 out of the 41 sites recorded on the SDNM north of I-8 can be categorized as “other archaeological and historic sites.” These include nine historic sites related to railroad, ranching, or travel routes.</p> <p>The only sites documented to have impacts related to grazing are along the Butterfield Overland Stage Route and the Mormon Battalion Trail immediately next to North Tank. These sites are entirely located within the 15 acres that were identified above as having been used by livestock historically, diminishing the vegetation. A protective fence installed in 1995 has been helpful in reducing</p>

**Table F-2
Land Health Objectives by Monument Object**

Biological Indicator	Applicable Standards
	disturbances from grazing and human activities on this site. Human activities have been so intense in this area that the causal factor for the level of disturbance in this area cannot be blamed on one activity alone. Unauthorized collection of artifacts, for instance, has been occurring over the years.

F.5.3.1 Land Health Standard 1 — Upland Sites

Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Objective:

- Signs of accelerated erosion are minimal and are appropriate for the site as indicated by ground cover (litter, rock, vegetative [canopy] cover, etc.) and signs of erosion. This objective applies to all ecological sites. A departure from the ecological site description or reference sheet of moderate or greater would not be achieving the standard. A departure of none to slight or slight to moderate is considered achieving the standard.
- Achievement of Standard 1 (appropriate erosion and vegetative cover levels) will ensure properly functioning watersheds and ecological processes in order to sustain healthy biotic populations and communities (biological objects of the Monument).

F.5.3.2 Land Health Standard 2 — Riparian — Wetland Site

Riparian-wetland areas are in proper functioning condition.

There are no riparian areas located within the Monument; therefore, this land health standard was not applicable and was not evaluated.

F.5.3.3 Land Health Standard 3 — Desired Resource Conditions

Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Productive and diverse uplands are paramount to the Monument’s biological resource goals and objectives. The desired resource conditions will address the land health indicators for the Monument’s biological objects and, when achieved, will ensure that the ecosystem is in functioning condition. Desired resource conditions are not identified by several stages. They identify the vegetation attributes, such as composition, structure, and cover, which are desired within the Monument. These include establishing vegetative characteristics necessary for soil protection and providing forage and habitat for both wildlife and livestock. Site potentials (soil, climate, topography) of the ecological sites establish the natural limits

on what can be produced in terms of vegetation and related resource values like forage, wildlife habitat, and watershed characteristics.

The criterion for meeting desired resource conditions is achievement of or conditions leading to the DPC objectives.

- The DPC objectives are specific to each ecological site and based on comparison area data collected from the Barry M. Goldwater Range (BGR) and Area “A” by Pacific Biodiversity Institute (PBI) and the BLM.
- These data were analyzed along with information from the National Resources Conservation Service (NRCS) Ecological Site Descriptions and reference sheets to estimate the potential or capability of the site to produce different kinds and amounts of vegetation so that the DPC objectives are realistic in terms of what is possible to achieve. Due to the variability within an ecological site the average value for each attribute tied to the indicators for land health were used to quantify the DPC objectives.
- All key areas will be measured against the ecological site DPC objectives (see Conclusions). The objectives will be used to determine whether standards for land health are being achieved or not achieved, and if not achieved, is significant progress being made toward achievement.

F.5.3.4 Ecological Site-Level Desired Plant Community Objectives

Sandy Wash Ecological Sites

- Maintain vegetative canopy cover at 34 percent
- Maintain composition of palatable browse species at 14 percent

Rationale: Based on the site potential, canopy cover at 34 percent should provide sufficient cover to support wildlife and bird species (elf owl, western screech owl, mule deer, quail, etc.) and prevent accelerated erosion of the site. Maintaining composition of palatable species (see **Attachment 7**, Key Management Species List) at 14 percent should provide adequate habitat and forage for wildlife and livestock. No more than 7 percent composition of the 14 percent composition will be allowed for wolfberry species (wolfberry species provide only limited seasonal forage for both livestock and some wildlife species).

Potential Cactus Ferruginous Pygmy-Owl Habitat (Sandy Wash Ecological Site)

- Maintain composition of palatable browse at 14 percent
- Maintain vegetative canopy cover at 40 percent with a multi-layered structure present. Multi-layered structure as represented by:
 - Trees - ironwood, blue palo verde, mesquite (tree form)
 - Tall shrubs – catclaw, wolfberry, burrobush, big bursage (*Ambrosia ambrosioides*)

- Low shrubs, forbs, annuals, i.e., white ratany, desert globemallow (*Sphaeralcea ambigua*)

Rationale: Maintaining vegetative canopy cover at 40 percent and a multi-layered structure will provide sufficient cover and structure to support cactus ferruginous pygmy-owl based on Wilcox et al 1999. Total vegetative canopy cover of 40 percent is identified in the sandy wash 7- to 10-inch precipitation zone ecological site description as potential for the site.

Maintaining composition of palatable browse (See **Attachment 7**, Key Management Species List) at 14 percent will maintain habitat and forage for wildlife. No more than 7 percent composition of the 14 percent 6 composition will be allowed for wolfberry species (wolfberry species provide only limited seasonal forage for both livestock and wildlife).

Ecological site data collected from BGR/Area A comparison areas indicated no perennial grass component in the sandy wash ecological site. (See Pacific Biodiversity Institute Study Plots on **Map F-4**, SDNM Grazing Allotments & Monitoring Sites.) It was determined that setting a DPC objective for perennial grass could not be quantified.

Loamy Swale Ecological Site:

- Maintain perennial grasses at 10 percent composition, and
- Maintain vegetative canopy cover at 20 percent.

Rationale: Maintaining composition of perennial grasses at 10 percent or more will provide forage for wildlife and livestock. Appropriate canopy cover levels will prevent accelerated erosion and provide cover for wildlife.

Limy Fan Ecological Site:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Rationale: Maintaining the ratany-bursage functional group, which consists of range ratany, white ratany, white bursage, and triangle-leaf bursage, on this site provides habitat for wildlife and forage for livestock. Appropriate vegetative cover levels will prevent accelerated erosion and provide cover for wildlife.

Limy Upland Deep Ecological Site:

- Maintain vegetative canopy cover at 10 percent, and
- Maintain the ratany-bursage functional group at 12 percent of total composition.

Rationale: Maintaining the ratany-bursage functional group, which consists of range ratany, white ratany, white bursage and triangle leaf bursage, on this site provides habitat for wildlife and forage for livestock. Appropriate vegetative cover levels will prevent accelerated erosion and provide cover for wildlife.

Limy Upland Ecological Site:

- Maintain total vegetative canopy cover at 12 percent,
- Maintain composition of palatable browse at 5 percent, and
- Maintain recruitment of saguaros at the current rate of 0.96 young saguaros per 12.5 meter radius plot.

Rationale: Maintaining palatable browse (See **Attachment 7**, Key Management Species List) will ensure perennial forage for livestock and wildlife. This community provides habitat for bighorn sheep, desert tortoise, mule deer, red-backed whiptail lizard, elf owl, western screech owl and other bird and wildlife species. Appropriate vegetative cover levels will prevent accelerated erosion of ecological sites (See NRCS ecological reference worksheets) and provide for wildlife habitat.

Maintaining the current recruitment rate for saguaros of 0.96 young saguaros per 12.5-meter radius plot (see **Attachment 5**, Pacific Biodiversity Institute *Saguaro Data*) is appropriate for this ecological site north of I-8. Recruitment of saguaros is necessary to maintain CFPO and other owl nesting sites and lesser long-nose bat feeding areas. The potential saguaro population varies by elevation, aspect, precipitation, and soil type.

The highest densities of saguaros, referred to as the “saguaro forest” in the Monument Proclamation, are found primarily within the limy upland and granitic hills ecological sites. Maintaining vegetative canopy cover on the site will provide nurse plants for saguaros. The limy upland ecological site is where livestock use in the “saguaro forest” is most likely to occur.

Granitic Hills Ecological Site:

- Maintain vegetative canopy cover at 16 percent, and
- Maintain recruitment of saguaros at the current rate of .83 young saguaros per 12.5-meter radius plot.

Rationale: This community provides habitat for bighorn sheep, desert tortoise, mule deer, red-backed whiptail lizards, and other wildlife species. Based on slope, terrain, and other limiting factors, livestock do not utilize the majority of this ecological site, particularly during the warmer months. Appropriate vegetative cover levels will prevent accelerated erosion, provide cover for wildlife, and provide nurse plants for saguaros. Maintaining the current recruitment rate for saguaros of 0.83 young saguaros per 12.5 meter radius plot (see **Attachment 5**, Pacific Biodiversity Institute *Saguaro Data*) is appropriate for this ecological site located north of I-8. The BGR/Area A saguaro study, which had a recruitment rate of 1.26 young saguaros per plot, conducted by PBI, was located primarily in the volcanic hills 7- to 10-inch and 10- to 13-inch precipitation zone ecological sites, with the data being combined from both sites. The saguaro stem count values in the BGR/Area A plots could potentially be greater due to the difference in the ecological sites and increased precipitation. Recruitment of saguaros is necessary to maintain CFPO nesting sites and lesser long-nose bat feeding areas. The potential saguaro population varies by elevation, aspect, precipitation, and soil type. Comparison area data and the ecological site guide indicate this site has low potential for agave species.

Sandy Loam Deep Ecological Site:

- Maintain total vegetative canopy cover at 15 percent, and
- Maintain composition of palatable browse at 16 percent.

Rationale: Maintaining palatable browse (see **Attachment 7**, Key Management Species List) will ensure perennial forage for livestock and wildlife. This community provides habitat for bighorn sheep, desert tortoise, mule deer, and other wildlife species. Appropriate vegetative cover levels will prevent accelerated erosion of ecological sites (See NRCS ecological reference worksheets). This site only occurs as a minor inclusion within the Monument; however, it is within the service use area of the Big Horn station livestock water on the Big Horn allotment.

F.5.4 UTILIZATION GUIDELINES

Monument utilization guidelines were quantified for the purposes of addressing future management actions. Utilization, along with other monitoring data, is a useful indicator to ascertain whether or not current livestock grazing is a significant causal factor for not achieving a land health standard. For example, consistently high levels of utilization over a period of years may indicate that livestock-grazing management practices or levels of use may need to be adjusted.

Utilization guidelines for the SDNM are as follows:

- Manage for slight use (20 percent or less) of current year’s growth on key perennial forage species in wilderness areas,
- Manage for moderate use (40 percent or less) of current year’s growth on key perennial browse species outside of wilderness areas, and
- Manage for moderate use (45 percent or less) of current year’s growth on key perennial grass species outside of wilderness areas.

The utilization guidelines addressed are intended to indicate a level of use or desired stocking rate to be achieved over a period of years. “Desert forage plants can sustain about 40 percent use of annual herbage production” (Holechek et al. 1999). Levels of utilization exceeding 40 percent on shrubs may exceed the threshold for maintenance or improvement in the growth and reproduction of the key forage species and have a long-term effect on vegetation canopy cover and composition.

These guidelines are intended to be met over the long term and not on a year-to-year basis. These measurements, when properly timed and conducted using appropriate methods and sampling procedures, can be used as an aid in:

- Analyzing distribution of animal use on a management unit,
- Interpreting cause-and-effect relationships for observed changes in resource attributes such as soil cover, species composition, residual cover, etc., and

- Adjusting stocking rates or timing of grazing when used in conjunction with other monitoring information.

Utilization and residue measurements are not terms and conditions or desired resource condition objectives. They are monitoring and assessment tools used with other information in evaluating whether desired resource conditions are being achieved.

F.6 INVENTORY AND MONITORING METHODOLOGY

F.6.1 RANGELAND SURVEY

A rangeland soil and vegetation survey was completed for all allotments within what is now the SDNM in 1981 as part of the planning effort for the Lower Gila South RMP/EIS. This Soil/Vegetation Inventory Method (SVIM) data and National Soil Conservation Service (NRCS) methods were used for determining range condition and apparent trend in the early 1980s and were used to develop the “Resource Protection Alternative” for the 1988 Lower Gila South RMP/EIS. Although that alternative was not selected as the preferred alternative at the time, it did assist in calculating stocking rates in the Lower Gila South Planning Area.

For purposes of this evaluation, the 1981 SVIM production data from several locations were compared to production data collected in 2008/2009. These data showed virtually no change in vegetation production over the 28 year period. Therefore, the forage allocations suggested in the Lower Gila South RMP Resource Protection Alternative were used to develop the stocking rates proposed in the current Alternative B..

F.6.2 KEY AREAS

A key area is a relatively small portion of an allotment selected because of its location, proximity to water, livestock and wildlife habitat values, and value as a long-term monitoring point. A key area:

- Is representative of the stratum in which it is located.
- Is located within a single ecological site and plant community.
- Should contain the key species where the key species concept is used.
- Is capable of, and likely to show, a response to management actions. This response should be indicative of the response that is occurring on the stratum.

Key areas were established by an interdisciplinary team on the SDNM allotments beginning in 2004. They are located in each of the major pastures and are selected in locations that represent where livestock grazing pressure is occurring across the management area. Key areas are typically established approximately 1 mile (+/- 0.5 miles) from a water source to prevent arbitrarily skewing the data toward heavy impacts (less than 0.5 miles from water) or toward fewer impacts (greater than 1.5 miles from water).

Key areas are established to monitor vegetative and soil conditions and trend over time and include representation of all major ecological sites. Monitoring methods are described in BLM Technical Reference 1734-4, Sampling Vegetation Attributes, 1996). Data collected from 36 key areas were used for this evaluation. Data collected at each key area included quantitative data (percent vegetative composition, relative production and dry weight rank, ground cover data, and utilization) and qualitative data (Indicators of Rangeland Health) (BLM Technical Reference 1734-6, Interpreting Indicators of Rangeland Health, 2000). See **Attachment 3** for key area data.

For collecting monitoring data, a 40- by 40-square-centimeter frame with a point in the center was used to collect between 100 and 200 quadrats of data for various attributes at each key area. The dry-weight-rank technique was used to collect production and relative composition. Cover data were collected by using the point-cover technique with the frame-center point. Species composition was calculated using the production data. These monitoring methods are described in BLM Technical Reference-1734-4, Sampling Vegetation Attributes (US Department of the Interior 1996).

F.6.2.1 Land Health

The upland health of several key areas was evaluated using the BLM Rangeland Health Evaluation Site Documentation Worksheet. (For detailed results, see **Attachment 3**, Key Area Data.)

This assessment is a qualitative and quantitative approach to look at how the ecological processes on a site are functioning. The product of the qualitative assessment is not a single rating of land health, but an assessment of three components called attributes. The attributes are:

- Soil/site stability,
- Hydrologic function, and
- Biotic integrity.

These observed attributes are placed into one of five categories depending on the degree of departure from the ecological site description or reference area. Summing all of the attributes makes a final upland health determination. The five categories are:

1. Extreme,
2. Moderate to extreme,
3. Moderate,
4. Slight to moderate, and
5. None to slight.

Soil/site stability is the capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water. Hydrologic function is the capacity of the site to capture, store, and safely release water from rainfall, runoff, and snowmelt and to resist reduction in this capacity and recover from disturbance. Biotic integrity is the capacity of the site to support

characteristic functional and structural vegetation communities and to resist loss due to disturbance and recover following disturbance. Functional groups are species of similar importance. Methods for the LHE are described in BLM Technical Reference 1734-6, Version 3, Interpreting Indicators of Rangeland Health (2000).

The Indicators of Rangeland Health Assessment is a qualitative approach to examine how the ecological processes on a site are functioning. The product of the qualitative assessment is not a single rating of rangeland health, but an assessment of three components called attributes. Seventeen interrelated indicators are used in the assessment. The rating for each indicator in the evaluation area is based on that indicator’s degree of departure from the Reference Sheet of each Ecological Site (i.e., none to slight, slight to moderate, moderate, moderate to extreme, and extreme). Refer to **Table F-3**, Rangeland Health Attributes for the Indicators of Rangeland Health assessment.

**Table F-3
Rangeland Health Attributes**

Soil/Site Stability	The capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water. Indicators are ground cover and signs of erosion.
Hydrologic Function	The capacity of the site to capture, store and safely release water from rainfall, runoff and snowmelt, to resist reduction in this capacity and recover from disturbance.
Biotic Integrity	The capacity of the site to support characteristic functional and structural vegetation communities and to resist loss due to disturbance and recover following disturbance. Indicators are vegetation composition, structure, and distribution.

Source: Technical Reference 1734-6

F.6.2.2 Utilization Studies

Utilization data are important in evaluating the effects of grazing and browsing on rangeland. Utilization measures the percentage of available forage that has been consumed or destroyed” in the current year (Utilization Studies and Residual Measurements, Interagency Technical Reference 1734-3, 1996). Utilization is conducted after the growing season or immediately after the grazing season. This process requires a comparison of the amount of herbage left compared with the amount of herbage produced during the year. Utilization may refer either to a single plant species, a group of species, or the vegetation as a whole. Moreover, any foraging use of the key species on key areas is assumed to reflect foraging use on the entire stratum.

Residual measurement is the determination of herbage material or stubble height left. Residual measurements and utilization data can be used: (1) to identify use patterns, (2) to help establish cause-and-effect interpretations of range trend data, and (3) to aid in adjusting stocking rates when combined with other monitoring data.

The methodology used to collect utilization data on the SDNM allotments was the Ocular Estimate Method (formerly the Modified Key Forage Plant Method) (Utilization Studies and Residual Measurements, Interagency Technical Reference 1734-3, 1996). This technique uses an ocular estimate

of forage utilization based on the percentage of a plant's weight remaining after utilization. Utilization classes are used to show relative degrees of use (negligible to severe) of herbaceous species (grasses and forbs), and growth of leaders on browse species (shrubs, half-shrubs, woody vines, and trees).

Utilization Transect Data: Utilization data were collected in the Conley and Big Horn allotments at several key areas in the spring of 2009, which represented use during the 2008 grazing season. Additional utilization transects were established on the Conley Allotment in 2009 (see **Table F-8**, Utilization Estimates within the Big Horn and Conley Allotments, 2008).

Use Pattern Mapping: Supplemental to acquiring utilization data at specific key areas, Use Pattern Mapping was conducted across the SDNM to obtain forage utilization patterns across the Monument as a whole. Use Pattern Mapping involves mapping areas for proportions of the annual production that has been consumed or destroyed by animals. This qualitative method helps identify distribution problems and solutions, develop objectives and grazing plans, locate areas where new range improvements could improve livestock distribution, and make adjustments in management plans.

Mapping utilization patterns involves traversing the management unit or pasture to obtain a general concept of these patterns. Mapping proceeds as the pasture is traversed. Utilization classes (or zones) were used to determine use at each stop. When another use zone is observed, the approximate boundary of the zone is recorded on the map. The gathered data is assembled and plotted on maps. Data points having the same use levels are linked together to form polygons. Each use category (negligible to severe) is assigned a distinct color. Features such as topography, rockiness, size of the area, location of salt, and distance from water all affect foraging habits of different kinds of animals. Unused areas suitable for grazing and areas of animal concentration should be delineated to help identify range improvements needed to change grazing use distribution.

Utilization patterns may be mapped for livestock, wildlife, and wild horses or wild burros, following discrete periods of use of forage species by these animals. This method can help managers determine whether or not the grazing plan is effective by identifying the relative extent of areas underused, overused, and properly used. Additionally, for the purposes of the LHE and Compatibility Analysis, Use Pattern Mapping was conducted to determine if or where livestock grazing was directly or indirectly impacting Monument objects. However, when problem areas are identified, other qualitative or quantitative methods should also be employed to determine the cause.

F.6.3 PACIFIC BIODIVERSITY INSTITUTE SITE DATA

In 2002 Pacific Biodiversity Institute (PBI) was subcontracted by The Nature Conservancy through an assistance agreement with the BLM to collect data within the Monument. Estimates of vegetative canopy cover by species were collected on 12.5-meter radius plots (approximately 0.12 acres). This was designed to be used as baseline information to help assess changes and trends in the condition of the natural communities. Analysis of the applicable vegetative community data for 48 study sites (interchangeably referred to as plots) is included in this evaluation. The study design was a linear transect extending out from a disturbance site (livestock waters, etc.). The first plot was located within the disturbance, the second 50 meters from the disturbance; the third 100 meters, and the fourth 500 meters. Several additional plots were located at further 500 meter intervals from the disturbance.

For the purposes of this evaluation, only plots located 1,000 meters (0.62 miles) or more from the disturbance sites were used. In this manner, these 48 PBI study plots resemble BLM key areas in that they represent a larger area within individual ecological sites (refer to **Section F.6.2, Key Areas**) and dramatically increased the sample size of data collected across the SDNM. PBI study sites that were located close to livestock waters were not used because these areas are not representative of what is occurring within the larger area. In addition, some study sites that crossed multiple ecological sites were not used. Depending on the location and position on the landscape, PBI study sites were analyzed to address vegetation attributes specific to wildlife habitat (bighorn sheep) values. In some instances, these sites were located in areas that receive no livestock use or negligible livestock use. Data were also collected by PBI in the Barry M. Goldwater Range (BGR) and the southern portion of Area A. (See **Map F-4, SDNM Grazing Allotments & Monitoring Sites**).

F.7 MANAGEMENT EVALUATION AND SUMMARY OF STUDIES DATA

F.7.1 ACTUAL USE

Actual livestock use data were ascertained from past permitted use. The number of AUMs in the SDNM for the 10-year period from 1998 to 2007 is shown in **Table F-4, Animal Unit Months 1998-2007**. This table is based on the permittees' billed amount for each year during the period. During several of the listed years, AUM amounts are substantially below permitted use levels, reflecting years when permittees elected non-use in anticipation of, or response to, drought conditions or times Animal Unit Months 1998 to 2007 when additional livestock were unavailable for restocking due to livestock markets. The ephemeral AUM column indicates years with exceptionally wet winters when ephemeral permits were issued, in addition to the perennial permits, to take advantage of additional available forage. The information in **Table F-4** is the best available actual use data that the BLM has records for in the area.

The 10-year average livestock use has varied from year to year due to annual fluctuations in forage conditions and ephemeral operations. Operators have voluntarily removed livestock as requested by the BLM during drier periods. In some cases, the operators have applied for non-use and reactivated use in the same grazing year as conditions improved. The data in **Table F-4, Animal Unit Months 1998-2007** and **Table F-5, Grazing Allotment Use, Permitted and 10-Year Average** is presented allotment-wide on public lands within the Planning Area.

**Table F-4
Animal Unit Months 1998–2007**

Year	SDNM Decision Area		
	Perennial AUMs	Ephemeral AUMs	Total AUMs
1998	2,995	4,594	7,589
1999	6,168	0	6,168
2000	5,325	393	5,718
2001	7,556	1,054	8,610
2002	1,928	11	1,939

**Table F-4
Animal Unit Months 1998–2007**

Year	SDNM Decision Area		
	Perennial AUMs	Ephemeral AUMs	Total AUMs
2003	5,049	162	5,211
2004	4,801	379	5,180
2005	5,929	4,861	10,790
2006	8,178	1,719	9,897
2007	6,747	1,781	8,528

Note: SDNM allotments include portions of the allotment outside SDNM boundaries.

Source: BLM 2009.

**Table F-5
Grazing Allotment Use, Permitted and 10-Year Average**

Allotment #	Allotment name	Type	Permitted Use (AUMs)	10-Year Average Permitted Use* (AUMs)
3009	Big Horn	cattle	6,104	5,659
3007	Beloat	cattle	2,988	2,262
3018	Conley	cattle	4,158	3,821
3053	Lower Vekol	cattle	1,164	528
3042	Hazen	cattle	1,181	1,066
3004	Arnold	cattle	0	N/A**

* Average use based on paid grazing bills, 1998-2007

**The Arnold allotment is ephemeral use only

F.7.2 PRECIPITATION

Precipitation data for the Monument were acquired from the Western Regional Climate Center monitoring sites located in Gila Bend and Maricopa. The 20-year average annual precipitation for the Gila Bend area is approximately 6.28 inches. The precipitation by month for the period of 1999 to 2008 is shown in **Table F-6**, Average Precipitation (in Inches) for Gila Bend, Arizona, 1999 to 2008. The average for this period was 6.16 inches. Extremes in precipitation include a low of 2.90 inches in 2002 and a high of 10.61 inches in 2003. The 20-year average precipitation for the Maricopa area is 7.63 inches. The precipitation by month for the period of 1999 to 2008 is shown in **Table F-7**, Average Precipitation (in Inches) for Maricopa, Arizona, 1999 to 2008. The average for this period was 6.57 inches. Extremes in precipitation include a low of 3.07 inches in 2002 and a high of 8.07 inches in 2005.

**Table F-6
Average Precipitation (in Inches) for Gila Bend, Arizona, 1999 to 2008**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN.
1999	0.20	0.11	0.04	1.15	0.01	0.15	2.45	2.04	0.10	0.00	0.00	0.00	6.25
2000	0.08	0.12	1.85	0.00	0.00	0.20	0.02	0.84	0.00	2.22	0.80	0.00	6.13

Table F-6
Average Precipitation (in Inches) for Gila Bend, Arizona, 1999 to 2008

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN.
2001	1.57	0.76	0.55	0.08	0.02	0.00	0.13	1.33	0.00	0.06	0.08	0.50	5.08
2002	0.05	0.00	0.03	0.00	0.00	0.00	0.13	0.00	0.21	0.30	1.79	0.39	2.90
2003	1.37	2.06	0.90	0.56	0.00	0.00	0.62	0.85	2.46	0.00	1.29	0.50	10.61
2004	0.60	0.86	0.29	1.10	0.00	0.00	1.27	0.51	0.00	1.30	0.66	1.54	8.13
2005	1.28	2.46	0.50	0.17	0.00	0.00	0.33	1.14	0.11	0.32	0.00	0.00	6.31
2006	0.00	0.00	1.02	0.00	0.00	0.00	0.65	0.57	0.58	0.05	0.00	0.31	3.18
2007	0.01	0.08	0.64	0.14	0.00	0.00	1.22	0.64	0.21	0.00	0.80	1.30	5.04
2008	1.57	0.90	0.00	0.00	2.20	0.00	0.82	1.45	0.15	0.00	0.12	0.76	7.97
Yearly Avg.	0.67	0.74	0.58	0.32	0.22	0.04	0.76	0.94	0.38	0.43	0.55	0.53	6.16

Table F-7
Average Precipitation (in Inches) for Maricopa, Arizona, 1999 to 2008

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN.
1999	0.02	0.34	0.50	1.05	0.00	0.02	2.45	0.54	1.90	0.00	0.00	0.00	6.82
2000	0.00	0.01	2.24	0.00	0.00	1.21	0.25	1.49	0.02	2.22	0.57	0.00	8.01
2001	2.04	0.40	0.97	1.19	0.00	0.08	0.63	0.37	0.00	0.68	0.25	0.78	7.39
2002	0.10	0.00	0.04	0.00	0.00	0.00	0.18	0.09	1.71	0.04	0.54	0.37	3.07
2003	0.50	1.34	0.22	0.09	0.00	0.00	0.52	1.03	0.47	0.04	0.63	0.26	5.10
2004	1.28	0.92	0.57	0.62	0.00	0.00	0.63	0.30	0.71	0.67	0.70	1.65	8.05
2005	2.08	3.55	1.0	0.14	0.00	0.00	0.31	0.86	0.00	0.10	0.00	0.01	8.07
2006	0.00	0.00	2.62	0.00	0.00	0.21	1.21	0.82	0.71	0.31	0.00	0.34	6.22
2007	0.58	0.23	1.23	0.12	0.33	0.00	0.69	1.56	0.40	0.00	0.81	0.00	5.95
2008	1.13	0.55	0.00	0.00	1.71	0.00	0.67	1.26	0.30	0.00	0.34	1.05	7.01
Yearly Avg.	0.77	0.73	0.94	0.32	0.20	0.15	0.75	0.83	0.62	0.41	0.38	0.45	6.57

F.7.3 KEY AREA DATA

See Key Area Data (**Attachment 3**) and Pacific Biodiversity Institute Study Plots (**Attachment 4**).

All pertinent key area data (production, composition, cover, utilization, etc.) were used in conjunction with the use pattern map to determine whether or not livestock grazing was a causal factor in not achieving Arizona Standards for Rangeland Health. For instance, in areas where the other key area data showed that Standards were not being achieved and were in areas with Moderate (41 to 60 percent use, colored yellow) or Heavy (61 to 80 percent use, colored orange), it was assumed that livestock grazing was the causal factor for non-achievement of the Standard(s). In contrast, in areas where Standards were not being achieved, but the areas did not correspond with moderate or heavy livestock use, it was assumed that livestock grazing was not the causal factor for non-achievement. This information helped formulate the Management Recommendations (Section F.16), which were carried forward into the

grazing compatibility analysis (**Appendix E**, Compatibility Analysis: Livestock Grazing on the Sonoran Desert National Monument), which, in turn, helped in the development of the range of alternatives analyzed in the RMP/EIS.

F.7.4 UTILIZATION AND USE PATTERN MAPPING

See **Map F-5**, SDNM Grazing Allotments and Use Pattern Mapping.

The majority of livestock use occurred during the Winter 2008/Spring 2009 season, which is typical of most years. Additional years of utilization data needs to be collected; however, 2008 does reflect patterns of use during a year with slightly above to average winter/spring precipitation levels and moderate ephemeral production. Ephemeral forage production per acre was approximately 400 to 500 lbs. air dry weight per acre. In years of above average moisture, these sites are capable of producing up to 2,000 lbs. air dry weight per acre.

As previously mentioned, utilization data were collected at several key areas in the Conley and Big Horn allotments in the spring of 2009, which represented use during the 2008 grazing season. Additional utilization transects were established on the Conley Allotment in 2009 (see **Table F-8**, Utilization Estimates within the Big Horn and Conley Allotments, 2008). Utilization was collected at 3 key areas on the Lower Vekol in September 2009, which does not represent 2008 grazing use, and was not included in **Table F-8**. Additionally, utilization was collected near two wildlife waters on the Hazen Allotment to examine utilization by wildlife in the area (cattle had not been turned out on the Hazen Allotment for several years, so any use on forage would have been by wildlife).

Use pattern mapping was conducted across the entire Monument, with the exception of the southern portion of the Hazen Allotment (because no cattle had been turned out into that allotment recently). **Map F-5**, shows the delineation of use patterns across the Monument. Water sources are included in the map to show the patterns of livestock use around water sources in the SDNM.

Table F-8
Utilization Estimates within the Big Horn and Conley Allotments, 2008*

Big Horn Key Area Utilization			
Key Area	Species	% Use	Utilization Class
BH 2	White ratany	19%	Slight
BH 3	White ratany	24%	Light
	Burrobrush	13%	Slight
BH 5(W)**	White ratany	39%	Light
BH 6(W)**	Big galleta	26%	Light
	Burrobrush	42%	Moderate
	White bursage	27%	Light
Conley Key Area Utilization			
Key Area	Species	% Use	Utilization Class
C 5	White bursage	14%	Slight
	Burrobrush	29%	Light

**Table F-8
Utilization Estimates within the Big Horn and Conley Allotments, 2008***

Conley Allotment Utilization Study Sites***			
Site	Species	% Use	Utilization Class
CU 2	White ratany	14%	Slight
	White bursage	12%	Slight
CU 3	White ratany	12%	Slight
CU 4	White ratany	49%	Moderate
CU 5	Burrobrush	18%	Slight
	Globemallow	24%	Light
CU 6	White ratany	34%	Light
CU7	White ratany	40%	Light
CU8 (W)**	White ratany	23%	Light
CU9 (W)**	Burrobrush	35%	Light
CU10	White ratany	43%	Moderate
	White bursage	26%	Light

*Utilization transects were conducted in Spring/Summer 2009 to capture utilization of the 2008 grazing season. Utilization transects were conducted on the Hazen allotment in Sept 2009, but reflect only wildlife utilization, as no livestock had been turned out. Therefore, Hazen Allotment data are not included in this table.

**W -- signifies wilderness location

***Utilization transects were established throughout the Conley Allotment in 2009 and were conducted in addition to utilization at key areas.

F.8 CONCLUSIONS

Conclusions are supported by the analysis of key area and PBI data, and information portrayed within the evaluation to show whether land health standards are being achieved or not achieved and whether significant progress towards achievement is being made. Conclusions are presented only for Arizona Standards 1 and 3. For Standard 1, conclusions are summarized to the allotment level for each allotment across all ecological sites. For Standard 3, conclusions are first summarized to each ecological site within each allotment, and then summarized to the allotment level for each allotment. Refer to sections F.10-F.15 for the various management objectives for each ecological site. Referring to the raw data in Key Area Data (**Attachment 3**) and Pacific Biodiversity Institute Study Plots (**Attachment 4**) will aid in interpreting and verifying the conclusions presented.

Achievement of Standard 3 considers the inherent variability within ecological site potential.

Data variability was considered when making the final determination whether or not a site is achieving Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, the site was considered achieving the objective if the canopy cover or the composition vegetative attributes measured were within 80 percent of the attribute value.

The final determination of whether or not an ecological site is achieving Standard 3 was based on a preponderance of evidence approach. More than 50 percent of the key areas and PBI plots representing

an ecological site had to be achieving all of the DPC objectives for the ecological site within an allotment to be considered achieving Standard 3. This approach was used because a statistical approach was not feasible, as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

F.9 BARRY M. GOLDWATER RANGE/AREA A REFERENCE SITE

In 1941, 78,000 acres (formerly known as Area “A”) were withdrawn for the BGR for military purposes. It was later returned to the BLM and was not reopened to grazing use. Ecological sites within the BGR/Area A were used as comparison areas to help quantify the resource-condition objectives because, being closed to livestock grazing since the 1940s, they meet the desired resource conditions for wildlife habitat and other resource values at the landscape level. Only the data that could be correlated to ecological sites present in both the BGR/Area A and the allotments north of I-8 were used as comparison data. Attainment of objectives for the BGR/Area A can be found in **Table F-9, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – BGR/Area A.**

**Table F-9
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – BGR/Area A**

Meets St. 3	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Composition objective	Actual composition	Achieved canopy cover**	Achieved composition
N	Sandy wash	233	34%	38%	14%	7%	Y	N
		252	34%	47.5%	14%	8%	Y	N
		262	34%	23.5%	14%	17%	N	Y
		271	34%	26%	14%	16%	N	Y
		BHPP3S	34%	50%	14%	10%		
N	Limy Fan	236	7%	6.5%	9%	0%	Y	N
		237	7%	8%	9%	0%	Y	N
		240	7%	8%	9%	12%	Y	N
		BHPP2S	7%	13%	9%	28%	Y	Y
Y	Limy Upland deep	269	10%	18%	12%	12%	Y	Y
		272	10%	17%	12%	0%	Y	Y
		234	10%	8%	12%	37%	Y	N
		BHPP1S	10%	10%	12%	45%	Y	Y
Y	Granitic Hills	232	16%	16%	N/A	N/A	Y	N/A

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.10 BIG HORN ALLOTMENT

F.10.1 LAND HEALTH STANDARD 1 — UPLAND SITES

Conclusion: Upland sites within the Big Horn allotment meet Standard 1.

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Rationale: The findings are based upon the preponderance of evidence of all indicators used to determine attainment of Standard 1.

The results of the upland assessment indicate a slight departure from the ecological site descriptions, with only one site in the slight to moderate category (see soil/site stability and hydrologic function attributes for Big Horn allotment in **Table F-18**, Departure from Ecological Site Description). The majority of the key areas and PBI plots (23 of 28) had vegetative cover levels that are appropriate for the site (see **Table F-9**) and the qualitative assessments of the soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction etc.) did not indicate any signs of accelerated erosion at any site. PBI cover data indicates that microbotic crusts are at appropriate levels in relation to the BGR/Area A comparison area (see microbotic crust cover data in **Table F-20**, Average Cover of Microbotic Crusts (% by Plot)).

F.10.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.10.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.10.3.1 Sandy Wash Ecological Site

Conclusion: Based upon the preponderance of evidence, the sandy wash ecological site is achieving Standard 3. All seven sites achieve the canopy cover objectives and the palatable browse objective. The results of use-pattern mapping was light to moderate use and do not indicate that current livestock management is the causal factor on the sites that are not achieving the objectives.

Objectives:

- Maintain sandy washes at 34 percent canopy cover. (applies to six sites: Key Areas BH-1 and BH-4 and PBI sites 190 192, 202 and 203),
- Maintain canopy cover at 40 percent for the potential CFPO sandy wash sites (applies to Key Area BH-8), and
- Maintain sandy washes at 14 percent composition of palatable browse (all seven sites).

Discussion: The canopy cover objective is being achieved or exceeded on all seven sites (see **Table F-10: Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Big Horn Allotment**). All of the vegetative components that form a multi-layered structure are present for potential CFPO and other wildlife habitat. The tree layer is represented by blue palo verde and ironwood, the tall shrub layer is represented by catclaw acacia, desert hackberry, and wolfberry, and the low shrub layer is represented by big bursage, triangle-leaf bursage, and bricklebush. There were no signs of accelerated erosion at any site (see **Table F-18**).

All seven sites achieve or exceed the palatable browse composition objective (see **Table F-10**).

F.10.3.2 Loamy Swale Ecological Site:

Conclusion: Standard 3 is being met for the loamy swale ecological site.

Objectives:

- Maintain perennial grasses at 10 percent composition, and
- Maintain total vegetative canopy cover at 20 percent.

Discussion: Data from the loamy swale key area (BH-7) shows that the objectives are being achieved with perennial grasses at 13 percent composition and vegetative cover at 36 percent (**Table F-10**).

F.10.3.3 Limy Fan Ecological Site:

Conclusion: Based upon the preponderance of evidence, the limy fan ecological site is meeting Standard 3. Two sites are achieving both objectives and one site is not achieving the objectives. Utilization levels on key species at Key Area BH-2 were slight to light (less than 40 percent) in 2008, and use-pattern mapping was at moderate use. This does not indicate that current livestock management is the causal factor on the sites that are not achieving the objectives.

Objectives:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Discussion: Data from Key Area BH-3 (11 percent) and PBI study site 58 (8 percent) indicate that both achieve the canopy cover objective. Key area BH-2 is close to achieving the objective at 5 percent canopy cover. Key area BH-3 and PBI study site 58 achieve the objective of 9 percent composition for the ratany-bursage shrub group. BH-2 does not achieve the objective at 6 percent (see **Table F-10**).

F.10.3.4 Limy Upland Deep Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the limy upland deep ecological site is not achieving Standard 3*. Only two of the five sites are achieving both objectives, and three sites are achieving only one of two objectives. Long-term trend data are not available to ascertain whether significant progress towards achievement is being made. Use-pattern mapping indicates 0-5 percent use on key species at

PBI sites 59 and 60 (see **Map F-5**) and indicate that current livestock management is not the causal factor on the sites that are not achieving the objectives.

Objectives:

- Maintain vegetative canopy cover at 10 percent, and
- Maintain ratany-bursage shrub group at 12 percent of total composition.

Discussion: Key area BH-5 and PBI study site 61 achieve the canopy cover objective. Key areas BH-13 and PBI sites 59 and 60 do not achieve the canopy cover objective. There were no indications of accelerated erosion at any of the sites. Key areas BH-5 and BH-13 and all three PBI study plots achieve the objective of 12 percent composition in the ratany-bursage shrub group (see **Table 8**).

F.10.3.5 Limy Upland Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the limy upland ecological site is achieving Standard 3*. Both sites achieve all three objectives. Use-pattern mapping indicates negligible livestock utilization.

Objectives:

- Maintain total vegetative canopy cover at 12 percent,
- Maintain composition of palatable browse species at 5 percent, and
- Maintain recruitment of saguaros at the current rate of 0.96 young saguaros per 12.5-meter radius plot.

Discussion: Key areas BH-9 and BH-12 are achieving the canopy cover objective at 12 percent and 14 percent. Both key areas achieve the palatable browse composition objective at 5 percent and 4 percent. Key Area BH-5 exceeded the wilderness objective of 20 percent utilization (see **Table F-10**). Results from the PBI saguaro data collection indicate recruitment of young saguaros is occurring at 0.96 stems per plot which achieves the objective (see **Attachment 5**, Pacific Biodiversity Institute Saguaro Data). Young saguaros are defined as less than 1 meter tall and are referred to as short stems in **Attachment 5**.

F.10.3.6 Sandy Loam Deep Ecological Site:

Conclusion: *Standard 3 is being achieved for the sandy loam deep ecological site*. The key area achieves both objectives. Use-pattern mapping indicates light utilization and key area utilization was at light use for two key species and moderate (42 percent) use for one key species.

Objectives:

- Maintain total vegetative canopy cover at 15 percent, and
- Maintain composition of palatable browse at 16 percent.

Discussion: Data from the sandy loam deep (BH-6) key area shows that the site is meeting the objective for palatable browse at 16 percent composition and achieves the canopy cover objective at 13 percent (see **Table F-9**). Utilization levels in 2008 on key species at Key Area BH-6 were light on big galleta (26 percent) and white bursage (27 percent) and moderate on burrobrush (42 percent). The wilderness area objective of 20 percent was exceeded (see **Table F-8**).

F.10.3.7 Granitic Hills Ecological Site:

Conclusion: Based upon the preponderance of evidence, the granitic hills ecological site is achieving Standard 3. Nine sites achieve both objectives and one site is achieving one objective. Use-pattern mapping indicates slight livestock utilization in the area around PBI site 63.

Objectives:

- Maintain vegetative canopy cover at 16 percent, and
- Maintain recruitment of saguaros at the current rate of 0.83 young saguaros per 12.5 meter radius plot.

Discussion: Eight of nine PBI study sites (63, 181, 183, 194, 196, 198, 199, 200 and 201) achieve the vegetative canopy cover objective. PBI site 63 does not achieve the objective at only 9.5 percent canopy cover, but there were no signs of accelerated erosion present. The ten granitic hills sites do not have DPC objectives for vegetative composition due to the fact that the majority of this ecological site is inaccessible to livestock.

Results from the PBI saguaro data collection indicate recruitment of young saguaros is occurring at 0.83 stems per plot, which is sufficient to maintain the population of saguaros (see **Table F-24**, Saguaro Cover & Stem Count Information for the Palo Verde-Mixed Cacti Community (PBI 2004)). Young saguaros are defined as less than 1 meter tall and are referred to as short stems in Pacific Biodiversity Institute Saguaro Data (**Attachment 5**).

F.10.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

Conclusion: Based upon the preponderance of evidence, *the majority of the Big Horn allotment is achieving Standard 3*. One ecological site, the limy upland deep ecological site, does not achieve Standard 3 and represents 29,384 acres of the 92,204 acres within the allotment.

Rationale: The upland land health was assessed for biotic integrity at four key areas representing the major ecological sites within the allotment. This assessment indicates that the plant communities are functioning close to expected for the site (see **Table F-18**).

Use-pattern mapping results (see **Map F-5**, SDNM Grazing Allotments and Use Pattern Mapping) indicate a general pattern of moderate (41 percent to 60 percent) utilization in the areas immediately surrounding some of the livestock waters. As distance from livestock waters increases, the use pattern zone moves to light (21 percent to 40 percent) and slight (6 to 20 percent) use. The majority of the Big Horn allotment within the SDNM falls within the slight use category.

Utilization at key areas and the results of use pattern mapping (short-term monitoring data) indicate that current livestock management is a significant causal factor on 2,974 acres within the limy upland deep ecological site, which is not achieving the Standard 3 objectives for canopy cover. Attainment of objectives for the Big Horn Allotment can be found in **Table F-10**, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Big Horn Allotment.

Table F-10
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Big Horn Allotment

Meets St. 3	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Composition objective	Actual composition	Achieved canopy cover**	Achieved composition
Y	Sandy wash	BH-1	34%	36%	14%	22%	Y	Y
		BH-4	34%	48%	14%	20%	Y	Y
		BH-8		41%	14%	12%	Y	Y
		190	34%	32%	14%	55%	Y	Y
		192	34%	31%	14%	18%	Y	Y
		202	34%	45.5%	14%	25.5%	Y	Y
		203	34%	43%	14%	19.5%	Y	Y
Y	Loamy swale	BH-7	20%	36%	10%	13%	Y	Y
Y	Limy Fan	BH-2	7%	5%	9%	6%	N	N
		BH-3	7%	11%	9%	20%	Y	Y
		58	7%	8.25%	9%	12%	Y	Y
N	Limy upland deep	BH-5	10%	14%	12%	26%	Y	Y
		BH-13	10%	6%	12%	17%	N	Y
		59	10%	7.25%	12%	13%	N	Y
		60	10%	5.5%	12%	36%	N	Y
		61	10%	15.5%	12%	14.5%	y	Y
Y	Limy upland	BH-9	12%	14%	5%	4%	Y	Y
		BH-12	12%	12%	5%	5%	Y	Y
Y	Sandy loam deep	BH-6	15%	13%	16%	16%	Y	Y
Y	Granitic hills	63	16%	9.5%	N/A	N/A	N	N/A
		181	16%	9.5%	N/A	N/A	Y	N/A
		183	16%	29.5%	N/A	N/A	Y	N/A
		194	16%	28.5%	N/A	N/A	Y	N/A
		196	16%	30%	N/A	N/A	Y	N/A
		198	16%	43.5%	N/A	N/A	Y	N/A
		199	16%	19%	N/A	N/A	Y	N/A
		200	16%	24.5%	N/A	N/A	Y	N/A
		201	16%	59%	N/A	N/A	Y	N/A

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.11 BELOAT ALLOTMENT

F.11.1 LAND HEALTH STANDARD 1 — UPLAND SITES

Conclusion: Upland sites within the Beloat allotment are achieving Standard 1.

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Rationale: This finding is based upon the preponderance of evidence of the indicators used to determine attainment of Standard 1. The results of the assessment indicate a slight departure from the ecological site descriptions for one key area and slight to moderate departure for two key areas (see **Table F-18**). The majority of the key areas and PBI plots (16 of 18) had vegetative cover levels that are appropriate for the site and the qualitative assessments of the soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction, etc.) did not indicate any signs of accelerated erosion. PBI cover data indicate that microbiotic crusts are at appropriate levels in relation to the BGR/Area A comparison area (see **Table F-20**).

F.11.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.11.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.11.3.1 Sandy Wash Ecological Site

Conclusion: Based upon the preponderance of evidence, *the sandy wash ecological site is not achieving Standard 3*. Both sites achieve the canopy cover objectives; however, only one of two sites achieves the palatable browse objective. The results of use-pattern mapping were negligible to light use and therefore *indicate that current livestock management is not the causal factor* for the site that is not achieving the palatable browse objective.

Objectives:

- Maintain sandy washes that have 34 percent canopy cover,
- Maintain canopy cover at 40 percent for the potential CFPO sandy wash site (B-2), and
- Maintain sandy washes at 14 percent composition of palatable browse species.

Discussion: Key area B-4 meets the canopy cover objective at 41 percent. Key area B-2 achieves the CFPO canopy cover objective. All of the vegetative components which form a multi-layered structure are present for potential CFPO and other wildlife habitat. The tree layer is represented by blue palo

verde and ironwood, the tall shrub layer is represented by catclaw acacia, desert hackberry, and wolfberry, and the low shrub layer is represented by big bursage, triangle-leaf bursage and bricklebrush.

Key area B-4 achieves the palatable species objective (15 percent). B-2 does not achieve the composition objective at 8 percent (**Table F-II**, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Beloat Allotment).

Table F-II
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Beloat Allotment

Meets St. 3	Ecological Site	Key area/PBI site	Canopy cover objective	Actual canopy cover	Composition objective	Actual composition	Achieved canopy cover***	Achieved composition
N	Sandy wash	B-2	40%	76%	14%	8%	Y	N
		B-4	34%	41%	14%	15%	Y	N
Y	Loamy swale	B-5	20%	79%	10%	23%	Y	Y
N	Limy Fan	B-8	7%	4%	9%	9%	N	Y
		40	7%	7%	9%	0%	Y	N
		41	7%	11%	9%	9%	Y	Y
		42	7%	8%	9%	25%	Y	Y
		43	7%	7%	9%	0%	Y	N
		44	7%	11%	9%	45%	Y	Y
		45	7%	8%	9%	3%	Y	N
46	7%	8.5%	9%	27%	Y	Y		
Y	Limy upland	B-9	12%	13%	5%	16%	Y	Y
Y	Granitic hills	B-1	16%	8%	N/A	N/A	N	Y
		48	16%	8%	N/A	N/A	N	Y
		49	16%	46.5%	N/A	N/A	Y	Y
		50	16%	31%	N/A	N/A	Y	Y
		51	16%	37%	N/A	N/A	Y	Y
		52	16%	48%	N/A	N/A	Y	Y

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.II.3.2 Loamy Swale Ecological Site:

Conclusion: Standard 3 is being achieved for the loamy swale ecological site.

Objectives:

- Maintain perennial grasses at 10 percent composition, and
- Maintain total vegetative canopy cover at 20 percent.

Discussion: Data from the loamy swale (B-5) key area indicates that the DPC objectives are being achieved with perennial grasses at 23 percent composition and vegetative cover at 79 percent (**Table F-II**).

F.1.1.3.3 Limy Fan Ecological Site:

Conclusion: Based upon the preponderance of evidence the limy fan ecological site is not achieving *Standard 3*. Only four of the eight sites (Key Area B-8 and 7 PBI sites) achieve both DPC objectives. Use levels were negligible to slight (less than 20 percent) and indicate that *current livestock management is not the causal factor* for not achieving the objectives.

Objectives:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Discussion: Data from Key area B-8 does not achieve the canopy cover objective (**Table F-II**). All seven PBI study plots (40-46) in the limy fan site achieve the canopy cover objective (**Table F-II**). There were no signs of accelerated erosion on any sites.

Key area B-8 achieves the ratany-bursage composition objective and four of the seven PBI sites achieve the objective. PBI sites 40, 43, and 45 do not achieve the objective (**Table F-II**).

F.1.1.3.4 Limy Upland Ecological Site:

Conclusion: The limy upland ecological site is achieving *Standard 3*.

Objectives:

- Maintain total vegetative canopy cover at 12 percent,
- Maintain composition of palatable browse at 5 percent, and
- Maintain recruitment of saguaros at the current rate of 0.96 young saguaros per 12.5 meter radius plot.

Discussion: Key area B-9 is achieving the canopy cover objective at 13 percent and achieving the objective for composition of palatable browse at 16 percent composition (**Table F-II**). Results from the PBI Saguaro Data indicate recruitment of young saguaros is occurring at 0.96 stems per plot. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in the Pacific Biodiversity Institute Saguaro Data (**Attachment 5**).

F.11.3.5 Granitic Hills Ecological Site:

Conclusion: Based upon the preponderance of evidence the *granitic hills ecological site is achieving Standard 3*. Five sites achieve both objectives. Key area B-1 is not achieving the canopy cover DPC objective.

Objectives:

- Maintain vegetative canopy cover at 16 percent, and
- Maintain recruitment of saguaros at the current rate of 0.83 young saguaros per 12.5 meter radius plot.

Discussion: Eight of nine PBI study sites (63, 181, 183, 194, 196, 198, 199, 200 and 201) achieve the vegetative canopy cover objective. PBI site 63 does not achieve the objective at only 9.5 percent canopy cover, but there were no signs of accelerated erosion present. The ten granitic hills sites do not have DPC objectives for vegetative composition because the majority of this ecological site is inaccessible to livestock.

Results from the PBI saguaro data indicate recruitment of young saguaros is occurring at 0.83 stems per plot, which is sufficient to maintain the population of saguaros. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in the Pacific Biodiversity Institute Saguaro Data (Attachment 5).

F.11.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

Conclusion: Based upon the preponderance of evidence, *the Beloat allotment is not fully achieving Standard 3*. The limy fan and sandy wash ecological sites, which comprise 17,969 acres out of 33,600 acres within the allotment, are not achieving Standard 3.

Rationale: The upland land health was assessed for biotic integrity at three key areas that represents the major ecological sites within the allotment. This assessment indicates that the plant communities are functioning close to expected for the site (see **Table F-18**).

The results of use-pattern mapping (short-term monitoring data) indicate that *current livestock management is not a significant causal factor* for those sites that are not achieving Standard 3. Use-pattern mapping results for 2008 indicate a general pattern of slight (6 percent - 20 percent) and light (21 percent to 40 percent) use in the area surrounding one livestock water and negligible use (0 to 5 percent) around another. The majority of the Beloat Allotment within the SDNM falls within the slight use category (See **Map F-5**).

F.12 CONLEY ALLOTMENT

F.12.1 LAND HEALTH STANDARD I — UPLAND SITES

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Conclusion: Upland sites within the Conley allotment are achieving Standard I.

Rationale: This finding is based upon the preponderance of evidence of the indicators used to determine attainment of Standard I. The majority of the key areas had vegetative cover levels that are appropriate for the site. Twelve of the sixteen sites achieve the canopy cover objectives. Soil/site stability and hydrologic function were evaluated at seven key areas to determine the departure from the site descriptions. The results of the assessment indicate at most a slight departure from the ecological site descriptions (see **Table F-18**) and the assessments of the soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction, etc.) did not indicate signs of accelerated erosion.

The analysis indicates soil stability and hydrologic functions on the allotment are appropriate to prevent accelerated erosion, and that the watersheds are in properly functioning condition. Erosion has been documented in localized areas around two stock tanks. These are more erosive soils that have received heavy recreation use both on and off of the trails in addition to livestock use.

PBI cover data indicates that microbotic crusts are at appropriate levels in relation to the BGR/Area A comparison area (see **Table F-20**).

F.12.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.12.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.12.3.1 Sandy Wash Ecological Site

Conclusion: Based upon the preponderance of evidence, *the sandy wash ecological site is not achieving Standard 3*. Only one of four key areas achieves both objectives.

Use-pattern mapping indicates that livestock use is light at Key Areas C-3 and C-7 and slight at C-1, and that utilization of key species at C-7 was light (see **Map F-5**), which indicate that *current livestock management is not the causal factor* for non-achievement of Standard 3.

Objectives:

- Maintain sandy washes that have 34 percent canopy cover, and
- Maintain sandy washes that have 14 percent composition of palatable browse species.

Discussion: All key areas achieve the canopy cover objective. Key Area C-7 achieves the palatable browse composition objective at 35 percent. Key Areas C-1 and C-3 and PBI Site 4 do not achieve the palatable browse composition objective at 9 percent, 2 percent, and 7 percent, respectively (see **Table F-12**, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Conley Allotment).

**Table F-12
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Conley Allotment**

Meets St. 3	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Composition objective	Actual composition	Achieved canopy cover**	Achieved composition
N	Sandy wash	C-1	34%	71%	14%	9%	Y	N
		C-3	34%	68%	14%	2%	Y	N
		4	34%	55%	14%	7%	Y	N
		C-7	34%	31%	14%	35%	Y	Y
Y	Loamy swale	C-9	20%	47%	10%	15%	Y	Y
N	Limy Fan	C-2	7%	6%	9%	0%	Y	N
		C-4	7%	8%	9%	7%	Y	N
		3	7%	17%	9%	0%	Y	Y
		5	7%	9.5%	9%	31%	Y	N
		16	7%	5%	9%	0%	N	N
		29	7%	3%	9%	0%	N	N
N	Limy upland deep	6	10%	8%	12%	3%	Y	N
N	Limy upland	C-5	12%	8%	5%	16%	N	Y
		C-10	12%	24%	5%	12%	Y	Y
N	Granitic hills	7	16%	9%	N/A	N/A	N	N/A
		187	16%	18%	N/A	N/A	Y	N/A

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.12.3.2 Loamy Swale Ecological Site:

Conclusion: Land Health Standard 3 is being achieved for the loamy swale ecological site.

Objectives:

- Maintain perennial grasses at 10 percent composition, and
- Maintain total vegetative canopy cover at 20 percent.

Discussion: Data from the loamy swale (C-9) key area shows that the objectives are being achieved with perennial grasses at 15 percent composition and canopy cover at 47 percent (**Table F-12**).

F.12.3.3 Limy Fan Ecological Site:

Conclusion: Based upon the preponderance of evidence, the *limy fan ecological site is not achieving Standard 3*. The majority of the key areas and PBI sites do not achieve both objectives. Use levels were slight (less than 20 percent) to light and *indicates current livestock management is not the causal factor* for not achieving the objectives.

Objectives:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Discussion: Key areas C-4 and C-2 and 2 – plots 3 and 5 of the four PBI sites, plots 3, 5, 16, and 29 – achieve the canopy cover objective. PBI plots 16 and 29 do not achieve the objective at 5 percent and 3 percent, respectively.

Only PBI plot 5 achieves the objective to have the ratany-bursage shrub group at 9 percent of total composition. (**Table F-12**).

F.12.3.4 Limy Upland Deep Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the limy upland deep ecological site is not achieving Standard 3*. PBI site 6 achieves only one of two objectives. Long-term trend data are not available to ascertain whether significant progress towards achievement is being made. Use-pattern mapping indicates light use on key species and indicates that *current livestock management is not the causal factor* for not achieving the objectives.

Objectives:

- Maintain vegetative canopy cover at 10 percent, and
- Maintain ratany-bursage shrub group at 12 percent of total composition.

Discussion: PBI site 6 achieves the canopy cover objective at 8 percent; however, it does not achieve the composition objective at 3 percent (**Table F-12**).

F.12.3.5 Limy Upland Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the limy upland ecological site is not achieving Standard 3*. One key area is achieving all three objectives and one key area is achieving two of three objectives. Use-pattern mapping at Key Area C-5 and C-10 was at slight use and utilization on key species at C-5 was at light and slight use, which indicates *current livestock grazing is the causal factor* for non-achievement of the objective.

Objectives:

- Maintain total vegetative canopy cover at 12 percent,
- Maintain composition of palatable browse at 5 percent, and
- Maintain recruitment of saguaros at the current rate of 0.96 young saguaros per 12.5 meter radius plot.

Discussion: Key area C-10 is achieving the canopy cover objective at 24 percent, but Key Area C-5 is not achieving the objective at 8 percent. Key areas C-5 and C-10 are achieving the palatable browse composition objective at 16 percent and 12 percent, respectively (**Table F-12**).

Results of the PBI saguaro study indicate recruitment of young saguaros is occurring at 0.96 stems per plot, which achieves the objective. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in the Pacific Biodiversity Institute Saguaro Data (**Attachment 5**).

F.12.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

Conclusion: Based upon the preponderance of evidence, *most of the Conley allotment is not achieving Standard 3*. The majority of the ecological sites, which comprise approximately 73,278 acres out of approximately 77,708 acres within the allotment that are accessed by livestock, are not achieving Standard 3.

Although Standard 3 is not being achieved throughout the entire allotment, the upland land health assessing biotic integrity at seven key areas indicates that the plant communities are functioning close to expected for the site (see **Table F-18**). There were no indications of accelerated erosion at any of the key areas.

Utilization at key areas and the results of use-pattern mapping (short-term monitoring data) indicate that *current livestock management is a significant causal factor for not achieving Standard 3* on a total of 5,517 acres.

Approximately 5,006 acres are within the limy fan ecological site, 320 acres are within the limy upland ecological site, 191 acres are within the granitic hills ecological site, and 10 acres are within the sandy wash ecological site (these 10 acres are not accounted for in the total acres because this ecological site is a linear feature within the upland ecological sites). These data were collected during a year with full permitted use and additional ephemeral livestock authorizations. Several utilization transects were run in addition to those located at the key areas for the purposes of this evaluation (see **Table F-8**). Use levels at these nine additional sites were rated at slight to light use with the exception of white ratany utilization at two sites (CU-4, CU-10), which were in the moderate level. Sites CU-8 and CU-9 indicated light use; however, this exceeded the utilization level set for wilderness areas.

Use-pattern mapping results indicate a general pattern of light (21 to 40 percent) to slight use (6 to 20 percent) in the areas surrounding most livestock waters with small areas of heavier (61 to 80 percent) use around two waters. One small area was mapped as severe use along a road used by livestock to

travel between water sources. The majority of the allotment falls within the slight and light use categories. (See **Map F-5, SDNM Grazing Allotments and Use Pattern Mapping.**)

F.13 HAZEN ALLOTMENT

F.13.1 LAND HEALTH STANDARD 1 — UPLAND SITES

Conclusion: Upland sites within the Hazen Allotment achieve Standard 1.

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Rationale: This finding is based upon the preponderance of evidence of the indicators used to determine attainment of Standard 1. The land health assessments from five key areas indicate two sites with a slight departure from the ecological site descriptions and three sites at slight to moderate departure (see **Table F-18**).

Nine of the eleven sites (key areas and PBI sites) had canopy cover levels that are appropriate for the ecological site and soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction, etc.) that did not indicate signs of accelerated erosion. PBI cover data indicated that microbiotic crusts are at appropriate levels in relation to the BGR/Area A comparison area (see **Table F-20, Average Cover of Microbiotic Crusts (% by Plot)**).

F.13.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.13.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.13.3.1 Sandy Wash Ecological Site

Conclusion: Based upon the preponderance of evidence, the sandy wash ecological site is not achieving Standard 3. Only two of four key areas and PBI sites achieve both objectives. It is more likely than not that the failure of this site to meet Standard 3 is not due to existing grazing-management practices or levels of grazing use, as livestock use levels were at negligible (0 to 5 percent) and slight (6 to 20 percent) levels.

Objectives:

- Maintain sandy washes at 34 percent canopy cover, and
- Maintain canopy cover at 40 percent for the potential CFPO sandy wash site (Key Area H-7), and

- Maintain sandy washes at 14 percent composition of palatable browse.

Discussion: Key Area H-7 achieves the CFPO canopy cover objective at 62 percent. PBI plot 228 achieves the canopy cover objective at 39 percent vegetative cover. Key area H-4 and PBI plot 230 do not achieve the canopy cover objective at 20 and 25 percent, respectively (**Table F-13**, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Hazen Allotment). PBI plot 230 (20 percent), PBI plot 228 (11.5 percent) and Key Area H-4 (38 percent) achieve the palatable browse composition objective (**Table F-13**). Composition data were not collected at Key Area H-7.

Table F-13
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Hazen Allotment

Meets St. 3**	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Composition objective	Actual composition	Achieved canopy cover***	Achieved composition***
N	Sandy wash	H-4	34%	20%	14%	38%	N	Y
		H-7	40%	62%	N/A	N/A	Y	N/A
		228	34%	39%	14%	11.5%	Y	Y
		230	34%	25%	14%	20%	N	Y
N	Limy Fan	H-1	7%	7%	9%	13%	Y	Y
		227	7%	26%	9%	4%	Y	N
		229	7%	8%	9%	0%	Y	N
Y	Limy upland deep	H-2	10%	8%	12%	15%	Y	Y
		H-6	10%	12%	12%	21%	Y	Y
Y	Granitic hills	H-5*	16%	12%	N/A	N/A	Y	N/A
		231	16%	21%	N/A	N/A	Y	N/A

*Key area H-5 lies within a lower precipitation zone of 6 to 8 inches precipitation per year, compared with the reference area site that lies within a precipitation zone of 8 to 10 inches precipitation per year. Because of the lesser precipitation, Key Area H-5 has a lower potential and greater variability in canopy cover produced. The criterion for achieving an objective was relaxed to accept a lesser threshold in this case and it was determined that 12 percent canopy cover was achieving the canopy cover objective.

**More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

*** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.13.3.2 Limy Fan Ecological Site

Conclusion: Based upon the preponderance of evidence, *the limy fan ecological site is not achieving Standard 3*. Key area H-1 achieves both objectives; however, the two PBI sites are not achieving both objectives. It is more likely than not that the failure of this site to meet Standard 3 is not due to existing

grazing-management practices or levels of grazing use, as livestock use levels were at negligible (0 to 5 percent) and slight (6 to 20 percent) levels.

Objectives:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Discussion: Key Area H-1 and PBI plots 227 and 229 achieve the canopy cover objective. Key Area H-1 achieves the ratany-bursage composition objective at 13 percent. PBI plots 227 (4 percent) and 229 (0 percent) do not achieve the objective (**Table F-13**).

Limy Upland Deep Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the limy upland deep ecological site is achieving Standard 3*. Both key areas achieve both objectives.

Objectives:

- Maintain vegetative canopy cover at 10 percent, and
- Maintain ratany-bursage shrub group at 12 percent of total composition.

Discussion: Key areas H-6 and H-2 achieve the canopy cover objective at 12 percent and 8 percent. Both key areas achieve the ratany-bursage composition objective with more than 12 percent composition (See **Table F-13**).

F.13.3.3 Granitic Hills Ecological Site:

Conclusion: Based upon the preponderance of evidence, *the granitic hills ecological site is achieving Standard 3*. PBI site 231 and Key Area H-5 achieve both objectives.

Objectives:

- Maintain vegetative canopy cover at 16 percent, and
- Maintain recruitment of saguaros at the current rate of 0.83 young saguaros per 12.5 meter radius plot.

Discussion: PBI plot 231 achieves the objective with 21 percent canopy cover. Key Area H-5 also achieves the canopy cover objective at 12 percent, as this location has a lower potential based on lower precipitation (6-8 inches) than the reference area (See **Table F-13**).

Results of the PBI saguaro study indicate recruitment of young saguaros is occurring at 0.83 stems per plot, which is sufficient to maintain the population of saguaros. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in **Attachment 5**, Pacific Biodiversity Institute Saguaro Data.

F.13.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

Based upon the preponderance of evidence, *the majority of the Hazen allotment is achieving Standard 3.* The sandy wash and limy fan ecological sites, which comprise approximately 5,699 acres out of approximately 31,926 acres within the allotment that are accessed by livestock, are not achieving Standard 3. It is more likely than not that the failure of these sites to meet Standard 3 is not due to existing grazing-management practices or levels of grazing use, as livestock use levels were at negligible (0 to 5 percent) and slight (6 to 20 percent) levels. The remaining 26,227 acres are achieving Standard 3.

The upland land health was assessed at five key areas representing the major ecological sites within the allotment. The biotic integrity attribute was evaluated at these sites to determine the departure from the ecological site descriptions. Two of the five key areas were rated at none to slight, and three were rated at slight to moderate (see **Table F-13**). This would indicate that the plant communities are functioning close to expected for the site and that biotic integrity on the allotment is appropriate.

Use-pattern mapping was only conducted near the two wildlife waters located within the allotment. One area received slight (6 to 20 percent) use, and the other area received negligible use (0 to 5 percent) use. (See **Map F-5**, SDNM Grazing Allotments and Use Pattern Mapping.) The utilization at both of these areas was from wildlife use as livestock have not been on this allotment for several years.

F.14 LOWER VEKOL ALLOTMENT

F.14.1 LAND HEALTH STANDARD 1 — UPLAND SITES

Conclusion: Upland sites within the Lower Vekol allotment achieve Standard 1.

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Rationale: This finding is based upon the preponderance of evidence of the indicators used to determine attainment of Standard 1. The LHE at three key areas indicates all three sites had a slight departure from the ecological site descriptions (see Table F-18). All key areas and PBI plots had canopy cover levels that are appropriate for the site and the assessment of the soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction, etc.) did not indicate signs of accelerated erosion.

F.14.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.14.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.14.3.1 Sandy Wash Ecological Site

Conclusion: *The sandy wash ecological site is not achieving Standard 3. Key area LV-3 achieved only one of two objectives for the ecological site. Use- pattern mapping at the key area was at light use, indicating current livestock grazing may not be the causal factor for non-achievement of the standard.*

Objectives:

- Maintain sandy washes that have 34 percent canopy cover, and
- Maintain sandy washes that have 14 percent composition of palatable browse species.

Discussion: Key area LV-3 achieves the canopy cover objective at 60 percent. The key area does not achieve the palatable browse objective at 6 percent (**Table F-14, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Lower Vekol Allotment**), resulting in not achieving Standard 3 on 2 miles (7 acres; 11 percent) of the desert wash community.

**Table F-14
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Lower Vekol Allotment**

Meets St. 3**	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Compos- ition objective	Actual compos- ition	Achieved canopy cover***	Achieved compos- ition***
N	Sandy wash	LV-3	34%	60%	14%	6%	Y	N
Y	Loamy swale	LV-1	20%	69%	10%	46%	Y	Y
Y	Limy upland deep	LV-2	10%	19%	12%	25%	Y	Y
N	Limy upland	LV-4	12%	10%	5%	1%	Y	N
Y	Granitic hills	185	16%	48%	N/A	N/A	Y	
		204	16%	38%	N/A	N/A	Y	
		205	16%	81%	N/A	N/A	Y	
		206	16%	40%	N/A	N/A	Y	
		207	16%	41%	N/A	N/A	Y	
		209	16%	70%	N/A	N/A	Y	

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.14.3.2 Loamy Swale Ecological Site:

Conclusion: Land Health Standard 3 is being achieved for the loamy swale ecological site.

Objectives:

- Maintain perennial grasses at 10 percent composition, and
- Maintain total vegetative canopy cover at 20 percent.

Discussion: Data from the loamy swale (LV-1) key area shows that both objectives are being achieved with perennial grasses at 46 percent composition and canopy cover at 69 percent (**Table F-14**).

Limy Upland Deep Ecological Site:

Conclusion: The limy upland deep ecological site is achieving Standard 3.

Objectives:

- Maintain vegetative canopy cover at 10 percent, and
- Maintain ratany-bursage shrub group at 12 percent of total composition.

Discussion: Key area LV-2 has 19 percent canopy cover which achieves the objective. Composition of the ratany/bursage group exceeds 12 percent; therefore achieving the objective (**Table F-14**).

F.14.3.3 Limy Upland Ecological Site:

Conclusion: *The limy upland ecological site is not achieving Standard 3.* The key area achieves two of three objectives and therefore does not achieve Standard 3. Use-pattern mapping indicated light use at the key area; therefore current *livestock grazing is not the causal factor* for non-achievement of the standard.

Objectives:

- Maintain total vegetative canopy cover at 12 percent,
- Maintain composition of palatable browse at 5 percent, and
- Maintain recruitment of saguaros at the current rate of 0.96 young saguaros per 12.5 meter radius plot.

Discussion: Key area LV-4 has 1 percent composition of palatable browse, which does not achieve the objective of 5 percent (Table F-14). LV-4 has 10 percent actual canopy cover, as opposed to the 12 percent cover objective. Results of the PBI saguaro study indicate recruitment of young saguaros is occurring at 0.96 stems per plot, which achieves the objective. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in **Attachment 5**, Pacific Biodiversity Institute Saguaro Data.

F.14.3.4 Granitic Hills Ecological Site:

Conclusion: The granitic hills ecological site is achieving Standard 3.

Objectives:

- Maintain vegetative canopy cover at 16 percent, and
- Maintain recruitment of saguaros at the current rate of 0.83 young saguaros per 12.5 meter radius plot.

Discussion: All six PBI plots (185, 204-207 and 209) in the granitic hills site have canopy cover achieving or exceeding the objective of 16 percent (see **Table F-14**).

Results of the PBI saguaro study indicate recruitment of young saguaros is occurring at 0.83 stems per plot, which is sufficient to maintain the population of saguaros. Young saguaros are defined as less than 1 meter tall and are referred to as short stems in the Pacific Biodiversity Institute Saguaro Data (**Attachment 5**).

F.14.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

Based upon the preponderance of evidence, the Lower Vekol allotment is achieving Standard 3. The sandy wash and limy upland ecological sites are not achieving Standard 3, but they represent only 583 of the 15,409 acres.

The biotic integrity attribute was evaluated to determine the departure from the ecological site descriptions. Two of the key areas were rated at none to slight, and one was rated at slight to moderate, indicating that the plant communities are functioning close to what is expected for the site.

Use-pattern mapping results indicate light (21 to 40 percent) to slight use (6 to 20 percent) within the majority of the allotment. One area of heavy (61 to 80 percent) use occurred around one livestock water, and an area of moderate (41 to 60 percent) use occurred in close proximity to another livestock water. (See **Map F-5, SDNM Grazing Allotments and Use Pattern Mapping**.) Utilization data indicate it is more likely than not that existing grazing management practices or levels of grazing use are factors in failing to achieve Standard 3 on 2 miles (7 acres; 11 percent) of the desert wash community. Attainment of objectives for the Lower Vekol Allotment can be found in **Table F-14**.

F.15 ARNOLD ALLOTMENT

F.15.1 LAND HEALTH STANDARD I — UPLAND SITES

Conclusion: Upland sites within the Arnold Allotment are achieving Standard I.

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).

Rationale: This finding is based upon the preponderance of evidence of the indicators used to determine attainment of Standard 1. The LHE from Key Area A-4 indicates only a slight departure from the ecological site description (see **Table F-18**). Although the key area did not achieve the canopy cover DPC objective, there were no signs of accelerated erosion based on the assessment of the soil-related indicators (rills, flow patterns, pedestals, bare ground, gullies, litter movement, and soil compaction, etc.). Soil and site stability and hydrologic function are appropriate to prevent accelerated erosion and the watershed is properly functioning.

F.15.2 LAND HEALTH STANDARD 3 — DESIRED RESOURCES CONDITIONS

Objective: Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

F.15.3 ANALYSIS OF DESIRED PLANT COMMUNITY OBJECTIVES BY KEY AREAS AND PBI SITES

F.15.3.1 Limy Fan Ecological Site:

Conclusion: *The limy fan ecological site is not achieving Standard 3.* The composition objective is being achieved; however, the canopy cover objective is not. Use pattern mapping results indicate slight use within the SDNM indicating *current livestock grazing is likely not the causal factor* for non-achievement.

Objectives:

- Maintain vegetative canopy cover at 7 percent, and
- Maintain ratany-bursage shrub group at 9 percent of total composition.

Discussion: Key area A-4 does not achieve the canopy cover objective at 1 percent canopy cover (**Table F-15**, Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Arnold Allotment). The key area achieves the ratany-bursage composition objective at 13 percent (**Table F-15**).

F.15.4 SUMMARY OF ECOLOGICAL SITE ANALYSIS

There is one key area (A-4) located within the SDNM on the Arnold Allotment. The Arnold Allotment comprises only a minor percentage (1 percent) of acres (1,609) within the SDNM. The key area does not achieve Standard 3 due to non-achievement of the canopy cover objective. There were no PBI plots located within the Arnold Allotment. The biotic integrity attribute was evaluated through the LHE to determine the departure from the ecological site; the key area was rated at none to slight (see **Table F-18**).

Use pattern mapping results indicate slight use (6 to 20 percent) in the allotment (see **Map F-5**, SDNM Grazing Allotments and Use Pattern Mapping) within the SDNM indicating *current livestock grazing is not likely the causal factor* for non-achievement of Standard 3.

**Table F-15
Attainment of Objectives by Key Area/Pacific Biodiversity Institute Site – Arnold Allotment**

Meets St. 3**	Ecological Site	Key area/ PBI site	Canopy cover objective	Actual canopy cover	Compos- ition objective	Actual compos- ition	Achieved canopy cover***	Achieved compos- ition***
N	Limy Fan	A-4	7%	1%	9%	13%	N	Y

*More than 50% of the key areas and PBI plots representing an ecological site had to be achieving all of the desired plant community objectives, for the ecological site within an allotment to be considered achieving land health standard 3. This represents a preponderance of evidence approach to ascertain whether land health standard 3 was achieved. This approach was used because a statistical approach was not feasible as the number of key areas and PBI plots on each ecological site were not adequate to statistically analyze each ecological site.

** Ecological site variability was considered when making the final determination of whether or not a site is achieving LH Standard 3 objectives. Rather than using the absolute value to determine achievement of the objective, if the canopy cover and/or the composition vegetative attributes measured were within 80% of the attribute value, the site was considered achieving the objective.

F.16 MANAGEMENT RECOMMENDATIONS

Monitoring and inventory data indicate that the majority of desirable perennial forage constitutes important browse species that are utilized by both livestock and wildlife. It is recommended to adjust the level of use on the SDNM to primarily fall-winter-spring with reduced levels during the summer months as follows: 65 percent of the permitted use would occur from October 1 to April 30, and 35 percent of permitted use would occur between May 1 and September 30. This would reduce potential competition with special status wildlife species and other wildlife species during the critical summer months. Ephemeral grazing does not appear to influence achievement of Land Health Standards, and thus should be considered to continue where applicable, in accordance with the Special Ephemeral Rule and the Arizona Guidelines for Grazing Administration.

The recommended adjustments to permitted livestock use and management practices will allow for continued achievement and significant progress towards achievement of Land Health Standards. It will also ensure continued protection of the objects of the Monument. This includes adjustments to permitted use, terms and conditions, and management practices.

Table F-16, SDNM Grazing Allotments Permitted Use* (AUMs), shows recommendations that consider the paramount purpose of protecting the biological and cultural objects of the Monument.

**Table F-16
SDNM Grazing Allotments Permitted Use* (AUMs)**

Allotment Name	Current Permitted Use for Entire Allotment	Current Permitted Use Within LSFO	Current Permitted Use Within SDNM	Recommended Total Permitted Use**	Recommended Permitted Use Within SDNM
Big Horn (95% within SDNM)	2,960*	148	2,812	2,184	2,031

Table F-16
SDNM Grazing Allotments Permitted Use* (AUMs)

Allotment Name	Current Permitted Use for Entire Allotment	Current Permitted Use Within LSFO	Current Permitted Use Within SDNM	Recommended Total Permitted Use**	Recommended Permitted Use Within SDNM
Beloat (26% within SDNM)	2,988	2,212	776	2,752	541
Conley (88% within SDNM)	3,867	464	3,403	2,036	1,572
Hazen (75% within SDNM)	1,181	295	886	708	531
Lower Vekol (71% within SDNM)	1,164	338	826	912	646
Arnold***	0	0	0	0	0
Total					5,321

* "Permitted use" means the forage allocated by, or under the guidance of, an applicable land use plan for livestock grazing in an allotment under a permit or lease and is expressed in AUMs.

** Two AUM values were calculated to provide the final recommended Active preference. The Lower Gila South RMP Resource Protection Alternative AUMs were prorated to the acres within the Monument for each allotment. The current permitted AUMs were prorated for the allotment acres outside of the Monument. The AUMs for the Big Horn allotment also reflect the reduction in permitted use due to the closure of the portion of the allotment south of I-8.

*** The Arnold Allotment will remain authorized as ephemeral only.

Rationale:

- Utilization data indicate that existing grazing management practices or levels of grazing use are factors in failing to achieve Standard 3 on 8,498 acres (within multiple polygons) of the 252,000 acres (3.4 percent) of the public lands north of I-8,
- The majority of desirable perennial forage is browse species and winter/spring annuals,
- Utilization limits (20 percent) established for the wilderness areas substantially limits forage available for current permitted AUMs established from Lower Gila South RMP,
- Reduces potential competition for forage with special status and other wildlife species,
- Supported by inventory and monitoring data, and
- Diet study for livestock based on the University of Arizona's Big Horn Allotment Cattle Diet Study (1982).

It also is recommended that the period and level of use be adjusted to primarily fall-winter-spring, with reduced use levels during the summer months as follows:

- Approximately 65 percent of permitted use would occur from Oct. 1 to April 30, and 35 percent of permitted use would occur during the summer season, from May 1 through Sept. 30.

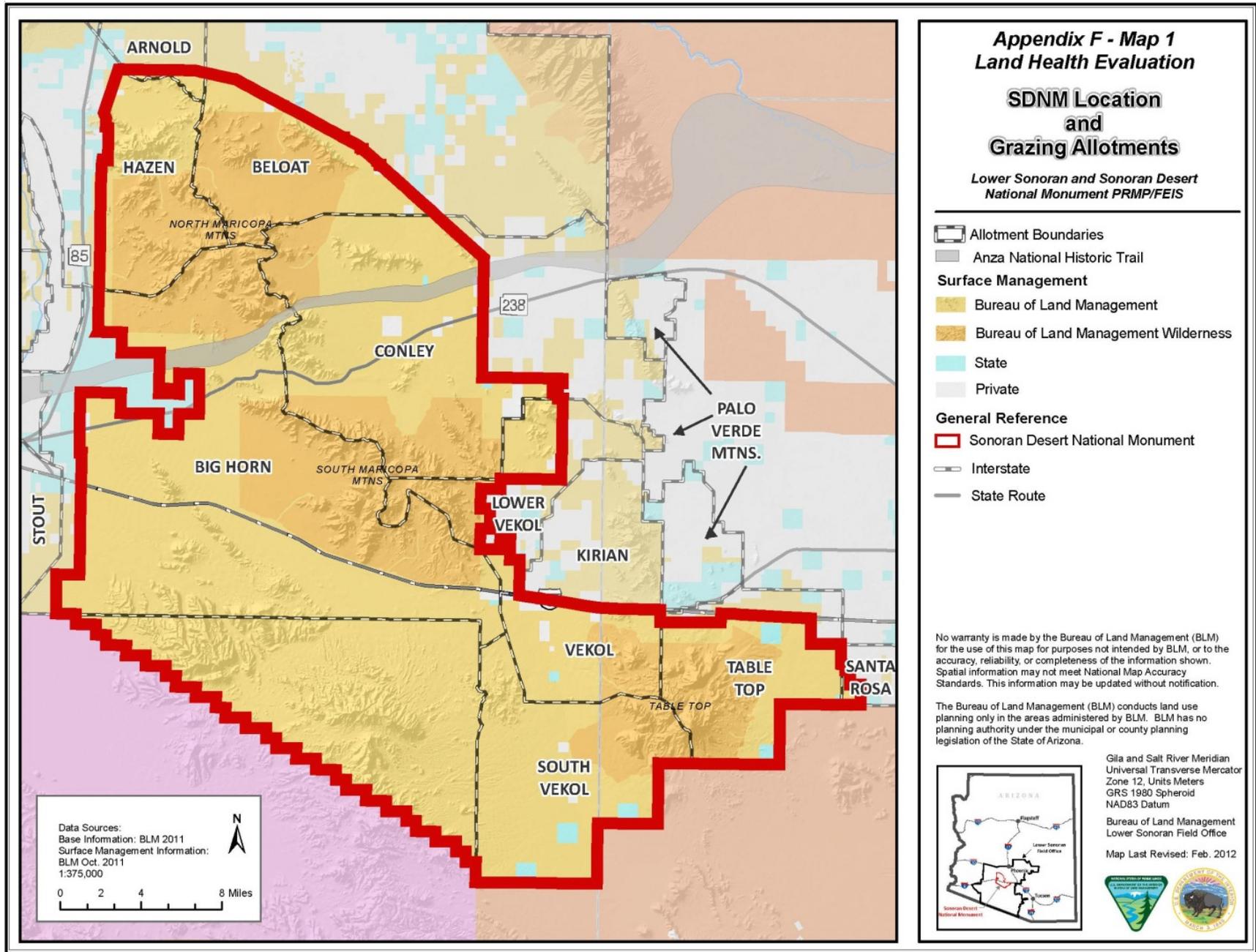
Rationale:

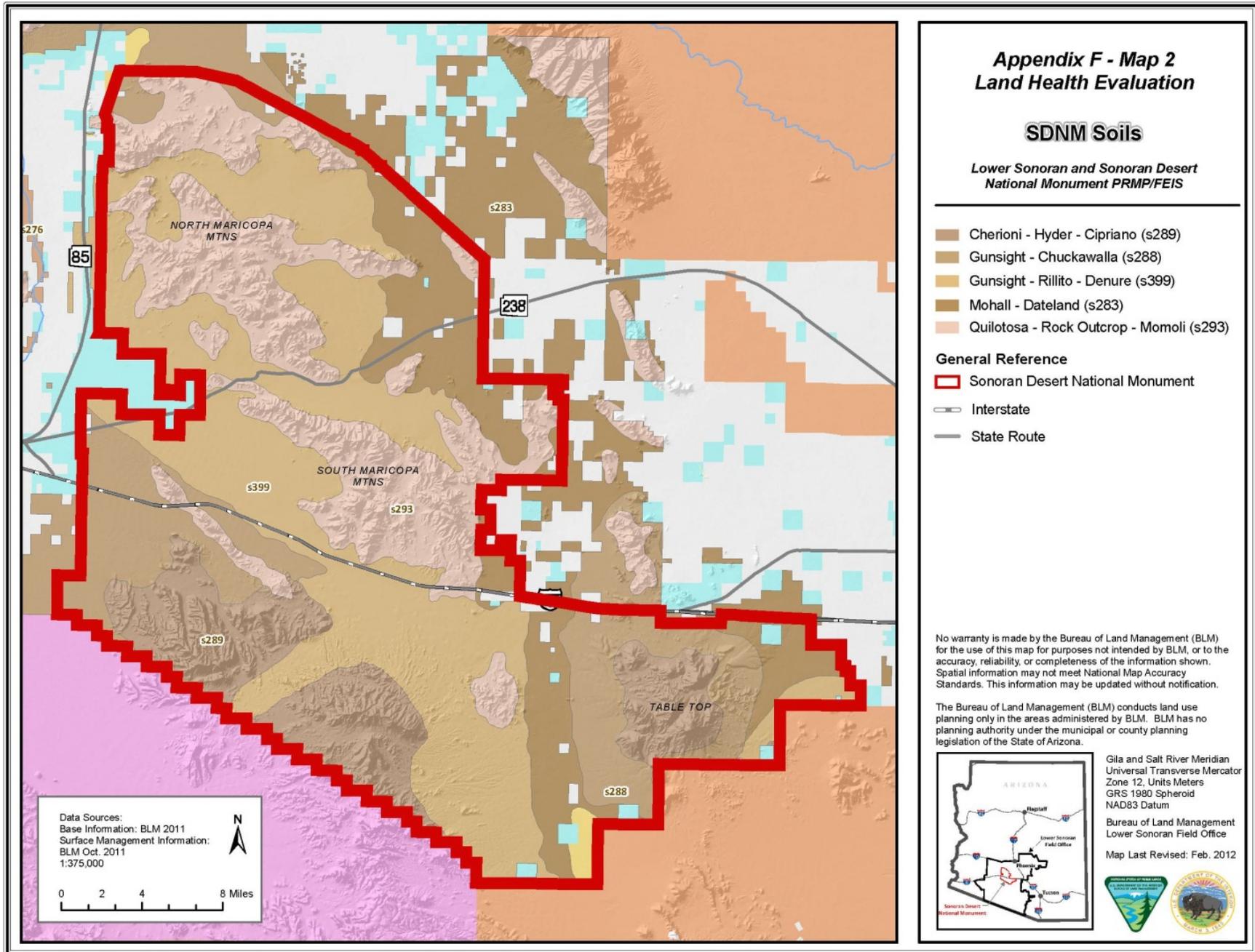
- Bimodal precipitation pattern with more consistent and widespread rainfall during winter and spring seasons,
- Majority of desirable perennial forage are winter browse species and winter/spring annuals,
- Reduces potential competition with wildlife during critical hot summer months,
- Reduces effects of concentrated livestock use around watering facilities,
- Reflects general pattern of current grazing management practices,
- Majority of forage production occurs during the winter/spring season (in above average precipitation years up to 2,000 lbs. + / acre), and
- Supported by the University of Arizona's Big Horn Allotment Cattle Diet Study (1982).

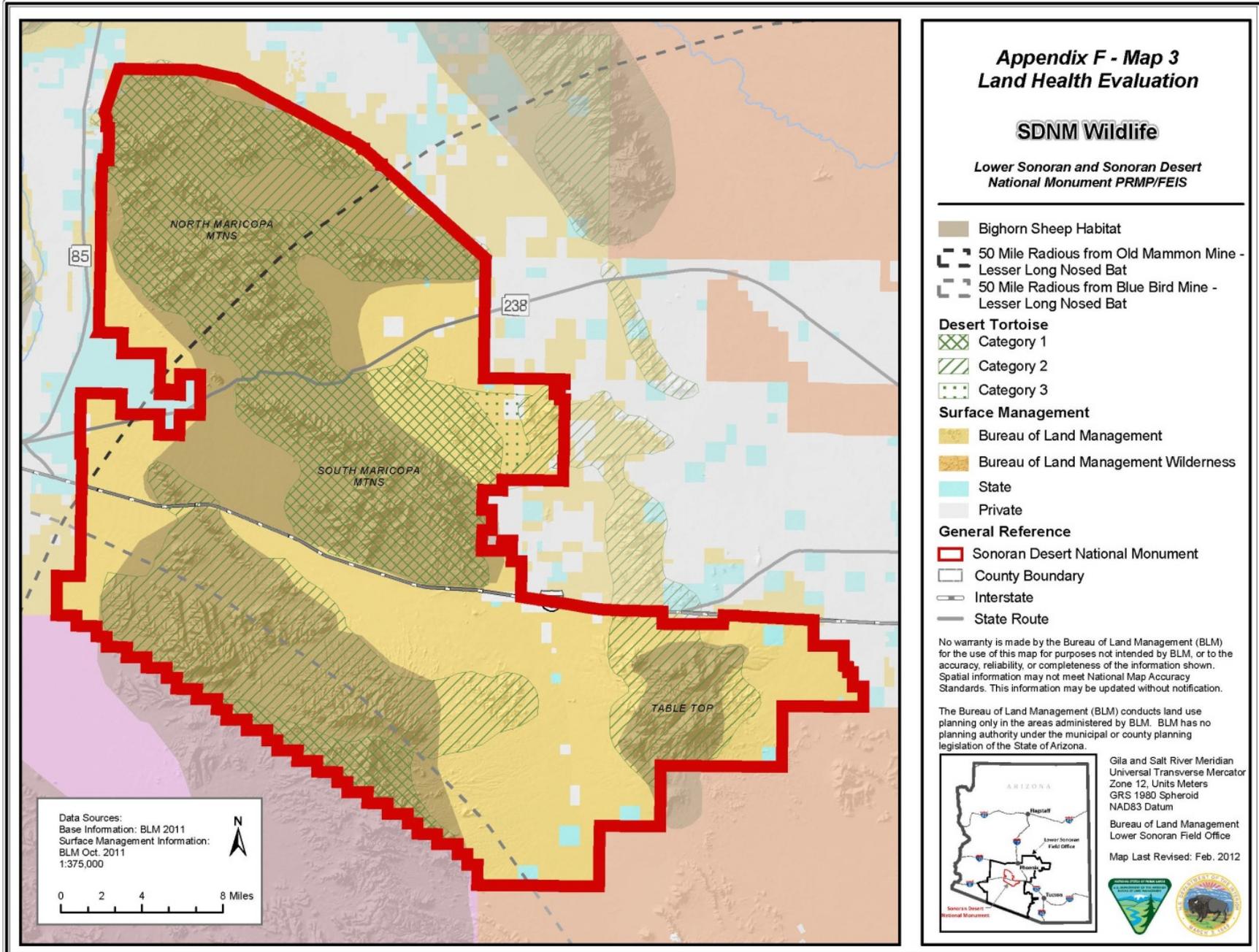
Monitoring and inventory data indicate that the majority of desirable perennial forage constitutes important browse species. These browse species are utilized by both livestock and wildlife. Reducing permitted use and adjusting the majority of the grazing use to the fall, winter, and spring seasons will reduce potential competition with special status wildlife and other wildlife species during the critical summer months.

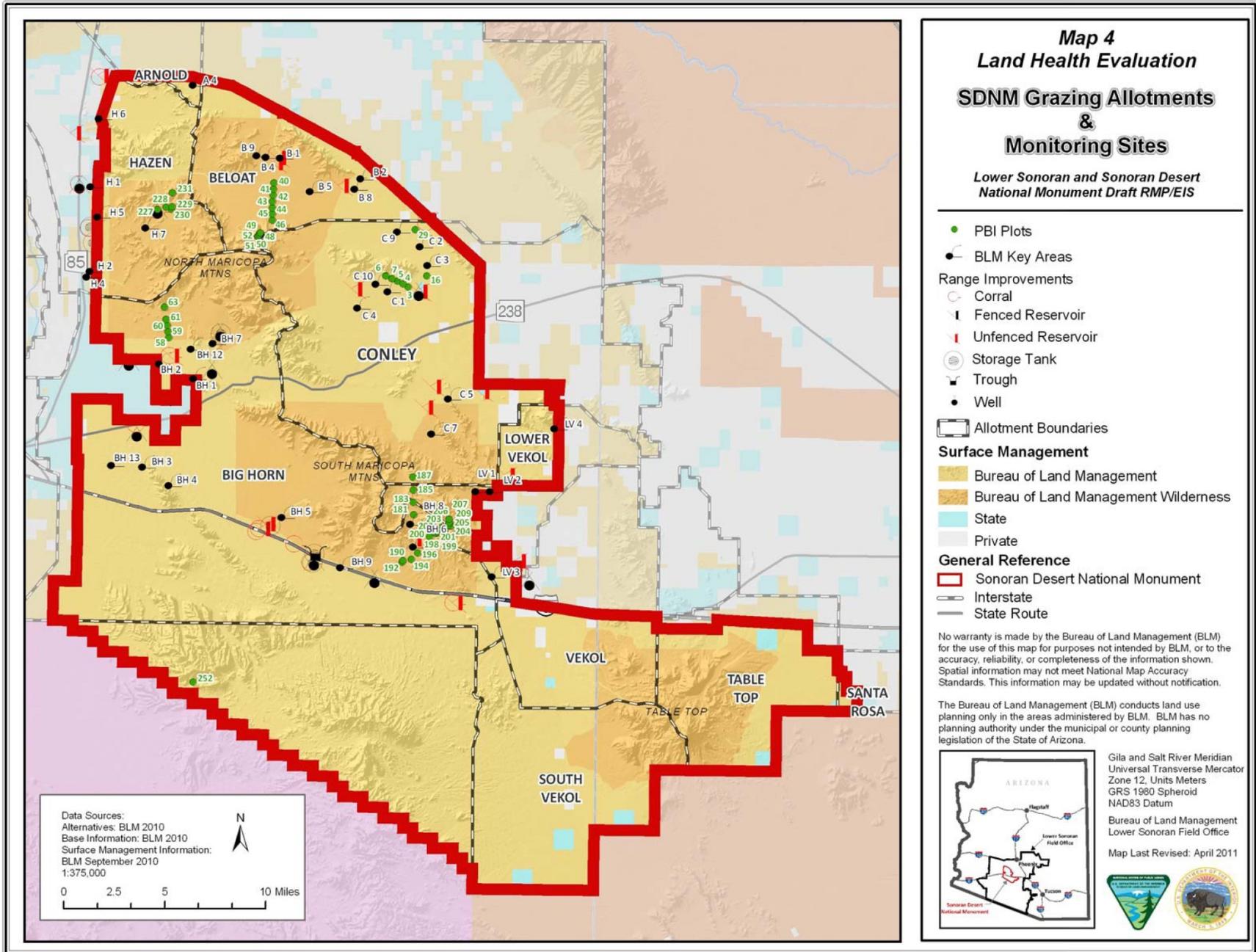
During years of above average rainfall, ephemeral vegetation (annual species) adds materially to the forage base (important browse species) for these allotments. Annual species germinate rapidly and mature early under the combination of favorable temperature and adequate moisture. However, they are short-lived, and field observations indicate they are available as forage for up to 16 weeks, depending on available moisture. Some annuals, such as Indian wheat (*Plantago spp.*), are used as forage even after curing, which is attributable to its high protein content. During years with ephemeral vegetation, the ephemeral production (400 to 2,000 pounds per acre air dry weight) can be many times the yearly perennial production.

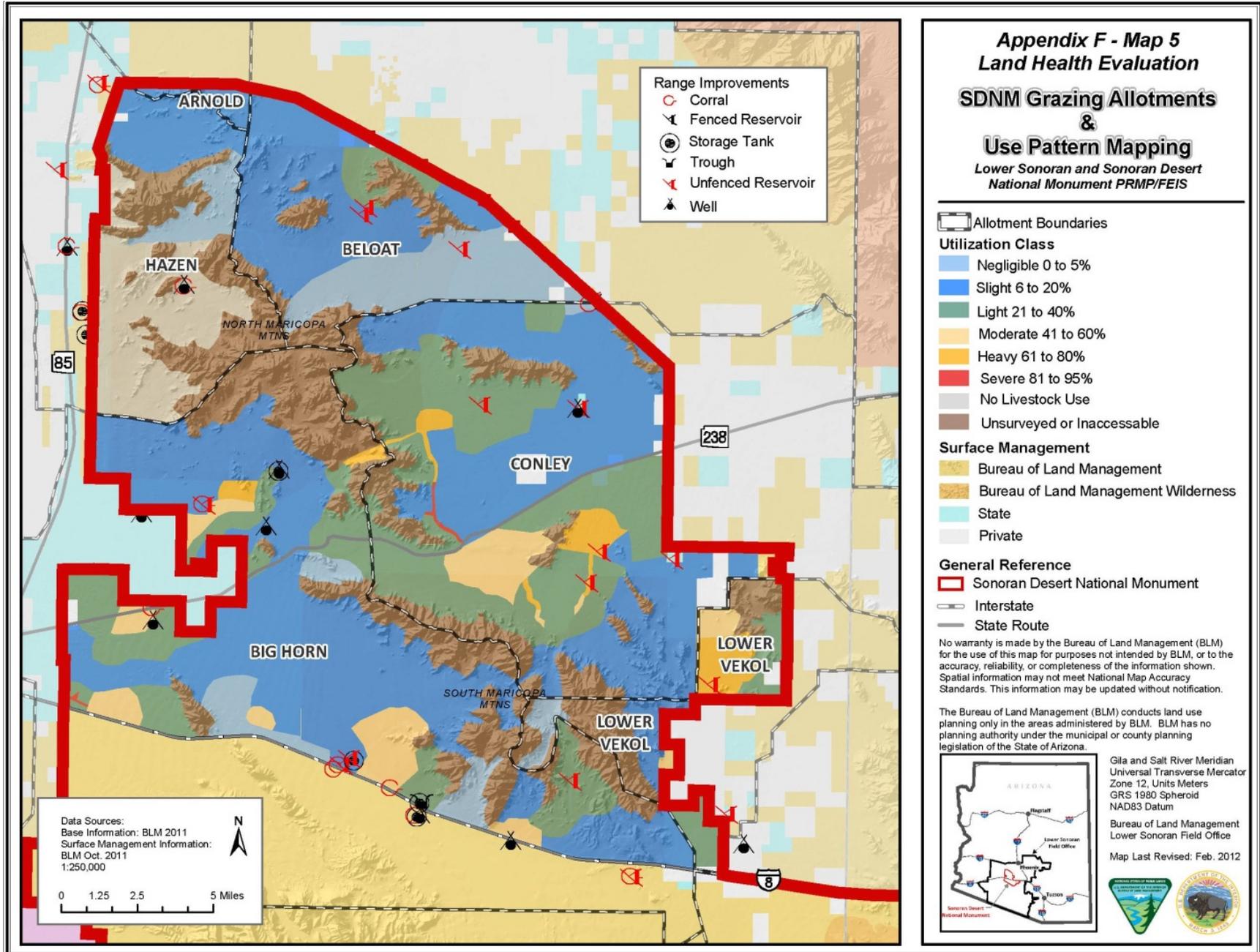
Ephemeral grazing will still be authorized for these grazing permits if the authorized officer determines that there will be available ephemeral forage. This determination must be based on a prediction of ephemeral forage production and be consistent with Guideline 3-5 "Grazing on designated ephemeral rangeland" (See **Attachment I**, Guidelines for Grazing Administration).











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ATTACHMENT I: ARIZONA RANGELAND HEALTH STANDARDS AND GUIDELINES FOR GRAZING ADMINISTRATION

INTRODUCTION

The Department of the Interior's final rule for Grazing Administration, issued on February 22, 1995, and effective August 21, 1995, requires that Bureau of Land Management (BLM) State Directors develop State or regional standards and guidelines for grazing administration in consultation with BLM Resource Advisory Councils (RAC), other agencies and the public. The final rule provides that fallback standards and guidelines be implemented, if State standards and guidelines are not developed by February 12, 1997. Arizona Standards and Guidelines and the final rule apply to grazing administration on public lands as indicated by the following quotation from the Federal Register, Volume 60, Number 35, page 9955:

"The fundamentals of rangeland health, guiding principles for standards and the fallback standards, address ecological components that are affected by all uses of public rangelands, not just livestock grazing. However, the scope of this final rule, and therefore the fundamentals of rangeland health of USC 4180.1, and the standards and guidelines to be made effective under USC 4180.2, are limited to grazing administration."

Although the process of developing standards and guidelines applies to grazing administration, present rangeland health is the result of the interaction of many factors in addition to grazing by livestock. Other contributing factors may include, but are not limited to, past land uses, land use restrictions, recreation, wildlife, rights-of-way, wild horses and burros, mining, fire, weather, and insects and disease.

With the commitment of BLM to ecosystem and interdisciplinary resource management, the standards for rangeland health as developed in this current process will be incorporated into management goals and objectives. The standards and guidelines for rangeland health for grazing administration, however, are not the only considerations in resolving resource issues.

The following quotations from the Federal Register, Vol. 60, No. 35, page 9956, February 22, 1995, describe the purpose of standards and guidelines and their implementation:

1. "The guiding principles for standards and guidelines require that State or regional standards and guidelines address the basic components of healthy rangelands. The Department believes that by implementing grazing-related actions that are consistent with the fundamentals of CFR 4180.1 and the guiding principles of CFR 4180.2, the long-term health of public rangelands can be ensured.
2. "Standards and guidelines will be implemented through terms and conditions of grazing permits, leases, and other authorizations, grazing-related portions of activity plans (including allotment management plans), and through range improvement-related activities.
3. The Department anticipates that in most cases the standards and guidelines themselves will not be terms and conditions of various authorizations but that the terms and conditions will reflect the standards and guidelines.

4. The Department intends that assessments and corrective actions will be undertaken in priority order as determined by BLM.

5. “The Department will use a variety of data including monitoring records, assessments, and knowledge of the locale to assist in making the “significant progress” determination. It is anticipated that in many cases it will take numerous grazing seasons to determine direction and magnitude of trend. However, actions will be taken to establish significant progress toward conformance as soon as sufficient data are available to make informed changes in grazing practices.”

FUNDAMENTALS & DEFINITIONS OF RANGELAND HEALTH

The Grazing Administration Regulations, at 43 CFR 4180.1, Federal Register Vol. 60, No. 35, pg. 9970, direct that the authorized officer ensures that the following conditions of rangeland health exist:

(a) Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.

(b) Ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.

(c) Water quality complies with State water-quality standards and achieves, or is making significant progress toward achieving, established BLM management objectives such as meeting wildlife needs.

(d) Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal proposed, Category 1 and 2 Federal candidate and other special status species.

These fundamentals focus on sustaining productivity of a rangeland rather than its uses. Emphasizing the physical and biological functioning of ecosystems to determine rangeland health is consistent with the definition of rangeland health as proposed by the Committee on Rangeland Classification, Board of Agriculture, National Research Council (Rangeland Health, 1994, pg. 4 and 5). This committee defines rangeland health “as the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained.” The committee also emphasizes “the degree of integrity of the soil and ecological processes that are most important in sustaining the capacity of rangelands to satisfy values and produce commodities.” The committee also recommends that “The determination of whether a rangeland is healthy, at risk, or unhealthy should be based on the evaluation of three criteria: degree of soil stability and watershed function, integrity of nutrient cycles and energy flow, and presence of functioning mechanisms” (Rangeland Health, 1994, pg. 97-98).

Standards describe conditions necessary to encourage proper functioning of ecological processes on specific ecological sites. An ecological site is the logical and practical ecosystem unit upon which to base an interpretation of rangeland health. Ecological site is defined as “a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and

amounts of vegetation and in its response to management” (Journal of Range Management, 48:279, 1995).

Ecological sites result from the interaction of climate, soils, and landform (slope, topographic position). The importance of this concept is that the “health” of different kinds of rangeland must be judged by standards specific to the potential of the ecological site. Acceptable erosion rates, water quality, productivity of plants and animals, and other features are different on each ecological site.

Since there is wide variation of ecological sites in Arizona, standards and guidelines covering these sites must be general. To make standards and guidelines too specific would reduce the ability of the BLM and interested publics to select specific objectives, monitoring strategies, and grazing permit terms and conditions appropriate to specific land forms.

Ecological sites have the potential to support several different plant communities. Existing communities are the result of the combination of historical and recent uses and natural events. Management actions may be used to modify plant communities on a site. The desired plant community for a site is defined as follows: “Of the several plant communities that may occupy a site, [the desired plant community is] the one that has been identified through a management plan to best meet the plan's objectives for the site. It must protect the site at a minimum” (Journal of Range Management, 48:279, 1995).

Fundamentals (a) and (b) define physical and biological components of rangeland health and are consistent with the definition of rangeland health as defined by the Committee on Rangeland Classification, Board on Agriculture, National Research Council, as discussed in the paragraph above. These fundamentals provide the basis for sustainable rangelands.

Fundamentals (c) and (d) emphasize compliance with existing laws and regulation and therefore define social and political components of rangeland health. Compliance with fundamentals (c) and (d) is accomplished by managing to attain a specific plant community and associated wildlife species present on ecological sites. These desired plant communities are determined in the BLM planning process or, where the desired plant community is not identified, a community may be selected that will meet the conditions of fundamentals (a) and (b) and also adhere to laws and regulations. Arizona Standard 3 is written to comply with fundamentals (c) and (d) and provide a logical combination of Standards and Guidelines for planning and management purposes.

STANDARDS AND GUIDELINES DEFINITIONS

Standards are goals for the desired condition of the biological and physical components and characteristics of rangelands. Standards:

1. Are measurable and attainable; and
2. Comply with various Federal and State statutes, policies, and directives applicable to BLM Rangelands.

Guidelines are management approaches, methods, and practices that are intended to achieve a standard. Guidelines:

1. Typically identify and prescribe methods of influencing or controlling specific public land uses;

2. Are developed and applied consistent with the desired condition and within site capability; and
3. May be adjusted over time.

Implementing Standards & Guidelines

The authorized officer will review existing permitted livestock use, allotment management plans, or other activity plans which identify terms and conditions for management on public land. Existing management practices and levels of use on grazing allotments will be reviewed and evaluated on a priority basis to determine if they meet, or are making significant progress toward meeting, the standards and are in conformance with the guidelines. The review will be interdisciplinary and conducted under existing rules which provide for cooperation, coordination, and consultation with affected individuals, federal, state, and local agencies, tribal governments, private landowners, and interested publics.

This review will use a variety of data, including monitoring records, assessments, and knowledge of the locale to assist in making the significant progress determination. Significance will be determined on a case by case basis, considering site potential, site condition, weather and financial commitment. It is anticipated there will be cases where numerous years will be needed to determine direction and magnitude of trend.

Upon completion of review, the authorized officer shall take appropriate action as soon as practicable but no later than the start of the next grazing year upon determining that the existing grazing management practices or level of use on public land are significant factors contributing to failure to achieve the standards and conform with the guidelines that are made effective under 43 CFR 4180.2. Appropriate action means implementing actions that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with guidelines.

Livestock grazing will continue where significant progress toward meeting standards is being made. Additional activities and practices would not be needed on such allotments. Where new activities or practices are required to assure significant progress toward meeting standards, livestock grazing use can continue contingent upon determinations from monitoring data that the implemented actions are effective in making significant progress toward meeting the standards. In some cases, additional action may be needed as determined by monitoring data over time.

New plans will incorporate an interdisciplinary team approach (Arizona BLM Interdisciplinary Resource Management Handbook, April 1995). The terms and conditions for permitted grazing in these areas will be developed to comply with the goals and objectives of these plans which will be consistent with the standards and guidelines.

ARIZONA STANDARDS & GUIDELINES

Arizona Standards and Guidelines (Standards & Guidelines) for grazing administration have been developed through a collaborative process involving the BLM State S&G Team and the Arizona Resource Advisory Council. Together, through meetings, conference calls, correspondence, and open houses with the public, the BLM State team and RAC prepared Standards & Guidelines to address the minimum requirements outlined in the grazing regulations. The Standards & Guidelines, including the criteria for

meeting Standards and relevant indicators, is an integrated document that conforms to the fundamentals of rangeland health and the requirements of the regulations when taken as a whole.

Upland sites, riparian-wetland areas, and desired resource conditions are each addressed by a Standard and associated Guidelines.

Standard I: Upland Sites

Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Criteria for meeting Standard I:

Soil conditions support proper functioning of hydrologic, energy, and nutrient cycles. Many factors interact to maintain stable soils and healthy soil conditions, including appropriate amounts of vegetative cover, litter, and soil porosity and organic matter. Under proper functioning conditions, rates of soil loss and infiltration are consistent with the potential of the site.

Ground cover in the form of plants, litter, or rock is present in patterns, kind, and amounts sufficient to prevent accelerated erosion for the ecological site and ground cover is increasing as determined by monitoring over an established period of time.

Signs of accelerated erosion are minimal or diminishing for the ecological site as determined by monitoring over an established period of time.

As indicated by such factors as:

- Ground cover,
- Litter,
- Live vegetation, amount and type (e.g., grass, shrubs, trees, etc.),
- Rock,
- Signs of erosion,
- Flow pattern,
- Gullies,
- Rills, and
- Plant pedestaling.

Exceptions and exemptions (where applicable): None

Guidelines:

Guideline 1-1: Management activities will maintain or promote groundcover that will provide for infiltration, permeability, soil moisture storage, and soil stability appropriate for the ecological sites within management units. The groundcover should maintain soil organisms and plants and animals to support the hydrologic and nutrient cycles, and energy flow. Groundcover and signs of erosion are surrogate measures for hydrologic and nutrient cycles and energy flow.

Guideline 1-2: When grazing practices alone are not likely to restore areas of low infiltration or permeability, land management treatments may be designed and implemented to attain improvement.

Standard 2: Riparian-Wetland Sites

Riparian-wetland areas are in properly functioning condition.

Criteria for meeting Standard 2:

Stream channel morphology and functions are appropriate for proper functioning condition for existing climate, landform, and channel reach characteristics. Riparian-wetland areas are functioning properly when adequate vegetation, land form, or large woody debris is present to dissipate stream energy associated with high water flows.

Riparian-wetland functioning condition assessments are based on examination of hydrologic, vegetative, soil and erosion-deposition factors. BLM has developed a standard checklist to address these factors and make functional assessments. Riparian-wetland areas are functioning properly as indicated by the results of the application of the appropriate checklist.

The checklist for riparian areas is in Technical Reference 1737-9 “Process for Assessing Proper Functioning Condition.” The checklist for wetlands is in Technical Reference 1737-11 “Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas.” These checklists are reprinted on the pages following the Guidelines for Standard 3.

As indicated by such factors as:

- Gradient,
- Width/depth ratio,
- Channel roughness and sinuosity of stream channel,
- Bank stabilization,
- Reduced erosion,
- Captured sediment,
- Ground-water recharge,

- Dissipation of energy by vegetation.

Exceptions and exemptions (where applicable):

- Dirt tanks, wells, and other water facilities for the purpose of providing water for livestock or wildlife that have not been determined through local planning efforts to provide for riparian or wetland habitat are exempt;
- Water impoundments permitted for construction, mining, or similar activities are exempt.

Guidelines:

Guideline 2-1: Management practices maintain or promote sufficient vegetation to maintain, improve or restore riparian-wetland functions of energy dissipation, sediment capture, groundwater recharge and stream bank stability, thus promoting stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform.

Guideline 2-2: New facilities are located away from riparian-wetland areas if they conflict with achieving or maintaining riparian-wetland function. Existing facilities are used in a way that does not conflict with riparian-wetland functions or are relocated or modified when incompatible with riparian-wetland functions.

Guideline 2-3: The development of springs and seeps or other projects affecting water and associated resources shall be designed to protect ecological functions and processes.

Standard 3: Desired Resource Conditions

Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained.

Criteria for meeting Standard 3:

Upland and riparian-wetland plant communities meet desired plant community objectives. Plant community objectives are determined with consideration for all multiple uses. Objectives also address native species, and the requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, Clean Water Act, and appropriate laws, regulations, and policies.

Desired plant community objectives will be developed to assure that soil conditions and ecosystem function described in Standard 1 and Standard 2 are met. They detail a site-specific plant community objective, which when obtained, will meet rangeland health standards, State water-quality standards, and adequate habitat for endangered, threatened, and sensitive species. Thus, desired plant community objectives will be used as an indicator of ecosystem function and rangeland health.

As indicated by such factors as:

- Composition,
- Structure,

- Distribution.

Exceptions and exemptions (where applicable):

- Ecological sites or stream reaches on which a change in existing vegetation is physically, biologically, or economically impractical.

Guidelines:

Guideline 3-1: The use and perpetuation of native species will be emphasized. However, when restoring or rehabilitating disturbed or degraded rangelands, non-intrusive, non-native plant species are appropriate for use where native species (a) are not available, (b) are not economically feasible, (c) cannot achieve ecological objectives as well as non-native species, or (d) cannot compete with already established non-native species.

Guideline 3-2: Conservation of Federal threatened or endangered, proposed, candidate, and other special status species is promoted by the maintenance and restoration of their habitats.

Guideline 3-3: Management practices maintain, restore, or enhance water quality in conformance with State and Federal standards.

Guideline 3-4: Intensity, season and frequency of use, and distribution of grazing use should provide for growth and reproduction of plant species needed to reach desired plant community objectives.

Guideline 3-5: Grazing on designated ephemeral (annual and perennial) rangeland may be authorized if the following conditions are met:

- Ephemeral vegetation is present in draws, washes, and under shrubs and has grown to usable levels at the time grazing begins;
- Sufficient surface and subsurface soil moisture exists for continued plant growth;
- Serviceable waters are capable of providing for proper grazing distribution;
- Sufficient annual vegetation will remain on site to satisfy other resource concerns, (i.e., watershed, wildlife, wild horses and burros); and
- Monitoring is conducted during grazing to determine if objectives are being met.

Guideline 3-6: Management practices will target populations of noxious weeds that can be controlled or eliminated by approved methods.

Guideline 3-7: Management practices to achieve desired plant communities will consider protection and conservation of known cultural resources, including historical and prehistoric sites and plants of significance to Native American people.

Lotic and Lentic Checklist

General Instructions:

1. The concept “relative to capability” applies wherever it may be inferred;
2. This checklist constitutes the minimum national standards required to determine proper functioning condition of lotic or lentic riparian-wetland areas;
3. As a minimum, an ID team will use this checklist to determine the degree of function of a lotic or lentic riparian-wetland area;
4. Mark one box for each element. Elements are numbered for the purpose of cataloging comments. The numbers do not declare importance;
5. For any item marked “No,” the severity of the condition must be explained in the “Remarks” section and must be a subject for discussion with the ID team in determining riparian-wetland functionality. Using the “Remarks” section to explain items marked “Yes” is encouraged but not required;
6. Based on the ID team's discussion, “functional rating” will be resolved and the checklist's summary section will be completed;
7. Establish photo points where possible to document the site.

Form may be obtained by contacting the BLM office.

ATTACHMENT 2: SDNM PRESIDENTIAL PROCLAMATION

PRESIDENTIAL PROCLAMATION 7397 OF JANUARY 17, 2001

THE WHITE HOUSE Office of the Press Secretary For Immediate Release, January 17, 2001
ESTABLISHMENT OF THE SONORAN DESERT NATIONAL MONUMENT BY THE PRESIDENT OF
THE UNITED STATES OF AMERICA

The Sonoran Desert National Monument is a magnificent example of untrammelled Sonoran desert landscape. The area encompasses a functioning desert ecosystem with an extraordinary array of biological, scientific, and historic resources. The most biologically diverse of the North American deserts, the monument consists of distinct mountain ranges separated by wide valleys, and includes large saguaro cactus forest communities that provide excellent habitat for a wide range of wildlife species.

The monument's biological resources include a spectacular diversity of plant and animal species. The higher peaks include unique woodland assemblages, while the lower elevation lands offer one of the most structurally complex examples of palo verde/mixed cacti association in the Sonoran Desert. The dense stands of leguminous trees and cacti are dominated by saguaros, palo-verde trees, ironwood, prickly pear, and cholla. Important natural water holes, known as tinajas, exist throughout the monument. The endangered acuña pineapple cactus is also found in the monument.

The most striking aspect of the plant communities within the monument are the abundant saguaro cactus forests. The saguaro is a signature plant of the Sonoran Desert. Individual saguaro plants are indeed magnificent, but a forest of these plants, together with the wide variety of trees, shrubs, and herbaceous plants that make up the forest community, is an impressive site to behold. The saguaro cactus forests within the monument are a national treasure, rivaling those within the Saguaro National Park.

The rich diversity, density, and distribution of plants in the Sand Tank Mountains area of the monument is especially striking and can be attributed to the management regime in place since the area was withdrawn for military purposes in 1941. In particular, while some public access to the area is allowed, no livestock grazing has occurred for nearly 50 years. To extend the extraordinary diversity and overall ecological health of the Sand Tanks Mountains area, land adjacent and with biological resources similar to the area withdrawn for military purposes should be subject to a similar management regime to the fullest extent possible.

The monument contains an abundance of packrat middens, allowing for scientific analysis of plant species and climates in past eras. Scientific analysis of the midden shows that the area received far more precipitation 20,000 years ago, and slowly became more arid. Vegetation for the area changed from juniper-oak-pinon pine woodland to the vegetation found today in the Sonoran Desert, although a few plants from the more mesic period, including the Kofa Mountain barberry, Arizona rosewood, and junipers, remain on higher elevations of north-facing slopes. The lower elevations and flatter areas of the monument contain the creosote-bursage plant community. This plant community thrives in the open expanses between the mountain ranges, and connects the other plant communities together. Rare patches of desert grassland can also be found throughout the monument, especially in the Sand Tank Mountains area. The washes in the area support a much denser vegetation community than the

surrounding desert, including mesquite, ironwood, palo verde, desert honeysuckle, chuperosa, and desert willow, as well as a variety of herbaceous plants.

This vegetation offers the dense cover bird species need for successful nesting, foraging, and escape, and birds heavily use the washes during migration.

The diverse plant communities present in the monument support a wide variety of wildlife, including the endangered Sonoran pronghorn, a robust population of desert bighorn sheep, especially in the Maricopa Mountains area, and other mammalian species such as mule deer, javelina, mountain lion, gray fox, and bobcat. Bat species within the monument include the endangered lesser long-nosed bat, the California leaf-nosed bat, and the cave myotis. Over 200 species of birds are found in the monument, including 59 species known to nest in the Vekol Valley area. Numerous species of raptors and owls inhabit the monument, including the elf owl and the western screech owl. The monument also supports a diverse array of reptiles and amphibians, including the Sonoran desert tortoise and the red-backed whiptail. The Bureau of Land Management has designated approximately 25,000 acres of land in the Maricopa Mountains area as critical habitat for the desert tortoise. The Vekol Valley and Sand Tank Mountain areas contain especially diverse and robust populations of amphibians. During summer rainfall events, thousands of Sonoran green toads in the Vekol Valley can be heard moving around and calling out.

The monument also contains many significant archaeological and historic sites, including rock art sites, lithic quarries, and scattered artifacts. Vekol Wash is believed to have been an important prehistoric travel and trade corridor between the Hohokam and tribes located in what is now Mexico. Signs of large villages and permanent habitat sites occur throughout the area, and particularly along the bajadas of the Table Top Mountains. Occupants of these villages were the ancestors of today's O'odham, Quechan, Cocopah, Maricopa, and other tribes. The monument also contains a much used trail corridor 23 miles long in which are found remnants of several important historic trails, including the Juan Bautista de Anza National Historic Trail, the Mormon Battalion Trail, and the Butterfield Overland Stage Route.

Section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 USC 431), authorizes the President, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and to reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected.

WHEREAS, it appears that it would be in the public interest to reserve such lands as a national monument to be known as the Sonoran Desert National Monument.

NOW, THEREFORE, I, WILLIAM J. CLINTON, President of the United States of America, by the authority vested in me by section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 USC 431), do proclaim that there are hereby set apart and reserved as the Sonoran Desert National Monument, for the purpose of protecting the objects identified above, all lands and interest in lands owned or controlled by the United States within the boundaries of the area described on the map entitled "Sonoran Desert National Monument" attached to and forming a part of this proclamation. The Federal land and interests in land reserved consist of approximately 486,149 acres, which is the smallest area compatible with the proper care and management of the objects to be protected.

For the purpose of protecting the objects identified above, all motorized and mechanized vehicle use off road will be prohibited, except for emergency or authorized administrative purposes. Nothing in this proclamation shall be deemed to enlarge or diminish the jurisdiction of the State of Arizona with respect to fish and wildlife management.

The establishment of this monument is subject to valid existing rights.

All Federal lands and interests in lands within the boundaries of this monument are hereby appropriated and withdrawn from all forms of entry, location, selection, sale, or leasing or other disposition under the public land laws, including but not limited to withdrawal from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing, other than by exchange that furthers the protective purposes of the monument. Lands and interests in lands within the monument not owned by the United States shall be reserved as a part of the monument upon acquisition of title thereto by the United States.

This proclamation does not reserve water as a matter of Federal law nor relinquish any water rights held by the Federal Government existing on this date. The Federal land management agencies shall work with appropriate State authorities to ensure that water resources needed for monument purposes are available.

The Secretary of the Interior shall manage the monument through the Bureau of Land Management, pursuant to applicable legal authorities, to implement the purposes of this proclamation. That portion identified as Area A on the map, however, shall be managed under the management arrangement established by section 3 of Public Law No. 99-606, 100 Stat. 3460-61, until November 6, 2001, at which time, pursuant to section 5(a) of Public Law No. 99-606, 100 Stat. 3462-63, the military withdrawal terminates. At that time, the Secretary of the Interior shall assume management responsibility for Area A through the Bureau of Land Management.

The Secretary of the Interior shall prepare a management plan that addresses the actions, including road closures or travel restrictions, necessary to protect the objects identified in this proclamation. Laws, regulations, and policies followed by the Bureau of Land Management in issuing and administering grazing permits or leases on all lands under its jurisdiction shall continue to apply with regard to the lands in the monument; provided, however, that grazing permits on Federal lands within the monument south of Interstate Highway 8 shall not be renewed at the end of their current term; and provided further, that grazing on Federal lands north of Interstate 8 shall be allowed to continue only to the extent that the Bureau of Land Management determines that grazing is compatible with the paramount purpose of protecting the objects identified in this proclamation.

Nothing in this proclamation shall be deemed to revoke any existing withdrawal, reservation, or appropriation; however, the national monument shall be the dominant reservation. Nothing in this proclamation shall preclude low level overflights of military aircraft, the designation of new units of special use airspace, or the use or establishment of military flight training routes over the lands included in this proclamation.

In order to protect the public during operations at the adjacent Barry M. Goldwater Range, and to continue management practices that have resulted in an exceptionally well preserved natural resource, the current procedures for public access to the portion of the monument depicted as Area A on the

attached map shall remain in full force and effect, except to the extent that the United States Air Force agrees to different procedures which the Bureau of Land Management determines are compatible with the protection of the objects identified in this proclamation.

Warning is hereby given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

IN WITNESS WHEREOF, I have hereunto set my hand this seventeenth day of January, in the year of our Lord two thousand one, and of the Independence of the United States of America the two hundred and twenty-fifth.

WILLIAM J. CLINTON

ATTACHMENT 3: KEY AREA DATA

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
Big Horn Allotment						
BH-1 (2009)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Ditaxis	ARNE2	3%	3%	
		Forbs				
		Annuals		7%	7%	
		Ditaxis	ARNE2	3%	3%	
		Shrubs				
		Burrobush	HYSA	13%	3%	
		Big Bursage	AMAM2	2%	1%	
		Desert Lavender	HYEM	1%	5%	
		Anderson Wolfberry	LYAN	42%	10%	
		Creosote	LATR2	5%	5%	
		Sweetbush Bebbia	BEJU	1%	1%	
		Trees				
		Blue Palo Verde	PAFL6	3%	2%	
		Ironwood	OLTE	8%	8%	
		Mesquite	PRVE	3%	3%	
		Catclaw Acacia	ACGR	7%	7%	
		Total		100%	57%	
		BH-2 (2009)	Limy Fan	Grasses		
Annuals				8%	5%	
Forbs						
Annuals				8%	8%	
Shrubs						
Triangle-leaf Bursage	AMDE4			6%	6%	
Saguaro	CAGI10			1%	1%	
Ratany	KRPA			0%	0%	
Anderson Wolfberry	LYAN			2%	1%	
Creosote	LATR2			64%	60%	
Staghorn Cholla	CYVE3			1%	1%	
Trees						
Little-leaf Palo Verde	PAMI5			1%	1%	
Ironwood	OLTE			11%	1%	
Total				100%	83%	

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-3 (2009)	Limy Fan	Grasses				
		Annuals		5%	5%	
		Forbs				
		Ditaxis	ARNE2	1%	0%	
		Annuals		8%	8%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	16%	16%	
		Ratany	KRPA	4%	4%	
		Creosote	LATR2	50%	50%	
		Anderson Wolfberry	LYAN	4%	1%	
		Trees				
		Little-leaf Palo Verde	PAMI5	4%	1%	
		Ironwood	OLTE	8%	1%	
		Total		100%	85%	
BH-4 (2009)	Sandy Wash	Grasses				
		Annuals		4%	4%	
		Forbs				
		Annuals		6%	6%	
		Ditaxis	ARNE2	10%	7%	
		Mat Spurge	EUPHO	3%	3%	
		Shrubs				
		Burrobush	HYSA	10%	4%	
		Sweetbush Bebbia	BEJU	3%	1%	
		Anderson Wolfberry	LYAN	18%	13%	
		Creosote	LATR2	4%	2%	
		Vine Milkweed	FUCY	1%	1%	
		Trees				
		Blue Palo Verde	PAFL6	22%	17%	
		Ironwood	OLTE	5%	3%	
		Catclaw Acacia	ACGR	14%	14%	
		Total		100%	75%	

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-5 (2009)	Limy Upland Deep	Grasses				
		Bush Muhly	MUPO2	1%	1%	
		Annuals		3%	3%	
		Forbs				
		Ditaxis Annuals	ARNE2	3%	3%	
		Annuals		5%	5%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	20%	14%	
		Ratany	KRPA	6%	4%	
		Creosote	LATR2	57%	57%	
		Cholla	OPUNTIA spp.	1%	1%	
		Trees				
		Little-leaf Palo Verde	PAMI5	2%	1%	
		Total		100%	89%	
BH-6 (2009)	Sandy Loam Deep	Grasses				
		Big Galleta	PLRI3	T	T	
		Bush Muhly	MUPO2	1%	1%	
		Annuals		3%	3%	
		Forbs				
		Annuals		3%	3%	
		Globemallow	SPAM2	1%	1%	
		Janusia	JAGR	T		
		Shrubs				
		Triangle-leaf Bursage	AMDE4	20%	20%	
		Creosote	LATR2	42%	19%	
		White Bursage	AMDU2	13%	13%	
		Anderson Wolfberry	LYAN	2%	1%	
		Catclaw Acacia	ACGR	2%	2%	
		Whitehorn Acacia	ACGR2	2%	2%	
		Burro Bush	HYS A	1%	1%	
		Trees				
		Mesquite	BRVE	2%	2%	
		Ironwood	OLTE	3%	3%	
		Little-leaf Palo Verde	PAMI5	5%	5%	
Total		100%	76%			

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-7 (2009)	Loamy Bottom	Grasses				
		Big Galleta	PLR13	13%	10%	
		Annuals		8%	8%	
		Forbs				
		Annuals		5%	5%	
		Ditaxis	ARNE2	15%	9%	
		Globemallow	SPAM2	2%	1%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	15%	2%	
		Anderson Wolfberry	LYAN	3%	3%	
		Brittlebush	ENFA	1%	0%	
		Trixis	TRCA8	2%	2%	
		Desert Lavender	HYEM	1%	0%	
		White Ratany	KRGR	3%	3%	
		Creosote	LATR2	21%	17%	
		Trees				
		Blue Palo Verde	PAFL6	4%	3%	
		Ironwood	OLTE	2%	2%	
		Catclaw Acacia	ACGR	6%	5%	
		Total		100%	70%	

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-8 (2009)	Sandy Wash	Grasses				
		Annuals		6%	6%	
		Forbs				
		Annuals		7%	7%	
		Mat Spurge	EUPHO	1%	1%	
		Globemallow	SPAM2	3%	3%	
		Shrubs				
		Limberbush	JACA2	3%	1%	
		White Ratany	KRGR	2%	1%	
		Big Bursage	AMAM2	4%	1%	
		Christmas Cholla	CYLE8	3%	3%	
		Desert Lavender	HYEM	2%	1%	
		Triangle-leaf Bursage	ANDE4	4%	2%	
		Saguaro	CAGI10	1%	1%	
		Jumping Cholla	CYFU10	1%	1%	
		Coulter's Bricklebush	BRCO	1%	1%	
		Creosote	LATR2	5%	2%	
		Desert Hackberry	CEPA	1%	1%	
		Trees				
		Little-leaf Palo Verde	PAMI5	7%	7%	
		Blue Palo Verde	PAFL6	10%	10%	
		Ironwood	OLTE	2%	2%	
		Catclaw Acacia	ACGR	8%	8%	
		Whitethorn Acacia	ACCO2	8%	4%	
		Total		100%	71%	

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-9 (2009)	Limy Upland	Grasses				
		Fluffgrass	ERPU14	1%	1%	
		Annuals		5%	5%	
		Forbs				
		Ditaxis	ARNE2	1%	1%	
		Mat Spurge	EUPHO	5%	4%	
		Annuals		5%	5%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	34%	34%	
		Ratany	KRPA	4%	3%	
		Creosote	LATR2	17%	17%	
		Buck Horn Cholla	CYACM	6%	5%	
		Saguaro	CAGI10	T		
		Limberbush	JACA2	T		
		Trees				
		Little-leaf Palo Verde	PAMI5	18%	7%	
		Ironwood	OLTE	4%	2%	
Total		100%	84%			
BH-12 (2009)	Limy Upland	Grasses				
		Annuals		4%	4%	
		Forbs				
		Buckwheat	ERIOG	4%	0%	
		Annuals		3%	3%	
		Shrubs				
		Anderson Wolfberry	LYAN	5%	5%	
		Fishook Pincushion	MAMMI	2%	1%	
		Hedgehog	ECEN	1%	1%	
		Brittlebush	ENFA	2%	2%	
		Triangle-leaf Bursage	AMDE4	12%	12%	
		Christmas Cholla	CYLE8	13%	6%	
		Creosote	LATR2	35%	19%	
		Trees				
		Ironwood	OLTE	2%	1%	
		Little-leaf Palo Verde	PAMI5	14%	9%	
		Saguaro	CAGI10	3%	2%	
Total		100%	65%			

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BH-13 (2009)	Limy Upland Deep	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		6%	6%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	7%	6%	
		White Bursage	AMDU2	3%	3%	
		White Ratany	KRGR	7%	7%	
		Creosote	LATR2	71%	71%	
		Staghorn Cholla	CYVE3	3%	1%	
		Teddybear Cholla	CYBI9	1%	1%	
		Trees				
		Little-leaf Palo Verde	PAMI5	T	T	
		Total		100%	98%	
Beloat Allotment						
B-1 (2004)	Granitic Hills	Grasses				
		Annuals		10%	10%	
		Forbs				
		Annuals		5%	5%	
		Shrubs				
		Brittlebush	CLDR	12%	10%	
		Triangle-leaf Bursage	JAGR	25%	25%	
		Anderson Wolfberry	SACY2	2%	2%	
		Creosote	AMDE4	18%	13%	
		Pincushion	LYAN	1%	1%	
		Buckhorn Cholla	CYACM	2%	2%	
		Trees				
		Little-leaf Palo Verde	PAMI5	25%	15%	
		Total		100%	83%	

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
B-2 (2004)	Sandy Wash	Grasses				
		Annuals		10%	10	
		Forbs				
		Annuals		15%	15%	
		Shrubs				
		Burrobush	HYSA	1%	1%	
		Triangle-leaf Bursage	AMDE4	7%	2%	
		Anderson Wolfberry	LYAN	31%	10%	
		Creosote	LATR2	26%	5%	
		Trees				
		Blue Palo Verde	PAFL6	6%	6%	
		Catclaw Acacia	ACGR	2%	2%	
		Mesquite	PRVE	2%	2%	
		Total		100%	53%	
B-4 (2004)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Forbs				
		Annuals		7%	7%	
		Shrubs				
		Drummond's Clematis	CLDR	7%	2%	
		Janusia	JAGR	1%	1%	
		Vine Milkweed	SACY2	17%	8%	
		Triangle-leaf Bursage	AMDE4	1%	1%	
		Anderson Wolfberry	LYAN	15%	5%	
		Trees				
		Blue Palo Verde	PAFL6	25%	20%	
		Catclaw Acacia	ACGR	22%	10%	
		Total		100%	59%	

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
B-5 (2004)	Loamy Bottom	Grasses				
		Big Galleta	PLR13	23%	10%	
		Annuals		10%	10%	
		Forbs				
		Annuals		15%	15%	
		Globemallow	SPAM2	1%	1%	
		Shrubs				
		Burrobush	HYSA	1%	0%	
		Anderson Wolfberry	LYAN	29%	18%	
		Creosote	LATR2	2%	2%	
		Vine Milkweed	SACY2	12%	0%	
		Trees				
		Catclaw Acacia	ACGR	7%	7%	
		Total		100%	64%	
B-8 (2004)	Limy Fan	Grasses				
		Annual		10%	10%	
		Forbs				
		Annual		15%	15%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	9%	8%	
		Creosote	LATR2	65%	60%	
		Christmas Cholla	CYLE8	1%	1%	
		Trees				
		Mesquite	PRVE	1%	1%	
Total		100%	95%			

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
B-9 (2004)	Limy Upland	Grasses				
		Annuals		4%	4%	
		Forbs				
		Spurge	EUPHO	2%	0%	
		Desert Trumpet	ERIN4	1%	1%	
		Annuals		3%	3%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	17%	17%	
		White Ratany	KRGR	13%	10%	
		Mormon Tea	EPHED	2%	2%	
		White Bursage	AMDU2	1%	1%	
		Creosote	LATR2	34%	19%	
		Hedgehog	ECEN	1%	1%	
		Brittlebush	ENFA	2%	2%	
		Trees				
		Little-leaf Palo Verde	PAMI5	19%	9%	
		Ironwood	OLTE	1%	1%	
Total		100%	70%			
Conley Allotment						
C-1 (2009)	Sandy Wash	Grasses				
		Annual		6%	6%	
		Bush Muhly	MUPO2	2%	2%	
		Forbs				
		Annual		7%	7%	
		Globemallow	SPAM2	1%	1%	
		Arrowleaf Milkweed	FUCY	1%	1%	
		Drommond's Clematis	CLDR	2%	2%	
		Ditaxis	ARNE2	1%	1%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	22%	2%	
		Anderson Wolfberry	LYAN	28%	9%	
		Creosote	LATR2	10%	4%	
		Trees				
		Blue Palo Verde	PAFL6	10%	10%	
		Ironwood	OLTE	1%	1%	
		Catclaw Acacia	ACGR	2%	2%	
Mesquite	PRVE	7%	7%			
Total		100%	55%			

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
C-2 (2009)	Limy Fan	Grasses				
		Annual		5%	5%	
		Forbs				
		Annual		7%	7%	
		Shrubs				
		Creosote	LATR2	84%	60%	
		Trees				
Mesquite	PRVE	2%	2%			
Total		100%	55%			
C-3 (2009)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Forbs				
		Annuals		9%	9%	
		Ditaxis	ARNE2	2%	2%	
		Tobacco	NIOB	2%	2%	
		Wirelettuce	STPA3	2%	2%	
		Shrubs				
		Big Bursage	AMAM2	25%	4%	
		Drummond's Clematis	CLDR	2%	2%	
		Desert Broom	BASA2	2%	1%	
		Creosote	LATR2	1%	1%	
		Trees				
		Catclaw Acacia	ACGR	6%	6%	
		Blue Palo Verde	PAFL6	42%	20%	
Mesquite	PRVE	2%	2%			
Total		100%	56%			
C-4 (2009)	Limy Fan	Grasses				
		Annual		6%	6%	
		Forbs				
		Annual		9%	9%	
		Shrubs				
		Greythorn	ZIOB	3%	1%	
		Anderson Wolfberry	LYAN	3%	1%	
		Barrel Cactus	FEWI	T		
		Triangle-leaf Bursage	AMDE4	7%	7%	
		Creosote	LATR2	70%	60%	
		Trees				
		Blue Palo Verde	PAFL6	2%	1%	
Total		98%	85%			

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
C-5 (2009)	Limy Upland	Grasses				
		Annuals		4%	4%	
		Big Galleta	PLRI3	1%	1%	
		Forbs				
		Annuals		2%	2%	
		Shrubs				
		White Ratany	KRGR	4%	4%	
		Creosote	LATR2	75%	19%	
		Triangle-leaf Bursage	AMDE4	2%	2%	
		White Bursage	AMDU2	10%	10%	
		Total		100%	44%	
C-7 (2009)	Sandy Wash	Grasses				
		Annuals		8%	8%	
		Forbs				
		Annuals		10%	10%	
		Shrubs				
		Burrobush	HYSA	28%	3%	
		Arrowleaf Milkweed	FUCY	1%	1%	
		Anderson Wolfberry	LYAN	17%	13%	
		Creosote	LATR2	2%	1%	
		Big Bursage	AMAM2	3%	2%	
		Trees				
		Blue Palo Verde	PAFL6	11%	11%	
		Ironwood	OLTE	7%	7%	
		Mesquite	PRVE	2%	1%	
		Catclaw Acacia	ACGR	11%	9%	
Total		100%	66%			

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*
C-9 (2009)	Loamy Bottom	Grasses			
		Big Galleta	PLRI3	12%	10%
		Bush Muhly	MUPO2	3%	3%
		Annuals		7%	7%
		Forbs			
		Globemallow	SPAM2	2%	2%
		Ditaxis	ARNE2	3%	3%
		Annuals		7%	7%
		Shrubs			
		Triangle-leaf Bursage	AMDE4	2%	2%
		Creosote	LATR2	4%	2%
		Drummond's Clematis	CLDR	1%	0%
		Arrowleaf Milkweed	FUCY	1%	0%
		Coulter's Brickelbush	BRCO	1%	1%
		Anderson Wolfberry	LYAN	37%	18%
		Trixis	TRCA8	2%	2%
		Trees			
		Blue Palo Verde	PAFL6	10%	9%
		Mesquite	PRVE	6%	6%
		Catclaw Acacia	ACGR	2%	1%
Total		100%	73%		
C-10 (2009)	Limy Upland	Grasses			
		Annuals		4%	4%
		Forbs			
		Annuals		3%	3%
		Shrubs			
		Triangle-leaf Bursage	AMDE4	8%	8%
		Creosote	LATR2	54%	19%
		Ocotillo	FOSP2	3%	2%
		Anderson Wolfberry	LYAN	1%	1%
		White Ratany	KRGR	11%	10%
		Trees			
		Little-leaf Bursage	AMDE4	8%	8%
		Creosote	LATR2	54%	19%
		Ocotillo	FOSP2	3%	2%
		Anderson Wolfberry	LYAN	1%	1%
		White Ratany	KRGR	11%	10%
		Little-leaf Palo Verde	PAMI5	16%	8%
Total		100%	55%		

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
Hazen Allotment						
H-1 (2009)	Limy Fan	Grasses				
		Annuals		5%	5%	
		Forbs				
		Annuals		8%	8%	
		Shrubs				
		White Ratany	KRGR	2%	2%	
		Triangle-leaf Bursage	AMDE4	11%	11%	
		Creosote	LATR2	64%	60%	
		Saguaro	CAGI10	2%	2%	
		Trees				
		Little-leaf Palo Verde	PAMI5	8%	2%	
		Total		100%	90%	
H-2 (2009)	Limy Upland Deep	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		2%	2%	
		Shrubs				
		White Ratany	KRGR	2%	2%	
		Triangle-leaf Bursage	AMDE4	13%	13%	
		Wolfberry	LYEX	5%	0%	
		Creosote	LATR2	66%	66%	
		Saguaro	CAGI10	4%	0%	
		Trees				
		Little-leaf Palo Verde	PAMI5	5%	1%	
Total		100%	87%			

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
H-4 (2009)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Forbs				
		Annuals		7%	7%	
		Arrowleaf Milkweed	FUCY	1%	1%	
		Shrubs				
		Burrobush	HYSA	28%	5%	
		Triangle-leaf Bursage	AMDE4	3%	2%	
		Sweetbush Bebbia	BEJU	3%	3%	
		Anderson Wolfberry	LYAN	15%	5%	
		Creosote	LATR2	4%	4%	
		Trees				
		Blue Palo Verde	PAFL6	14%	14%	
		Little-leaf Palo Verde	PAMI5	5%	5%	
		Mesquite	PRVE	8%	5%	
		Whitethorn Acacia	ACCO2	3%	3%	
		Catclaw Acacia	ACGR	4%	4%	
		Total		100%	63%	
		H-5 (2009)	Granitic Hills	Grasses		
Annuals				10%	10%	
Forbs						
Annuals				7%	7%	
Shrubs						
Brittlebush	ENFA			3%	3%	
Triangle-leaf Bursage	AMDE4			7%	7%	
Wolfberry	LYEX			3%	3%	
Creosote	LATR2			38%	12%	
Buckhorn Cholla	CYACM			11%	10%	
Barrel Cactus	FECY			1%		
Trees						
Little-leaf Palo Verde	PAMI5			20%	15%	
Total				100%	67%	

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
H-6 (2009)	Limy Upland Deep	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		2%	2%	
		Shrubs				
		Ratany	KRPA	12%	11%	
		White Bursage	AMDU2	3%	2%	
		Triangle-leaf Bursage	AMDE4	6%	5%	
		Creosote	LATR2	74%	74%	
		Total		100%	97%	
Lower Vekol Allotment						
LV-1 (2009)	Loamy Bottom	Grasses				
		Big Galleta	PLRI3	44%	35%	
		Bush Muhly	MUPO	22%	2%	
		Annuals		4%	4%	
		Forbs				
		Annuals		4%	4%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	15%	10%	
		Anderson Wolfberry	LYAN	11%	9%	
		Creosote	LATR2	6%	6%	
		Trees				
		Mesquite	PRVE	6%	6%	
		Catclaw Acacia	ACGR	8%	6%	
		Total		100%	82%	
LV-2 (2009)	Limy Upland Deep	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		4%	4%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	15%	10%	
		Anderson Wolfberry	LYAN	11%	9%	
		Creosote	LATR2	6%	6%	
		Trees				
		Mesquite	PRVE	6%	6%	
		Catclaw Acacia	ACGR	8%	6%	
		Total		100%	82%	

Table F-17
Vegetation Composition Data

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
LV-3 (2009)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Forbs				
		Ditaxis	ARNE2	1%	1%	
		Annuals		7%	7%	
		Shrubs				
		Burrobush	HYSA	1%	1%	
		Triangle-leaf Bursage	AMDE4	9%	2%	
		Desert Hackberry	CEPA	1%	1%	
		Anderson Wolfberry	LYAN	5%	2%	
		Creosote	LATR2	29%	8%	
		Trees				
		Blue Palo Verde	PAFL6	11%	11%	
		Ironwood	OLTE	1%	1%	
		Whitethorn Acacia	ACCO2	8%	4%	
		Catclaw Acacia	ACGR	5%	3%	
		Mesquite	PRVE	17%	7%	
		Total		100%	53%	
LV-4 (2009)	Limy Upland	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		3%	3%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	32%	32%	
		Ratany	KRPA	1%	1%	
		Creosote	LATR2	49%	19%	
		Ocotillo	FOSP2	1%	1%	
		Staghorn	CYVE3	1%	1%	
		Jumping Cholla	CYFU10	5%	5%	
		Trees				
		Saguaro	CAGI10	1%	1%	
		Little-leaf Palo Verde	PAMI5	4%	4%	
		Total		100%	70%	

**Table F-17
Vegetation Composition Data**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
Arnold Allotment						
A-4 (2009)	Limy Fan	Grasses				
		Annuals		5%	5%	
		Forbs				
		Annuals		8%	8%	
		Ditaxis	ARNE2	3%	3%	
		Spurge	EUPHO	8%	8%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	6%	6%	
		Creosote	LATR2	63%	46%	
		Ratany	KRPA	7%	7%	
		Total		100%	83%	

*ESD: Ecological Site Description. Each NRCS Ecological Site Description provides a listing of plant species composition that could be present (or “allowed”) on the site. The “% Present” column indicates what was present on the site.

**Table F-18
Departure from Ecological Site Description**

Site	Soil/Site Stability	Hydrologic Function	Biotic Integrity
Big Horn			
BH-1	None to slight	None to slight	Slight to moderate
BH-2	Slight to moderate	Slight to moderate	Slight to moderate
BH-4	None to slight	None to slight	None to slight
BH-5	None to slight	None to slight	None to slight
Beloat			
B-2	Slight to moderate	Slight to moderate	Slight to moderate
B-4	None to slight	None to slight	Slight to moderate
B-5	Slight to moderate	Slight to moderate	Slight to moderate
Conley			
C-1	None to slight	None to slight	None to slight
C-2	None to slight	None to slight	None to slight
C-3	None to slight	None to slight	None to slight
C-4	None to slight	None to slight	None to slight
C-5	None to slight	None to slight	None to slight
C-7	None to slight	None to slight	None to slight
C-9	None to slight	None to slight	None to slight
Hazen			
H-1	Slight to moderate	Slight to moderate	Slight to moderate
H-2	Slight to moderate	Slight to moderate	Slight to moderate

**Table F-18
Departure from Ecological Site Description**

Site	Soil/Site Stability	Hydrologic Function	Biotic Integrity
H-4	None to slight	None to slight	None to slight
H-5	None to slight	None to slight	None to slight
H-6	Slight to moderate	Slight to moderate	Slight to moderate
Lower Vekol			
LV-1	None to slight	None to slight	None to slight
LV-2	None to slight	None to slight	Slight to moderate
LV-3	None to slight	None to slight	None to slight
Arnold			
A-4	None to slight	None to slight	None to slight

**Table F-19
Vegetative Canopy Cover Data (%)**

Key Area	Ecological Site	Vegetative Canopy (%)
Big Horn Allotment		
BH-1	Sandy Wash	36%
BH-2	Limy Fan	5%
BH-3	Limy Fan	11%
BH-4	Sandy Wash	48%
BH-5	Limy Upland Deep	14%
BH-6	Sandy Loamy Deep	13%
BH-7	Loamy Bottom	36%
BH-8	Sandy Wash	41%
BH-9	Limy Upland	12%
BH-12	Limy Upland	12%
BH-13	Limy Upland Deep	6%
Beloat Allotment		
B-1	Granitic Hills	8%
B-2	Sandy Wash	76%
B-4	Sandy Wash	41%
B-5	Loamy Bottom	79%
B-8	Limy Fan	4%
B-9	Limy Upland	13%
Conley Allotment		
C-1	Sandy Wash	71%
C-2	Limy Fan	6%
C-3	Sandy Wash	68%
C-4	Limy Fan	8%
C-5	Limy Upland	8%
C-7	Sandy Wash	31%

**Table F-19
Vegetative Canopy Cover Data (%)**

Key Area	Ecological Site	Vegetative Canopy (%)
C-9	Loamy Bottom	31%
C-10	Limy Upland	24%
Hazen Allotment		
H-1	Limy Fan	7%
H-2	Limy Upland Deep	8%
H-4	Sandy Wash	20%
H-5	Granitic Hills	12%
H-6	Limy Upland Deep	12%
H-7	Sandy Wash	62%
Lower Vekol Allotment		
LV-1	Loamy Bottom	69%
LV-2	Limy Upland Deep	19%
LV-3	Sandy Wash	60%
LV-4	Limy Upland	10%
Arnold Allotment		
A-4	Limy Fan	1%

Other cover data (litter, gravel and bare ground) were also collected at each key area. These were not included in the overall data analysis. Litter cover can vary dramatically from year to year, depending on precipitation. Gravel covers, which range from 5-60% are highly variable for these soil series and are not good indicators of rangeland condition. Instead, ecological sites within the grazed portions of the SDNM were compared to similar ecological sites in the ungrazed sites in BGR/Area A.

**Table F-20
Average Cover of Microbiotic Crusts (% by Plot)**

Vegetation Community (Ecological Site)	BGR/ Area A	Big Horn	Conley	Beloat	Hazen	Lower Vekol
Creosote Bursage (Limy Fan, Limy Upland Deep)	1.8	9.5	3.2	2.1	5.0	**
Xeroriparian (Sandy Wash)	0.0	1.7	1.0	**	1.5	**

Other cover data (litter, gravel and bare ground) were also collected at each key area. These were not included in the overall data analysis. Litter cover can vary dramatically from year to year, depending on precipitation. Gravel covers, which range from 5-60% are highly variable for these soil series and are not good indicators of rangeland condition. Instead, ecological sites within the grazed portions of the SDNM were compared to similar ecological sites in the ungrazed sites in BGR/Area A.

**Table F-21
BMG/Area A Comparison Plots – Big Horn Allotment**

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BHPP1S (2009)	Limy Upland Deep	Grasses				
		Annuals		2%	2%	
		Forbs				
		Mat Spurge	EUPHO	1%	0%	
		Annuals		4%	4%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	34%	11%	
		Ratany	KRPA	11%	7%	
		Creosote	LATR2	34%	34%	
		Buckhorn Cholla	CYACM	4%	1%	
		Hedgehog	ECEN	1%	0%	
		Saguaro	CAGI10	1%	1%	
		Ocotillo	FOSP2	3%	2%	
		Trees				
		Little-leaf Palo Verde	PAMI5	4%	0.5%	
		Ironwood	OLTE	1%	0.5%	
Total		100%	63%			
BHPP2S (2009)	Limy Fan	Grasses				
		Annuals		3%	3%	
		Forbs				
		Annuals		5%	5%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	24%	17%	
		Ratany	KRPA	4%	3%	
		Creosote	LATR2	51%	51%	
		Mistletoe	PHCA	T		
		Burrobush	HYSA	1%	0%	
		Buckhorn Cholla	CYACM	3%	1%	
		Saguaro	CAGI10	1%	1%	
		Limberbush	JACA2	T		
		Trees				
		Ironwood	OLTE	4%	1%	
		Catclaw Acacia	ACGR	1%	0%	
Little-leaf Palo Verde	PAMI5	3%	1%			
Total		100%	83%			

Table F-21
BMG/Area A Comparison Plots – Big Horn Allotment

Transect	Ecological Site	Plant species	Symbol	% Present	% Allowed in ESD*	
BHPP3S (2009)	Sandy Wash	Grasses				
		Annuals		5%	5%	
		Forbs				
		Ditaxis	ARNE2	1%	1%	
		Annuals		6%	6%	
		Spurge	EUPHO	1%	1%	
		Shrubs				
		Triangle-leaf Bursage	AMDE4	6%	2%	
		Coulter’s Bricklebush	BRCO	2%	2%	
		Big Bursage	AMAM	1%	1%	
		Creosote	LATR2	30%	5%	
		Burrobush	HYSA	1%	1%	
		Anderson Wolfberry	LYAN	9%	7%	
		Trees				
		Catclaw Acacia	ACGR	1%	1%	
		Ironwood	OLTE	33%	14%	
		Little-leaf Palo Verde	PAMI5	4%	4%	
Total		100%	19%			

*ESD: Ecological Site Description. Each NRCS Ecological Site Description provides a listing of plant species composition that could be present (or “allowed”) on the site. The “% Present” column indicates what was present on the site.

Table F-22
BGR/Area A Pacific Biodiversity Institute Plots

Plot #	Scientific Name	% Cover	% Composition
Limy Fan			
236	<i>Larrea Divaricata Tridentata</i>	6%	92%
	<i>Cylindropuntia Acanthocarpa</i>	0.25%	4%
	<i>Carnegiea Gigantea</i>	0.25%	4%
	Total	6.5%	100%
237	<i>Larrea Divaricata Tridentata</i>	8%	100%
	Total	8%	100%
240	<i>Larrea Divaricata Tridentata</i>	7%	88%
	<i>Krameria Grayi</i>	1%	12%
	Total	8%	100%

Table F-22
BGR/Area A Pacific Biodiversity Institute Plots

Plot #	Scientific Name	% Cover	% Composition
Limy Upland Deep			
269	<i>Muhlenbergia Porteri</i>	1%	5%
	<i>Larrea Divaricata Tridentata</i>	7%	38%
	<i>Krameria Grayi</i>	2%	11%
	<i>Fouquieria Splendens</i>	3%	16%
	<i>Erioneuron Pulchellum</i>	3%	16%
	<i>Cylindropuntia Leptocaulis</i>	1%	5%
	<i>Ambrosia Deltoidea</i>	0.25%	1%
	Total	18%	97%
272	<i>Pleuraphis Rigida</i>	0.25%	1%
	<i>Larrea Divaricata Tridentata</i>	8%	46%
	<i>Cylindropuntia Fulgida</i>	9%	53%
	Total	17%	100%
234	<i>Larrea Divaricata Tridentata</i>	5%	63%
	<i>Krameria Grayi</i>	2%	25%
	<i>Ambrosia Dumosa</i>	1%	12%
	Total	8%	100%
Granitic Hills			
	<i>Parkinsonia Microphylla</i>	4%	25%
	<i>Lycium</i>	3%	18%
	<i>Larrea Divaricata Tridentata</i>	2%	12%
	<i>Fouquieria Splendens</i>	3%	18%
	<i>Echinocereus Engelmannii</i>	1%	6%
	<i>Cylindropuntia Acanthocarpa</i>	1%	6%
	<i>Carnegiea Gigantea</i>	0.25%	2%
	<i>Ambrosia Dumosa</i>	1%	6%
	<i>Ambrosia Deltoidea</i>	1%	6%
	Total	16%	100%
Sandy Wash			
233	<i>Ziziphus Obtusifolia</i>	2%	5%
	<i>Sebastiania Bilocularis</i>	0.25%	1%
	<i>Parkinsonia Florida</i>	15%	40%
	<i>Olneya Tesota</i>	15%	40%
	<i>Lycium Andersonii</i>	3%	8%
	<i>Larrea Divaricata Tridentata</i>	1%	3%
	<i>Condalia Warnockii</i>	0.25%	1%
	<i>Carnegiea Gigantea</i>	0.25%	1%
	<i>Ambrosia Ambrosioides</i>	1%	3%
	Total	38%	100%

Table F-22
BGR/Area A Pacific Biodiversity Institute Plots

Plot #	Scientific Name	% Cover	% Composition
252	<i>Parkinsonia Microphylla</i>	30%	63%
	<i>Olneya Tesota</i>	10%	21%
	<i>Lycium</i>	1%	2%
	<i>Larrea Divaricata Tridentata</i>	2%	4%
	<i>Janusia Gracile</i>	2%	4%
	<i>Fagonia Californica</i>	0.25%	1%
	<i>Encelia Farinosa</i>	1%	2%
	<i>Ditaxis lanceolata</i>	0.25%	1%
	<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
	<i>Carnegiea Gigantea</i>	0.25%	1%
	<i>Brickellia Coulteri</i>	0.25%	1%
	<i>Ambrosia Deltoidea</i>	0.25%	1%
	Total	47.5%	100%
262	<i>Ziziphus Obtusifolia</i>	0.25%	1%
	<i>Trixis Californica</i>	0.25%	1%
	<i>Prosopis Velutina</i>	1%	4%
	<i>Parkinsonia Microphylla</i>	8%	34%
	<i>Lyrocarpa Coulteri</i>	0.25%	1%
	<i>Lycium</i>	1%	4%
	<i>Larrea Divaricata Tridentata</i>	3%	13%
	<i>Krameria Grayi</i>	0.25%	13%
	<i>Fouquieria Splendens</i>	0.25%	1%
	<i>Ditaxis lanceolata</i>	0.25%	1%
	<i>Condalia Warnockii</i>	1%	4%
	<i>Bebbia Juncea Aspera</i>	2%	9%
	<i>Asclepias Subulata</i>	1%	4%
	<i>Ambrosia Confertifolia</i>	1%	%
	<i>Ambrosia Ambrosioides</i>	1%	4%
	<i>Acacia Greggii</i>	3%	13%
	Total	23.5%	100%

Table F-22
BGR/Area A Pacific Biodiversity Institute Plots

Plot #	Scientific Name	% Cover	% Composition
271	<i>Ziziphus Obtusifolia</i>	2%	8%
	<i>Prosopis Velutina</i>	2%	8%
	<i>Parkinsonia Microphylla</i>	3%	12%
	<i>Olneya Tesota</i>	2%	8%
	<i>Lycium</i>	4%	15%
	<i>Larrea Divaricata Tridentata</i>	10%	38%
	<i>Ephedra Aspera</i>	2%	8%
	<i>Atriplex Canescens</i>	0.25%	1%
	<i>Ambrosia Deltoidea</i>	0.25%	1%
	<i>Acacia Greggii</i>	0.25%	1%
	<i>Acacia Constricta</i>	0.25%	1%
	Total	26%	100%

ATTACHMENT 4: PACIFIC BIODIVERSITY INSTITUTE STUDY PLOTS

**Table F-23
Pacific Biodiversity Institute Study Plots**

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
Big Horn Allotment				
58	Limy Fan	<i>Larrea Divaricata Tridentata</i>	7%	85%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	1%	12%
		Total	8%	100%
59	Limy Upland Deep	<i>Larrea Divaricata Tridentata</i>	6%	80%
		<i>Ferocactus Cylindraceus</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	1%	13%
		Total	7.25%	96%
60	Limy Upland Deep	<i>Mammillaria</i>	0.25%	5%
		<i>Larrea Divaricata Tridentata</i>	3%	54%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	5%
		<i>Ambrosia Deltoidea</i>	2%	36%
		Total	5.5%	100%
61	Limy Upland Deep	<i>Parkinsonia Microphylla</i>	2%	13%
		<i>Larrea Divaricata Tridentata</i>	11%	71%
		<i>Krameria Grayi</i>	0.25%	1.5%
		<i>Carnegiea Gigantea</i>	0.25%	1.5%
		<i>Ambrosia Deltoidea</i>	2%	13%
		Total	15.5%	100%
63	Granitic Hills	<i>Parkinsonia Microphylla</i>	6%	62%
		<i>Mammillaria Grahamii</i>	0.25%	3%
		<i>Lycium</i>	0.25%	3%
		<i>Larrea Divaricata Tridentata</i>	1%	10%
		<i>Fouquieria Splendens</i>	0.25%	3%
		<i>Ferocactus Emoryi</i>	0.25%	3%
		<i>Encelia Farinosa Farinosa</i>	0.25%	3%
		<i>Cylindropuntia Acanthocarpa</i>	1%	10%
		<i>Ambrosia Deltoidea</i>	0.25%	3%
		Total	9.5%	100%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
181	Granitic Hills	<i>Parkinsonia Microphylla</i>	6%	20%
		<i>Olneya Tesota</i>	4%	14%
		<i>Larrea Divaricata Tridentata</i>	0.25%	1%
		<i>Krameria Grayi</i>	2%	7%
		<i>Fouquieria Splendens</i>	3%	10%
		<i>Fagonia Californica</i>	2%	7%
		<i>Eriogonum Inflatum</i>	1%	3%
		<i>Erioneuron Pulchellum</i>	1%	3%
		<i>Encelia Farinosa Farinosa</i>	1%	3%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	9%	31%
		Total	29.5%	100%
183	Granitic Hills	<i>Granitic Hills</i>	1%	2%
		<i>Parkinsonia Microphylla</i>	20%	51%
		<i>Lycium</i>	2%	5%
		<i>Larrea Divaricata Tridentata</i>	1%	2%
		<i>Fouquieria Splendens</i>	1%	2%
		<i>Fagonia Californica</i>	3%	8%
		<i>Eriogonum Inflatum</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	1%	2%
		<i>Draba Cuneifolia</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Caliandra Eriophylla</i>	3%	8%
		<i>Aristida</i>	1%	2%
		<i>Ambrosia Deltoidea</i>	5%	13%
		Total	39.5%	99%
194	Granitic Hills	<i>Parkinsonia Microphylla</i>	18%	63%
		<i>Lycium</i>	1%	3%
		<i>Larrea Divaricata Tridentata</i>	3%	11%
		<i>Hyptis Emoryi</i>	1%	3%
		<i>Fouquieria Splendens</i>	0.25%	1%
		<i>Fagonia Californica</i>	0.25%	1%
		<i>Eriogonum Fasciculatum</i>	4%	14%
		<i>Encelia Farinosa Farinosa</i>	0.25%	1%
		<i>Brickellia Coulteri</i>	0.25%	1%
		<i>Aristida Purpurea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	0.25%	1%
		Total	28.5%	100%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
196	Granitic Hills	<i>Parkinsonia Microphylla</i>	9%	30%
		<i>Lycium Parishii</i>	1%	3%
		<i>Larrea Divaricata Tridentata</i>	8%	27%
		<i>Fouquieria Splendens</i>	0.25%	1%
		<i>Euphorbia</i>	1%	3%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Fulgida</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Carnegiea Gigantea</i>	1%	3%
		<i>Ambrosia Deltoidea</i>	9%	30%
		Total	30%	100%
198	Granitic Hills	<i>Parkinsonia Microphylla</i>	20%	46%
		<i>Olneya Tesota</i>	2%	4%
		<i>Mammillaria Grahamii</i>	0.25%	1%
		<i>Lycium</i>	0.25%	1%
		<i>Larrea Divaricata Tridentata</i>	1%	2%
		<i>Krameria Grayi</i>	1%	2%
		<i>Janusia Gracile</i>	0.25%2%	1%
		<i>Fouquieria Splendens</i>	1%	4%
		<i>Fagonia Californica</i>	1%	2%
		<i>Ditaxis Lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Aristida Purpurea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	14%	32%
		Total	43.5%	100%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
199	Granitic Hills	<i>Sphaeralcea Ambigua</i>	1%	5%
		<i>Parkinsonia Florida</i>	1%	5%
		<i>Notholaena Standleyi</i>	0.25%	1%
		<i>Nicotiana Obtusifolia</i>	0.25%	1%
		<i>Muhlenbergia Porteri</i>	0.25%	1%
		<i>Machaeranthera Pinnatifida</i>	0.25%	1%
		<i>Lycium</i>	1%	5%
		<i>Janusia Gracile</i>	0.25%	1%
		<i>Hyptis Emoryi</i>	7%	37%
		<i>Fagonia Californica</i>	1%	5%
		<i>Ephedra Aspera</i>	1%	5%
		<i>Encelia Farinosa Farinosa</i>	2%	11%
		<i>Ditaxis Lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Brickellia Coulteri</i>	3%	16%
		Total	19%	97%
200	Granitic Hills	<i>Trixis Californica</i>	0.25%	1%
		<i>Pleuraphis Rigida</i>	0.25%	1%
		<i>Parkinsonia Microphylla</i>	3%	13%
		<i>Mammillaria Grahamii</i>	0.25%	1%
		<i>Hyptis Emoryi</i>	4%	16%
		<i>Hibiscus Denudatus</i>	4%	16%
		<i>Fouquieria Splendens</i>	2%	8%
		<i>Fagonia Californica</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	1%	33%
		<i>Ditaxis Adenophora</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	1%	4%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Aristida</i>	1%	4%
		Total	24.5%	100%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
201	Granitic Hills	<i>Selaginella Arizona</i>	25%	42%
		<i>Parkinsonia Microphylla</i>	6%	10%
		<i>Krameria Grayi</i>	3%	5%
		<i>Hyptis Emoryi</i>	1%	2%
		<i>Fouquieria Splendens</i>	3%	5%
		<i>Euphorbia</i>	1%	2%
		<i>Eriogonum Inflatum</i>	1%	2%
		<i>Encelia Farinosa Farinosa</i>	6%	10%
		<i>Ditaxis lanceolata</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Aristida Purpurea</i>	3%	5%
		<i>Ambrosia Deltoidea</i>	6%	10%
		<i>Acacia Constricta</i>	2%	3
		Total	59%	100%
190	Sandy Wash	<i>Sphaeralcea Ambigua</i>	0.25%	1%
		<i>Prosopis Velutina</i>	2%	6%
		<i>Parkinsonia Florida</i>	3%	9%
		<i>Olneya Tesota</i>	3%	9%
		<i>Nicotiana Obtusifolia</i>	1%	3%
		<i>Muhlenbergia Porteri</i>	0.25%	1%
		<i>Lyrocarpa Coulteri</i>	2%	6%
		<i>Hymenoclea Salsola</i>	15%	47%
		<i>Euphorbia Polycarpa</i>	1%	3%
		<i>Euphorbia Arizona</i>	0.25%	1%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Calliandra Eriophylla</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	0.25%	1%
		<i>Acacia Greggii</i>	3%	9%
		Total	32%	99%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
192	Sandy Wash	<i>Parkinsonia Microphylla</i>	10%	32%
		<i>Parkinsonia Florida</i>	7%	22%
		<i>Nicotiana Obtusifolia</i>	0.25%	1%
		<i>Lyrocarpa Coulteri</i>	0.25%	1%
		<i>Lycium Parishii</i>	3%	10%
		<i>Larrea Divaricata Tridentata</i>	4%	12%
		<i>Hymenoclea Salsola</i>	3%	10%
		<i>Ditaxis Neomexicana</i>	0.25%	1%
		<i>Cylindropuntia Leptocaulis</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	0.25%	1%
		<i>Ambrosia Ambrosioides</i>	0.25%	1%
		Total	31%	100%
202	Sandy Wash	<i>Viguiera Parishii</i>	0.25%	0.5%
		<i>Trixis Californica</i>	1%	2%
		<i>Pleuraphis Rigida</i>	0.25%	0.5%
		<i>Parkinsonia Microphylla</i>	20%	44%
		<i>Menodora Scabra</i>	0.25%	0.5%
		<i>Lycium</i>	1%	2%
		<i>Larrea Divaricata Tridentata</i>	0.25%	0.5%
		<i>Janusia Gracile</i>	3%	6%
		<i>Hyptis Emoryi</i>	3%	6%
		<i>Hibiscus Denudatus</i>	0.25%	0.5%
		<i>Heteropogon Contortus</i>	0.25%	0.5%
		<i>Fouquieria Splendens</i>	0.25%	0.5%
		<i>Fagonia Californica</i>	2%	4%
		<i>Eriogonum Inflatum</i>	1%	2%
		<i>Eriogonum Fasciculatum</i>	1%	2%
		<i>Ephedra Aspera</i>	0.25%	0.5%
		<i>Encelia Farinosa Farinosa</i>	2%	4%
		<i>Ditaxis lanceolata</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Carnegiea Gigantea</i>	1%	2%
		<i>Calliandra Eriophylla</i>	1%	2%
		<i>Ayenia Microphylla</i>	0.25%	0.5%
		<i>Aristida</i>	0.25%	0.5%
		<i>Ambrosia Deltoidea</i>	5%	11%
Total	45.5%	96%		

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
203	Sandy Wash	<i>Trixis Californica</i>	1%	2%
		<i>Selaginella Arizonica</i>	0.25%	0.5%
		<i>Parkinsonia Florida</i>	25%	58%
		<i>Lycium</i>	1%	2%
		<i>Janusia Gracile</i>	0.25%	0.5%
		<i>Hyptis Emoryi</i>	2%	5%
		<i>Heteropogon Contortus</i>	0.25%	0.5%
		<i>Fouquieria Splendens</i>	2%	4.5%
		<i>Eriogonum Inflatum</i>	0.25%	0.5%
		<i>Eriogonum Fasciculatum</i>	3%	7%
		<i>Ephedra Aspera</i>	0.25%	0.5%
		<i>Encelia Farinosa Farinosa</i>	4%	9%
		<i>Ditaxis lanceolata</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Carnegiea Gigantea</i>	0.25%	0.5%
		<i>Aristida Purpurea</i>	1%	2%
<i>Ambrosia Deltoidea</i>	0.25%	0.5%		
		Total	43%	97.5%
Beloat				
40	Limy Fan	<i>Larrea Divaricata Tridentata</i>	7%	100%
41	Limy Fan	<i>Lycium Andersonii</i>	0.25%	2%
		<i>Larrea Divaricata Tridentata</i>	10%	89%
		<i>Ambrosia Deltoidea</i>	1%	9%
		Total	11%	100%
42	Limy Fan	<i>Larrea Divaricata Tridentata</i>	6%	75%
		<i>Ambrosia Deltoidea</i>	2%	25%
		Total	8%	100%
43	Limy Fan	<i>Larrea Divaricata Tridentata</i>	7%	100%
44	Limy Fan	<i>Larrea Divaricata Tridentata</i>	6%	53%
		<i>Euphorbia</i>	0.25%	2%
		<i>Ambrosia Deltoidea</i>	5%	45%
		Total	11%	100%
45	Limy Fan	<i>Parkinsonia Microphylla</i>	0.25%	3%
		<i>Larrea Divaricata Tridentata</i>	7%	88%
		<i>Ferocactus Wislizeni</i>	0.25%	3%
		<i>Euphorbia</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	0.25%	3%
		Total	8%	100%

**Table F-23
Pacific Biodiversity Institute Study Plots**

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
46	Limy Fan	<i>Larrea Divaricata Tridentata</i>	6%	70%
		<i>Krameria Grayi</i>	0.25%	3%
		<i>Carnegiea Gigantea</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	2%	24%
		Total	8.5%	100%
48	Granitic Hills	<i>Trixis Californica</i>	0.25%	T
		<i>Sphaeralcea Ambigua</i>	2%	4%
		<i>Selaginella Arizonica</i>	30%	47%
		<i>Porophyllum Gracile</i>	0.25%	T
		<i>Parkinsonia Microphylla</i>	15%	23%
		<i>Mirabilis Laevis v. Villosa</i>	1%	2%
		<i>Menodora Scabra</i>	1%	2%
		<i>Lycium Berlandieri</i>	1%	2%
		<i>Lycium</i>	0.25%	T
		<i>Larrea Divaricata Tridentata</i>	0.25%	T
		<i>Janusia Gracile</i>	3%	5%
		<i>Fouquieria Splendens</i>	1%	2%
		<i>Eriogonum Fasciculatum</i>	3%	5%
		<i>Ephedra Aspera</i>	0.25%	T
		<i>Encelia Farinosa Farinosa</i>	4%	6%
		<i>Ditaxis lanceolata</i>	0.25%	T
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	T
		<i>Carnegiea Gigantea</i>	0.25%	T
		<i>Ambrosia Deltoidea</i>	1%	2%
		<i>Acacia Greggii</i>	0.25%	T
Total	64%	100%		

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
49	Granitic Hills	<i>Trixis Californica</i>	1%	2%
		<i>Viguiera Parishii</i>	1%	2%
		<i>Stephanomeria Pauciflora</i>	0.25%	T
		<i>Sphaeralcea</i>	4%	9%
		<i>Selaginella Arizonica</i>	7%	16%
		<i>Pleuraphis Rigida</i>	1%	2%
		<i>Parkinsonia Microphylla</i>	10%	23%
		<i>Lycium Exsertum</i>	1%	2%
		<i>Lycium Berlandieri</i>	5%	11%
		<i>Janusia Gracile</i>	4%	9%
		<i>Hyptis Emoryi</i>	0.25%	T
		<i>Fouquieria Splendens</i>	0.25%	T
		<i>Eriogonum Wrightii</i>	0.25%	T
		<i>Ephedra Aspera</i>	1%	2%
		<i>Encelia Farinosa Farinosa</i>	9%	20%
		<i>Ditaxis lanceolata</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	T
		<i>Carnegiea Gigantea</i>	0.25%	T
		Total	46.5	100%
50	Granitic Hills	<i>Viguiera Parishii</i>	2%	6%
		<i>Senna Covesii</i>	0.25%	1%
		<i>Porophyllum Gracile</i>	2%	6%
		<i>Parkinsonia Microphylla</i>	5%	16%
		<i>Mirabilis Laevis v. Villosa</i>	1%	3%
		<i>Lycium</i>	0.25%	1%
		<i>Larrea Divaricata Tridentata</i>	0.25%	1%
		<i>Krameria Grayi</i>	2%	6%
		<i>Janusia Gracile</i>	1%	3%
		<i>Fouquieria Splendens</i>	1%	3%
		<i>Eriogonum Inflatum</i>	1%	3%
		<i>Eriogonum Fasciculatum</i>	1%	3%
		<i>Ephedra Aspera</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	2%	6%
		<i>Echinocereus Engelmannii</i>	1%	3%
		<i>Cylindropuntia Bigelovii</i>	4%	13%
		<i>Cylindropuntia Acanthocarpa</i>	4%	13%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ambrosia Dumosa</i>	3%	10%
		Total	31%	99%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
51	Granitic Hills	<i>Viguiera Parishii</i>	3%	8%
		<i>Tridens Muticus</i>	0.25%	1%
		<i>Sphaeralcea Ambigua</i>	3%	8%
		<i>Selaginella Arizonica</i>	1%	3%
		<i>Porophyllum Gracile</i>	1%	3%
		<i>Parkinsonia Microphylla</i>	4%	9%
		<i>Opuntia Chlorotica</i>	1%	3%
		<i>Muhlenbergia Porteri</i>	1%	3%
		<i>Mirabilis Laevis v. Villosa</i>	1%	3%
		<i>Lycium Berlandieri</i>	3%	8%
		<i>Larrea Divaricata Tridentata</i>	5%	13%
		<i>Krameria Grayi</i>	2%	5%
		<i>Janusia Gracile</i>	5%	13%
		<i>Gymnosperma Glutinosum</i>	0.25%	1%
		<i>Fouquieria Splendens</i>	1%	3%
		<i>Eriogonum Fasciculatum</i>	2%	5%
		<i>Ephedra Aspera</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	3%	8%
		<i>Celtis Pallida Pallida</i>	0.25%	1%
		<i>Agave Deserti Simplex</i>	0.25%	1%
	Total	37%	100%	
52	Granitic Hills	<i>Viguiera Parishii</i>	0.25%	0.5%
		<i>Stephanomeria Pauciflora</i>	0.25%	0.5%
		<i>Selaginella Arizonica</i>	22%	46%
		<i>Salsola Tragus</i>	0.25%	0.5%
		<i>Prophyllum Gracile</i>	0.25%	0.5%
		<i>Parkinsonia Microphylla</i>	0.25%	0.5%
		<i>Mammillaria Grahamii</i>	0.25%	0.5%
		<i>Lycium Berlandieri</i>	0.25%	0.5%
		<i>Lycium</i>	0.25%	0.5%
		<i>Larrea Divaricata Tridentata</i>	3%	6%
		<i>Krameria Grayi</i>	0.25%	0.5%
		<i>Janusia Gracile</i>	0.25%	0.5%
		<i>Fouquieria Splendens</i>	3%	6%
		<i>Eriogonum Fasciculatum</i>	0.25%	2%
		<i>Encelia Farinosa Farinosa</i>	0.25%	31.5%
		<i>Ditaxis lanceolata</i>	0.25%	0.5%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
	Total	48%	99%	

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
Conley Allotment				
29	Limy Fan	<i>Larrea Divaricata Tridentata</i>	3%	100%
3	Limy Fan	<i>Larrea Divaricata Tridentata</i>	17%	100%
5	Limy Fan	<i>Prosopis Velutina</i>	1%	11%
		<i>Lycium Andersonii</i>	0.25%	3%
		<i>Larrea Divaricata Tridentata</i>	5%	52%
		<i>Ferocactus</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	3%	31%
		Total	9.5%	100%
16	Limy Fan	<i>Larrea Divaricata Tridentata</i>	5%	95%
		<i>Carnegiea Gigantea</i>	0.25%	5%
		Total	5%	100%
4	Sandy Wash	<i>Sphaeralcea Coulteri</i>	0.25%	0%
		<i>Prosopis Velutina</i>	0.25%	0%
		<i>Parkinsonia Florida</i>	35%	64%
		<i>Lycium Andersonii</i>	15%	27%
		<i>Larrea Tridentata</i>	4%	7%
		<i>Ambrosia Deltoidea</i>	0.25%	0%
		Total	55%	100%
6	Limy Upland Deep	<i>Larrea Divaricata Tridentata</i>	7%	90%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	3%
		<i>Carnegiea Gigantea</i>	0.25%	3%
		<i>Ambrosia Deltoidea</i>	0.25%	3%
		Total	8%	99%
7	Granitic Hills	<i>Parkinsonia Microphylla</i>	0.25%	3%
		<i>Lycium Andersonii</i>	0.25%	3%
		<i>Larrea Divaricata Tridentata</i>	1%	10%
		<i>Hyptis Emoryi</i>	1%	10%
		<i>Encelia Farinosa Farinosa</i>	5%	65%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	3%
		<i>Carnegiea Gigantea</i>	0.25%	3%
		<i>Aristida</i>	0.25%	3%
Total	9%	100%		

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
187	Granitic Hills	<i>Parkinsonia Microphylla</i>	4%	22%
		<i>Olneya Tesota</i>	0.25%	1%
		<i>Mammillaria</i>	0.25%	1%
		<i>Lycium</i>	0.25%	1%
		<i>Larrea Divaricata Tridentata</i>	2%	11%
		<i>Krameria Grayi</i>	1%	6%
		<i>Fagonia Californica</i>	0.25%	1%
		<i>Euphorbia</i>	2%	11%
		<i>Eriogonum Inflatum</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	3%	17%
		<i>Echinocereus</i>	0.25%	1%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Bigelovii</i>	0.25%	1%
		<i>Cylindropuntia Acanthocarpa</i>	2%	11%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	1%	6%
		<i>Allionia Incarnata</i>	1%	6%
	Total	18%	99%	
Hazen Allotment				
227	Limy Fan	<i>Sphaeralcea Ambigua</i>	0.25%	1%
		<i>Parkinsonia Florida</i>	12%	46%
		<i>Olneya Tesota</i>	0.25%	1%
		<i>Larrea Divaricata Tridentata</i>	12%	46%
		<i>Hymenoclea Salsola</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	1%	4%
		Total	26%	100%
229	Limy Fan	<i>Larrea Divaricata Tridentata</i>	5%	59%
		<i>Echinocereus Engelmannii</i>	0.25%	3%
		<i>Cylindropuntia Bigelovii</i>	3%	35%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	3%
		Total	9%	100%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
231	Granitic Hills	<i>Viguiera Parishii</i>	2%	10%
		<i>Sphaeralcea Ambigua</i>	1%	5%
		<i>Senecio</i>	0.25%	1%
		<i>Parkinsonia Microphylla</i>	2%	10%
		<i>Mammillaria Grahamii</i>	0.25%	1%
		<i>Larrea Divaricata Tridentata</i>	2%	10%
		<i>Hyptis Emoryi</i>	1%	5%
		<i>Fouquieria Splendens</i>	0.25%	1%
		<i>Fagonia Californica</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	5%	24%
		<i>Echinocereus Engelmannii</i>	0.25%	1%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Bigelovii</i>	4%	19%
		<i>Cylindropuntia Acanthocarpa</i>	1%	5%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Aristida</i>	1%	5%
	Total	21%	100%	
228	Sandy Wash	<i>Parkinsonia Microphylla</i>	2%	5%
		<i>Olnya Tesota</i>	20%	51%
		<i>Lycium Berlandieri</i>	10%	26%
		<i>Larrea Divaricata Tridentata</i>	4%	10%
		<i>Hyptis Emoryi</i>	0.25%	1%
		<i>Hymenoclea Salsola</i>	1%	2.5%
		<i>Encelia Farinosa Farinosa</i>	0.25%	1%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	1%	2.5%
			Total	39%
230	Sandy Wash	<i>Parkinsonia Microphylla</i>	7%	29%
		<i>Olnya Tesota</i>	3%	12%
		<i>Lycium Berlandieri</i>	2%	8%
		<i>Larrea Divaricata Tridentata</i>	4%	17%
		<i>Krameria Grayi</i>	2%	8%
		<i>Fagonia Californica</i>	1%	4%
		<i>Encelia Farinosa Farinosa</i>	1%	4%
		<i>Ditaxis lanceolata</i>	0.25%	4%
		<i>Aristida</i>	0.25%	1%
		<i>Ambrosia Dumosa</i>	1%	4%
		<i>Ambrosia Deltoidea</i>	3%	12%
			Total	25%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
Lower Vekol Allotment				
185	Granitic Hills	<i>Parkinsonia Microphylla</i>	25%	52%
		<i>Lycium</i>	6%	13%
		<i>Fouquieria Splendens</i>	3%	6%
		<i>Encelia Farinosa Farinosa</i>	3%	6%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Ambrosia Deltoidea</i>	10%	21%
		Total	48%	100%
204	Granitic Hills	<i>Viguiera Parishii</i>	0.25%	1%
		<i>Trixis Californica</i>	0.25%	1%
		<i>Sphaeralcea Ambigua</i>	0.25%	1%
		<i>Senecio Lemmonii</i>	0.25%	1%
		<i>Selaginella Arizonica</i>	4%	10%
		<i>Pleuraphis Rigida</i>	0.25%	1%
		<i>Parkinsonia Microphylla</i>	7%	19%
		<i>Mirabilis Laevis v. Villosa</i>	1%	2%
		<i>Mammaillaria Grahamii</i>	0.25%	1%
		<i>Lycium</i>	3%	8%
		<i>Larrea Divaricata Tridentata</i>	0.25%	1%
		<i>Krameria Grayi</i>	1%	2%
		<i>Hyptis Emoryi</i>	3%	8%
		<i>Hibiscus Denudatus</i>	0.25%	1%
		<i>Fouquieria Splendens</i>	1%	2%
		<i>Fagonia Californica</i>	0.25%	1%
		<i>Eriogonum Inflatum</i>	1%	2%
		<i>Ephedra Aspera</i>	1%	2%
		<i>Encelia Farinosa Farinosa</i>	9%	24%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Bigelovii</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ayenia Microphylla</i>	0.25%	1%
		<i>Aristida</i>	1%	2%
		<i>Ambrosia Deltoidea</i>	1%	2%
		<i>Adenophyllum Porophylloides</i>	0.25%	1%
<i>Acleisanthes longiflora</i>	0.25%	1%		
Total	38%	100%		

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
205	Granitic Hills	<i>Viguiera Parishii</i>	15%	18%
		<i>Stephanomeria Pauciflora</i>	1%	1%
		<i>Sphaeralcea Ambigua</i>	2%	3%
		<i>Senecio Lemmonii</i>	2%	3%
		<i>Selaginella Arizonica</i>	20%	25%
		<i>Parkinsonia Microphylla</i>	2%	3%
		<i>Nicotiana Obtusifolia</i>	0.25%	T
		<i>Mirabilisi Laevis v. Villosa</i>	0.25%	T
		<i>Menodora Scabra</i>	1%	1%
		<i>Lycium</i>	5%	6%
		<i>Larrea Divaricata Tridentata</i>	5%	6%
		<i>Krameria Grayi</i>	1%	1%
		<i>Janusia Gracile</i>	10%	12%
		<i>Hyptis Emoryi</i>	0.25%	T
		<i>Fouquieria Splendens</i>	3%	4%
		<i>Eriogonum Wrightii</i>	2%	3%
		<i>Eriogonum Fasciculatum</i>	0.25%	T
		<i>Ephedra Aspera</i>	1%	1%
		<i>Cylindropuntia Acanthocarpa</i>	2%	3%
		<i>Celtis Pallida Pallida</i>	1%	1%
		<i>Brickellia Coulteri</i>	1%	1%
		<i>Aloysia Wrightii</i>	0.25%	T
		<i>Agave Desert Simplex</i>	2%	3%
<i>Adenophyllum Porophylloides</i>	0.25%	T		
<i>Acacia Greggii</i>	3%	4%		
Total		81%	99%	

**Table F-23
Pacific Biodiversity Institute Study Plots**

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
206	Granitic Hills	<i>Granitic Hills</i>	1%	2%
		<i>Selaginella Arizona</i>	10%	24%
		<i>Parkinsonia Microphylla</i>	9%	22%
		<i>Menodora Scabra</i>	0.25%	1%
		<i>Lycium Andersonii</i>	0.25%	1%
		<i>Krameria Grayi</i>	2%	5%
		<i>Janusia Gracile</i>	0.25%	1%
		<i>Fouquieria Splendens</i>	0.25%	1%
		<i>Eriogonum Fasciculatum</i>	2%	5%
		<i>Ephedra Aspera</i>	0.25%	1%
		<i>Encelia Farinosa Farinosa</i>	1%	2%
		<i>Ditaxis lanceolata</i>	0.25%	1%
		<i>Cylindropuntia Bigelovii</i>	5%	12%
		<i>Cylindropuntia Acanthocarpa</i>	0.25%	1%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Aristida</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	8%	19%
			Total	40.25%
207	Granitic Hills	<i>Selaginella Arizona</i>	8%	20%
		<i>Parkinsonia Microphylla</i>	10%	26%
		<i>Lycium</i>	2%	5%
		<i>Krameria Grayi</i>	1%	2%
		<i>Janusia Gracile</i>	1%	2%
		<i>Fouquieria Splendens</i>	1%	2%
		<i>Eriogonum Fasciculatum</i>	1%	2%
		<i>Ephedra Aspera</i>	1%	2%
		<i>Encelia Farinosa Farinosa</i>	3%	7%
		<i>Echinocereus</i>	0.25%	1%
		<i>Cylindropuntia Bigelovii</i>	1%	2%
		<i>Cylindropuntia Acanthocarpa</i>	1%	2%
		<i>Carnegiea Gigantea</i>	0.25%	1%
		<i>Ambrosia Deltoidea</i>	8%	20%
		<i>Agave Deserti Simplex</i>	0.25%	1%
		<i>Acacia Constricta</i>	2%	5%
			Total	41%

Table F-23
Pacific Biodiversity Institute Study Plots

Plot #	Ecological Site	Scientific Name	% Cover	% Composition
209	Granitic Hills	<i>Viguiera Parishii</i>	4%	6%
		<i>Stephanomeria Pauciflora</i>	3%	4%
		<i>Sphaeralcea Ambigua</i>	2%	3%
		<i>Senecio Lemmoni</i>	1%	1%
		<i>Selaginella Arizonica</i>	25%	36%
		<i>Parkinsonia Microphylla</i>	2%	3%
		<i>Menodora Scabra</i>	1%	1.5%
		<i>Lycium</i>	1%	1.5%
		<i>Krameria Grayi</i>	2%	3%
		<i>Janusia Gracile</i>	2%	3%
		<i>Hyptis Emoryi</i>	3%	3%
		<i>Fouquieria Splendens</i>	15%	4%
		<i>Eriogonum Fasciculatum</i>	2%	22%
		<i>Ephedra Aspera</i>	2%	3%
		<i>Encelia Farinosa Farinosa</i>	1%	1.5%
		<i>Echinocereus</i>	0.25%	T
		<i>Cylindropuntia Acanthocarpa</i>	1%	1.5%
		<i>Carnegiea Gigantea</i>	0.25%	T
		<i>Aristida</i>	0.25%	T
		<i>Agave Deserti Simplex</i>	0.25%	T
		<i>Adenophyllum Porophylloides</i>	1%	1.5%
<i>Acacia Greggii</i>	1%	1.5%		
<i>Total</i>		70%	100%	

ATTACHMENT 5: PACIFIC BIODIVERSITY INSTITUTE SAGUARO DATA

Table F-24
Saguaro Cover & Stem Count Information for the Palo Verde-Mixed Cacti Community
(PBI 2004)

Dependent Variable	Location	
	Former Area A and BMGR (mean ± SD)	Remainder SDNM (mean ± SD)
<i>Palo Verde-Mixed Cacti-Mixed Scrub on Bajadas (Includes Limy Upland Ecological Site)</i>		
Sample Size (n)	5	30
# Total Stems	2.00 ± 1.00	2.44 ± 3.38
# Short Stems	0.00 ± 0.00	0.96 ± 1.81
# Medium Stems	0.60 ± 0.89	0.70 ± 1.26
# Tall Stems	1.40 ± 1.14	0.78 ± 1.42
% Cover	0.40 ± 0.34	0.67 ± 0.76
<i>Palo Verde-Mixed Cacti-Mixed Scrub on Rocky Slopes (Includes Granitic Hills Ecological Site)</i>		
Sample Size (n)	28	36
# Total Stems	4.33 ± 4.35	2.67 ± 3.92
# Short Stems	1.26 ± 1.43	0.83 ± 1.42
# Medium Stems	2.11 ± 2.78	1.33 ± 2.28
# Tall Stems	0.96 ± 1.22	0.50 ± 0.90
% Cover	0.62 ± 0.55	0.34 ± 0.25

ATTACHMENT 6: RESOURCE CONDITION OBJECTIVES RELATED TO GRAZING MANAGEMENT

Objectives from the Lower Gila South RMP, 1988

Maintain ecological rangeland conditions currently in good to excellent condition and improve those areas in poor to fair condition.

Resource objectives from the Strategy for Desert Tortoise Habitat Management on Public Lands in Arizona (TP), 1990

- Ensure that livestock use is consistent with the category goals, objectives and management actions of the Rangewide Plan and this strategy. This may include limiting, precluding, or deferring livestock use as documented in activity plans or other site-specific plans. The Habitat Category Goals are: Category I - Maintain stable, viable populations and protect existing tortoise habitat values; increase populations, where possible. Category II – Maintain stable, viable populations and halt further declines in tortoise habitat values. Category III - Limit tortoise habitat and population declines to the extent possible by mitigating impacts.
- Manage livestock to allow adequate and suitable native forage and cover for tortoises throughout the year.
- Where ecological site potential permits, manage livestock grazing to increase native perennial grasses, forbs and shrubs that are required by tortoise.
- Allow utilization of tortoise forage and cover plants by livestock only to levels which allow for long-term plant vigor and adequate standing vegetation for late summer-fall tortoise use.
- Ephemeral ranges are managed for the protection of perennial vegetation and dependent wildlife species.

ATTACHMENT 7: KEY MANAGEMENT SPECIES LIST

Important browse species list for livestock and mule deer (Krausman et al. 2005):

- Parry dalea (DAPA)
- White burrobush (HYSA)
- Lance-leaf ditaxis (DILA)
- Saltbush (ATCA)
- White bursage (AMDU)
- Slender janusia (JAGR)
- Drummond's clematis (CLDR)
- Ratany (KR spp.)
- Twinberry (MESC)
- Mormon tea (EP spp.)
- Desert lavender ((HYEM)
- Wolfberry (LY spp.)
- Whitestem paperflower (PSCO)
- Goldeneye (VIDE)
- Coulter lyrefruit (LYCO)
- White flythicket (BRIN)
- Trumpet buckwheat (ERIN)
- Abutilon (AB spp.)
- Sweetbush bebbia (BEJU)
- Trixis (TRCA)
- Bricklebush (BRCO)
- Desert hibiscus (HIDE)
- False mesquite (CAER)
- Flattop buckwheat (ERFA)