United States Department of the Interior
Bureau of Land Management
Sonoran Desert National Monument

Appendix 3 - Final Land Health Evaluation

Sonoran Desert National Monument Complex

Arnold (#03004)
Beloat (#03007)
Big Horn (#03009)
Conley (#03018)
Hazen (#03042)
Lower Vekol (#03053)

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Table of Contents

List of Appendices

1.0 Introduction

The Bureau of Land Management (BLM), Lower Sonoran Field Office (LSFO) completed a Land Health Evaluation (LHE) for the Sonoran Desert National Monument (SDNM) in 2012. The LHE results were analyzed in a compatibility study to determine if livestock grazing was compatible with the paramount purpose of protecting the objects of the SDNM. The LHE and the compatibility findings were used to inform the 2012 SDNM Proposed Resource Management plan (RMP)/Final Environmental Impact Statement (EIS).

The 2012 Record of Decision (ROD) and the Proposed RMP/EIS pertaining to livestock use were challenged in the U.S. District Court, for the District of Arizona. The court ordered the BLM to prepare a new LHE and compatibility determination to be incorporated into the 2012 RMP. The court did not vacate the grazing decisions for livestock use contained in the RMP, as approved by the 2012 ROD. As a result, the 2012 ROD decisions pertaining to livestock use remains in effect.

The 2012 LHE addressed the achievement of Arizona Standards for Rangeland Health and determined if livestock grazing was the causal factor for not achieving Standards for those portions of allotments found within the SDNM. In response to the court order, the BLM determined a landscape-level analysis was needed because most of the allotments have permitted use for public lands inside and outside of the SDNM that should be addressed holistically (Appendix A).

The BLM re-inventoried the soils and vegetation and collected additional monitoring data to assess land health on the SDNM. In 2016, the BLM developed a new study design to address the resource conditions of the SDNM at the landscape scale for public lands inside/outside of the SDNM north of Interstate 8 (I-8), here after referred to as the SDNM Complex. This resulted in an extensive soil and vegetation data analysis of rangeland health and the biological objects of the SDNM. The new study design included new data collection protocols for improved statistical analysis and repeatability.

The purpose of this new LHE is to re-evaluate the Arizona Standards for Rangeland Health (Standards) on the BLM-administered public lands available for livestock use as provided for under the 2012 SDNM RMP. This updated LHE report contains preliminary conclusions on achievement or non-achievement of Standards and causal factors for non-achievement of Standard 1 or 3 or both. If current or historical grazing is a significant causal factor, the BLM may propose actions to correct the results of that use.

As part of the LHE process, desired plant community (DPC) objectives were established for the biological objects of the SDNM. This updated LHE proposes management recommendations that will assure soil conditions and ecosystem function, as described in Standards 1 and 3, will continue to be achieved or if not achieved make significant progress toward achieving the Standards.

The Secretary of the Interior approved Arizona's Standards for Rangeland Health (Standards) and Guidelines for Grazing Administration (Guidelines) in April 1997. The Decision Record signed by the BLM State Director (April 1997) provides for full

implementation of the Standards and Guidelines in Arizona BLM Land Use Plans including all Resource Management Plans developed after 1997. See Appendix B for Arizona's Standards for Rangeland Health. Standards are measurable and attainable goals for the desired condition of the biological resources and physical components/characteristics of desert ecosystems found within the SDNM.

2.0 Complex Profile

2.1 SDNM Complex Description

The SDNM Complex is located northeast of the town of Gila Bend, AZ, and is bound by the Gila River to the north, I-8 to the south, the Estrella and Palo Verde mountains to the east, and the Gila River and Highway 85 to the west. The Complex ranges from 780 to 3,182 feet in elevation and contains mountainous areas separated by broad alluvial valleys. Mining, utility right-of-ways, agriculture, livestock grazing, industrial land use, horseback riding, and off-highway vehicle (OHV) use are common on the Complex. The Complex is comprised of six grazing allotments, all of which have portions within the SDNM (Map 1).

2.2 Physical Description of the SDNM Complex

The following is a general description of the location of the allotments within the Complex. See Table 1 for land status and allotment acreages, and Map 1 for the location of the allotments.

2.2.1 Arnold

The Arnold Allotment has three defined pastures. It is bound by the Gila River to the north, Highway 85 to the west, the Maricopa Mountains to the south, and the Beloat Allotment to the east. Approximately 2,621 acres of public land at the south end of the allotment are within the SDNM. Mining (outside the SDNM), utility right-of-ways, and OHV use are common on the Arnold. The Buckeye Hills span the northern portion of the Arnold and taper down into the Little Rainbow Valley in the south. The soils range from shallow granitic hills in the north to deeper alluvial fans in the south. Elevation in the area ranges from 900 ft. to 1,500 ft.

2.2.2 Beloat

The Beloat Allotment is bound by the Gila River to the north, the Estrella Mountains to the east, the Maricopa Mountains to the west, and the Conley Allotment to the south. The Beloat spans the majority of the Rainbow Valley area which encompasses a large amount of private, residential, agricultural, and State land near the City of Buckeye, AZ. The urban/rural interface facilitates OHV use and utility right-of-ways are common in this area. Approximately one quarter of the Beloat is within the SDNM. The Beloat is roughly bisected by Rainbow Valley Road and split into six pastures, three in the east and three in the west. The soils range from shallow calcaric granitic hills in the west, and deep alluvial fans in the valley, to moderately deep non-calcaric soils in the east. Elevation in the area ranges from 1,100 ft. to 2,493 ft.

2.2.3 Big Horn

The Big Horn Allotment is bound by Highway 85 to the west, I-8 to the south, the Hazen Allotment to the north and the Maricopa Mountains to the east. Almost the entire Big Horn is within the SDNM with the exception of 16,436 acres of State land and a small portion with no available water south of I-8. The SDNM portion of the Big Horn south of Interstate 8 was closed to grazing in the designating Presidential Proclamation. Three pastures remain, north and south, bisected by State Route 238, and the Big Horn pasture in the southeast corner. The State land in the Big Horn is unfenced, authorized for perennial grazing, and almost exclusively located in the north pasture. The Big Horn

has relatively low recreational activity and few utility right-of-ways. The soils range from shallow granitic hills in the east to broad alluvial fans with well-developed shallow calcaric duripans in the west. Elevation ranges from 780 ft. to 3,182 ft.

2.2.4 Conley

The Conley Allotment is bound by the Maricopa Mountains to the west, the Beloat Allotment to the north, the Palo Verde Mountains to the east and the Lower Vekol Allotment to the south. The Conley spans the majority of the Mobile Valley which includes a large amount of private land, dispersed residential, landfills, and some State land. OHV use, utility corridors, and industrial land uses are common in the Conley. Approximately 60 percent of the allotment lies within the SDNM boundary. The Conley is split into four pastures, two in the north and two in the south, roughly bisected by State Route 238. The soils range from shallow granitic hills in the west to deep alluvial fans in the Mobile Valley. Elevation ranges from 1,260 ft. to 3,182 ft.

2.2.5 Hazen

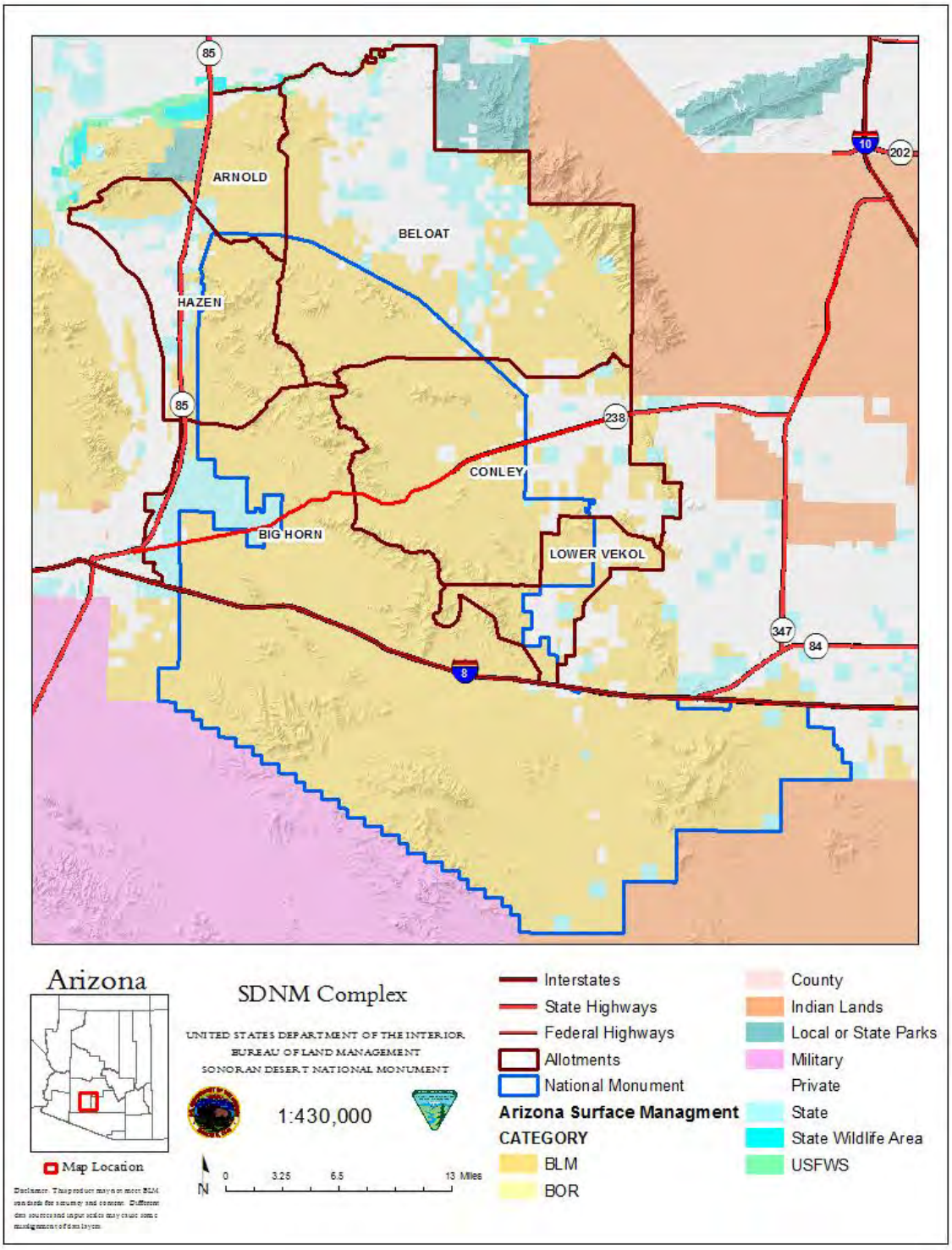
The Hazen Allotment is bound by the Buckeye Hills to the north, the Gila River to the west, the Maricopa Mountains to the east, and the Big Horn Allotment to the south. The majority of private, industrial and agricultural, and State lands reside west of Highway 85 that roughly bisects the Hazen. OHV use and utility right-of-ways are common on the Hazen. Approximately 50 percent of the Hazen lies within the SDNM. The Hazen is split into four pastures, three east of Highway 85 and one west. The soils are evenly dispersed throughout the Hazen ranging from shallow granitic hills in the Maricopa Mountains and Buckeye Hills to deeper alluvial fans in Little Rainbow Valley. Elevation in the area ranges in from 800 ft. on the Gila River to 2,493 ft.

2.2.6 Lower Vekol

The Lower Vekol Allotment is bound by the Booth Hills and the Conley Allotment to the north, the Maricopa Mountains to the west, the Kirian Allotment to the east, and Interstate-8 to the south. The Lower Vekol spans the Vekol Valley where the majority of the private, dispersed residential, and State land resides. Only the western portion of the Lower Vekol is within the SDNM. OHV use, horseback riding, and utility right-of-ways are common on the Lower Vekol. The Lower Vekol is split into five pastures, three in the north and two in the south. One of the smaller northern pastures contains a series of nine earthen dikes to reduce water velocity and improve infiltration. However, their effectiveness is limited. Elevation ranges from 1,600 ft. to around 2,600 ft.

Table 1. Land Status and Allotment acreage of the SDNM Complex.

Allotment	BLM Administered Public acres	BLM Administered Public acres within SDNM	Private acres	State acres	Total acres
Arnold	22,890	2,621	1,290	1,110	25,290
Beloat	101,860	34,405	52,020	22,710	176,590
Big Horn	97,195	91,986	1,090	16,436	114,721
Conley	91,140	80,368	24,310	3,020	118,470
Hazen	42,190	31,749	12,570	9,590	64,350
Lower Vekol	22,530	16,079	6,410	800	29,740



Map 1. SDNM Complex Allotments North of Interstate-8

3.0 Complex Resources

3.1 Major Land Resource Areas

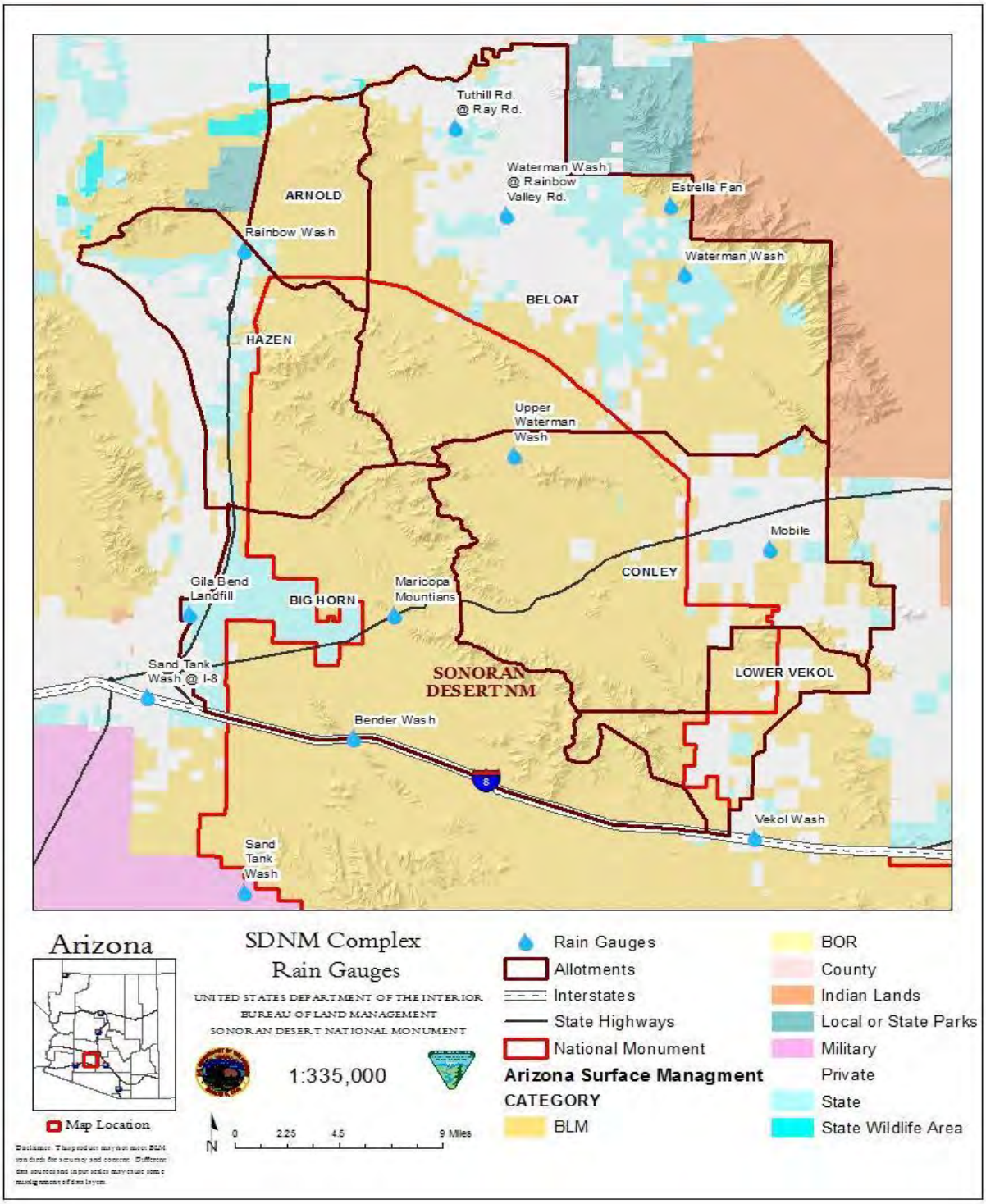
A Major Land Resource Area (MLRA) is a broad geographic area that is characterized by a particular pattern of soils, climate, water resources, vegetation, and land use. The SDNM Complex lies on the transition between the 40-3 MLRA Colorado (Lower) Sonoran Desert and the 40-2 MLRA Middle Sonoran Desert, exhibiting features from both where the majority of the SDNM Complex receives less than 7 inches of precipitation annually and the majority of the SDNM Complex is above 1,200 feet in elevation.

MLRA	(in)	Lower Limit	Upper Limit
40-3	3-7	300 ft.	1,200 ft.
40-2	7-10	1,200 ft.	2,000 ft.

3.2 Climate

3.2.1 Precipitation

The SDNM Complex exhibits a bi-modal precipitation seasonality that is characteristic of southern Arizona. During winter and spring, frontal storm systems move west-to-east guided by the jet stream. Summer monsoon thunderstorms also deliver significant amounts of precipitation to the area. The SDNM Complex, as well as the majority of southern Arizona, exhibits strong year-to-year variations in precipitation due to El Nino-Southern oscillations, with wet periods followed by dry periods. Precipitation data were obtained from the Maricopa County Flood Control District. Thirteen rain gauges are dispersed throughout and within close proximity to the SDNM Complex (Map 2). These gauges have been in operation from 10 to 31 years, depending on location, and their elevations range from 750 ft. to 1,720 ft. The mean annual precipitation from all thirteen locations is 5.8 inches with a maximum of 7.13 inches over a 25 year period at Vekol wash and a minimum of 4.71 inches over a 20 year period at the Gila Bend Landfill.



Map 2. SDNM Complex Rain Gauges and their Location.

3.2.2 Temperature

Winter temperatures are very mild with very few days recording freezing for short periods of time. Summertime temperatures are hot, to very 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 350 days in uplands.

3.3 Soils

The soils of the SDNM Complex were determined using a soil map produced by the Natural Resources Conservation Service (NRCS), Soil Survey AZ653, 1997. This survey covers the Gila Bend-Ajo Area, Arizona. This evaluation is primarily focused on potential livestock impacts to soils and vegetation, therefore, only the most common soils that are potentially accessible to livestock were included in this evaluation. Variables that limit livestock accessibility include slope (>30 percent), rockiness of terrain, and fencing/manmade barriers.

Soils in this area have a hyperthermic soil temperature regime and a typical aridic moisture regime and are often described as complexes due to the intimate intermingling of soil types. Many of the soils in this area are formed from granitic and or volcanic parent material. Each soil is described as a "map unit" in the NRCS soil survey. The following soils/map units make up 78 percent of the SDNM Complex and correspond with specific ecological sites.

3.3.1 Map Units

Map Unit:
Quilotosa-Momoli-Carrizo complex, 1 to 15 percent slope

The Quilotosa-Momoli-Carrizo complex map unit is found on low granite hills and fan terraces. The Quilotosa component makes up about 40 percent of the map unit and is found on gently sloping granitic hills/uplands. This soil is shallow to very shallow and somewhat excessively drained. It is formed in alluvium and colluvium derived dominantly from granite and granite-gneiss. Typically, 45 to 95 percent of the surface is covered with pebbles, cobbles, stones, and boulders. The soil is extremely gravelly and loamy with a depth of 4 to 16 inches. The Momoli component makes up about 20 percent of the map unit and is found on nearly level to strongly sloping fan terraces. This soil is deep and somewhat excessively drained. It is formed in alluvium derived dominantly from mixed rocks. Typically, 35 to 85 percent of the surface is covered with pebbles, cobbles, and stones. The soil is very gravelly and loamy. The Carrizo component makes up about 15 percent of the map unit and is found on nearly level alluvial fans and adjoining flood plains (washes). This soil is deep and excessively drained. It is formed in recent alluvium derived dominantly from mixed rocks. Typically, 40 to 80 percent of the surface is extremely gravelly sandy loam. This soil is subject to flooding during prolonged, high-intensity storms.

The corresponding ecological site for this map unit is Granitic Upland.

Map Units:
Dateland-Cuerda complex, 0 to 3% slopes
Denure-Rillito-Why complex, 1 to 5% slopes
Denure-Coolidge complex, 1 to 3% slopes

Dateland-Cuerda complex is found on fan terraces and flood plains (washes). The Dateland component makes up about 60 percent of the map unit and is found on nearly level fan terraces. These soils are deep and well drained. They formed in alluvium derived dominantly from mixed rocks. Typically, 5 to 15 percent of the surface is

covered with pebbles. The soils are loamy. The Cuerda component makes up about 30 percent of the map unit and is found on nearly level flood plains. These soils are deep and well drained. They are formed in stratified alluvium derived dominantly from mixed rocks. Typically, 1 to 10 percent of the surface is covered with pebbles. The soils are loamy to very gravely loam.

The Denure-Rillito-Why complex is found on fan terraces dissected by flood plains. The Denure component makes up about 40 percent of the map unit and is found on nearly level and gently sloping fan terraces. This soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 20 to 50 percent of the surface is covered with pebbles. This soil is gravelly and loamy throughout. The Rillito component makes up about 25 percent of the map unit and is found on nearly level and gently sloping fan terraces. This soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 35 to 80 percent of the surface is covered with pebbles. The soil is gravelly and loamy and is underlain by a very limy layer at a depth of 5 to 40 inches. The Why component makes up about 15 percent of the map unit and is found on nearly level flood plains. This soil is deep and somewhat excessively drained. It formed in stratified alluvium derived dominantly of mixed rocks. Typically, 1 to 10 percent of the surface is covered with pebbles. This soil is a sandy loam.

The Denure-Coolidge complex map unit is found on nearly level fan terraces. The Denure component makes up about 55 percent of the map unit and is described previously. The Coolidge component makes up about 25 percent of the map unit and is found on fan terraces. The soil is deep and well drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 10 to 50 percent of the surface is covered with pebbles. This soil is a gravelly very fine sandy loam to fine sandy loam.

The corresponding ecological site for these soil map units is Limy Fan.

Map Unit:
Cipriano-Momoli complex, 1 to 7% slopes

The Cipriano-Momoli complex map unit is found on fan terraces dissected by shallow flood plains. The Cipriano component makes up about 60 percent of the map unit and is found on nearly level to moderately steep volcanic mountains and hills. This soil is shallow and very shallow and somewhat excessively drained. It formed in alluvium and colluvium derived dominantly from basalt. Typically, 50 to 85 percent of the surface is covered with pebbles, cobbles, stones, and hardpan fragments. This soil is very gravelly and loamy and is underlain by a hardpan at a depth of 6 to 20 inches. The Momoli component makes up about 15 percent of the map unit and is found on nearly level to strongly sloping fan terraces. This soil is deep and somewhat excessively drained. It is formed in alluvium derived dominantly from mixed rocks. Typically, 35 to 85 percent of the surface is covered with pebbles, cobbles, and stones. This soil is very gravelly and loamy.

The corresponding ecological site for this soil map unit is Limy Upland.

Map Units:
Gunsight-Rillito-Carrizo complex, 1 to 15% slopes
Momoli-Comobabi association, 5 to 15% slopes

The Gunsight-Rillito-Carrizo complex map unit is found on fan terraces dissected by narrow flood plains. The Gunsight component makes up about 45 percent of the map unit and is found on nearly level to moderately steep fan terraces. This soil is deep and somewhat excessively drained. It is formed in alluvium derived dominantly from mixed rocks. Typically, 40 to 70 percent of the surface is covered with pebbles. The soil is extremely gravelly and loamy and is underlain by a very limy layer at a depth of 5 to 24 inches. The Rillito component makes up about 35 percent of the map unit and is found on nearly level and gently sloping fan terraces. This soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 35 to 80 percent of the surface is covered with pebbles. The soil is gravelly and loamy and is underlain by a very limy layer at a depth of 5 to 40 inches. The Carrizo component makes up about 15 percent of the map unit and is found on nearly level alluvial fans and adjoining flood plains. This soil is deep and excessively drained. It is formed in recent alluvium derived dominantly from mixed rocks. Typically, 40 to 80 percent of the surface is extremely gravelly sandy loam. This soil is subject to flooding during prolonged, high-intensity storms.

The Momoli-Comobabi association map unit is found on fan terraces flanking granitic mountains. The Momoli component makes up about 50 percent of the map unit and is found on the higher nearly level to strongly sloping fan terraces. This soil is deep and somewhat excessively drained. It is formed in alluvium derived dominantly from mixed rocks. Typically, 35 to 85 percent of the surface is covered with pebbles, cobbles, and stones. This soil is very gravelly and loamy. The Comobabi component makes up about 25 percent of the map unit and is found in the lower fan terraces. This soil is shallow or very shallow and is well drained. It formed in alluvium derived dominantly from granite and gneiss. Typically, 50 to 90 percent of the surface is covered with cobbles and pebbles. This soil is an extremely cobbly sandy loam with an indurated hardpan ranging from 7 to 20 inches in depth.

The corresponding ecological site for these soil map units is Limy Upland Deep.

Map Units:
Carrizo-Momoli complex, 0 to 3% slopes
Why-Carrizo complex, 0 to 3% slopes

Carrizo-Momoli complex map unit is found on long, narrow flood plains and on fan terraces and alluvial fan in the areas where washes emerge from the mountains. The Carrizo component makes up about 65 percent of the map unit and is found on nearly level alluvial fans and adjoining flood plains. This soil is deep and excessively drained. It is formed in recent alluvium derived dominantly from mixed rocks. Typically, 40 to 80 percent of the surface is extremely gravelly sandy loam. This soil is subject to flooding during prolonged, high-intensity storms. The Momoli component makes up about 25 percent of the map unit and is found on nearly level to strongly sloping fan terraces. This soil is deep and somewhat excessively drained. It is formed in alluvium derived

dominantly from mixed rocks. Typically, 35 to 85 percent of the surface is covered with pebbles, cobbles, and stones. This soil is very gravelly and loamy.

The Why-Carrizo complex map unit is found on alluvial fans and flood plains. The Why component makes up about 30 percent of the map unit and is found on nearly level flood plains. This soil is deep and somewhat excessively drained. It formed in stratified alluvium derived dominantly of mixed rocks. Typically, 1 to 10 percent of the surface is covered with pebbles. This soil is a sandy loam. The Carrizo component makes up about 25 percent of the map unit and is described previously.

The corresponding ecological site for these soils is Sandy Bottom.

Map Unit:
Denure-Why complex, 1 to 5% slopes

The Denure-Why complex map unit is found on fan terraces and flood plains. The Denure component makes up about 60 percent of the map unit and is found on nearly level and gently sloping fan terraces. This soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 20 to 50 percent of the surface is covered with pebbles. This soil is gravelly and loamy throughout. The Why component makes up about 20 percent of the map unit and is found on nearly level flood plains. This soil is deep and somewhat excessively drained. It formed in stratified alluvium derived dominantly of mixed rocks. Typically, 1 to 10 percent of the surface is covered with pebbles. This soil is a sandy loam.

The corresponding ecological site for these soils is Sandy Loam Deep.

Map Unit:
Mohall complex, 0 to 3% slopes

The Mohall complex map unit is found on broad basin floors and adjoining fan terraces. Mohall soil is occasionally flooded and is in nearly level depression areas along ephemeral drainages. This soil is deep and well drained. It formed in alluvium derived dominantly from mixed rocks. Typically, 1 to 10 percent of the surface is covered with pebbles. The soils are a sandy loam to sandy clay loam. Depth to a very limey layer ranges from 20 to 40 inches.

The corresponding ecological site for these soils is Sandy Loam Upland.

3.4 Ecological Sites

An ecological site is a distinctive kind of land based on recurring soil, landform, geological, and climate characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its ability to respond similarly to management actions and natural disturbances (Caudle et al. 2013). The ecological site concept provides a consistent way to classify and describe rangeland soils and vegetation by delineating land units with similar capabilities to respond to management activities or disturbance. Ecological site descriptions (ESD) are reports that provide information about a particular ecological site within a specific MLRA and

precipitation zone (p.z.). ESDs developed by the NRCS admit to the natural variability of the soil and plant communities of the ecological sites, but serves as a baseline for the attributes defined in ESDs. The ESDs for the ecological sites within the SDNM Complex are considered "provisional" meaning the ESD "represents the lowest tier of documentation that is releasable to the public" but contains enough information to distinguish unique ecological sites and has undergone quality control and quality assurance protocols. Due to the natural variability of ecological sites and the provisional status of the existing ESDs, the following descriptions of the seven most prevalent (major), by acreage and distribution, ecological sites that together make up more than 70 percent of the SDNM Complex are derived from both NRCS ESDs (https://esis.sc.egov.usda.gov/) and BLM field observations within the SDNM Complex. The remaining, less than 30 percent, ecological sites are either inaccessible to livestock due to steep rocky terrain or are very small in size.

3.4.1 Granitic Upland

Granitic Uplands make up approximately 2.5 percent of the SDNM Complex. This ecological site occurs on hills and terraces with slopes ranging from 1 to 15 percent and elevations from 937 to 1,498 ft. The soils are shallow and formed on acidic materials such as granite and gneiss. The soils are non-calcareous and coarse textured with well-developed covers of rock and gravel. However, calcareous precipitate can be found on the bedrock surfaces. Bedrock is often protruding the soil surface. Plant-soil moisture relationships are fair. The potential plant community is a diverse mixture of trees, shrubs, and cacti.

The corresponding vegetation community for this ecological site is Palo Verde-Mixed Cactus.

3.4.2 Limy Fan

Limy Fans make up approximately 34.8 percent of the SDNM Complex. This ecological site occurs on fan and stream terraces with slopes ranging from 1 to 3 percent and elevations from 860 to 1,575 ft. These are deep calcareous soils formed in loamy alluvium of moderate age and mixed origins. They range from sandy loam to loamy surface textures. Subsurface texture may include fine or coarse loam. Surface gravel and cryptogams can be common on this site. Plant-soil moisture relationships are poor to fair. The potential plant community is dominated by desert shrubs with few other shrub and cacti species. Most perennial species found on these sites are unpalatable to livestock (cattle). This site has the potential to produce large quantities of annual forbs and grasses during years with above average precipitation (ephemeral forage).

The corresponding vegetation communities for this ecological site are Creosote-Bursage desert scrub and Palo Verde-Mixed Cactus.

3.4.3 Limy Upland

Limy Uplands make up approximately 6.2 percent of the SDNM Complex. This ecological site occurs on fan terraces, ridgetops, pediments and mesa tops with slopes ranging from 1 to 7 percent and elevations from 294 to 1,678 ft. Soils are shallow over strongly cemented lime pans (duripans) which stop water movement and curtail root penetration. The soils are coarse to loamy textured formed in old alluvium of mixed

origins and are very calcareous. The soil surface is often protected by gravel or cryptogams or a combination of both. Plant-soil moisture relationships are poor. The potential plant community on this ecological site is a mixture of desert shrubs, cacti, and annual forbs and grasses. Most perennial species found on this ecological site are unpalatable to livestock (cattle).

The corresponding vegetation communities for this ecological site are Creosote-Bursage desert scrub and Palo Verde-Mixed Cactus.

3.4.4 Limy Upland Deep

Limy Upland Deep make up approximately 15.8 percent of the SDNM Complex. This ecological site occurs primarily on fan terraces and hills with slopes ranging from 1 to 15 percent and elevations from 836 to 1,693 ft. Soils are deep formed in very gravelly sandy loam alluvium of various ages and from mixed origins. They are calcareous and have over 35 percent gravels in the soil profile. The soil surface is often covered with gravels, lime pan fragments, and cryptogam crusts. Plant-soil moisture relationships are poor. The potential plant community is dominated by desert shrubs with a few other shrub and cacti species. Most perennial species found on this ecological site are unpalatable to livestock (cattle) and wildlife but can provide shade and cover.

The corresponding vegetation communities for this ecological site are Creosote-Bursage desert scrub and Palo Verde-Mixed Cactus.

3.4.5 Sandy Bottom

Sandy Bottoms make up approximately 6.3 percent of the SDNM Complex. This ecological site occurs on floodplains and alluvial fans with slopes ranging from 0 to 3 percent and elevations from 870 to 1,993 ft. Soils are very young on gravelly and sandy alluvium of mixed origin. Textures range from sandy loam to very gravely sands. They are deep and excessively drained. This ecological site receives significant run-on moisture from adjacent uplands and has good plant-soil moisture relationships. The potential plant community is dominated by trees, desert shrubs, and annual forbs and grasses. Many of the perennial species found on this ecological site are palatable to livestock (cattle) and provide shade and cover for livestock and wildlife. This ecological site is preferred by livestock and wildlife alike.

The corresponding vegetation community for this ecological site is Ephemeral Wash.

3.4.6 Sandy Loam Deep

Sandy Loam Deep make up approximately 4.6 percent of the SDNM Complex. This ecological site is found on fan and stream terraces with slopes ranging from 1 to 3 percent and elevations from 1,277 to 1,988 ft. Soils are deep formed from sandy alluvium of mixed origins. The soils are sandy loam throughout with non-clayey cambic horizons. These soils are non-calcareous in the first 4 to 6 inches. The soil surfaces are loamy with few gravels. Plant-soil moisture relationships are fair to good. The potential plant community is a mixture of trees, shrubs, cacti, and perennial grasses. This ecological site has the potential to produce a large amount of annual forbs and grasses during wet years (ephemeral forage).

The corresponding vegetation community for this ecological site is Palo Verde-Mixed Cactus.

3.4.7 Sandy Loam Upland

Sandy Loam Uplands make up approximately 8.3 percent of the SDNM Complex. This ecological site is found on fan and stream terraces with slopes ranging from 1 to 3 percent and elevations from 1,171 to 1,630 ft. Soils are deep formed from sandy alluvium of mixed origins. The soils are sandy loam throughout with a clayey horizon. These soils are non-calcareous in the first 4 to 6 inches. The soil surface is loamy with few gravels. Plant-soil moisture relationships are good. The potential plant community is a mixture of trees, shrubs, cacti, and perennial grasses. This ecological site has the potential to produce a large amount of annual forbs and grasses during wet years (ephemeral forage).

The corresponding vegetation community for this ecological site is Palo Verde-Mixed Cactus.

3.5 Vegetation

The SDNM Complex has three major vegetation communities: the Creosote-Bursage desert scrub, the Palo Verde- Mixed Cactus and the Ephemeral Wash vegetation communities (Map 3). These vegetation communities are identified in NRCS ESDs and their acreages/miles were obtained from the national Landfire data set for the Creosote-Bursage and Palo Verde-Mixed Cactus Communities and 100K topographic map for the Ephemeral Wash community.

3.5.1 Creosote-Bursage Desert Scrub

This vegetation community is generally in the lower elevations on desert flats and valley bottoms. Creosote-Bursage Desert Scrub is comprised primarily of creosote (*Larrea tridentata*) in the flats with minor amounts of shrubs such as triangle-leaf bursage (*Ambrosia deltoidea*), white or range ratany (*Krameria grayi or erecta*), and trees such as little-leaf palo verde (*Parkinsonia microphylla*) and ironwood (*Olneya tesota*). It covers approximately 52 percent of the SDNM Complex. During periods of above average precipitation, this vegetation community has the potential to produce a thousand pounds per acre of ephemeral forage in the form of annual grasses and forbs.

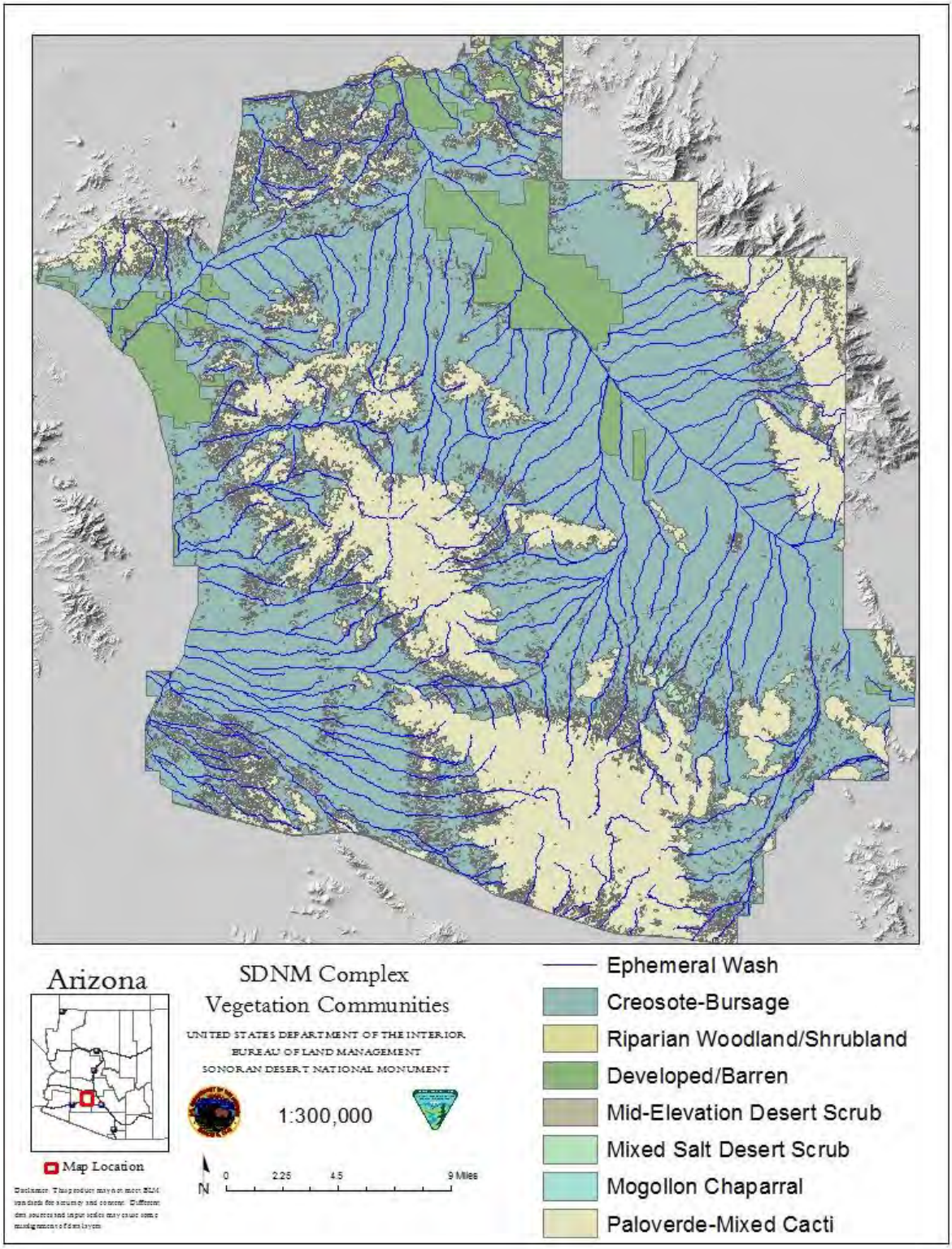
3.5.2 Palo Verde-Mixed Cactus

This vegetation community generally occupies the mountain slopes and upper bajadas. It is a mix of palo verde (*Parkinsonia* spp.), ironwood and varied shrub species like triangle-leaf bursage, white bursage (*Ambrosia dumosa*), white and range ratany and a mixed variety of cactus including cholla species (*Cylindropuntia* spp.), Engelmann's hedgehog (*Echinocereus engelmannii*) and barrel cactus (*Ferocactus* spp.). Ocotillo (*Fouquieria splendens*) also occur in this community. It comprises approximately 40 percent of the SDNM Complex. The highest densities of saguaro (*Carnegia gigantea*) are found in this vegetation community.

3.5.3 Ephemeral Wash

This site occurs in the larger drainage ways that dissect the bajadas and desert flats throughout the SDNM Complex. In some cases the drainage is braided and can cover a

large surface area. It is a multi-layered vegetation 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*), burrobrush (*Hymenoclea monogyra*), and bricklebush (*Brickellia coulteri*). It covers approximately 6 percent of the SDNM Complex. During periods of above average precipitation, this community has the potential to produce a thousand pounds per acre of ephemeral forage. Both wildlife and cattle use ephemeral washes as travel corridors and are important foraging areas.



Map 3. Vegetation Communities of the SDNM Complex.

3.6 Wildlife Resources

3.6.1 Special Status Species

3.6.1.1 Sonoran Desert Tortoise

In December of 2010, the Sonoran desert tortoise (SDT) (*Gopherus morafkai*) was added to the US Fish and Wildlife Service (USFWS) candidate species list. However, the petition for listing was denied in October 2015 by the USFWS (USFWS 2015). The USFWS entered into a candidate conservation agreement (CCA) with assurances with cooperating agencies in Arizona and is classified as a BLM sensitive species. The CCA defines SDT habitat as:

The SDT occurs primarily on rocky slopes and bajadas of Mohave desert scrub and Arizona Upland and Lower Colorado River Valley subdivisions of Sonoran desert scrub. They most often occur in Palo Verde-mixed cacti associations, but have been documented in semi-desert grassland, interior chaparral, oak woodland, ponderosa pine-dominated coniferous forests, and thorn-scrub habitats.

Population densities and movements are correlated with available or potential shelter sites. Tortoises escape temperature extremes by retreating to their shelters, which stay cooler in summer and warmer in winter than outside temperatures. Most often, SDTs excavate burrows in loose soils at the base of boulders and rock outcrops. Natural rock cavities, caliche caves in incised cut banks of washes, and packrat middens are also used for shelter-sites. Tortoises occasionally dig soil shelters on more or less open slopes or under vegetation, or may rest directly under live or dead vegetation without constructing a shelter. Shelter-sites are rarely found in shallow soils (USFWS 2015).

The CCA does state, “there is little overlap in the habitat shared by livestock and SDT in most areas in Arizona” (USFWS 2015), although there is a potential for overlap to occur in areas that are classified as SDT habitat and in areas that the LHE defines as “sandy bottom” in and around tortoise habitat. In south-central Arizona the SDT were found to be using bursage habitat on alluvial slope around washes (Riedle et al. 2008). Within these areas there are plant species on the LHE “Key Species” and “Palatable Species” lists that are consumed by cattle and SDT.

There are many recommended conservation measures in the 2015 CCA in regards to grazing and some are listed below:

- Review on a case-by-case basis, all discretionary use requests to determine associated impacts to SDT and implement measures to avoid, minimize or mitigate impacts to achieve SDT population and habitat objectives described in land use plans.
- Avoid locating livestock concentration areas within ¼ mile of occupied SDT habitat.
- Evaluate plant community condition through Range Health Evaluation – permit renewal process.
- Continue to implement and enforce regulations.
- Set DPC objectives that incorporate SDT habitat requirements.

- Implement grazing management changes to achieve or make significant progress toward meeting DPC objectives.
- Ensure adequate forage remains for SDT following ephemeral use periods.
- Encourage livestock operators to rest or defer grazing during drought.

The 2012 Lower Sonoran-Sonoran Desert NM Proposed RMP/Final EIS includes a description of SDT habitat and habitat goals:

- Category I desert tortoise habitat includes habitat that is necessary to maintain populations with the highest densities, which are stable or increasing, and experiences the fewest conflicts with current land uses.
- Category II habitats may support stable populations and/or are contiguous with medium to high-density habitat.
- Category III habitats are the least manageable and contain medium to subpar habitats; however, these areas do exist between Category I and II habitats and should be managed for dispersal between Category I and II habitats.

The goal of the BLM is to maintain stable and viable populations with no net loss of habitat in Category I and II habitats and to limit population declines to the extent possible in Category III habitats by mitigating impacts (BLM 2012).

The SDNM Complex has approximately 154,258 acres of Category I, 60,280 acres of Category II and 15,958 acres of Category III SDT habitat (Map 4).

3.6.1.2 Lesser Long-Nosed Bat

The lesser long-nosed bat (*Leptonycteris yerbabuenae*) was removed from the list of threatened and endangered species in 2018 (83 FR 17093 17110). The lesser long-nosed bat continues to be a BLM sensitive species. 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 flower and fruit 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). Medium to high density columnar cactus habitat (30 or more saguaro per acre) within 40 miles of known roost sites are considered valuable habitat (BLM 2012).

Lesser long-nosed bats are efficient fliers and are known to fly considerable distances from roost sites to foraging sites. Foraging areas are those areas with sufficient food resources within 40 miles of a roost site. There is a known lessor long-nosed bat roost site within 40 miles of the entire SDNM Complex.

3.6.1.3 Cactus Ferruginous Pygmy-Owl

The cactus ferruginous pygmy owl (CFPO) (*Glaucidium brasilianum cactorum*) was delisted in 2006 (FR 73 (106) 31418-31424). Currently, the CFPO is on the BLM's sensitive species list.

The CFPO has not been documented on the SDNM, but potential and suitable habitat does occur in several locations throughout the SDNM, 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 in Conley and Beloat allotments were identified as potential CFPO habitat. A few of the larger livestock waters surrounded by dense vegetation, such as mesquite (*Prosopis* spp.), may also be considered suitable habitat. Suitable habitat for this species lies within uplands and washes of the Arizona Upland Subdivision; below 4,000 foot elevation. Suitable habitat patches are areas greater than three acres in size and consist of braided wash systems and/or other densely vegetated areas. Suitable habitat consists of dense thickets of vegetation such as palo verde, ironwood, mesquite, acacia (*Senegalia* spp.), and saguaro. It contains a diversity of species and a vegetation community structure comprised of shrubs, trees less than six inches in diameter, and/or saguaro with cavities. Structural height of vegetation is usually evenly divided in volume or density between herbaceous ground cover and low shrubs, medium-sized shrubs and trees.

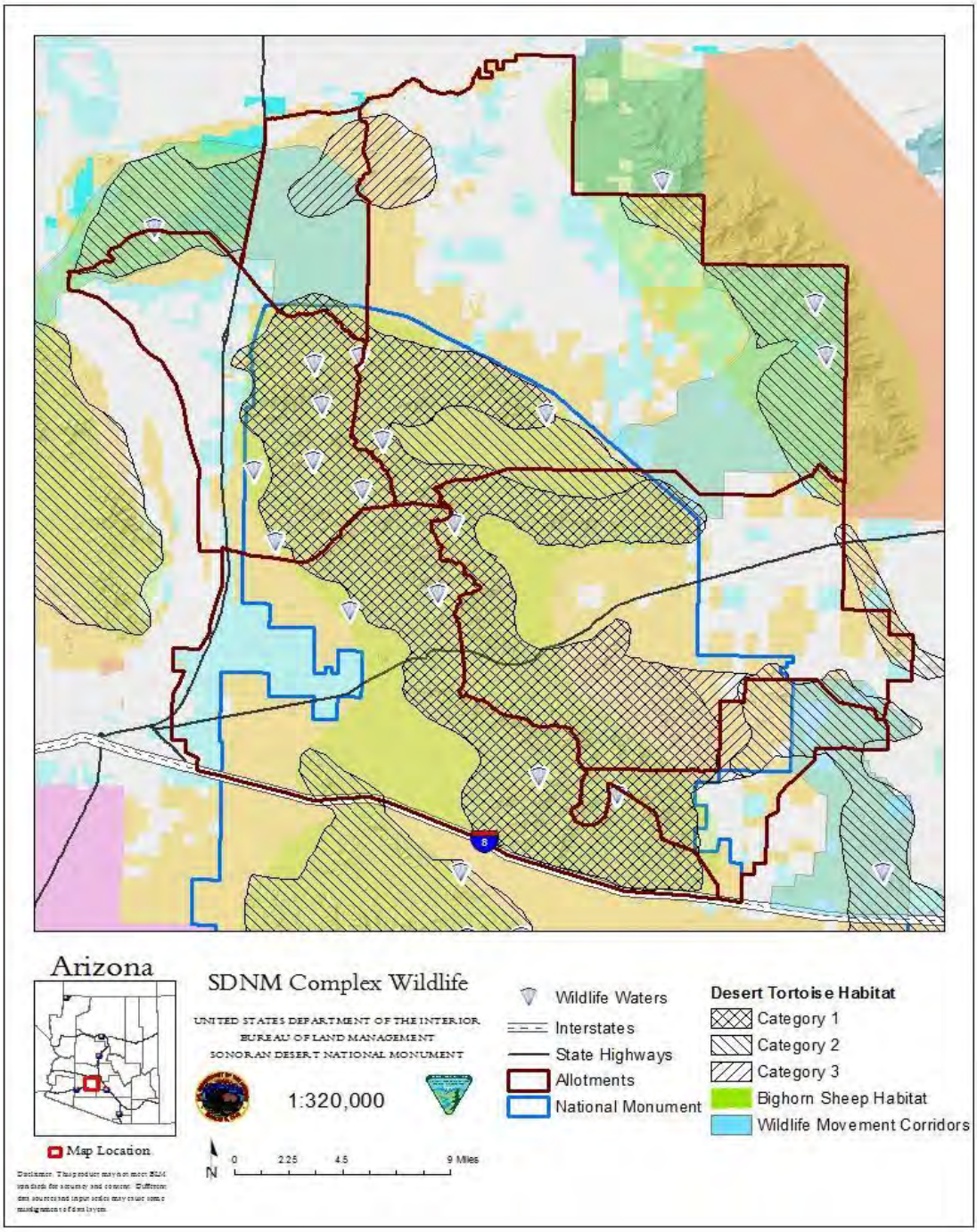
Surveys were conducted throughout the SDNM in 2001 and south of Interstate 8 in 2004, following the protocol developed by the Arizona Game and Fish Department (AGFD 2000). No CFPO were detected during those survey efforts. A 2018 review of the Arizona Game and Fish Departments Heritage Data Management System (HDMS), found that no CFPO have been documented within five miles of the SDNM Complex although their Predicted Range Models state that it is possible for them to occur in the SDNM Complex.

3.6.1.4 Other Special Status Species

In addition to the species listed previously, some of the other BLM special status species that could occur within the SDNM Complex are the gilded flicker (*Colaptes chrysoides*), LeConte's thrasher (*Toxostoma lecontei*), Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), western mastiff bat (*Eumops perotis*) and cave myotis (*Myotis velifer*).

3.6.2 Other Wildlife

There are many species within the SDNM Complex that the AGFD considers "Species of Economic and Recreation Importance Predicted within five Miles of Project Vicinity" (AGFD 2018). Wildlife species that occur within the SDNM Complex and associated allotments include, but are not limited to mule deer (*Odocoileus hemionus*), desert bighorn sheep (*Ovis canadensis mexicana*), Gambel's quail (*Callipepla gambelii*), javelina (*Pecari tajacu*), mourning dove (*Zenaida macroura*), and white-winged dove (*Zenaida asiatica*).



Map 4: Wildlife Habitat and Movement Corridors in the SDNM Complex

*Desert tortoise habitat and wildlife movement corridor layers source: 2012 BLM LSFO/SDNM RMP

4.0 SDNM Complex Grazing Management

4.1 Grazing History

Livestock grazing in Gila Bend and the surrounding areas began in the late 1700s with a few Native American 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 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 SDNM boundary. The first wells in the area were drilled in Rainbow Valley around 1910 to 1912, one of which was north of Mobile and would have provided some livestock access within what is now the SDNM. At this time the only waters in the Vekol valley area consisted of several dirt stock tanks that provided temporary water for cattle from the Tohono O'odham people. Ranching operations began in 1917 in the Sand Tank Mountain area. The first water sources for livestock 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).

Rangelands for the SDNM Complex allotments were classified between 1973 and 1976 as either perennial-ephemeral or ephemeral only pursuant to the special rule published in the Federal Register on December 7, 1968 (33 FR 18245). These classifications correspond to the following types of designated rangelands:

> Ephemeral rangelands is defined in the grazing regulations to mean "areas of the Hot Desert Biome (Region) that do not consistently produce enough forage to sustain a livestock operation but may briefly produce unusual volumes of forage to accommodate livestock grazing." "Ephemeral plant" means a short-lived annual plant that completes its life cycle in a few weeks. Examples include Indian wheat (*Plantago purshii*), filaree (*Erodium cicutarium*), Russian thistle (*Salsola kali tenifolia*), red brome (*Bromus rubens*), and six weeks grama (*Bouteloua barbata*).
>
> Perennial-ephemeral rangelands means areas of the Hot Desert Biome that produces enough perennial forage each year to support a year-round livestock operation and from time to time produces ephemeral vegetation suitable to accommodate additional livestock grazing.

Terms and conditions for Ephemeral use only or a combination of Perennial/Ephemeral use were stipulated on applicable permits (Table 2).

Ephemeral use authorization allows the permittee to apply to make use of ephemeral forage when it becomes available. After receiving an application to activate an ephemeral authorization, BLM must determine if ephemeral plant growth is sufficient to support the requested use. Upon approval of the application, the BLM will issue a grazing fee bill that specifies the allowed livestock numbers, period-of-use, the allotment and pasture as applicable, and the forage amount, in AUMs. Livestock were

last authorized to graze under an ephemeral grazing authorization on the Arnold in 2014 and 2015 for a total of 852 AUMs. This in the only ephemeral grazing that has been authorized on the SDNM Complex since 2012.

Perennial/Ephemeral Use Authorizations have Mandatory Terms and Conditions that specify number of livestock, type of livestock, period of use and permitted AUMs or perennial forage that may be consumed annually throughout the term of the authorization. Additional use of ephemeral forage may be authorized after the BLM has considered rangeland conditions and determined that such use will not cause detrimental effects to the perennial forage resource and does not present conflicts with other resource uses and values. Upon application approval, the BLM will issue a grazing fee bill that specifies the allowed livestock numbers, period-of-use, the allotment and pasture as applicable, and the ephemeral forage amount, in AUMs.

In 1941, 78,000 acres of "Area A" were withdrawn for military use, effectively ending livestock grazing. "Area A" was then re-conveyed to the BLM in the year 2001 under Public Law 106-65. Also in 2001, the Presidential Proclamation designating the SDNM did not allow grazing to continue on 156,938 acres south of I-8 following the end of the terms of the existing permits. Grazing in this area ended in 2009. This equates to 7,255 formerly authorized AUMs across five allotments, south of I-8, that are unavailable for grazing. Prior to the 2012 SDNM RMP, the remaining allotments, north of I-8, adhered to the terms and conditions as seen in Table 2.

Table 2. Mandatory terms and conditions and authorized animal unit months (AUMs) on the SDNM Allotment Complex pre 2012 RMP.

Allotment	Livestock Number	Livestock Kind	Grazing Period		Percent (%) Public Land	Type Use	AUMs
			Begin	End			
Arnold	0	Cattle	03/01	02/28	96	Ephemeral	0
Beloat	300	Cattle	03/01	02/28	83	Active*	2,988
Big Horn	559	Cattle	03/01	02/28	91	Active*	6,104
Conley	350	Cattle	03/01	02/28	99	Active*	4,158
Hazen	120	Cattle	03/01	02/28	82	Active*	1,181
Lower Vekol	101	Cattle	03/01	02/28	96	Active*	1,164

Active* = Perennial/Ephemeral

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

However, according to the Presidential Proclamation, the remaining allotments north of I-8 "…shall be allowed to continue [to be grazed] 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." See Appendix C for the SDNM's Presidential Proclamation.

Current Management
The current management for the SDNM complex was established in the 2012 SDNM RMP and are described in Table 3.

Table 3. Current Mandatory terms and conditions and AUMs on the SDNM Complex.

Allotment	Livestock Number	Livestock Kind	Grazing Period		Percent (%) Public Land	Type Use	AUMs
			Begin	End			
Arnold	0	Cattle	03/01	02/28	96	Ephemeral	0
Beloat	300	Cattle	03/01	02/28	83	Active*	2,988
Big Horn	269	Cattle	03/01	02/28	91	Active*	2,960
Conley	40	Cattle	03/01	02/28	99	Active*	464
Hazen	120	Cattle	03/01	02/28	82	Active*	1,181
Lower Vekol	101	Cattle	03/01	02/28	96	Active*	1,164

Active* = Perennial/Ephemeral

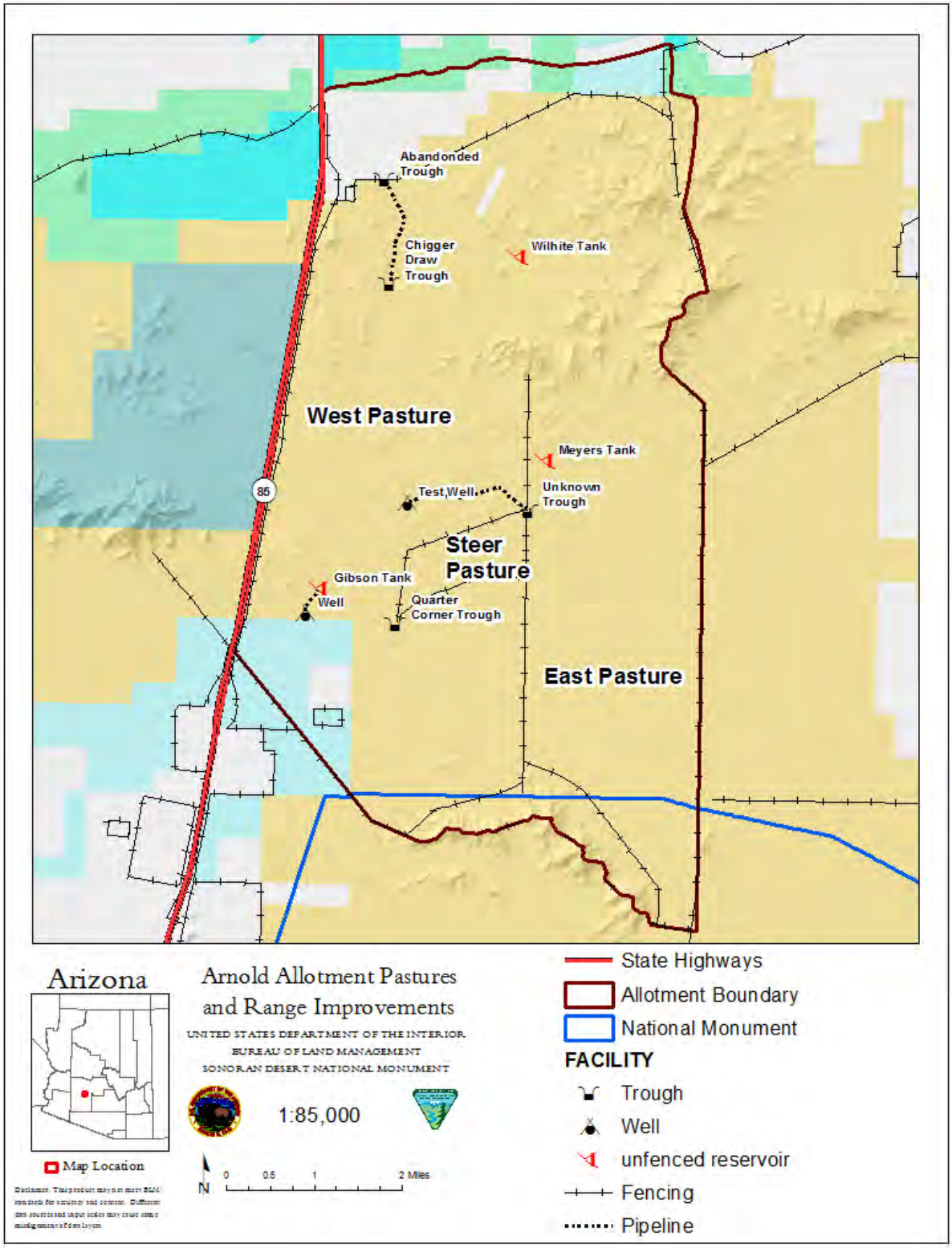
Other terms and conditions:
When forage conditions warrant, livestock grazing may be authorized upon application to utilize and ephemeral forage crop pursuant to federal grazing regulations, special management requirements and other guidance.

Each allotment's management changed over time with the addition/removal of fencing and water sources. The following descriptions describe allotment management before and after the SDNM's designation and 2012 RMP. No new range improvements have been installed since the 2012 RMP. However, range improvements have been more thoroughly inventoried for this analysis to accurately show the management of grazing allotments.

4.1.1 Arnold

The Arnold Allotment is classified as ephemeral use only. In years with sufficient precipitation, the grazing permittee may apply for use based on the available ephemeral forage. The Arnold is split into three pastures, one in the east, one in the west, and a smaller steer holding pasture in the center (Map 5). There are three dirt reservoirs and three well/pipeline served troughs. However, only one well, Chiggar well, is currently in working order. When grazing is authorized, cattle are distributed between the pastures

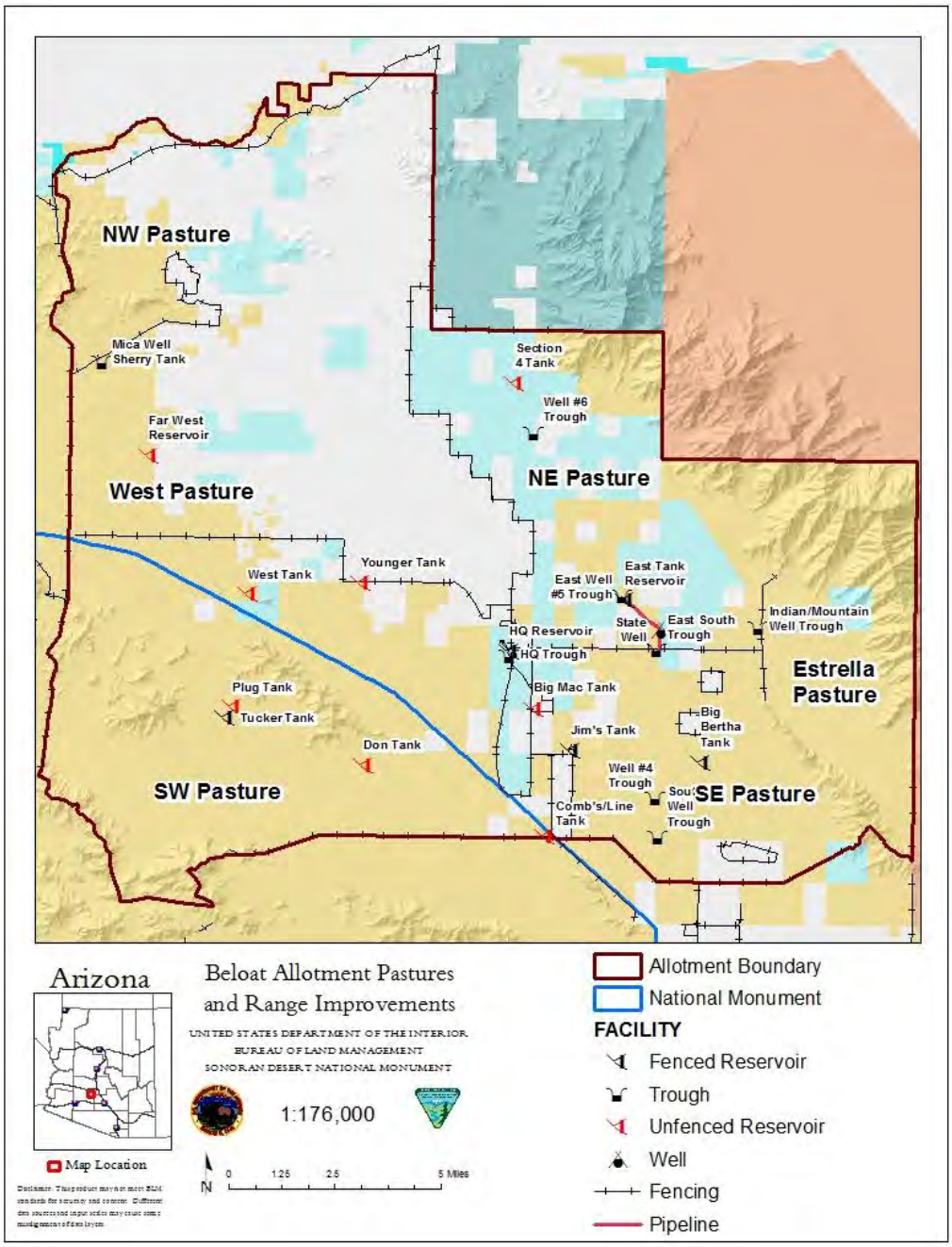
and water sources to utilize ephemeral forage. Approximately 45 percent, of the SDNM within the Arnold is fenced out from cattle use.



Map 5. Arnold Allotment Pastures and Range Improvements.

4.1.2 Beloat

The Beloat Allotment is classified as perennial/ephemeral. A maximum base herd of 300 cows graze the Beloat year round. Additional cattle may be added to utilize ephemeral forage during years with sufficient precipitation. The Beloat is split into six pastures, three in the east and three in the west (Map 6). However, the smallest pasture in the northwest has no available water at this time. There are seven well/pipeline served troughs and eleven dirt reservoirs. Fifty percent of the dirt reservoirs only hold water during years with above average precipitation. The most productive pastures with relatively even water distribution are the three eastern pastures along the Estrella Mountains. The western two pastures with available water are equal in size, but less productive. Therefore, the western pastures are used primarily as ephemeral pastures. Cattle are most frequently gathered and sorted at the Headquarters well and reservoir in the center of the Beloat off Bullard Avenue. Only the southwest pasture contains portions within the SDNM. The urban/rural interface introduces challenges such as land sales, utility right-of-ways, and gates frequently left open.

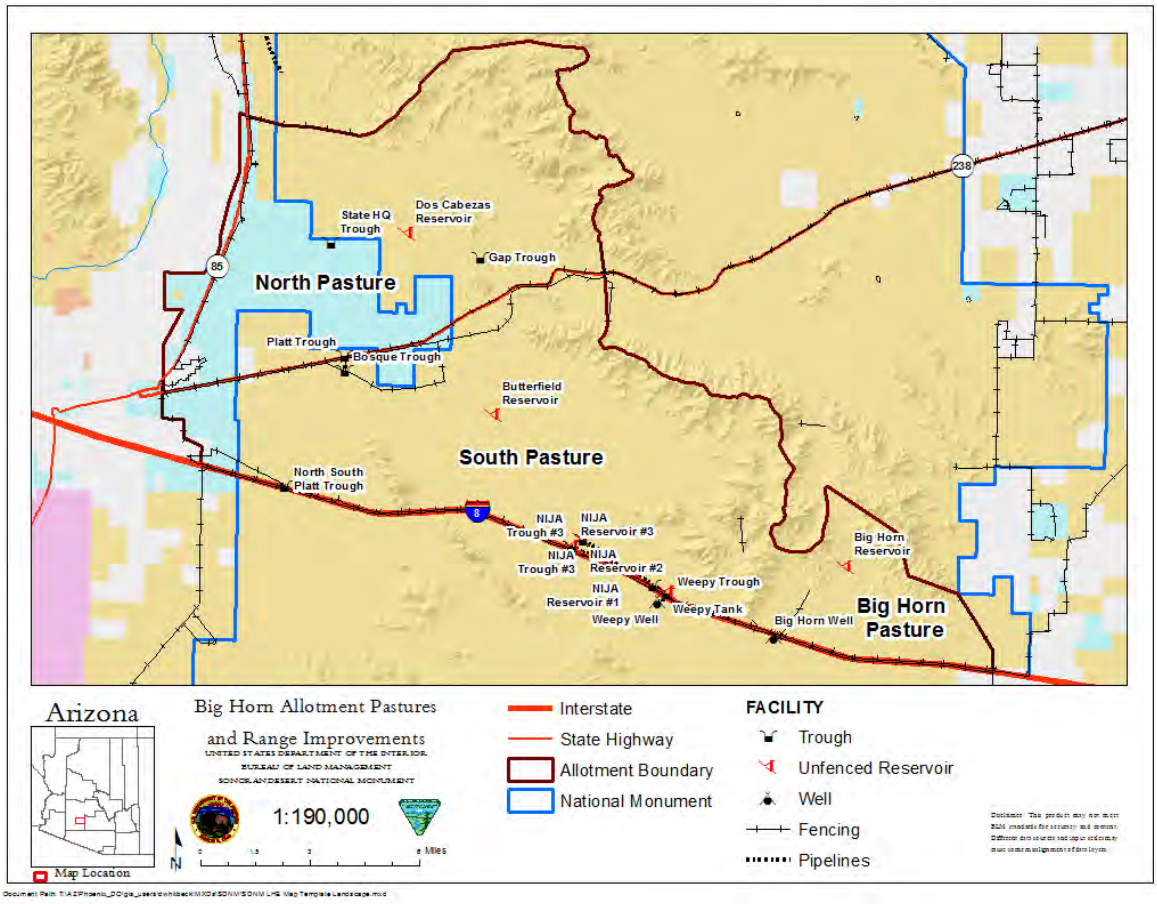


Map 6. Beloat Allotment Pastures and Range Improvements

4.1.3 Big Horn

The Big Horn Allotment is classified as perennial/ephemeral. Prior to the designation of the SDNM, a maximum base herd of 559 cattle were authorized to graze the Big Horn year round. Following the designation of the SDNM, the pasture south of I-8 (53,144 acres), became unavailable for grazing. In the 2012 RMP, a maximum base herd of 269 cattle was determined to be the new appropriate level to graze the Big Horn year round. The Big Horn permit expired in 2009 and cannot be renewed until final action on the court order is taken. Despite the expiration of the grazing permit in 2009, grazing has continued at an unknown level on the State lands in the northern pasture. The Big Horn

is split into three pastures, two south of State Route 238 and one north (Map 7). Water distribution across the Big Horn is fair, with four well/pipeline fed troughs and four dirt reservoirs that are only reliable during years with above average precipitation. The majority of the Big Horn is within the SDNM boundary.

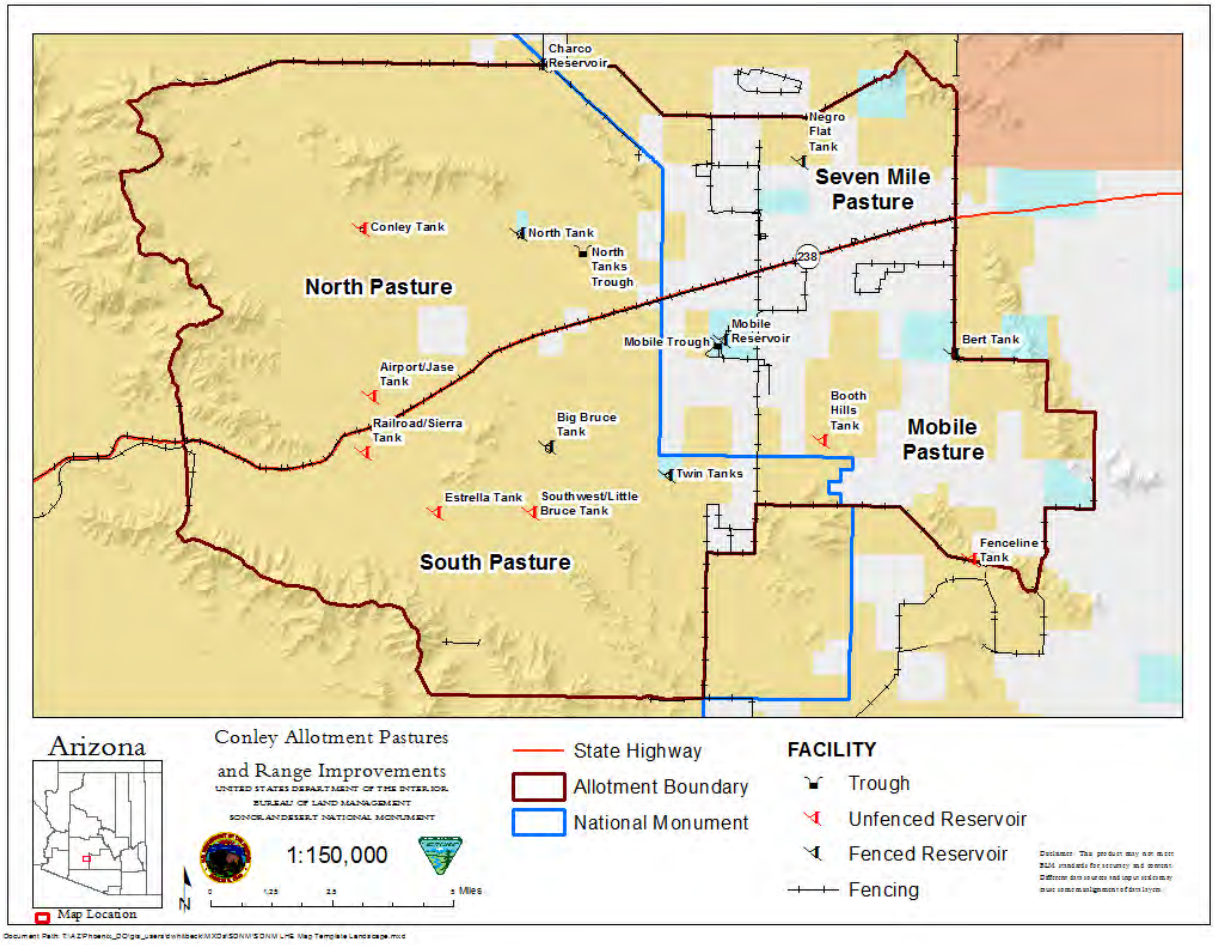


Map 7. Big Horn Pastures and Range Improvements

4.1.4 Conley

The Conley Allotment is classified as perennial/ephemeral. Prior to the 2012 RMP, 350 cattle were authorized to graze the Conley year round. The 2012 RMP/ROD made the SDNM portion of the Allotment unavailable for grazing which reduced the authorized maximum base herd to 40 cattle yearlong on the non-SDNM portions of the Conley. Following the permit's expiration in 2015, the BLM was unable to renew the permit for the Conley until the RMP/EIS for the SDNM is finalized. The Conley permit expired in 2015 and cannot be renewed until final action on the court order is taken. Therefore, no grazing has occurred since 2015. The Conley is split into four pastures, two in the north and two in the south, bisected by State Route 238 (Map 8). The Conley is served by two "well" fed water troughs and 13 dirt reservoirs, of which, all but four are reliable during drought years. These waters are evenly distributed across the Conley. Livestock were often gathered and sorted at North Tank Reservoir in the north pasture and at the Mobile Reservoir in the south pasture. During years with sufficient precipitation, stocker cattle are brought to the Conley to utilize the ephemeral forage. The entire

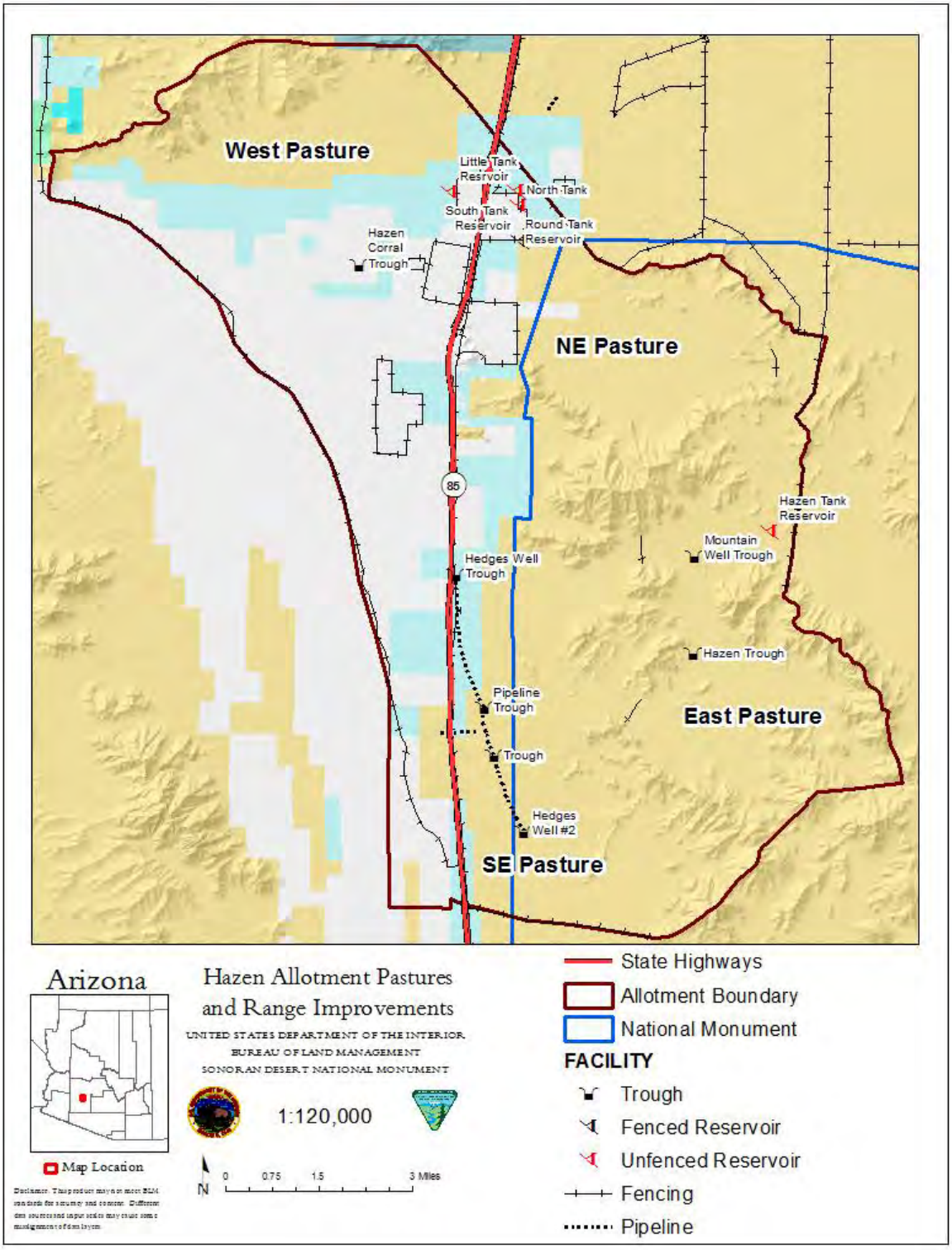
western two thirds of the Conley is within the SDNM boundary which includes eight dirt reservoirs and one well fed trough.



Map 8. Conley Allotment Pastures and Range Improvements

4.1.5 Hazen

The Hazen Allotment is classified as perennial/ephemeral. Before and after the 2012 RMP, a maximum base herd of 120 cattle were authorized to graze the Hazen year round. However, the Hazen has not been grazed in more than 10 years. The Hazen is split into four pastures, three east of Highway 85 and one west (Map 9). The Hazen was served by five well/pipeline fed troughs and five dirt reservoirs, however, none appear to have been operational in the past 10 years. The west pasture is served by only one trough in the eastern corner and is the least productive pasture on the Hazen. The majority of the eastern pastures are within the SDNM boundary.

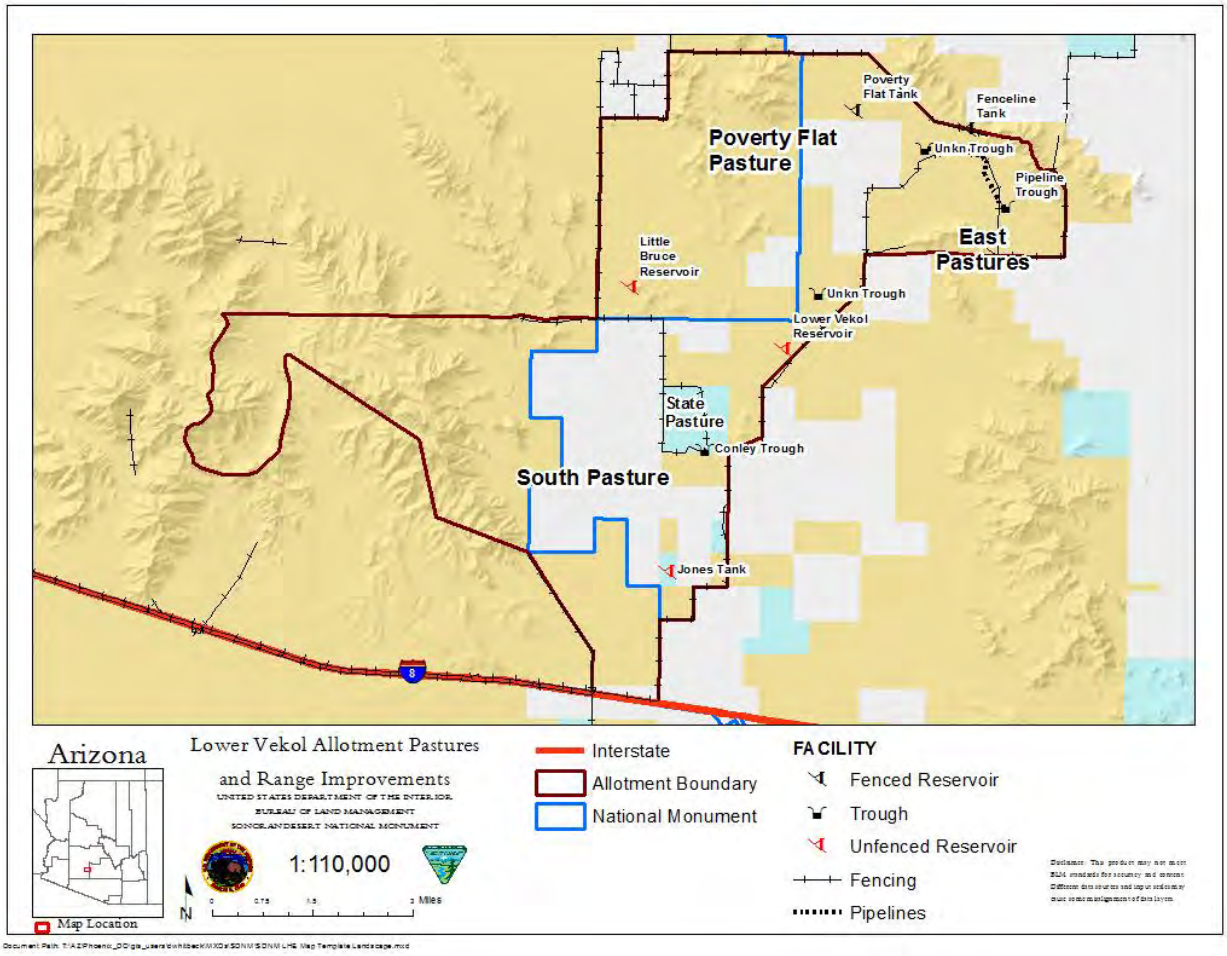


Map 9. Hazen Allotment Pastures and Range Improvements

4.1.6 Lower Vekol

The Lower Vekol Allotment is classified as perennial/ephemeral. Before and after the 2012 RMP, a maximum base herd of 101 cattle was authorized to graze the Lower Vekol year round. The Lower Vekol is split into five pastures, with three in the north and two

in the south (Map 10). The north pastures include two small pastures in the eastern portion, one of which encompasses a series of nine dikes. The smaller of the two southern pastures is a holding pasture adjacent to the ranch headquarters at Conley well. In the past, the Lower Vekol has been run in conjunction with the Kirian Allotment to the east. The Lower Vekol is served by five well/pipeline fed troughs and six dirt reservoirs. The entire west half of the Lower Vekol is within the SDNM boundary. Only one of the six dirt reservoirs, Little Bruce, is within the SDNM and is currently non-functional.



Map 10. Lower Vekol Allotment Pastures and Range Improvements

5.0 SDNM Complex Management Objectives

5.1 BLM Rangeland Management 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; the Public Rangelands Improvement Act of 1978; presidential proclamations under the Antiquities Act of 1906; and other executive and public land orders. Objectives are: 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; 7) to manage, maintain and improve the condition of the public rangelands so they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; and 8) to authorize grazing on the SDNM only to the extent that the BLM determines that grazing is compatible with the paramount purpose of protecting the objects of the SDNM.

Title 43 Code of Federal Regulations (CFR) Part 4100 governs grazing administration for public rangelands. Among other things, the regulations in subpart 4180 require the implementation of standards and guidelines to achieve the fundamentals of rangeland health.

The 2012 LSFO and SDNM Records of Decision address livestock management on public lands. The following are the goals and objectives from each Record of Decision regarding livestock grazing:

> GR-1: Manage livestock grazing in the Lower Sonoran Decision Area to provide for multiple uses while maintaining healthy ecosystems (2012a, p. 2-63).
>
> GR-1.1: Livestock grazing use and associated practices will be managed in a manner consistent with other multiple use needs and other desired resource condition objectives to ensure that the health of rangeland resources and ecosystems are maintained or improved. Management will achieve, or make significant progress toward achieving, Standards and produce a wide range of public values, such as wildlife habitat, livestock forage, recreation opportunities, clean water, and functional watersheds.
>
> GR-2: Manage livestock grazing in the SDNM Decision Area to provide for multiple uses while maintaining healthy ecosystems and protecting the Monument's biological and cultural resources (2012b, p. 2-66.).
>
> GR-2.1: Public lands in SDNM north of I-8 available to livestock use will be managed to achieve or make significant progress toward achieving Land Health Standards to ensure that the health of the biological resources are maintained or

improved. Livestock grazing use and associated practices will be managed in a manner consistent with other multiple use needs and other desired resource condition objectives to ensure that the health of rangeland resources and ecosystems are maintained or improved.

5.2 SDNM Complex Land Health Objectives

BLM land health objectives are specific to each of Arizona's Standards for Rangeland Health, and objectives were developed using indicators associated with these Standards. The achievement of these Standards assures rangeland health, State water quality standards, and wildlife habitat including endangered, threatened, and sensitives species. These Standards are as follows:

5.2.1 Standard 1 - Upland Sites

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

Objective:
Maintain a departure of "Moderate" or less from the monitoring plot's corresponding ESD reference sheet. This is a qualitative and quantitative review of the site specific monitoring plot's 17 indicators for rangeland health where each indicator contributes to the assessment of the plot's attributes of soil site stability, hydrologic function, and biotic integrity. For all plots, the 3-7" p.z. ESD reference sheets were used unless the reference sheet was incomplete or unavailable, then the 7-10" p.z. ESD reference sheet for the same soil type was used.

Standard 1 achievement of ecological sites are assessed within each allotment. An ecological site within an allotment achieves Standard 1 if the majority, greater than 50 percent, of the plots representing the ecological site within the allotment are achieving at least two of the three rangeland health attributes (soil site stability, hydrologic function, and biotic integrity).

5.2.2 Standard 2 - Riparian - Wetland Site

Riparian-wetland areas are in proper functioning condition.

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

5.2.3 Standard 3 - Desired Resource Conditions

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

Objective:
Achieve DPC objectives at the majority, more than 50 percent, of monitoring plots. DPC objectives are developed, with economic and social considerations, to meet and conserve the short-term and long-term potential for ecological sites to produce vegetation (Schacht 1993; Borman and Pyke 1994). DPC objectives are selected from vegetation community attributes observed on the ecological sites (Task Group on Unity of Concepts and Terminology Committee Members 1995). This is a quantitative

assessment of ground cover and vegetative community attributes for each plot's corresponding ecological site. DPC objectives were developed for each of the seven most prevalent ecological sites on the SDNM Complex by evaluating the data from randomly stratified monitoring plots on each of the most prevalent ecological sites without expected livestock use or unnatural disturbances. Areas with little livestock impact was defined as areas greater than 2 miles of livestock waters (See Appendix H). For each ecological site, DPC objectives were set one standard deviation from the average of each vegetation community attribute from data collected on plots located greater than two miles distance from livestock water, current or historic, and without additional unnatural disturbances (Table 4). This represents the average spread, natural variability, of the normally distributed data from the mean of each vegetation community attribute absent of unnatural disturbances.

The following objectives represent a sample of the natural condition of the vegetation communities on each ecological site due to limited potential for current or historical livestock disturbance and other unnatural disturbances in these areas. The bare ground DPC objective was set using the average plus one standard deviation. Percent bare ground is to be less than or equal to this objective. The foliar cover DPC objective was set using the average minus one standard deviation. Percent foliar cover is to be greater than or equal to this objective. The palatable species, palatable to both wildlife and livestock (Appendix D), DPC objective was set using the average minus one standard deviation. Percent palatable species is to be greater than or equal to this objective. The species diversity, Shannon Index, DPC objective was set using the average minus one standard deviation. Species diversity is to be greater than or equal to this objective.

Achievement of Standard 3 on ecological sites is assessed within each allotment. An ecological site within an allotment achieves Standard 3 if the majority, greater than 50 percent, of the plots representing the ecological site are achieving DPC objectives. A plot representing an ecological site achieves Standard 3 if more than 50 percent of the DPC objectives are achieved. Achievement of Standard 3 ensures productive and diverse upland communities of native species exist and are maintained and that the ecosystem is in functioning condition with vegetation community attributes consistent with soil protection and with providing forage and cover for both wildlife, general and sensitive species, and livestock. Literature defining forage and cover requirements for cactus ferruginous pygmy-owl, bighorn sheep, desert tortoise, lesser long-nosed bat, and mule deer were reviewed to ensure the DPC objectives for each ecological site are consistent with the species' requirements (AZGFD 2000; BLM 2012; Buechner 1960; Heffelfinger et al. 2006; Oftedal 2002; Van Devender et al. 2002).

Table 4. Desired Plant Community Objectives by Ecological Site.

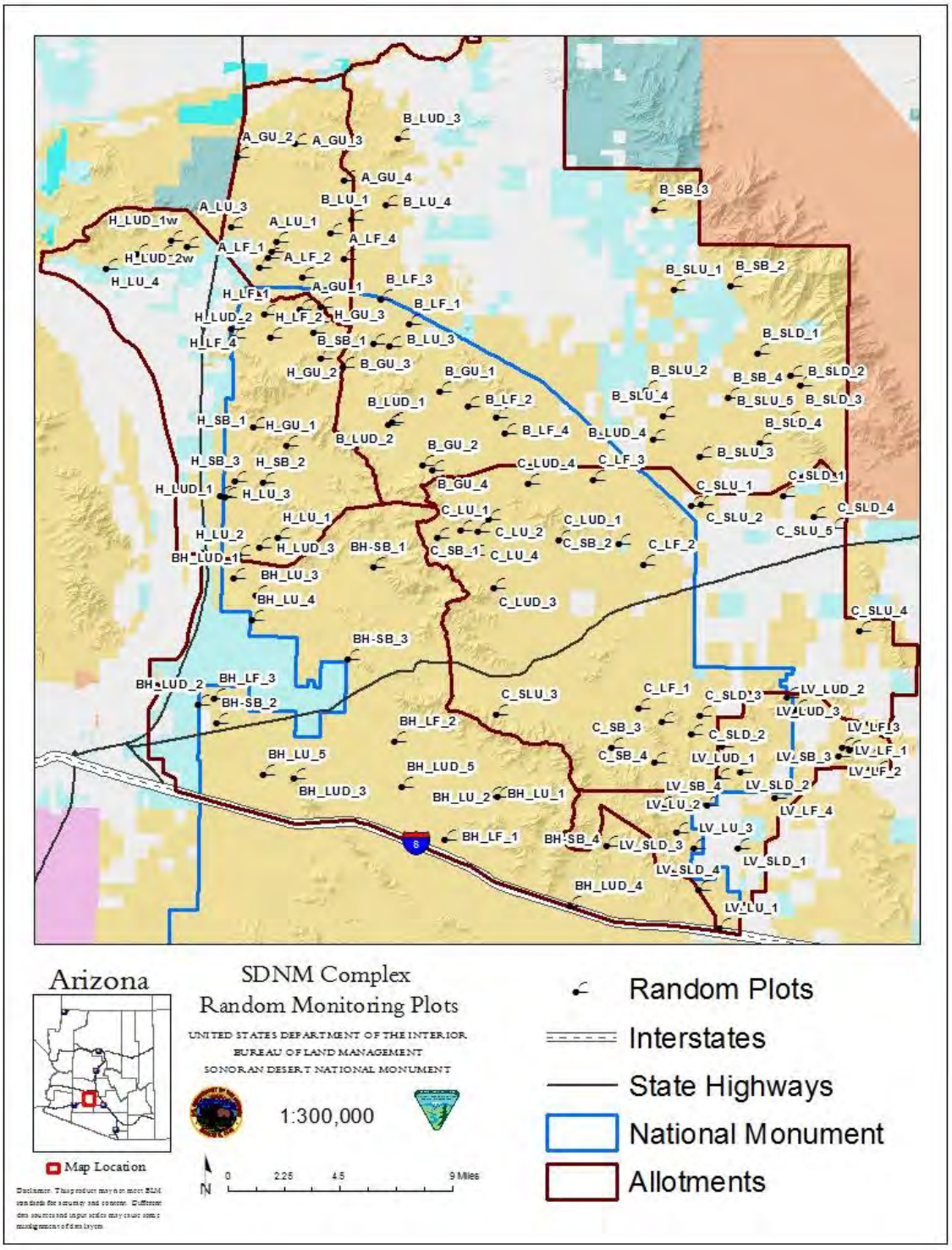
Desired Plant Community Objective	Granitic Upland	Limy Fan	Limy Upland Deep	Limy Upland	Sandy Bottom/Wash	Sandy Loam Deep	Sandy Loam Upland
Bare Ground	≤20%	≤22%	≤30%	≤24%	≤37%	≤72%	≤62%
Foliar Cover	≥13%	≥8%	≥7%	≥9%	≥17%	≥10%	≥14%
Palatable Species	≥7%	≥1%	≥1%	≥9%	≥33%	≥3%	≥10%
Species Diversity (Shannon Index)	≥1.11	≥0.24	≥0.37	≥0.49	≥1.18	≥0.52	≥0.45

6.0 Complex Inventory and Monitoring Methodology

6.1 Stratified Random Plots

A landscape approach was used to inventory soil and vegetation resource conditions and assess land health across the SDNM Complex. Random plot stratification and monitoring plot design in accordance with "BLM Technical Reference 1734-04" was implemented to provide an unbiased representation of soil and vegetation resources across the SDNM Complex. Data from the randomly stratified plots were used to determine the variability of ecological site and vegetation community attributes across the SDNM Complex. Ten plots were randomly stratified by allotment and the seven most prevalent ecological sites, as described above. The plots were visited in order, one through ten, until four sites matching the ecological site description were set. Plots with known disturbances, from sources other than livestock or livestock management infrastructure such as mining operations and right-of-ways, and areas inaccessible by livestock were excluded from the sample design. Mining operations, roads (300 foot buffer from the centerline), and steep slopes (>30 percent) were excluded from the sampling polygons. The sample design was based around a goal of four samples (plots) per stratum (ecological site within allotment). This number was selected because this is the maximum number of samples that could be monitored with the current resources available. However, some strata contain three samples due to the limited area suitable for plots to be established and some strata that needed additional plots to reduce data variability or represent underrepresented areas contain five samples. Generally, larger sample sizes provide increased precision when estimating unknown parameters.

The BLM interdisciplinary team reviewed attributes of the SDNM's objects and determined which monitoring methods are needed to adequately monitor those attributes and the Arizona Standards for Rangeland Health (Appendix E). Between 2017 and 2018, 124 random plots were monitored using Line Point Intercept, Belt Density, Soil Stability, and indicators of rangeland health (Map 11). Only perennial plants were the measured using these methods in order to relate the attributes of perennial vegetation communities to corresponding ESDs. Annual plants were excluded from this study due to the inherent variability of occurrence and production.



Map 11. Stratified Random Monitoring Plots and their Locations on the Complex

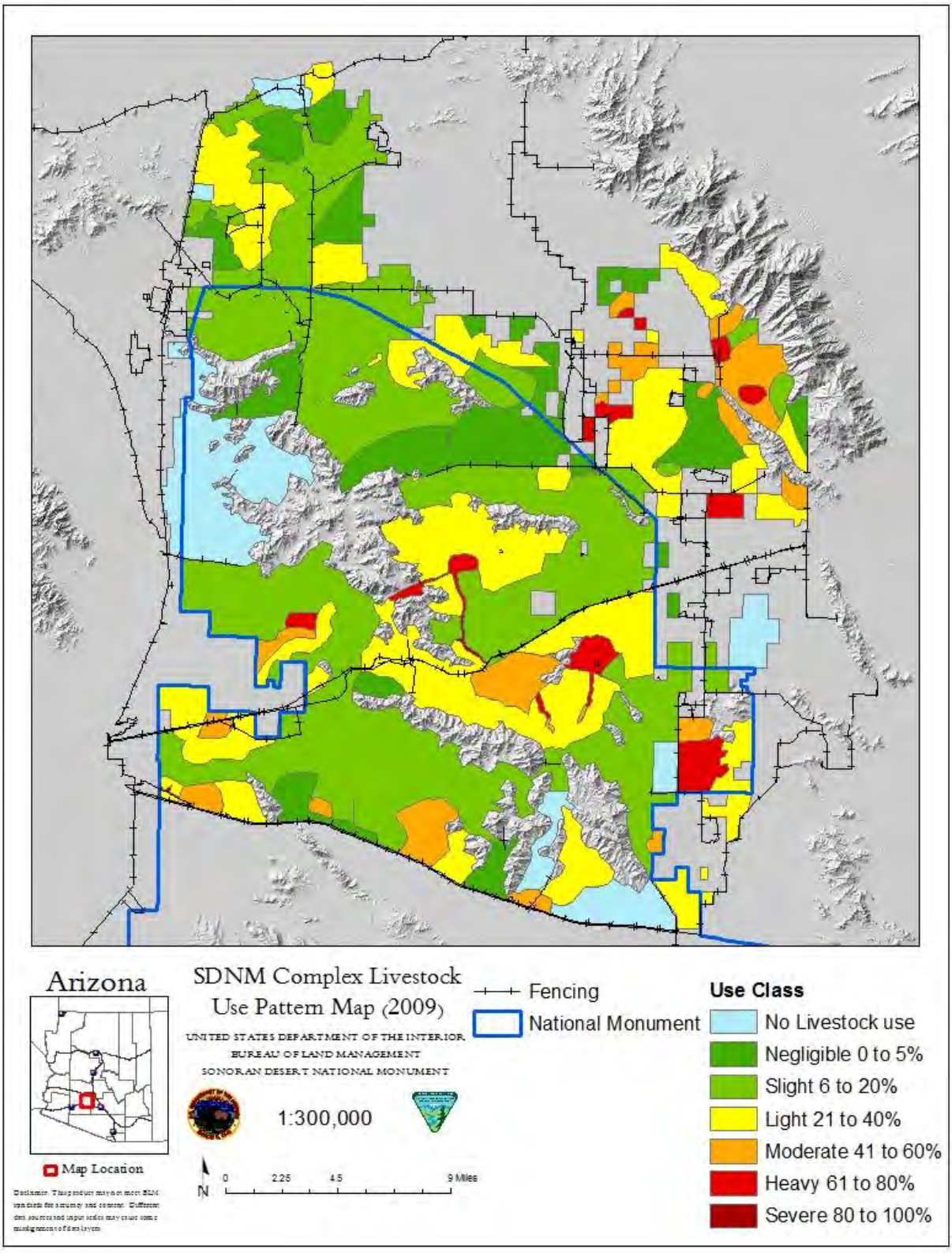
6.2 Livestock Utilization, Use Pattern mapping, and Use Probability Mapping

Utilization monitoring was conducted at several of the key areas multiple times between 2008 and 2012 using the Key Species Method found in "Technical Reference 1734-3 Utilization Studies and Residual Measurements, 1996". Key forage species are

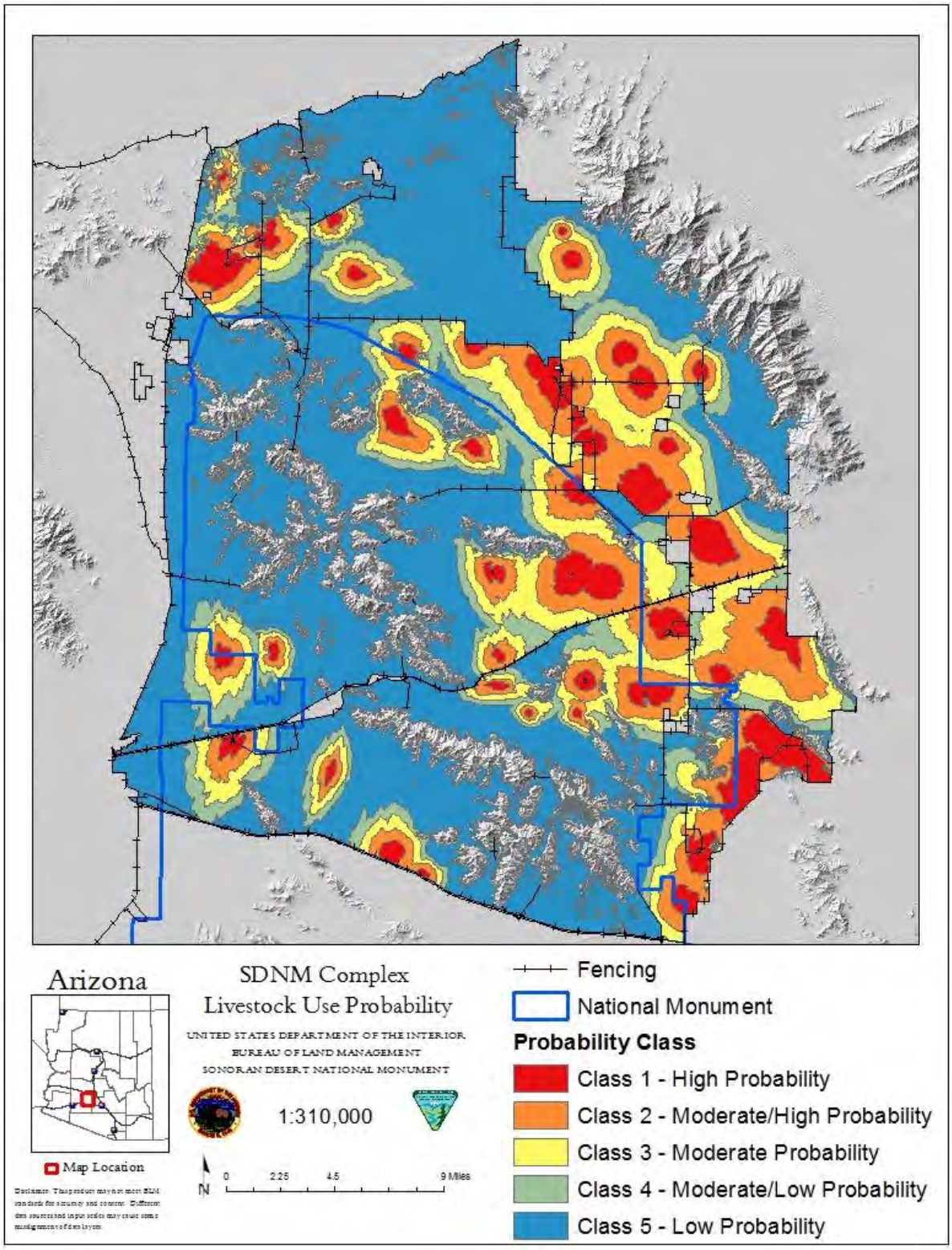
defined as important forage species that serve as indicators of status and/or trend for the entire vegetation community. Because key forage species are preferred, the utilization of key species can be extrapolated to judge the proper use of other less preferred palatable species of a site.

A livestock use pattern map was produced in 2009 using the "Mapping Utilization Patterns" methods as described in TR 1734-3. Mapping involved driving every road on each allotment to obtain a general concept of the use patterns. Observers stopped every one-half to one mile and collected utilization data using the Landscape Appearance Method, as described in TR 1734-3, which is an ocular assessment classifying the utilization of each key forage species. In addition, BLM used the Key Plant Method to collect utilization data at the key areas. The utilization measurements were used to delineate use zones on the final livestock use pattern map (Map 12).

Between 2007 and 2018, the number of livestock grazing the SDNM Complex has steadily declined (Figure 2). This is due, in part, to the expiration of four of the six grazing permits on the SDNM Complex. Therefore, current utilization data for the Big Horn, Hazen, Conley, and Lower Vekol allotments are unavailable. Using the best available data, a livestock use probability map was developed to illustrate areas with and without expected livestock use across the SDNM Complex (Map 13). This map was developed using tools in geographic information systems (GIS) software where geographic variables known to influence livestock grazing and distribution were considered (Appendix F). The map is classified into 5 classes corresponding to the potential intensity of past and future livestock use. Class 1 identifies areas with a high potential for livestock use and Class 5 identifies areas with a low potential for livestock use. This map supports the 2009 use pattern map, in terms of probability rather than actual use. For example, the use probability map predicted the probability of use in similar areas where use was mapped on the 2009 use pattern map. The livestock use probability map was used to assist in determining if current and/or historical livestock grazing is the causal factor for the non-achievement of Standards.



Map 12. SDNM Complex Livestock Use Pattern Map (2009)



Map 13. Probability/Potential for Livestock Use on the SDNM Complex

7.0 Evaluation and Summary of Studies Data

7.1 Precipitation

Precipitation data for the SDNM Complex were acquired from the Flood Control District of Maricopa County. Thirteen rain gauges are dispersed throughout and within close proximity the SDNM Complex. These gauges have been in operation from 10 to 31 years, depending on location, and their elevations range from 750 ft. to 1,720 ft. The mean precipitation from all thirteen locations is 5.8 inches annually (Figure 1) with a maximum of 7.13 inches over a 25 year period at Vekol wash rain gauge and a minimum of 4.71 inches over a 20 year period at the Gila Bend Landfill rain gauge.

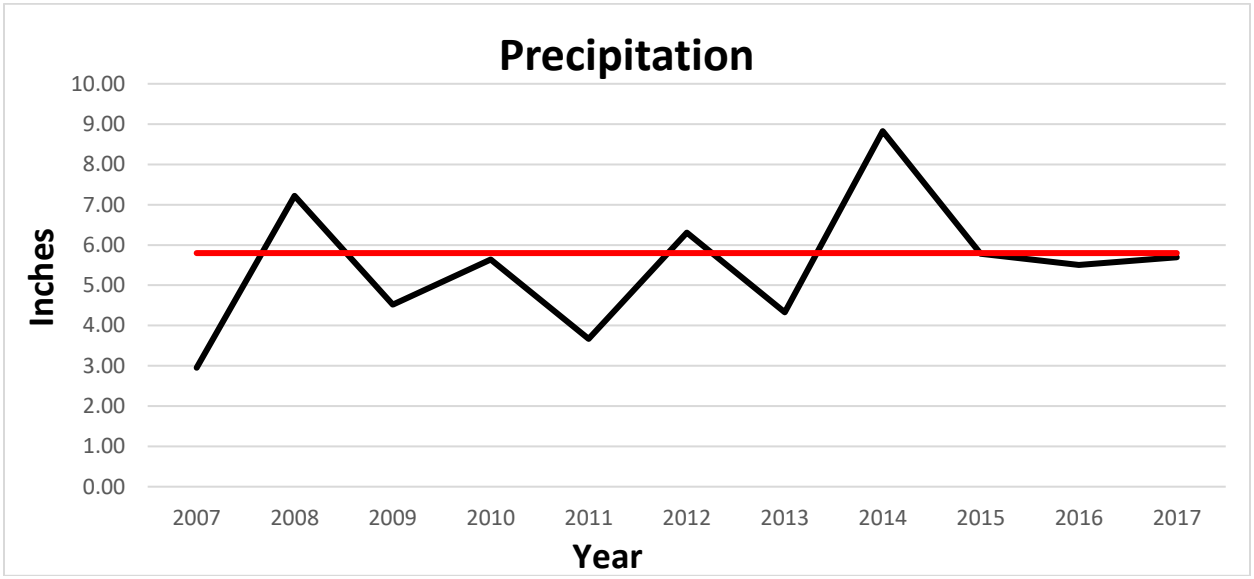


Figure 1. Yearly precipitation average across the SDNM Complex (black line), in each year from 2007 to 2017, and average annual precipitation (red line = 5.8 inches) on the SDNM Complex over the period 2007 to 2017.

7.2 Actual Use

Actual use data for livestock grazing is calculated from billing, actual use reporting, and grazing case files (Table 5 and Figure 2). Livestock actual use has varied from year to year due to annual fluctuations in forage conditions and the livestock market.

Table 5. Actual use estimates (AUMs) on the SDNM Complex.

Allotment	AUMs by Year											
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Arnold	0	0	2,462	0	0	0	0	114	738	0	0	0
Beloat	747	1,992	1,992	1,992	1,195	2,988	2,988	2,988	2,988	2,988	2,988	2,988
Big Horn	6,104	1,436	34	0	0	0	0	0	0	0	0	0
Conley	4,158	4,158	4,158	4,158	4,158	4,158	377	377	4,158	968	0	0
Hazen	1,181	1,181	1,181	1,181	1,181	1,181	1,181	1,181	0	0	0	0
Lower Vekol	0	1,164	1,164	1,164	0	0	288	0	0	0	0	0

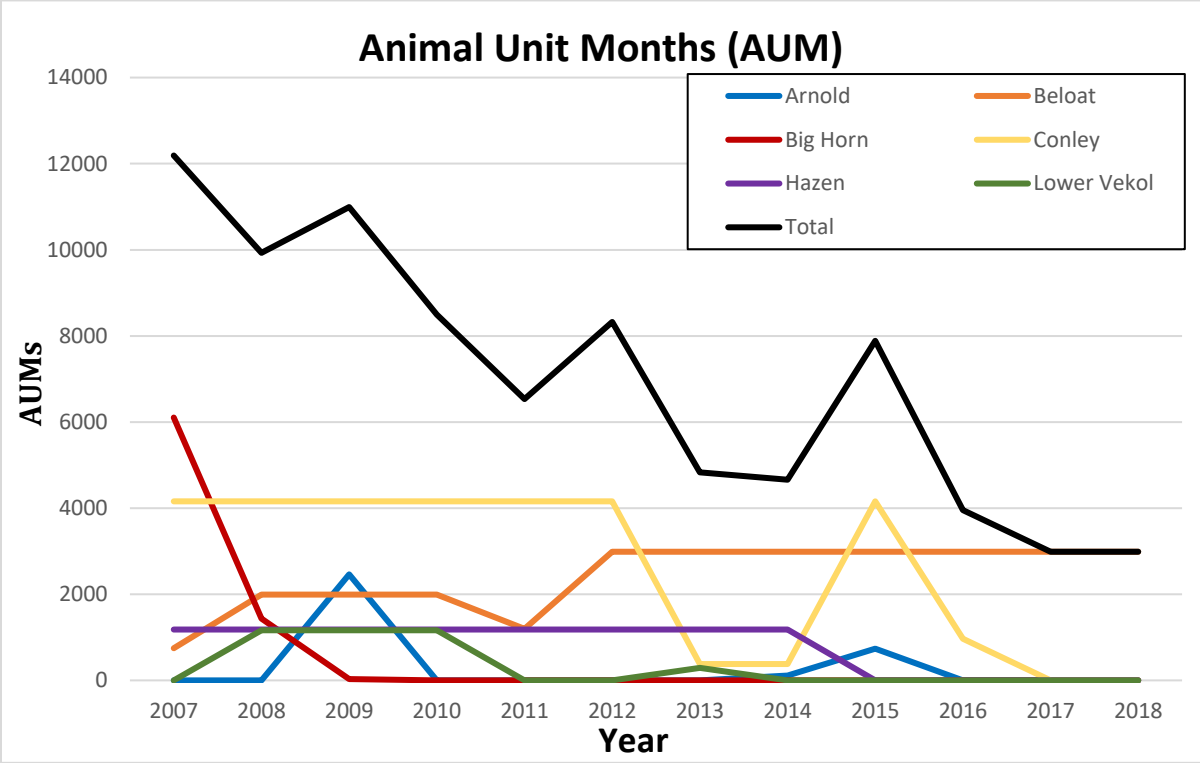


Figure 2. Authorized AUMs by year

7.3 Random Plot Data

See Appendix G for random plot data.

7.4 Livestock Use Probability Map

A livestock use probability map was developed to illustrate the distribution of potential livestock impacts near livestock waters that have been in operation over the past 10 years (Map 12). The higher the class number, the less likely livestock utilize the area due to distance from water, terrain, and other barriers. The percentage of the SDNM Complex within each use Class is listed in Table 6.

Table 6. Percentage of the SDNM Complex within each class.

Class	Percentage of SDNM Complex
Class 1 – High Use Probability	7.1
Class 2 – Moderate/High Use Probability	13.8
Class 3 – Moderate Use Probability	13.5
Class 4 – Moderate/Low Use Probability	10.9
Class 5 – Low Use Probability	54.6

8.0 Conclusions

The qualitative and quantitative data from the random monitoring plots were used to draw conclusions regarding the achievement or non-achievement Standards 1 and 3. Conclusions are summarized by allotment, major ecological site within allotment, vegetation community, and wildlife habitat areas within allotments. Only the most prevalent ecological sites present within each allotment are evaluated in this section. Not all prevalent ecological sites of the SDNM Complex are represented within each allotment. Section 5.2 defines the various management objectives for each prevalent ecological site of the SDNM Complex, and referring to the raw data in Appendix G, will aid in interpreting and verifying the presented conclusions.

The evaluation of livestock use probability mapping and field observations are used to determine if livestock grazing is the causal factor for non-achievement of either Standard 1 or 3. For example, if livestock sign (trails, hoof action, and dung) was observed on a plot failing to achieve a Standard and the plot is within livestock use probability Class 1 through 4, it is likely that livestock grazing is the causal factor for the non-achievement of the Standard in question.

The percentage of the three most common vegetation communities (creosote-bursage, palo verde-mixed cactus, and ephemeral wash) and wildlife habitat (bighorn sheep and SDT) failing to achieve Standards 1 and 3 are also summarized based on the proportion (percentage) each plot represents in the vegetation community/habitat area by allotment. Plots were weighted based on the number of plots within a given vegetation community/habitat area (acres) or ephemeral wash (miles). Some allotments may be absent of some vegetation communities and/or habitat types. The acres or miles of the vegetation communities presented in the tables below may not equal the total acreage of the allotment because of areas inaccessible to livestock and other vegetation communities that make up a small proportion of the allotment. Acres of wildlife habitat types only represent the areas with suitable habitat for each species within each grazing allotment. Vegetation communities and wildlife habitat areas overlap with multiple ecological site types. The analysis of these areas is not used to ascertain achievement or non-achievement of Standards but intended to show the condition of the vegetation communities/wildlife habitat.

8.1 Arnold Allotment

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).

The three major ecological sites within the Arnold Allotment are achieving Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Granitic Upland	4	4	Yes	N/A
Limy Fan	4	3	Yes	N/A
Limy Upland	4	4	Yes	N/A

Rationale:
The majority of the plots representing Granitic Upland, Limy Fan, and Limy Upland are achieving Standard 1.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1.

Vegetation Community/Species Habitat	Total Acres of Veg Community/Habitat	% Community Not Achieving Standard 1	% Community Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	16,130 ac	12.5	12.5
Palo Verde Mixed Cactus	5,110 ac	0.0	0.0
Bighorn Sheep	1,715 ac	0.0	0.0
SDT Category 1	1,760 ac	0.0	0.0
SDT Category 3	5,338 ac	0.0	0.0

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Two of the three major ecological sites within the Arnold Allotment are achieving Standard 3.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Granitic Upland	4	3	Yes	N/A
Limy Fan	4	0	No	Livestock Grazing
Limy Upland	4	3	Yes	N/A

Rational:
The majority of the plots representing the Granitic Upland and Limy Upland ecological sites are achieving Standard 3.

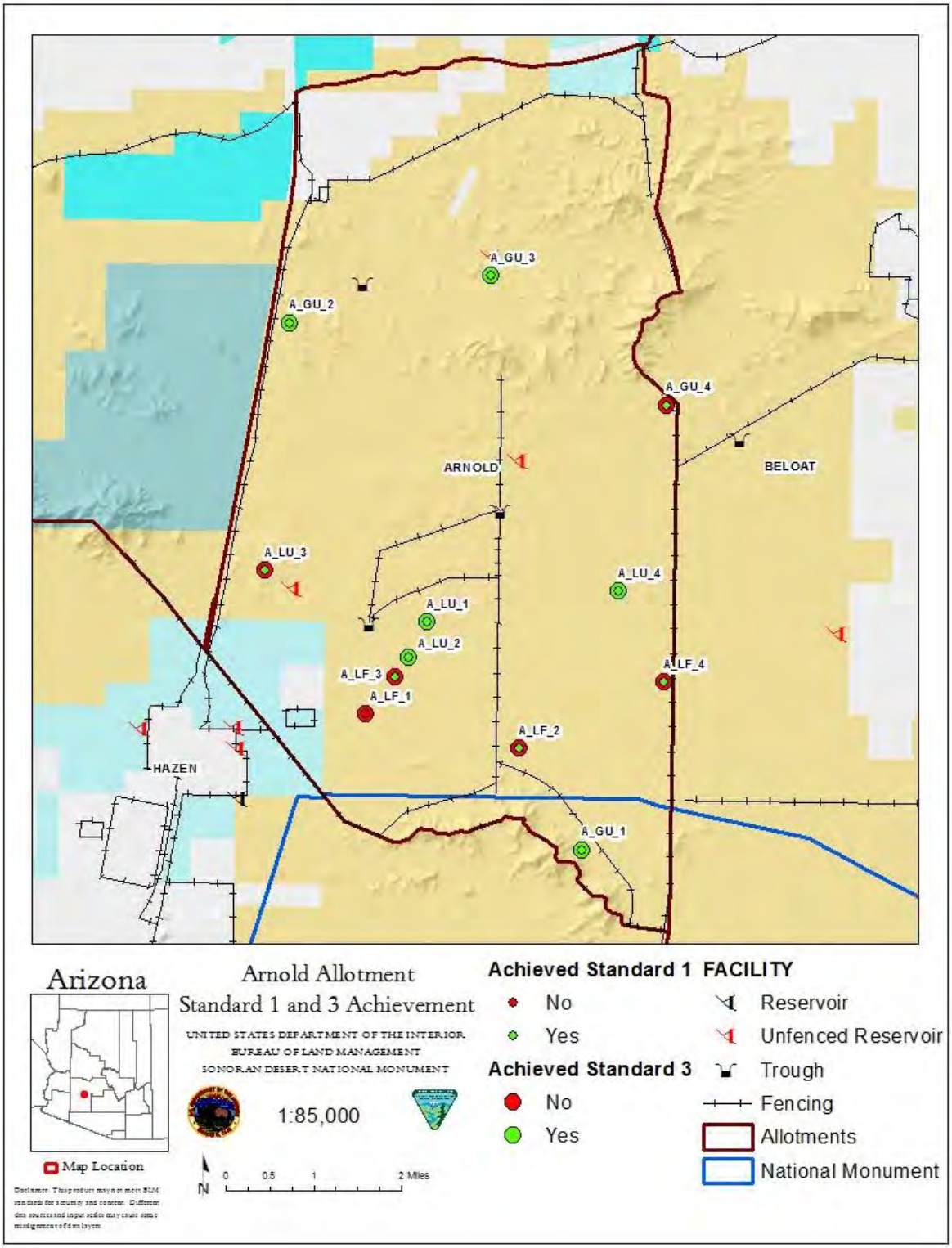
None of the monitoring plots representing the Limy Fan ecological site are achieving Standard 3. Two of the four Limy Fan monitoring plots not achieving Standard 3 are within livestock use probability Class 5 and two are within Class 2. The plots within Class 2 also showed livestock use in the form of trails, loitering areas, and scat. Therefore, historical livestock grazing was determined to be the causal factor for the non-achievement of Standard 3 on the Limy Fan ecological site.

Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

Vegetation Community/Species Habitat	Total Acres of Veg Community/Habitat	% Community Not Achieving Standard 3	% Community Not Achieving Standard 3 Due to Livestock Grazing
Creosote Bursage	16,130 ac	62.5	25.0
Palo Verde Mixed Cactus	5,110 ac	25.0	0.0
Bighorn Sheep	1,715 ac	0.0	0.0
SDT Category 1	1,760 ac	0.0	0.0
SDT Category 3	5,338 ac	50.0	0.0

Summary of Ecological Site Analysis
Based on field observations and data collected, the Arnold allotment is achieving Standard 1 on the three major ecological sites and achieving Standard 3 on two of the three major ecological sites. The Limy Fan ecological site fails to achieve Standard 3 on all four monitoring plots. Livestock grazing is determined to be the causal factor for non-achievement on two of the four monitoring plots. The lack of palatable species and excessive bare ground are contributing factors for the non-achievement of Standard 3.

The monitoring plots where livestock grazing is determined to be the causal factor for the non-achievement of Standard 3 are located in the southern portion of the west pasture. The ecological sites in the northern portion of the allotment do not appear to have livestock grazing impacts.



Map 14. Arnold Standard 1 and 3 Achievement

8.2 Beloat Allotment

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).

Five of the seven major ecological sites within the Beloat Allotment are achieving Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Granitic Upland	4	4	Yes	N/A
Limy Fan	4	3	Yes	N/A
Limy Upland	4	3	Yes	N/A
Limy Upland Deep	4	4	Yes	N/A
Sandy Bottom	4	4	Yes	N/A
Sandy Loam Deep	4	0	No	Livestock Grazing
Sandy Loam Upland	5	2	No	Livestock Grazing

Rationale:
The majority of the plots representing Granitic Upland, Limy Fan, Limy Upland, Limy Upland Deep, and Sandy Bottom ecological sites are achieving Standard 1.

Two of the five plots representing the Sandy Loam Upland ecological site are achieving Standard 1. Of the three Sandy Loam Upland plots failing to achieve Standard 1, one is in livestock use probability Class 2 with livestock trails and scat, one in is livestock use probability Class 3 with livestock trails and scat, and one is in livestock use probability Class 4 with livestock trails and scat. Based on field observations and data collected, livestock grazing is determined to be the causal factor for the non-achievement of Standard 1 on the Sandy Loam Upland ecological site.

None of the plots representing the Sandy Loam Deep ecological site are achieving Standard 1. Of the four Sandy Loam Deep plots failing to achieve Standard 1, one is in livestock use probability Class 1 with livestock trails and loitering areas, one is in livestock use probability Class 4 with historical livestock trails, loitering areas, and an absence of palatable species, and one is in livestock use probability Class 5 with recent livestock trails, substantial use of key species, and loitering areas, and one is in livestock use probability Class 5 with livestock trails and scat. Based on field observations and data collected, livestock grazing is determined to be the causal factor for the non-achievement of Standard 1 on the Sandy Loam Deep ecological site. The excessive use within livestock use probability Class 5 is likely due to the prolonged stocking of the pasture and the relatively high forage quality of these areas causing livestock to travel further in search of forage.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 1	Percent Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	65,614 ac	18.2	9.1
Palo Verde Mixed Cactus	16,703 ac	50	50
Ephemeral Wash	184.7 mi	0	0
Bighorn Sheep	72,259 ac	41.4	41.4
SDT Category 1	19,624 ac	11.1	11.1
SDT Category 2	35,667 ac	39.1	39.1
SDT Category 3	6,293 ac	0.0	0.0

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Five of the seven major ecological sites within the Beloat Allotment are achieving Standard 3.

Ecological Site	Number of plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Granitic Upland	4	3	Yes	N/A
Limy Fan	4	4	Yes	N/A
Limy Upland	4	3	Yes	N/A
Limy Upland Deep	4	1	No	Unknown
Sandy Bottom	4	3	Yes	N/A
Sandy Loam Deep	4	2	No	Livestock Grazing
Sandy Loam Upland	5	3	Yes	N/A

Rationale:
The majority of the plots representing the Granitic Upland, Limy Fan, Limy Upland, Sandy Bottom, and Sandy Loam Upland ecological sites are achieving Standard 3.

Two of the four plots representing the Sandy Loam Deep ecological site are achieving Standard 3. Of the two Sandy Loam Deep plots failing to achieve Standard 3, one is in livestock use probability Class 1 with livestock trails and scat, and one is in livestock

use probability Class 4 with livestock trails and scat from the previous year and absent of palatable species. Based on field observations and data collected, livestock grazing is determined to be the causal factor for the non-achievement of Standard 3 on the Sandy Loam Deep ecological site.

One of the four plots representing the Limy Upland Deep ecological site is achieving Standard 3. Of the three plots failing to achieve Standard 3, one is in livestock use probability Class 2 with one livestock/wildlife trail present, absent of palatable species, and receives little additional moisture in the form of run-on moisture, and two are in livestock use probability Class 5 with no livestock impacts or use of palatable species. Based on field observations and data collected, livestock grazing is not the causal factor for the non-achievement of Standard 3 on the Limy Upland Deep ecological site.

Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

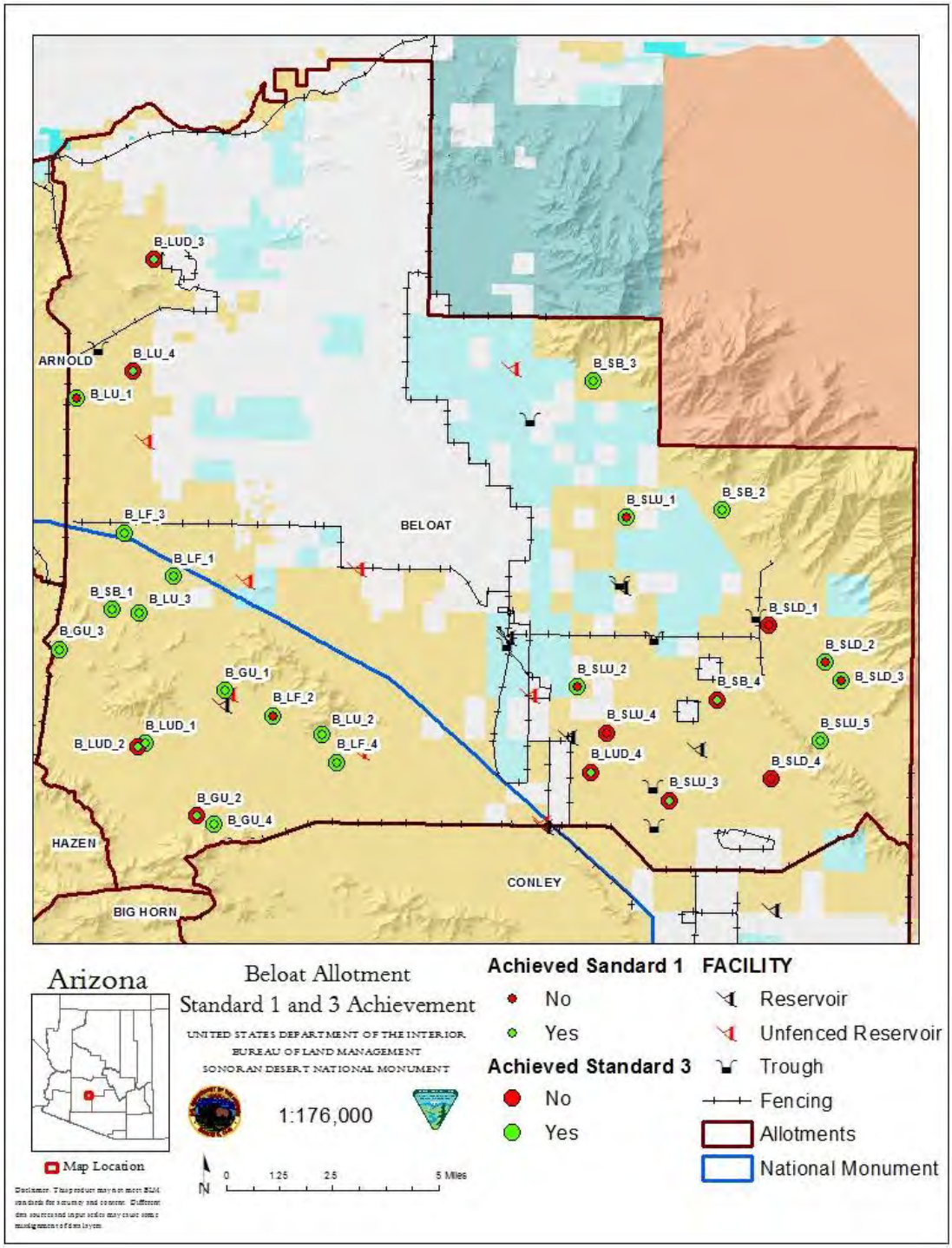
Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 3	Percent Not Achieving Standard 3 Due to Livestock Grazing
Creosote Bursage	65,614 ac	27.3	9.1
Palo Verde Mixed Cactus	16,703 ac	42.9	28.6
Ephemeral Wash	184.7 mi	25.0	25.0
Bighorn Sheep	72,259 ac	16.6	9.4
SDT Category 1	19,624 ac	11.1	0.0
SDT Category 2	35,667 ac	15.6	0.0
SDT Category 3	6,293 ac	100.0	0.0

Summary of Ecological Site Analysis

Based on field observations and data collected the Beloat Allotment is achieving Standard 1 and Standard 3 on five of the seven major ecological sites.

Objectives for Standard 1 are not achieved on the Sandy Loam Deep and Sandy Loam Upland ecological sites. Soil site stability and hydrologic function are the primary objectives not achieved on these ecological sites. Livestock grazing is determined to be the causal factor for the non-achievement for the majority of the monitoring plots on both ecological sites. Both ecological sites are only present in the eastern pastures near the Estrella Mountains where the majority of perennial livestock grazing occurs causing cattle to stray beyond livestock use probability Class 4 in search of forage.

Objectives for Standard 3 are not achieved on the Limy Upland Deep and Sandy Loam Deep ecological sites. All DPC objectives are not achieved on Sandy Loam Deep plots and foliar cover is the primary objective not achieved on Limy Upland Deep plots. Livestock grazing is determined to be the causal factor for the non-achievement of Standard 3 on the Sandy Loam Deep ecological site but not the causal factor for the non-achievement of Standard 3 for the Limy Upland Deep ecological site.



Map 15. Beloat Standard 1 and 3 Achievement

8.3 Big Horn Allotment

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).

Three of the four major ecological sites within the Big Horn Allotment achieve Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Limy Fan	3	1	No	Unauthorized Current Livestock Grazing/Historical Livestock Grazing
Limy Upland	5	4	Yes	N/A
Limy Upland Deep	5	5	Yes	N/A
Sandy Bottom	4	4	Yes	N/A

Rationale:
The majority of the plots representing the Limy Upland, Limy Upland Deep, and Sandy Bottom ecological sites are achieving Standard 1.

One of the three plots representing the Limy Fan ecological site is achieving Standard 1. Of the two plots failing to achieve Standard 1 on the Limy Fan ecological site, one is in livestock use probability Class 1 with old livestock trails traversing the plot and no recent use of palatable species, and one is in livestock use probability Class 5 with recent livestock sign, trails and scat, and absent of palatable species. However, livestock have not been authorized to use the allotment since 2009. Based on field observations and data collected, current unauthorized livestock grazing and historical (greater than 2 years past) livestock grazing is the causal factor for non-achievement of Standard 1 on the Limy Fan ecological site.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 1	Percent Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	44,335 ac	37.5	37.5
Palo Verde Mixed Cactus	28,681 ac	0.0	0.0
Ephemeral Wash	183.6 mi	0.0	0.0
Bighorn Sheep	73,024 ac	8.5	8.5
SDT Category 1	48,965 ac	0.0	0.0
SDT Category 2	2,705 ac	0.0	0.0

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

All four major ecological sites within the Big Horn Allotment are achieving Standard 3.

Ecological Site	Number of plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Limy Fan	3	2	Yes	N/A
Limy Upland	5	5	Yes	N/A
Limy Upland Deep	5	3	Yes	N/A
Sandy Bottom	4	4	Yes	N/A

Rationale:
The majority of plots representing the Limy Fan, Limy Upland, Limy Upland Deep and Sandy Bottom ecological sites are achieving Standard 3.

Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

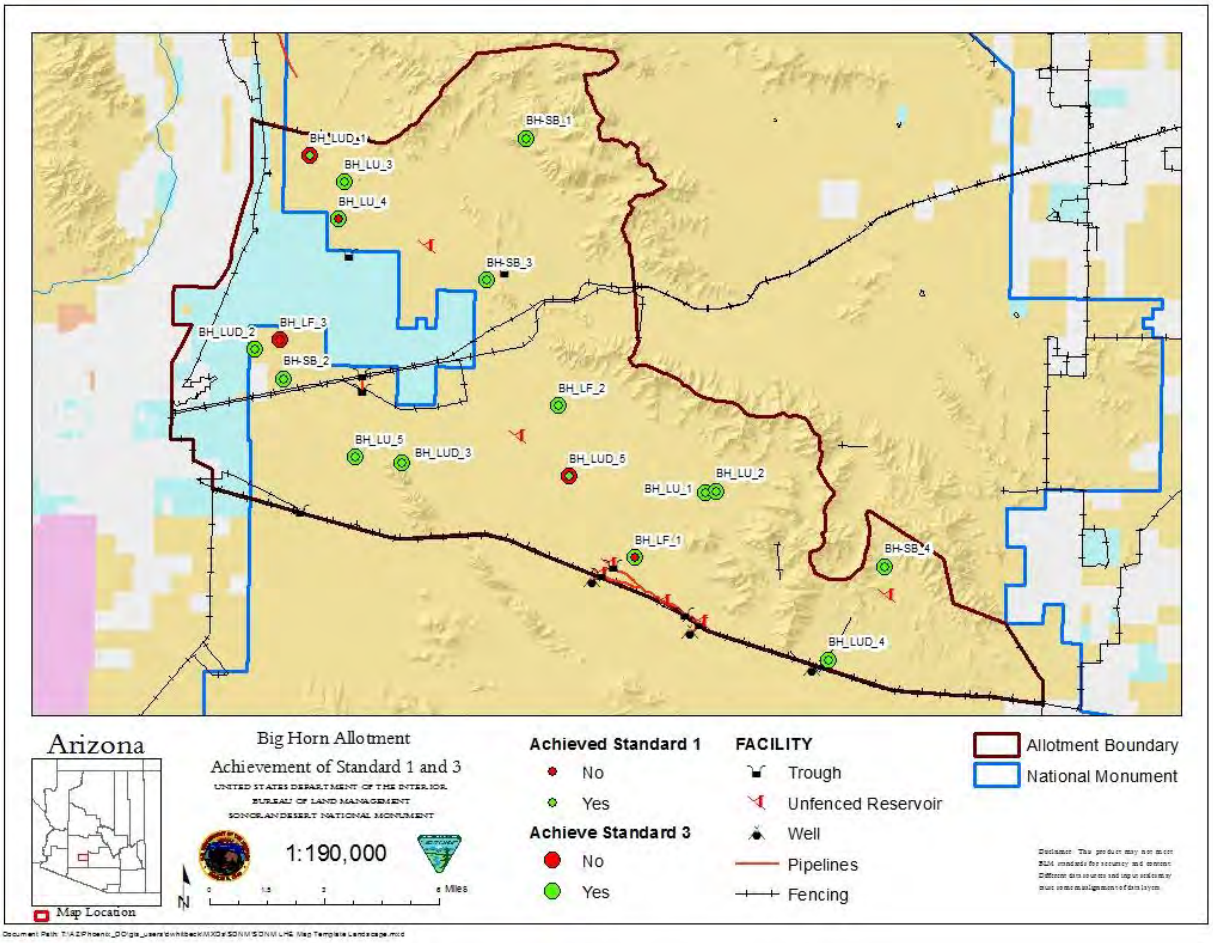
Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 3	Percent Not Achieving Standard 3 Due to Livestock Grazing
Creosote Bursage	44,335 ac	25.0	12.5
Palo Verde Mixed Cactus	28,681 ac	20.0	0.0
Ephemeral Wash	183.6 mi	0.0	0.0
Bighorn Sheep	73,024 ac	8.5	0.0
SDT Category 1	48,965 ac	0.0	0.0
SDT Category 2	2,705 ac	0.0	0.0

Summary of Ecological Site Analysis
Based on field observations and data collected, the Big Horn Allotment is achieving Standard 1 on three of the four major ecological sites and Standard 3 on all major ecological sites.

Objectives for Standard 1 are not achieved on the Limy Fan ecological site. Soil Site Stability and Hydrologic Function objectives are not achieved on the Limy Fan ecological site. Current livestock grazing and historical livestock grazing impacts in the form of livestock trails and loitering areas were observed and are determined to be the causal factors for non-achievement of Standard 1 for the Limy Fan ecological site.

Objectives for Standard 1 are not achieved on one Limy Upland plot. Numerous livestock trails and significant key species utilization was observed on the Limy Upland plot in the northern pasture. However, the remaining four Limy Upland plots are achieving Standard 1.

Objectives for Standard 3 are achieved on all four major ecological sites.



Map 16. Big Horn Standard 1 and 3 Achievement

8.4 Conley Allotment

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).

Four of the six major ecological sites within the Conley Allotment are achieving Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Limy Fan	3	1	No	Livestock Grazing
Limy Upland	4	4	Yes	N/A
Limy Upland Deep	4	3	Yes	N/A
Sandy Bottom	4	3	Yes	N/A
Sandy Loam Deep	4	1	No	Livestock Grazing
Sandy Loam Upland	5	3	Yes	N/A

Rationale:
The majority of the plots representing Limy Upland, Limy Upland Deep, Sandy Bottom, and Sandy Loam Upland ecological sites achieve Standard 1.

One of the three plots representing the Limy Fan ecological site is achieving Standard 1. Of the two plots failing to achieve Standard 1 on the Limy Fan ecological site, one is in livestock use probability Class 1 with livestock trails and scat, and one is in livestock use probability Class 2 with livestock trails and scat and absent of palatable species. Based on field observations and data collected, livestock grazing is the causal factor for the non-achievement of Standard 1 on the Limy Fan ecological site.

One of four plots representing the Sandy Loam Deep ecological site is achieving Standard 1. Of the three plots failing to achieve Standard 1 on the Sandy Loam Deep ecological site; one is in livestock use probability Class 3 with historical livestock grazing impacts and several livestock trails on the plot, and one is in livestock use probability Class 3 with no recent livestock grazing impacts or use of palatable species, and one is in livestock use probability Class 5 with livestock trails but no recent use of palatable species. Based on field observations and data collected, livestock grazing is the causal factor for the non-achievement of Standard 1 on the Sandy Loam Deep ecological site in the southwest pasture but not the northeast pasture.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 1	Percent Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	55,329 ac	60.0	40.0
Palo Verde Mixed Cactus	20,426 ac	33.3	20.0
Ephemeral Wash	167.4 mi	25.0	25.0
Bighorn Sheep	45,687 ac	20.6	13.8
SDT Category 1	48,498 ac	27.2	18.1
SDT Category 2	8,526 ac	20.1	20.1
SDT Category 3	2,142 ac	100.0	100.0

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Two of the six major ecological sites within the Conley Allotment are achieving Standard 3.

Ecological Site	Number of plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Limy Fan	3	1	No	Livestock Grazing
Limy Upland	4	3	Yes	N/A
Limy Upland Deep	4	2	No	Unknown
Sandy Bottom	4	4	Yes	N/A
Sandy Loam Deep	4	2	No	Livestock Grazing
Sandy Loam Upland	5	2	No	Unknown

Rationale:
The majority of the plots representing the Limy Upland and Sandy Bottom ecological sites are achieving Standard 3.

Two of the four plots representing the Limy Upland Deep ecological site are achieving Standard 3. Of the two plots failing to achieve Standard 3 on the Limy Upland Deep ecological site, one is in livestock use probability Class 3 with no significant livestock grazing impacts and absent of palatable species, and one is in livestock use probability Class 5 with no significant livestock grazing impacts. Based on field observations and

data collected, livestock grazing is not the causal factor for the failure of Standard 3 on the Limy Upland Deep ecological site.

Two of the four plots representing the Sandy Loam Deep ecological site are achieving Standard 3. Of the two plots failing to achieve Standard 3 on the Sandy Loam Deep ecological site, one is in livestock use probability Class 3 with no livestock grazing impacts, and one is in livestock use probability Class 3 with livestock trails. Based on field observations and data collected, livestock grazing is the causal factor for the non-achievement of Standard 3 on one of the two plots representing the Sandy Loam Deep ecological site in the northeast pasture.

One of the three plots representing the Limy Fan ecological site is achieving Standard 3. Of the two plots failing to achieve Standard 3 on the Limy Fan ecological site, one is in livestock use probability Class 2 with livestock trails and absent of palatable species, and one is in livestock use probability Class 3 and absent of palatable species. Based on field observations and data collected, livestock grazing is the causal factor for non-achievement of Standard 3 on the Limy Fan ecological site in the northwest pasture but not the southwest pasture.

Two of the five plots representing the Sandy Loam Upland ecological site are achieving Standard 3. Of the three plots failing to achieve Standard 3 on the Sandy Loam Upland ecological site, one is in livestock use probability Class 2 with historical livestock grazing impacts, and two are in livestock use probability Class 4 each with historical livestock sign and absent of palatable species. Based on field observations and data collected, livestock grazing is not the causal factor for non-achievement of Standard 3 on the Sandy Loam Upland ecological site.

Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

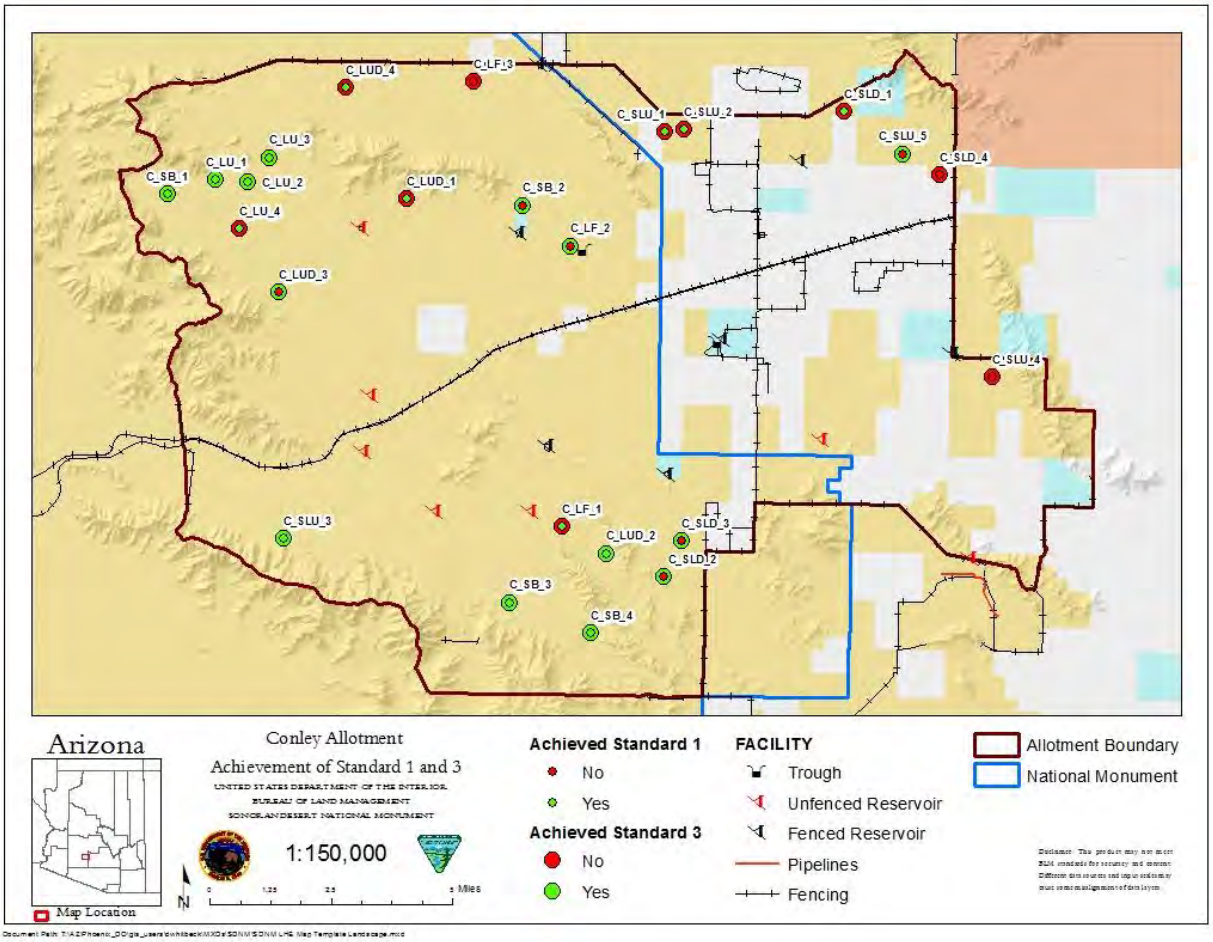
Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 3	Percent Not Achieving Standard 3 Due to Livestock Grazing
Creosote Bursage	55,329 ac	60.0	20.0
Palo Verde Mixed Cactus	20,426 ac	46.7	13.3
Ephemeral Wash	167.4 mi	0	0
Bighorn Sheep	45,687 ac	27.5	6.8
SDT Category 1	48,498 ac	18.1	0.0
SDT Category 2	8,526 ac	40.3	20.1
SDT Category 3	2,142 ac	0.0	0.0

Summary of Ecological Site Analysis

Based upon field observations and data collected the Conley Allotment is achieving Standard 1 on four of the six major ecological sites and Standard 3 on two of the six major ecological sites.

Objectives for Standard 1 are not achieved on the Limy Fan and Sandy Loam Deep ecological sites. The majority of plots representing the Limy Fan ecological site are not achieving soil site stability and hydrologic function objectives. Based on field observations and data collected, livestock grazing is the causal factor for the non-achievement of Standard 1 for the Limy Fan ecological site. The majority of plots representing the Sandy Loam Deep ecological site are not achieving the soil site stability, hydrologic function, and biotic integrity objectives for Standard 1. Based on field observations and data collected, livestock grazing is the causal factor for the non-achievement of Standard 1 in the southwest pasture but not the northeast pasture.

Objectives for Standard 3 are not achieved on the Limy Fan, Limy Upland Deep, Sandy Loam Deep, and Sandy Loam Upland ecological sites. The majority of the plots representing the Limy Fan ecological site indicated excessive bare ground and absence of palatable species. Based on field observations and data collected, livestock grazing is the causal factor for non-achievement of Standard 3 on the Limy Fan ecological site in the northwest pasture but not the southwest pasture. The majority of the plots representing the Limy Upland Deep ecological site indicate excessive bare ground and low foliar cover. Based on field observations and data collected, livestock grazing is not the causal factor for non-achievement of Standard 3 on the Limy Upland Deep ecological site. The plots representing the Sandy Loam Deep ecological site indicate low foliar cover, low palatable species composition, and low species diversity. Based on field observations and data collected livestock grazing is the causal factor for non-achievement of Standard 3 for the Sandy Loam Deep ecological site in the most northern portion of the northeast pasture. The plots representing the Sandy Loam Upland ecological site indicate excessive bare ground and low foliar cover. Based on field observations and data collected livestock grazing is not the causal factor for non-achievement of Standard 3 for the Sandy Loam Upland ecological site.



Map 17. Conley Standard 1 and 3 Achievement

8.5 Hazen Allotment

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).

The five major ecological sites within the Hazen Allotment achieve Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Granitic Upland	4	4	Yes	N/A
Limy Fan	4	4	Yes	N/A
Limy Upland	4	4	Yes	N/A
Limy Upland Deep	6	6	Yes	N/A
Sandy Bottom	5	5	Yes	N/A

Rationale:
All the plots representing the Granitic Upland, Limy Fan, Limy Upland, Limy Upland Deep, and Sandy Bottom ecological sites are achieving Standard 1.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 1	Percent Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	21,947 ac	0.0	0.0
Palo Verde Mixed Cactus	9,329 ac	0.0	0.0
Ephemeral Wash	76.9 mi	0.0	0.0
Bighorn Sheep	35,896 ac	0.0	0.0
SDT Category 1	28,431 ac	0.0	0.0
SDT Category 2	3,646 ac	0.0	0.0

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Four of the five major ecological sites within the Hazen Allotment are achieving Standard 3.

Ecological Site	Number of plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Granitic Upland	4	4	Yes	N/A
Limy Fan	4	3	Yes	N/A
Limy Upland	4	2	No	Unknown
Limy Upland Deep	6	6	Yes	N/A
Sandy Bottom	5	3	Yes	N/A

Rationale:
The majority of the plots representing the Granitic Upland, Limy Fan, Limy Upland Deep, and Sandy Bottom ecological sites are achieving Standard 3. Two of the four plots representing the Limy Upland ecological site are achieving Standard 3. Of the two plots failing to achieve Standard 3 on the Limy Upland ecological site, one is in livestock use probability Class 5 with no livestock grazing impacts and absent of palatable species, and one is in livestock use probability Class 5 with no livestock grazing impacts. Based on field observations and data collected, livestock grazing is not the causal factor for the non-achievement of Standard 3 on the Limy Upland ecological site.

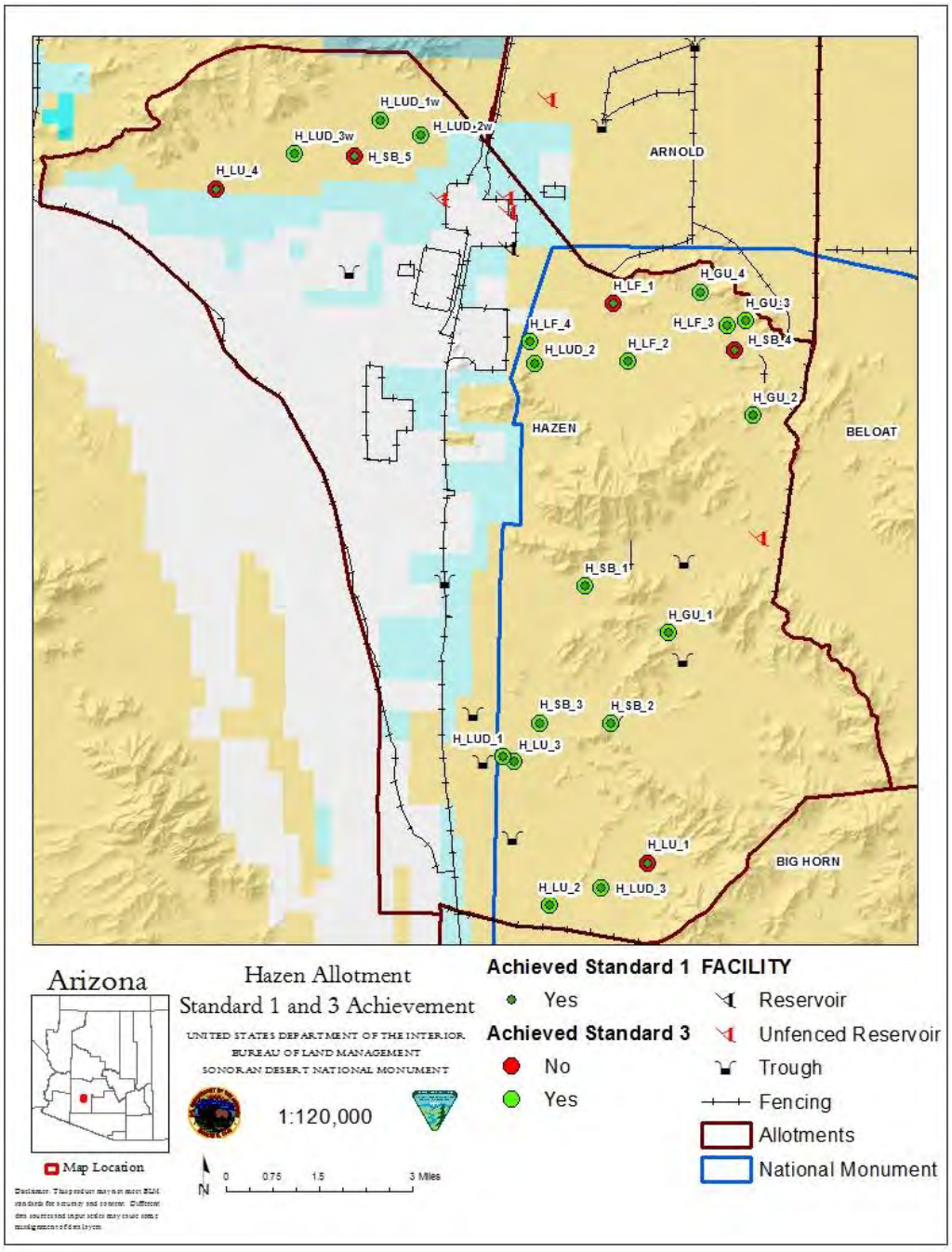
Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 3	Percent Not Achieving Standard 3 Due to Livestock Grazing
Creosote Bursage	21,947 ac	23.1	0.0
Palo Verde Mixed Cactus	9,329 ac	0.0	0.0
Ephemeral Wash	76.9 mi	40.0	0.0
Bighorn Sheep	35,896 ac	16.5	0.0
SDT Category 1	28,431 ac	21.4	0.0
SDT Category 2	3,646 ac	0.0	0.0

Summary of Ecological Site Analysis
Based upon field observations and data collected, the five major ecological sites are achieving Standard 1, and four of the five major ecological sites are achieving Standard 3.

Objectives for Standard 1 are achieved on all five major ecological sites.

Objectives for Standard 3 are achieved on four of the five major ecological sites. Objectives for Standard 3 are not achieved on the Limy Upland ecological site. Plots representing the Limy Upland ecological site indicate low foliar cover and low species diversity. Based on field observations and data collected, livestock grazing is not the causal factor for the non-achievement of Standard 3 on the Limy Upland ecological site.



Map 18. Hazen Standard 1 and 3 Achievement

8.6 Lower Vekol Allotment

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).

Three of the five major ecological sites within the Lower Vekol Allotment are achieving Standard 1.

Ecological Site	Number of Plots	Number of Plots Achieving Standard 1	Ecological Site Achieving Standard 1?	Causal Factor For Non-Achievement
Limy Fan	4	0	No	Human-altered Hydrology
Limy Upland	4	3	Yes	N/A
Limy Upland Deep	3	2	Yes	N/A
Sandy Bottom	4	4	Yes	N/A
Sandy Loam Deep	4	2	No	Historical Livestock Grazing

Rationale:
The majority of the plots representing Limy Upland, Limy Upland Deep, and Sandy Bottom ecological sites are achieving Standard 1.

Two of the four plots representing the Sandy Loam Deep ecological site are achieving Standard 1. Of the two plots failing to achieve Standard 1 on the Sandy Loam Deep ecological site, one is in livestock use probability Class 1 with livestock trails traversing the plot and absent of palatable species, and one is in livestock use probability Class 3 with no livestock grazing impacts but with absent of palatable species. Based on field observations and data collected, historical livestock grazing is the causal factor for the non-achievement of Standard 1 on the Sandy Loam Deep ecological site.

None of the plots representing the Limy Fan ecological site are achieving Standard 1. Of the four plots failing to achieve Standard 1 on the Limy Fan ecological site, two are in livestock use probability Class 1 with horse trails and scat but no recent cattle grazing impacts and absent of palatable species, and one is in livestock use probability Class 1 with no recent livestock grazing impacts and absent of palatable species, and one is in livestock use probability Class 1 with no livestock grazing impacts and absent of palatable species. Based on field observations and data collected, current livestock grazing is not the causal factor for non-achievement of Standard 1 on the Limy Fan ecological site. The Lower Vekol dyke system has altered the hydrology of the area resulting in Limy Fans with low soil site stability, low hydrologic function, and low biotic integrity.

Proportion of vegetation communities and wildlife habitat not achieving Standard 1.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 1	Percent Not Achieving Standard 1 Due to Livestock Grazing
Creosote Bursage	10,597 ac	55.6	11.1
Palo Verde Mixed Cactus	6,560 ac	16.7	16.7
Ephemeral Wash	34.7 mi	0.0	0.0
Bighorn Sheep	8,089 ac	0.0	0.0
SDT Category 1	6,992 ac	0.0	0.0
SDT Category 2	10,446 ac	42.8	14.2
SDT Category 3	2,139 ac	33.3	33.3

Land Health Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

Two of the five major ecological sites on the Lower Vekol Allotment are achieving Standard 3.

Ecological Site	Number of plots	Number of Plots Achieving Standard 3	Ecological Site Achieving Standard 3?	Causal Factor For Non-Achievement
Limy Fan	4	1	No	Human-altered Hydrology/Recreation
Limy Upland	4	1	No	Historical Livestock Grazing
Limy Upland Deep	3	2	Yes	N/A
Sandy Bottom	4	3	Yes	N/A
Sandy Loam Deep	4	2	No	Historical Livestock Grazing

Rationale:
The majority of the plots representing the Limy Upland Deep and Sandy Bottom ecological sites are achieving Standard 3.

One of the four plots representing the Limy Fan ecological site is achieving Standard 3. Of the three plots failing to achieve Standard 3 on the Limy Fan ecological site, one is in livestock use probability Class 1 with recreational horse riding impacts but no cattle grazing impacts and absent of palatable species, and one is in livestock use probability Class 1 with no recent livestock grazing impacts and absent of palatable species, and one is in livestock use probability Class 1 with no livestock grazing impacts and absent

of palatable species. Based on field observations and data collected, livestock grazing is not the causal factor for non-achievement of Standard 3 on the Limy Fan ecological site. The Lower Vekol dyke system has altered the hydrology by trapping surface flow and reducing run-on moisture to Limy Fans resulting in high bare ground, low foliar cover, limited palatable species, and low species diversity.

One of the four plots representing the Limy Upland ecological site is achieving Standard 3. Of the three plots failing to achieve Standard 3 on the Limy Upland ecological site, one is in livestock use probability Class 1 with livestock trails traversing the plot and absent of palatable species, and one is in livestock use probability Class 3 with livestock trails traversing the plot but no current use of the palatable species, and one is in livestock use probability Class 5 with livestock trails traversing the plot and absent of palatable species. Based on field observations and data collected, historical, greater than 2 years past, livestock grazing is the causal factor for the non-achievement of Standard 3 on the Limy Upland ecological site.

Two of the four plots representing the Sandy Loam Deep ecological site are achieving Standard 3. Of the two plots failing to achieve Standard 3 on the Sandy Loam Deep ecological site, one is in livestock use probability Class 1 with historical livestock trails traversing the plot and absent of palatable species, and one is in livestock use probability Class 3 with no livestock grazing impacts and absent of palatable species. Based on field observations and data collected, historical livestock grazing is the causal factor for the non-achievement of Standard 3 on one of the two plots representing the Sandy Loam Deep ecological site.

Proportion of vegetation communities and wildlife habitat not achieving Standard 3.

Vegetation Community/Species Habitat	Acres/Miles of Veg Community/Habitat	Percent Not Achieving Standard 3	Percent Not Achieving Standard 3 Due to Historical Livestock Grazing
Creosote Bursage	10,597 ac	66.7	22.2
Palo Verde Mixed Cactus	6,560 ac	50.0	33.3
Ephemeral Wash	34.7 mi	25.0	0.0
Bighorn Sheep	8,089 ac	0.0	0.0
SDT Category 1	6,992 ac	0.0	0.0
SDT Category 2	10,446 ac	71.4	28.5
SDT Category 3	2,139 ac	66.6	33.3

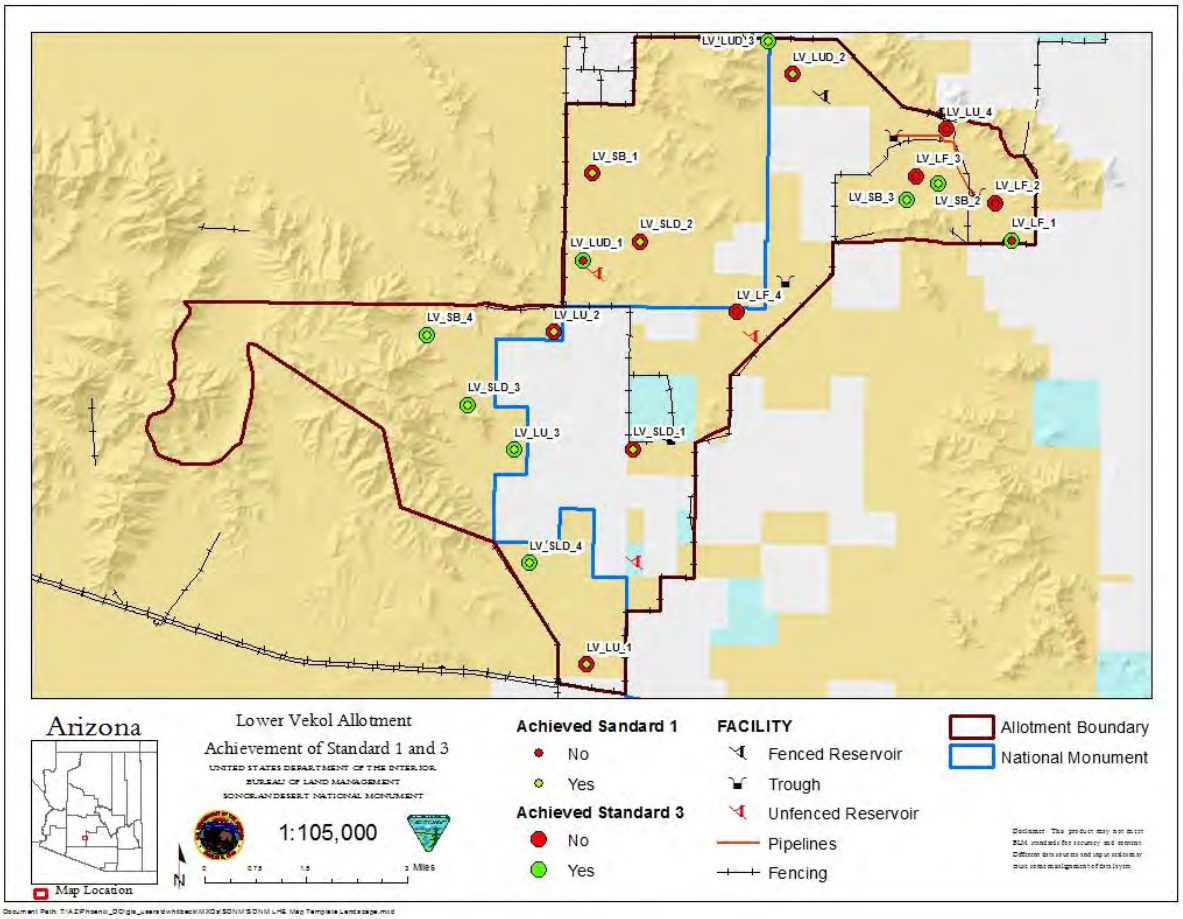
Summary of Ecological Site Analysis

Based upon field observations and data collected three of the five major ecological sites are achieving Standard 1 and two of the five major ecological sites are achieving Standard 3.

Objectives for Standard 1 are not achieved on the Limy Fan and Sandy Loam Deep ecological sites. The majority of the plots representing the Limy Fan ecological sites are

not achieving objectives for the soil site stability, hydrologic function, and biotic integrity attributes. Based on field observations and data collected, livestock grazing is not the causal factor for the non-achievement of Standard 1 on the Limy Fan ecological site. The majority of the plots representing the Sandy Loam Deep ecological site are not achieving objectives for soil site stability. Based on field observations and data collected, historical livestock grazing is the causal factor for the non-achievement of Standard 1 on the Sandy Loam Deep ecological site.

Objectives for Standard 3 are not achieved on the Limy Fan, Limy Upland, and Sandy Loam Deep ecological sites. The majority of the plots representing the Limy Fan ecological site are not achieving all DPC objectives. Based on field observations and data collected, livestock grazing is not the causal factor for the non-achievement of Standard 3 on the Limy Fan ecological site. The majority of the plots representing the Limy Upland ecological site are not achieving the bare ground objective indicating excessive bare ground. Based on field observations and data collected, historical, (greater than 2 years past), livestock grazing is the causal factor for the non-achievement of Standard 3 on the Limy Upland ecological site. The majority of plots representing the Sandy Loam Deep ecological site are not achieving the bare ground, foliar cover, and palatable species DPC objectives. Based on field observations and data collected (historical, greater than 2 years past), livestock grazing is the causal factor for the non-achievement of Standard 3 on one of the two plots representing the Sandy Loam Deep ecological site.



Map 19. Lower Vekol Standard 1 and 3 Achievement

9.0 Recommendations

Based on the analysis of monitoring data and field observations, it is suggested that grazing can remain available, with management modifications such as seasonal, deferred, or rotation grazing, on the SDNM portions of allotments that make up the SDNM Complex north of Interstate 8 with permitted use ranging from ephemeral use only to a maximum of 4,232 perennial AUMs.

Rationale:
The management of livestock grazing has differed between allotments and over the years, exhibiting a range of historical grazing impacts across the SDNM Complex. Some monitoring plots within the SDNM portion of the SDNM Complex are failing to achieve Standard 1 or 3 or both due to livestock grazing as previously authorized. Conversely, some monitoring plots within the SDNM portion of the SDNM Complex with known and expected historical livestock use are achieving Standard 1 or 3 or both. Varying grazing intensity and duration of historical livestock grazing is likely the causal factor for this contradiction. Additionally, the majority (54.6%) of the SDNM Complex is mapped as livestock use probability Class 5 where it is unlikely that substantial livestock grazing has or would occur. Without the redevelopment and/or addition of new water sources, grazing is likely to remain compatible with monument objects in these areas.

An adjustment in the management of livestock will be required to make progress towards the achievement of Standards within the SDNM. Grazing schemes, such as ephemeral grazing, deferred grazing, rotational grazing and seasonal grazing, featuring appropriate stocking rates that limit the use of perennial species, can prevent livestock grazing from significantly affecting the diversity and reproductive capability of forage species (Hall et al. 2005; Enright and Miller 2007).

It is recommended that no more than 4,232 perennial AUMs are authorized on the SDNM portion of the SDNM Complex. This maximum was calculated by averaging the perennially, non-ephemeral, authorized AUMs for each allotment between 2007 and 2018 and calculating the amount of AUMs within the SDNM portion of each allotment by the percentage of BLM land in the SDNM (Table 7).

Table 7. Maximum Perennial AUM Calculations

Allotment	Classification	Ave. Perennial Use 2007-2018	Percent BLM Acres in SDNM	Prorated Ave. Perennial AUMs
Arnold	Ephemeral	0.00	11.45	0.00
Beloat	Perennial/Ephemeral	2,402.83	33.77	811.43
Big Horn	Perennial/Ephemeral	356.83	94.64	337.70
Conley	Perennial/Ephemeral	2,569.00	88.18	2,265.34
Hazen	Perennial/Ephemeral	787.33	75.25	592.46
Lower Vekol	Perennial/Ephemeral	315.00	71.36	224.78
TOTAL				4,231.71

Source: BLM 2020

Livestock grazing management, including stocking rates and grazing systems, of allotments available for grazing will be analyzed, in accordance with the National Environmental Policy Act, on an implementation-level basis in the future.

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