

**Draft Existing and Desired Conditions
of the
Hay Lake Complex**

Anderson Mesa Landscape Scale Assessment

USDA Forest Service
Southwestern Region
Coconino National Forest

Existing Condition of the Hay Lake Complex

Introduction

This objective of this report is to identify and describe existing and desired conditions of the Hay Lake Complex in the context of the various resources and the use by man and animal of those resources. The functions and processes that influence this unique area called Hay Lake will be evaluated in this section. A goal of the Anderson Mesa Landscape Scale Assessment is to complete a comprehensive document that describes the existing and desired conditions and ecosystem functions. This document is not a decision document (EA, EIS, etc.) with proposed projects, but rather a compilation of data that identifies those ecosystem functions that are working and those that are not, and suggestions for restoring functions that are broke.

The Anderson Mesa area lies between the extensive pine country of the rim and the high desert of the little Colorado River-Basin. It is an area of limited rainfall making grass and forb productivity variable from year to year. The entire mesa is geographically defined by 4 watershed boundaries; however, there are common, repeated vegetative types throughout. It is large in scale, covering approximately 270,000 acres.

The bulk of the report will describe the existing conditions and ecosystem functions of vegetation, soils, recreation, roads, and wetlands and disturbance factors that influence these resource area. The area of interest in this report includes the lakes complex that occurs around the Hay Lake area. The lake/wetland areas include Hay Lake, Long Lake, Soldier Lake, Soldier Lake Annex and Tremaine Lake. These sites will be known as the Hay Lake complex in this document. Daze Lake also occurs within the boundary of the Hay Lake complex, but is not augmented by a ditch system.

Background

The damming of Tremaine Lake, in the 1920's and subsequent construction of water delivery structures (ditches and dikes) has altered water movement in and adjacent to the Hay Lake complex. This manipulation of water has had a direct affect on the soil features we observe today in Hay Lake. Along with the land-leveling for irrigation, soil features have been altered and do not appear as they did before the dam construction.

Water is an important commodity in the arid southwest. The distribution and management of the waters within the Hay Lake Complex is no exception. As water moves across the landscape and through man-made channels into and through the complex of seasonal wetlands and reservoirs in the Hay Lake area, an accountability of water use needed to be determined. These waters are used by wildlife, recreational uses and by the local Bar T Bar Ranch known locally as the Sod Farm, owned and operated by Bob and Judy Prosser. A Modification Agreement among the Bar T Bar Ranch Company Limited Partnership, L.L.L.P., dated November 10, 1999, describes the legal water rights. The water sharing agreement describes both water storage rights and water use rights for Tremaine Lake and Soldier and Soldier Annex Lakes. The 'First Right' is 1,000 acre-feet goes to the Bar T Bar Ranch, the 'Second Right' is 3,300 acre-feet goes through the Forest Service lands to the NRCS Wetland Restoration Plan easement.

The Natural Resources Conservation Service purchased a conservation easement from Bar T Bar, Ltd. Partnership in Coconino County, Arizona, in January 2000 to restore approximately 760 acres of irrigated pasture back to an ephemeral wetland ecosystem. The easement includes another 757 acres of upland that will serve as a buffer to the wetland. The easement was purchased through NRCS's Wetland Reserve Program for the primary purpose of restoring wetland functions and values for the benefit of migratory birds and other wetland dependant species. The 1,517 acres was part of a larger private land in-holding within the Coconino National Forest southeast of Flagstaff and was subsequently purchased by the U.S. Forest Service. Currently, the water rights have not been legally finalized for the Hay Lake purchase.

The water delivery system includes man-made irrigation ditches, natural channels and a series of outlet structures that divert water. The outlet works of Tremaine Dam direct water into any of three ditches (east, west, and Main). The East ditch carries flows along the east edge of the wetland easement and joins the main channel south of the wetland easement; these flows continue to the Bar T Bar Ranch. The West ditch delivers flow into existing irrigation ditches within the Hay Lake basin; these basin ditches direct floes to optimize irrigation distribution uniformity. The ditch system actually brings water in from not only the Jacks Canyon 5th code watershed (where all but Soldier Lake reside), but also from the Canyon Diablo canyon 5th code.

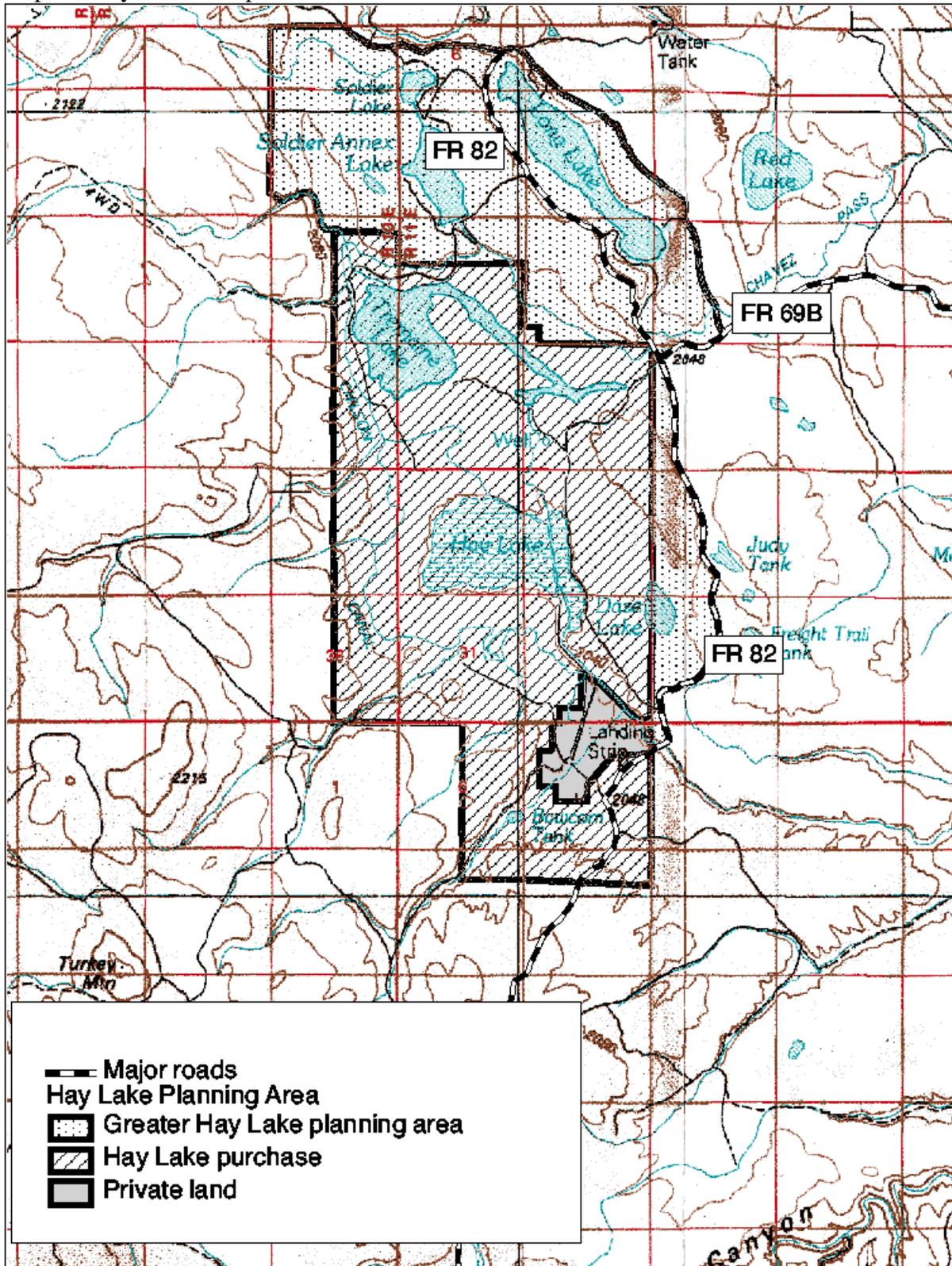
The main channel meanders from Tremaine Lake outlet, south towards the east edge of Hay Lake basin. Historically, the Main channel traveled into the central part of the Hay Lake basin. Sometime in the early 1900's the channel was realigned and lowered to flow straight to the basin outlet and a plug was placed in the historic channel. This effectively served to lower the water table and drain the basin for establishment and irrigation of pasture grass. Draining the basin through channeling, ditching and land leveling reduced the hydrology of Hay Lake. Attempts to farm the basin nearly eliminated the former wetland plant community.

Existing Conditions

The following description of existing condition includes all the lands within the Hay Lake Complex as shown on the map below and does not separate out the NRCS easement but is all inclusive.

The existing condition descriptions as reported by the other 5 Focus Groups can be overlaid onto the Hay Lake Complex area. An attempt has been made to capture the pertinent information or excerpts from those reports relative to the Hay Lake area.

Map 1. Hay Lake Complex



Wetlands

Average precipitation in and around the Hay Lake Complex is 16 inches. This average precipitation is derived from midpoint precipitation levels from the Terrestrial Ecosystem Survey for the Coconino National Forest (Miller et al, 1995).

There are two unique riparian-wetland types identified on the mesa: 1) the lentic type is characterized by standing water habitat such as lakes, ponds, seeps, bogs, and meadows, and 2) lotic, which consists of running water habitat such as rivers, streams, and springs. The lentic type is commonly referred to as wetlands, with the lotic type commonly referred to as riparian areas. No lotic riparian areas occur within the Hay Lake complex.

Functions of Wetlands

Wetland function is a combination of a variety of processes. The most important process that dominates the wetland function is the hydrologic cycle. Wetlands on Anderson Mesa are disconnected from groundwater and thus are completely reliant on precipitation for water input. Therefore, standing water and vegetation in wetlands can fluctuate wildly from being basically non-existent in dry periods to being highly productive, lush wetlands in wet periods. In the Hay Lake complex, this natural function of wetlands is augmented by an extensive ditch system and constructed earthen dams that have increased the depth of water and the normal residence time of water on-site.

Wetland Types of the Hay Lake Complex

The types of wetlands that occur in and around the Hay Lake Complex are a function of the seasonal and yearly fluctuations of wetland water levels (termed the wetlands hydroperiod) (Fredrickson and Dugger, 1993). As stated above, the artificial augmentation of these sites through increased water and depth has determined structure and composition of wetland flora and fauna (Fredrickson and Dugger, 1993). The wetland types that occur on Anderson Mesa are defined by Fredrickson and Dugger (1993) using the classification system developed by Stewart and Kantrud (1971). The wetland types that occur in the Hay Lake Complex area are listed in Table 1. The table indicates the wetland type, the flooding regime, the typical plant species occupying the deepest zone of the wetland, and the flooding frequency of the wetland.

Table 1: Wetland types that occur on Anderson Mesa

Wetland Type	Flooding Regime	Plant Species Occupying Deepest Zone	Flooding Frequency
Reservoir, open water	Permanent water	submergent vegetation; bare soil	every year
Semi-permanent	6-12 months	Hardstem bulrush Cattail submerged aquatics	>7 of 10 years
Seasonal	3-6 months	Manna grass spikerush Carex spp.	<7 of 10 years

As stated in Table 1, the hydroperiod of the different wetland types has different plant associations. Seasonal and semi-permanent wetland types contain emergent vegetation that has adapted to a wetter environment.

Table 2.

Lentic Riparian-Wetlands

Name	Acres	Wetland Type	Grazing Status	Stock Tank
Hay Lake	458	Seasonal and Semi-Permanent	In NRCS wetland easement, no graze	
Total Acres	458			
Long Lake	367	Reservoir	Grazed by cattle within Lakes pasture Bar T Bar Allotment.	
Soldier Annex	123	Reservoir	Grazed by cattle within Lakes pasture Bar T Bar Allotment.	
Soldier Lake	32	Reservoir	Grazed by cattle within Trap pasture Bar T Bar Allotment.	
Tremaine Lake	517	Reservoir	Grazed within Bar T Bar Allotment.	
Total Acres	1,039			
All Wetland Acres	1,497			

Vegetation

Anderson Mesa is a unique area for its grassland habitat type. It lies between the extensive pine country of the Mogollon Rim and the high desert of the little Colorado River-Basin. It is an area of limited rainfall making grass and forb productivity variable from year to year. Over the past century, the mesa has lost significant grassland acreage due to invasion of the pinyon and juniper woodland as a result of a variety of disturbances or lack thereof.

The entire mesa is geographically defined by 4 watershed boundaries of which only one covers the Hay Lake Complex. There are 35 TES map units that cover the Mesa. These were aggregated down to 8 unique vegetation types ranging from pinyon-juniper woodlands at the lowest elevations to small acreages of mixed conifer at the highest elevations.

Table X shows the vegetation type, and aggregated TES map units that exist in the Hay Lake Complex area. Existing vegetation types result from differences in soil type, climate and disturbances.

Table 3. Anderson Mesa LSA Vegetation Types and TES Units

Vegetation Type	TES Map Units	
Montane Meadows	41, 53, 55	West of Soldier Lake
Western Wheatgrass/Blue Grama Grasslands	453, 515	
Pinyon-Juniper /Blue Grama Woodlands	438, 440	
Pinyon-Juniper Woodlands	433, 434, 435, 437,439, 441, 455,465, 490, 491	

Ponderosa Pine/PJ/AZ Fescue/Blue Grama	500, 523, 524, 527	
Water		All Lakes in the complex

Map 2 (below) displays the 8 vegetation types in the landscape. Anderson Mesa TES Based Vegetation Classifications displays descriptions of vegetation.

The TES can be found by following this link, <http://alic.arid.arizona.edu/tes/tes.html>. It displays soil classification by TES map unit found within each vegetation type. The classification follows the 6th approximation of Soil Taxonomy and is mapped to the soil family level.

Descriptions for the vegetative types can be found in the Vegetation Existing Condition Report.

Map 2. Anderson Mesa TES Based Vegetation Classifications.

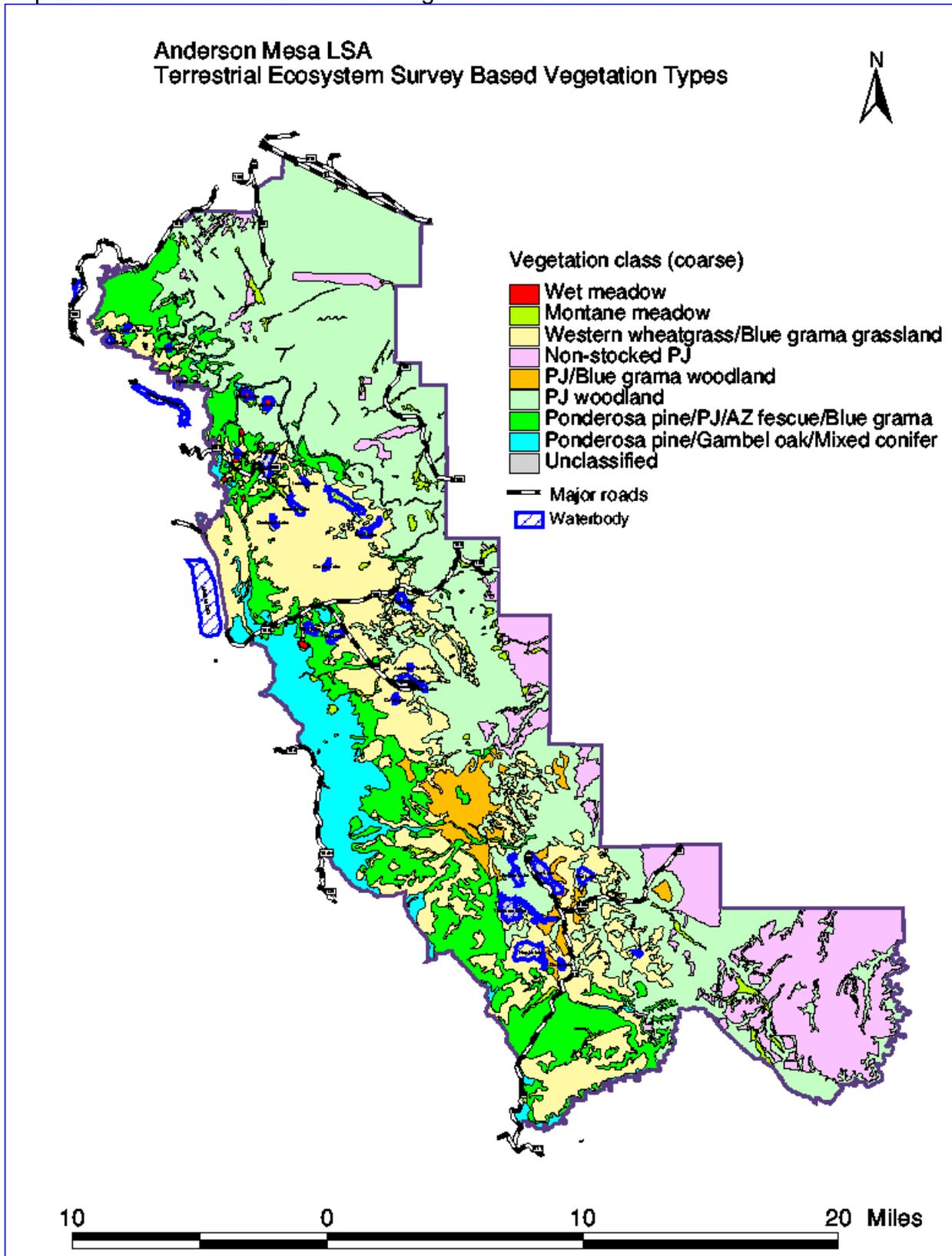


Table 4. Existing and Desired Vegetative Ground Cover (VGC) and Tree Canopy Cover That Exist Within the Hay Lake Complex

VEGETATION TYPE	TES EXISTING VGC (RANGE) PERCENT	TES EXISTING VGC (AVERAGE) TES PERCENT	TES PPC VGC PERCENT	FERA EXISTING TREE CANOPY COVER PERCENT	TES PPC TREE CANOPY COVER PERCENT
Montane Meadow	5 - 80	10 - 45	55 - 90	0 - 40	<5
Western wheatgrass/Blue grama grasslands (pinyon-juniper lifezone)	3 - 55	10 - 25	35 - 45	0 - 40	Trace
Pinyon-Juniper Woodlands	5 - 65	10 - 35	30 - 65	20 - 80	35 - 50
Pinyon-Juniper Blue Grama Woodlands	3 - 40	10 - 30	40 - 45	40 - 60	40
Ponderosa Pine/AZ Fescue/Blue Grama	5 - 90	25 - 55	65 - 70	20 - 70	55

Threatened, Endangered and Sensitive Plant Species:

There are 20 Threatened, Endangered and Sensitive Species present on the Coconino National Forest but only one known population (*Hedeoma diffusum*) is located on the landscape. Table X shows this species and other species with potential habitat on the mesa. Please see Project Record #XX for detailed descriptions of these species and their potential habitat.

Table 5. TES Plants or Potential Habitats in the Hay Lake Complex.

Scientific Name	Common Name	Status	Known locations in the Analysis Area	Potential Habitat in the Analysis Area	Comments
Arenaria aberrans	Mt. Dellenbaugh sandwort	S	No	?	No confirmed locations on Forest. Habitat includes parks and meadows
Astragalus rusbyi	Rusby milkvetch	S	No	Yes	No known locations in project area, but basalt soils in the Analysis Area may provide habitat
Helenium arizonicum	Arizona Sneezeweed	S	No	Yes	Habitat includes wetland areas such as intermittent streams and natural water sources
Penstemon nudiflorus	Flagstaff beardtongue	S	No	Yes	Distribution includes open ponderosa pine and pinyon-juniper forests

Identified Mollisols (Grassland Soils)

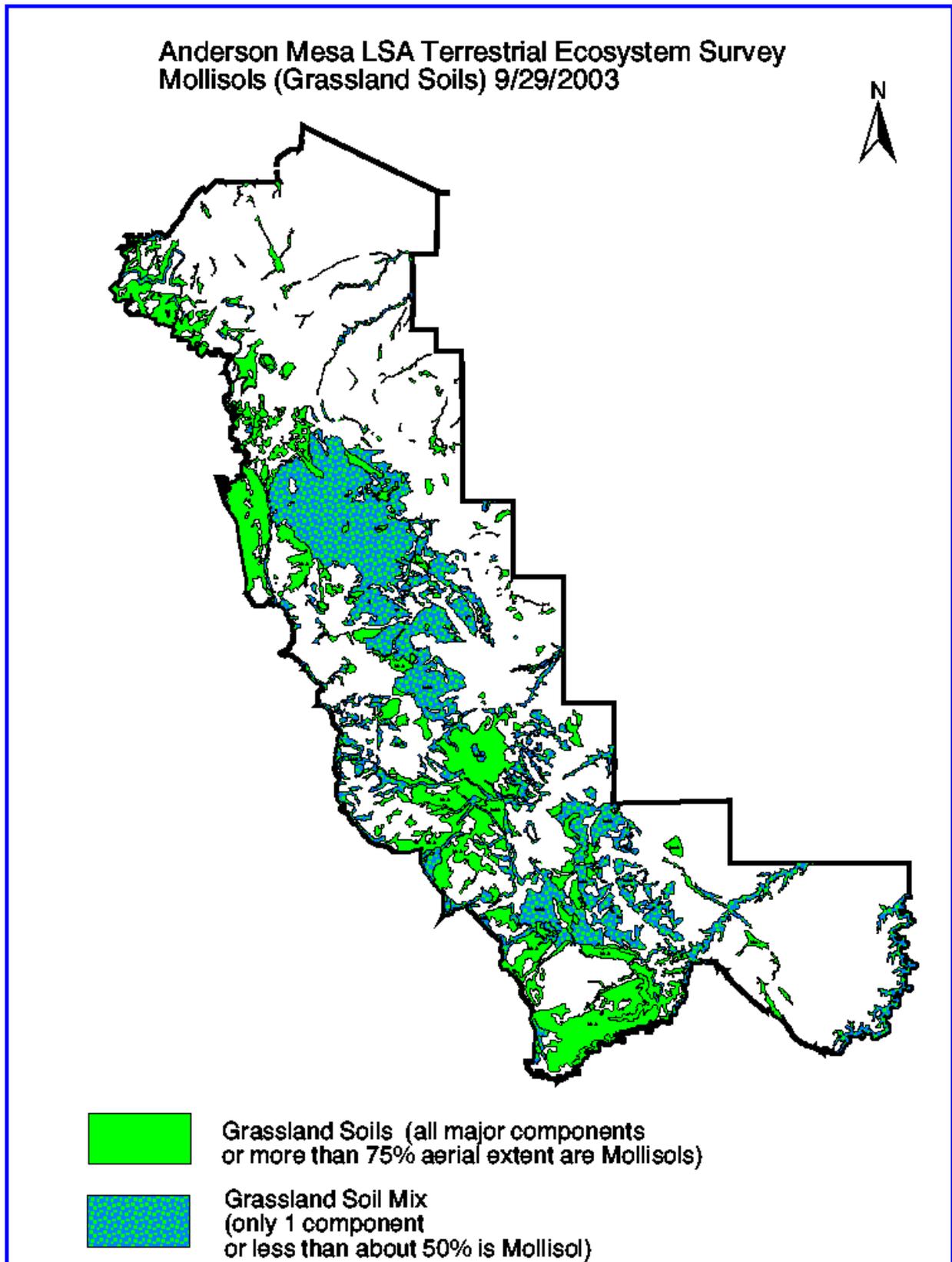
Mollisols were mapped and identified during the TES and are displayed in Table X below.

Mollisols are one of 12 soil order classifications and are characterized by very dark colored, fairly highly organic and base-rich soil surfaces common in grasslands. The TES identified 14 map units with at least one component classified as a Mollisol. On the Anderson Mesa landscape, these soils likely formed under grassland vegetation types or under pinyon-juniper woodland or ponderosa pine forest types with low canopy covers and high grassy interspaces.

Table 6. Vegetation type, TES map unit numbers identified as Mollisols Within the Hay Lake Complex.

Vegetation Type	Mollisol (Grassland-like) Composition	TES Map Units	
Montane Meadows	All major components or > 90%	41, 53, 55	
Western Wheatgrass/Blue Grama Grasslands	Some to most components or > 45 - 85%	453, 515	
Pinyon-Juniper /Blue Grama Woodlands	All major components or > 75 – 85%	438, 440	
Pinyon-Juniper Woodlands	No major components or < about 10%	433, 434, 435, 437,439, 441, 455,465, 490, 491	
Ponderosa Pine/PJ/AZ Fescue/Blue Grama	1 or more major components or about 60 – 80 % and Mollic integrate	523, 524, 527	

Map 3. Mollisols (Grassland Soils) identified by the TES

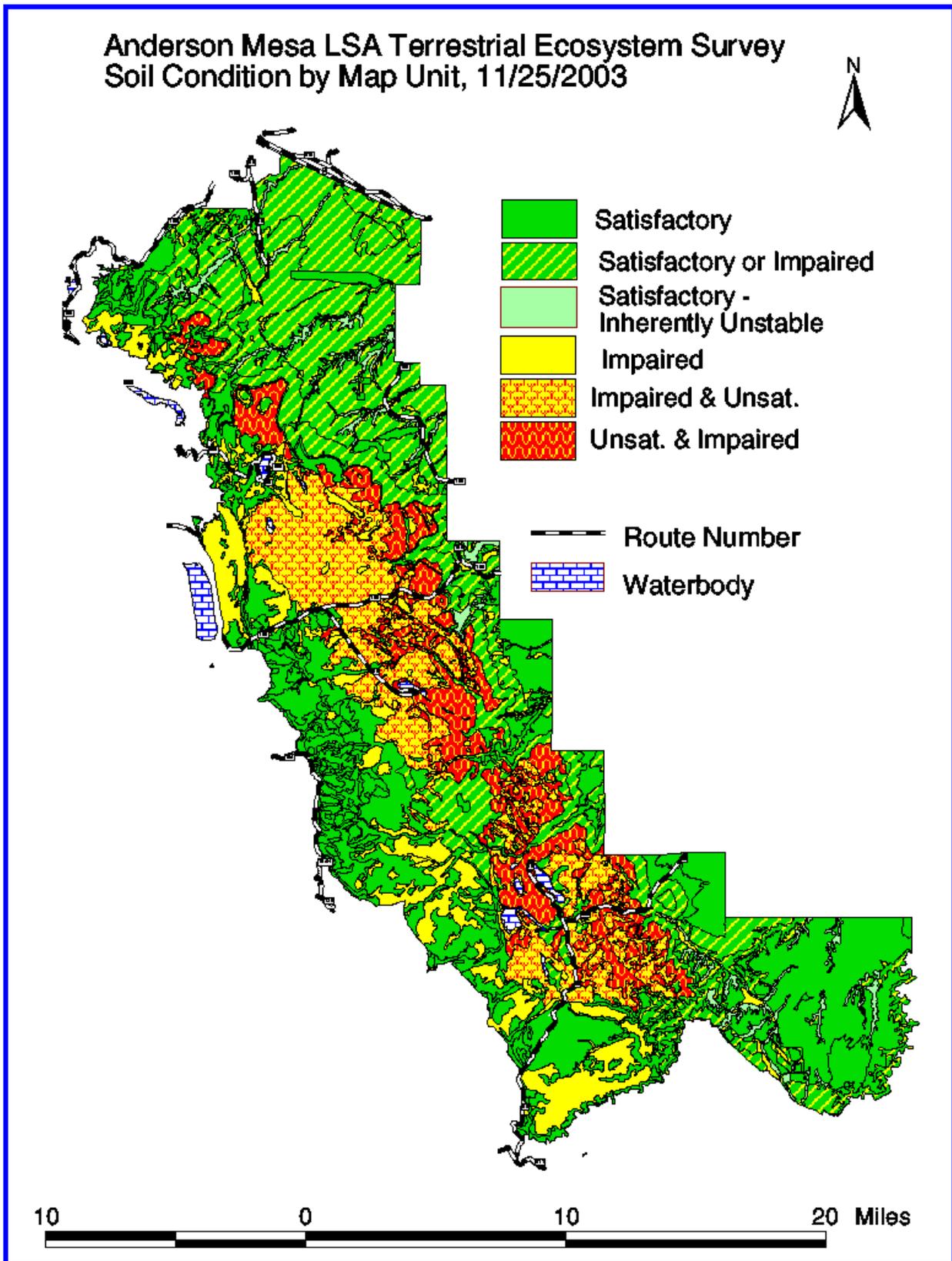


Soil Condition by Vegetation Type and TES Map Unit

Table 7. Soil Condition, and Associated Vegetation Type and TES Map Unit.

VEGETATION TYPE	TES MAP UNIT	SOIL CONDITION	
Montane Meadow	41, 53, 55	Impaired	
Western wheatgrass/Blue grama grasslands	453, 515	Impaired and Unsatisfactory	
Pinyon-Juniper/Blue Grama Woodlands	438, 440	Satisfactory and Impaired	
Pinyon-Juniper/Woodlands	433, 434, 435, 437, 439, 441, 455, 465, 490, 491	All Classes, Satisfactory, Impaired, Unsatisfactory and Satisfactory-Inherently Unstable	
Ponderosa Pine/AZ Fescue/Blue	523, 524, 527	Satisfactory	

Map 4. Terrestrial Ecosystem Soil Condition



Pathogens and Fire History Within the Hay Lake Complex

Disturbances were identified by vegetation type above. Landscape-wide disturbances include ungulate grazing, recreational impact, drought, pathogens and fire are inclusive of the Hay Lake Complex. Along with fire suppression over the last several decades, excessive grazing likely contributed to overstocked woodlands and select ponderosa pine vegetation types by reducing vegetation ladders and eliminating the ability of the herbaceous understory to carry low intensity fire.

Fire played a dominant role in the pre-settlement period for the Coconino National Forest (NF). During this time plant communities were shaped by fire and the health of most ecosystems was dependent on fire (Moody et. al. 1992). Pre-settlement fires in most ecosystems frequently spread over large areas in the abundant grass. As settlement began in the late 1870s to 1880s, large numbers of grazing livestock utilized much of the annual grass production, leaving little fuel to promote the spread of wildfires.

Pearson (1950) and Shubert (1974) noted that prolific ponderosa pine regeneration occurred in 1919 in the Flagstaff area. This was due to cool and wet climatic conditions that occurred in the early 1900s and 1910s. The cool wet conditions promoted seed production, germination, and seedling establishment. Grazing reduced competition and fire occurrence, contributing to long-term survival of seedlings. Other seedling establishment events occurred in the 20th century in the southwest, notably in the early 1950's. While these events are well documented for ponderosa, they are not well documented for pinyon and juniper. It has been suggested however that the same combination of early 1900s "climatological and biological events" resulted in similar prolific pinyon and juniper seedling establishment and survival (Ffolliott and Gottfried, 2002).

Exclusion of wildfires from many of the ecosystems caused changes to occur including:

- Fuel buildups that would eventually lead to large crown-replacing and catastrophic wildfires
- Understory seedlings in the pine forests survived in unprecedented numbers
- Juniper and pinyon seedlings began surviving in grass savannas

Pinyon/Juniper Existing Condition: Stands of pinyon and juniper that existed prior to European settlement presently exist in most of their historic locations with slight modifications to structures and fuel loadings. The frequency for low intensity fires has expanded somewhat and probably ranges from 10 to 50+ years. Live and dead/down fuel loadings are slightly elevated from historic conditions as a result of fire exclusion. Pinyon and juniper trees that existed prior to European settlement have grown and matured, and are providing elements of "Old Growth" (snags, dead/down material, hiding and thermal cover, etc.). Young PJ have been able to become established and grow to a size that reduces their susceptibility to low intensity wildfires. This increases average stocking levels and live fuel loading for these sites. There is evidence of ongoing invasion of grassland interspaces primarily by juniper but also some pinyon. The rate of this invasion is currently unknown.

The frequency of high intensity fires is still within the historic range of 100 to 500+ years, but this could change if the practice of fire exclusion continues. Historically, wildfires were dependent upon drought conditions to generate fire intensities in PJ that would result in crown fires. Drought conditions are still needed to generate crown fires, but as more young trees become established and provide ladder fuels, and as the large trees become older and decadent (numerous dead limbs in the crown causing a high dead/live fuel ratio), these stands will be at greater risk for high intensity wildfires.

Grassland Fire History: Grasslands at all elevations are fire dependent. They need fire to maintain the health and vigor of the plants, to maintain the productivity of the soils, and to reduce competition from invading shrub and trees from neighboring woodlands. Fire frequency ranged on average from 5-10 years with intensities varying dependent upon fine fuel moistures and amount of dead fuels present. Many were large, landscape-sized fires. Fires that covered large areas occurred in dry years following one or more years of good production. Most large fires occurred in summer months due to the high incidence of lightning.

Existing Condition: Grazing (removal of fine fuels that historically carried wildfires) and exclusion of wildfires has allowed expansion of trees and shrubs into areas that were historically grasslands. In many cases and over large portions of the Anderson Mesa assessment area, this expansion has resulted in vegetation type changes. Areas that were historically grasslands or sparsely treed savannas are now heavily stocked stands of pinyon-juniper woodland or young stands of ponderosa pine forest.

Transportation (roads)

The analysis area is moderately roaded. The terrain offers little or no natural barriers for off road travel. The policy concerning off-road travel has been open unless posted closed. This has allowed users to drive cross-country and has contributed to the number and location of roads in the Anderson Mesa area. Due to the dry conditions on the mesa, the tracks created by off-road use remain visible for some time, encouraging others to follow. Due to the lack of proper drainage, water is retained in these tracks and become impassible in wet conditions. Drivers then move over to an adjacent dry area, and then multiple tracks or a “braiding” effect is created. A high percentage of the roads within the analysis area are user created. Most user created roads do not comply with resource management direction, or consider resource protection in their location. Due to the high number of miles on the forest needing work, most of the maintenance level 3 roads within the landscape area have received minimal maintenance and resurfacing over the last 10 years

Many system roads begin as user created roads and were incorporated into the roads system in the 1980s. They have inadequate drainage, are most often poorly located and many are causing resource damage. “Roads and off-road vehicle use affects wetland sites by compacting soils, which in-turn affects nutrient cycling, changing decomposition rates, and soil physical properties. This change in upland soil condition affects the amount of material that enters wetland sites, thus again affecting the nutrient cycling and changing decomposition rates through increased sediments.”

Most of the known roads around the Hay Lake Complex are considered 'Non-system roads'. These roads currently do not have maintenance levels assigned to them. If any of these roads are incorporated into the road system, maintenance levels would be assigned at that time.

The existing roads can be generally described as in fair to poor condition. Most are user created by ranchers, wood gatherers, hunters or those who drive for recreation. The greater availability of 4 wheel vehicles has resulted in a larger increase of user created roads in the last few years. This trend is expected to increase.

The Forest Plan calls for 1 mile per square mile in the pinion pine/juniper area and 2 miles per square mile in the ponderosa pine areas. We currently have 711 miles of open road, resulting in a density of 1.68 miles per square mile. If the current proposals shown in the Forest Plan, Amendment 4, are followed, we will have an open road system of 579 miles or 1.37 miles per square mile. This figure includes the non-systems roads.

Wildlife

Migratory Birds

President Clinton signed Executive Order 13186 on January 10, 2001, placing emphasis on conservation of migratory birds. This order requires that an analysis be made of the effects of Forest Service actions on Species of Concern listed by Partners in Flight, the effects on Important Bird Areas (IBA's) identified by Partners in Flight (Latta et al. 1999), and the effects to important overwintering areas.

Environment

There are no Important Bird Areas (IBA) within the assessment area. The closest IBA exists at Mormon Lake, which is located directly adjacent to Anderson Mesa. There are no important overwintering areas for priority bird species within the assessment area. The following describes each habitat type found within the assessment area and the associated bird species of concern.

Pinyon-juniper Habitat Types

Pinyon-juniper woodlands are found mostly in the north half and east side of the Hay Lake area. The pinyon-juniper/ponderosa pine transitional habitat type is found mostly in the west and south sides of the Hay Lake area. Five species have been identified as priority species of concern. These are gray flycatchers, pinyon jays, gray vireos, black-throated gray warblers, and juniper titmouse. The juniper titmouse is addressed in the management indicator species table.

High Elevation Grassland Habitat Types

High elevation grassland habitat types are interspersed around Hay Lake and Tremaine Lake. Four species have been identified as species of concern for high elevation grasslands. They are ferruginous hawks, Swainson's hawks, burrowing owls, and grasshopper sparrows.

Freshwater Marsh Habitat Types

Freshwater marshes are areas of permanent to semi-permanent fresh water characterized by relatively shallow depths and extensive coverage of submergent and emergent plants, such as

duckweeds, cattail, rushes and sedges. Four reservoirs and one seasonal wetland provide marsh habitat in the Hay Lake area. One species for the assessment area has been identified as a species of concern, the American bittern.

Table 8. Summarizes Priority Species by Habitat, & Status in the Hay Lake Complex.

Migratory birds – pinyon-juniper habitat priority species.				
Priority Species	Vegetation Composition & Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
<i>Empidonax wrightii</i> Gray Flycatcher	-Primary: pinyon pine and/or juniper, with an open overstory of ponderosa pine. -Larger stands of PJ with open understory, some areas with sagebrush. -May need some ground cover to support insect populations for foraging. -Larger taller stands of sagebrush and greasewood.	-Elevation 4,500 to 7,500 ft, locally to 9,000 ft. -Mid to late successional stages. -Edge effect and fragmentation do not appear to be an issue.	-Brown-headed cowbird host (maybe increasing). -Insectivore low forager – often ground gleaner. -	Status of gray flycatchers is expected to be static to increasing. Expected to be common in assessment area. Large-scale chaining and juniper pushes were done in much of the pinyon-juniper vegetation types on Anderson Mesa. Large acreages affected with few trees being left regardless of size, age, or value from a wildlife perspective. These early treatments greatly reduced the availability of mature stands of pinyon and juniper trees tied mainly to rocky, inaccessible sites.
<i>Gymnorhinus cyanocephalus</i> Pinyon Jay	-Breeds in pinyon and ponderosa pine. -Usually in pinyon-juniper where pinyon is dominant. -Over 85% of nests found in bottom half of canopy. -Commonly in extensive stands of pinyon-juniper with open physiognomy. -May increase as mid and understory decrease.	-Nest and cache on south side of trees. -Elevation 5,000 to 7,500 ft.). -May key in on warmest microclimate for nesting. -Mid-late successional (pine nuts in mature trees). -Use extensive stands for foraging, colony may have up to an 8 sq mi. home range.	-Roost and nest colonially up to 250 individuals. -Only one nest per tree, usually. -Communal feeders of fledglings between 3-6 weeks old. -Long-term pair bonds. -Co-evolved with pinyon trees. -May suffer from common raven predation.	Mixed stands of pinyon-juniper occur over large areas and pinyon heavily impacted by drought and beetle kill. In general, trees greater than 75 years old are preferred in large numbers. Thought to be relatively stable in Arizona. Pinyon jays were common on the area prior to beetle kill. Their presence and breeding behavior is dependent upon availability of pine seed crops.
<i>Vireo vicinior</i> Gray Vireo	-Pinyon-juniper with broad-leafed shrubs. -Utah serviceberry, single-leaf ash. -Open, not in stands greater than 280 trees/ha. -Usually nest and forage at <2 m. (29 in.-8 ft.).	-Rocky, drier sites. -Moderate to steep slopes (canyon/mesa slopes). -Elevation 3,200 to 6,800 ft. -Not usually found in chained/young PJ. -Patch size small. -Plumbeous vireo move in when structure is denser, patch size larger.	-Frequent cowbird parasitism. -Low foliage gleaner for insects.	Gray vireos generally occur at naturally low population densities. Within the assessment area, rare open stands of mature pinyon-juniper are interspersed with areas of young trees. In general, mature stands of pinyon-juniper within the assessment area have much higher tree densities than the preferred 280 trees per hectare, thus limiting the availability of habitat for this species. Considered to be stable in Arizona and in the analysis area.
<i>Dendroica negrescens</i> Black-	-Mostly pinyon. -Also commonly occurs in Madrean	-Not found where juniper becomes dominant.	-Brown-headed cowbird	This species is thought to be stable or slightly increasing in Arizona. They are common

Migratory birds – pinyon-juniper habitat priority species.				
Priority Species	Vegetation Composition & Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
throated Gray Warbler	<ul style="list-style-type: none"> -oak/pine-oak in southeastern AZ w/ shrub component. -In taller and denser PJ woodland. -Usually nest 2-15 ft. -Low to mid-story nester. -Prefers relatively heavy conifer cover. -Forage most often in pinyon. 	<ul style="list-style-type: none"> -In PJ, usually between 6,500 and 8,000 ft. in AZ. -Locally below 6,500 ft in PJ. -Commonly found in lower elevations in SE AZ habitats. -May prefer woodlands w/ interspersed shrubby openings. -Successional stage: mid to late pinyon woodland. -Unknown if fragmentation has an effect on species. 	<ul style="list-style-type: none"> parasitism occurs, but effect unknown. -Forages low to mid-canopy, foliage gleaner. 	within the assessment area and are considered to be stable to increasing.

Migratory birds – high elevation grassland habitat priority species.				
Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
<i>Buteo swainsoni</i> Swainson's Hawk	<ul style="list-style-type: none"> -More grass and less small woody shrubs than Ferruginous Hawk habitat. -Sparse shrublands, small, open woodlands -Nest trees include: cottonwood, catclaw acacia, tall cholla, juniper -Will forage in agriculture fields, but the crop cannot be taller than local grass; prey difficult to locate. -Nest in small trees in smaller clumps, wind breaks, woody washes esp. when adjacent to red-tailed hawks. 	<ul style="list-style-type: none"> -Elevation 4,900 to 7,000 ft, locally to 9,500 ft. in the White Mountains. -Prefer large expanses of grasslands with interspersed trees or large shrubs. -Primarily a tree nester, but also nest on utility poles, windmills. 	<ul style="list-style-type: none"> -Eat grasshoppers during migration and on wintering grounds. Foods: lizards, snakes, birds, ground squirrels, voles, pocket gophers. -Non-breeders hunt communally and eat primarily insects. -not as sensitive to human activity as ferruginous hawk. 	Swainson's hawks occupy grassland habitats within the assessment area, although habitat is limited to short grass prairie habitats. Woodland encroachment into these grasslands and global decreases in this species numbers are expected to be resulting in static to decreasing numbers of Swainson's hawks within the assessment area.
<i>Buteo regalis</i> Ferruginous Hawk	<ul style="list-style-type: none"> -Scattered, isolated junipers for nesting -Sparsely vegetated grassland. -Nest on elevated areas 	<ul style="list-style-type: none"> -Elevation: 4,900 to 6,200 ft. -Nest sites in isolated junipers, ledges, knolls, rock outcrops or pillars, cliffs faces. -Nests are placed in open with grand view. -Shows no preference for shading. 	<ul style="list-style-type: none"> -Occur where larger populations of prairie dogs, ground squirrels, rabbits, and pocket gophers exist. -High sensitivity to human disturbance around nests. 	No known nesting. Fall migratory use in grasslands on Anderson Mesa. This species is expected to be static within the assessment area.
<i>Athene cunicularia</i> Burrowing Owl	<ul style="list-style-type: none"> -Grasses and plant communities in early succession. -Grasses and plant communities in early 	<ul style="list-style-type: none"> -Elevation 4,900 to 7,000 ft. -Little to no slope. -Dry, open, shortgrass, treeless plains, often 	<ul style="list-style-type: none"> -Limited to areas with active small and/or burrowing 	Habitat is limited to grasslands. Documented in area. Considered to be declining throughout

Migratory birds – high elevation grassland habitat priority species.				
Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
	<p>successional stage.</p> <p>-Rock outcrops that attract burrowing mammals to provide burrows.</p>	<p>associated with burrowing mammals.</p> <p>-Need perches: fencepost, mounds, powerlines, etc.</p> <p>-Early successional stage (grassland).</p>	<p>mammals, such as prairie dogs.</p> <p>-Food: insects (grasshoppers, crickets, beetles) and small mammals, herps, birds.</p>	<p>the majority of their range. Population numbers vary with burrow availability. Within the assessment area, they are expected to be stable to slightly declining.</p>
<p><i>Ammodramus savannarum</i>, Grasshopper Sparrow</p>	<p>-Plains lovegrass, sacaton sp., black grama, vine mesquite, little bluestem, agave.</p> <p>-Taller (12 – 20 inch) mixed tall bunchgrass and turf grass or sodgrass.</p>	<p>-Elevation 4,900 – 6,500 ft.</p> <p>-Moderately open grassland areas w/patchy bare ground, flat to gently rolling hills.</p> <p>-Some level of shrub component.</p> <p>-Territory size not sure in AZ, but 0.6 – 1.4 ha. From eastern North America.</p> <p>-Need low perches such as fences, posts, taller grass, low shrubs.</p> <p>-Tall grass components esp. during breeding season.</p>	<p>-During breeding season feed on grasshoppers, and other insects</p> <p>-During winter, feed primarily on grass seeds.</p> <p>-Sing two entirely separate songs.</p>	<p>This species does not regularly occur in the area. It is considered to be accidental. In Arizona, it is limited to southeastern Pima County (Buenos Aires N.W.R.) east through Santa Cruz and southern Cochise County ad south into northern Sonora, with a separate population breeding in the plains grasslands of Chino Valley in Yavapai County (Latta, et al. 1999).</p>

Migratory birds – freshwater marsh habitat priority species.				
Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
<p><i>Botaurus lentiginosus</i> American Bittern</p>	<p>-During the breeding season, the American Bittern ranges from the Mid-United States to northern Canada. Its wintering range stretches from the south Atlantic coast across the Gulf coast and west to southern California.</p> <p>-Areas of freshwater wetlands with tall emergent vegetation, shorelines, and vegetative fringes.</p>	<p>-The bird prefers beaver-created wetlands to those of glacial origin.</p> <p>- Southern populations occupying regions where temperatures are milder, however, appear to be non-migratory.</p> <p>-Changes in wetland isolation and stabilized water regimes are also eroding habitat quality.</p>	<p>-Little is known about migration patterns of the species.</p> <p>-Members of the species appear to be highly asocial, with minimal pair bonds between the sexes. Foraging is completely solitary.</p>	<p>-potential habitat is marshy areas in reservoirs, semi-permanent and seasonal wetlands</p> <p>- population is undergoing a substantial decline due to loss and degradation of habitat.</p> <p>-The US Fish and Wildlife Service listed the species as a Nongame Species of Management Concern in 1982 and 1987.</p>

Table 9. Management Indicator Species Found Within the Hay Lake Complex.

<i>Species</i>	<i>AMLSA Management Area</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
MAMMALS			
<i>Cervus elaphus</i> Elk	3, 4, 6, 7, 8, 9	Occupy mountain meadows and coniferous forest, pinyon juniper woodlands, and are occasionally seen in the plains grassland, or even desertscrub. They are primarily grazers. Elk do well in Arizona's mild climates.	Elk are present and abundant throughout the entire Hay Lake area, and are most plentiful within the conifer habitats. Elk summer and winter in the area.
<i>Odocoileus hemionus</i> Mule Deer	5, 6, 7, 8	Occupy the conifer and woodland habitats, typically inhabiting the conifer types during the summer and the woodlands in the winter. They are primarily browsers, feeding on shrubs and mast as well as a variety of forbs and green grasses.	Although widespread and abundant nationally, mule deer populations have been declining throughout the southwest. Populations of mule deer on Anderson Mesa have been variable, but are considered to be stable. Anderson Mesa is an important stronghold for mule deer, because the forestwide mule deer population is expected to continue to decline. The pinyon-juniper woodlands and ponderosa pine/P-J transitional zone are the habitats where mule deer is primarily found.
<i>Antilocapra americana</i> Pronghorn	9, 10	Pronghorn are grassland and opening dependent species. They use areas where slopes are less than 30%, rainfall is about 10-15" per year, with water every 1-4 miles. Low vegetative structure, averaging 10-15" is preferred.	Occupy grasslands and openings throughout the area, and are known to use wooded areas as well. Pronghorn summer and breed in the Hay Lake area. Winter range is at the east edge of the Mesa and eastward onto state, BLM and private lands. Population is declining on the mesa. Anderson Mesa is an important habitat area for pronghorn on the Coconino National Forest.
BIRDS			
<i>Meleagris gallopavo merriamii</i> Wild Turkey	3, 4	Turkeys need a variety of habitats and forage types. Habitat needs include spring migration corridors, roosts, escape cover, and nest sites. There are differences between summer and winter habitat needs. Winter habitat includes mixed ponderosa pine and pinyon-juniper. A Gambel oak component is important for mast production and foraging. However, juniper can substitute as a mast producer. For roosting, tall (>50 feet), mature ponderosa pines are needed with wide branches in areas of dense cover. Often turkeys choose roost pines in canyons. Winter foraging tends to focus on oak and pinyon mast and grasses. Summer range includes ponderosa pine and mixed conifer with aspen sub-climax forest. Summer foraging tends to focus on insects and forbs. Insects are especially important for new broods. Nesting usually occurs on steep (>30%) slopes with good canopy and horizontal cover.	Merriam's turkey occurs throughout forested areas of the area, depending on the season. Roosts are generally found in pine stringers, transition areas between ponderosa pine vegetation types, and grassland or pinyon-juniper woodland vegetation types. There are 3 known roosts in the Hay Lake area. The Arizona turkey population has been in statewide decline since the mid to late 1970's. Within the last five years, turkey populations have experienced an increase, including those in the Hay Lake area (Game Management Unit 5B). The increase in turkey sightings is possibly attributed to an increase in ponderosa pine seed production, increased poult survival resulting from mild winters and, at times, wet summers, and changes in hunting regulations.
<i>Parus inornatus</i> Juniper (plain) Titmouse	7, 8	Juniper titmice are year round residents of Arizona. These birds are obligate secondary cavity nesters, and according to observation, most nest cavities are located in juniper trees (T. Corman, AGFD, pers.obs.). Diameter of nest trees ranged from 1.5 – 5.5 inches. The species is an obligate inhabitant of pinyon-juniper woodlands (Andrews and Righter 1992, Behle 1985, Phillips et al 1964, Small 1994). Studies by LaRue (1994) and Masters (1979) tentatively indicate that "the proportion of the breeding bird density the titmouse contributes to tends to drop with increasing tree density, increasing total bird density, increasing	Habitat for this species is common, however as tree densities and canopy cover increase in the pinyon-juniper woodlands, habitat suitability decreases. Recent pinyon mortality, due to bark beetles, has resulted in an increase of nesting habitat for the short-term.

<i>Species</i>	<i>AMLSA Management Area</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
		proportion of junipers and increasing canopy cover" (Latta et al 1999).	
<i>Anas cyanoptera</i> Cinnamon Teal	12	Nesting habitat is seasonal and semi-permanent wetlands with tall, dense herbaceous vegetation within 300 feet of waters. Resting and feeding also occurs on reservoirs. Foods are plants and invertebrates.	Seasonal wetland habitat is stable, but remains below potential. Reservoir habitat is stable. There are 459 acres of seasonal wetlands (Hay Lake) and 1039 acres of reservoirs (Long, Soldier, Soldier Annex, and Tremaine lakes). There are other various tanks, potholes and temporary waters in the area. Cinnamon teals are summer residents on the Forest. Their population trend on the Forest is inconclusive. This species is one of the most common waterfowl species that nests on Anderson Mesa, but nest and reproductive success was reported as low. Precipitation and water levels positively influence waterfowl nesting occurrence and success. Cinnamon teal are susceptible to nest predation if vegetation height around nests is short.
<u>MACROINVERTEBRATES</u>			
See Fisheries Resources report	12		

Table 10. Sensitive Species Found Within the Hay Lake Complex.

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<u>MAMMALS</u>			
<i>Microtus mexicanus navaho</i> , Navajo Mountain Mexican vole	FS sen	Found at elevations between 3,800 and 9,700 feet. Typically occupy dry grassy or dry grass-forb vegetation in association with ponderosa pine or other coniferous forests. Also found in low, dense, shrubby thickets.	Potential habitat is present
<u>BIRDS</u>			
<i>Falco peregrinus anatum</i> American peregrine falcon	FS sen	The essential habitat for the peregrine falcon includes rock cliffs for nesting and a large foraging area. Suitable nesting sites occur on rock cliffs with a mean height of 200 to 300 feet. The subspecies anatum breeds on isolated cliffs and is a permanent resident on Coconino National Forest. Peregrines prey mainly on birds found in wetlands, riparian areas, meadows within a 10 to 20 mile radius from the nest site.	The nearest known eyries are located in East Clear creek; the falcons can easily forage in the Hay Lake area. Potential habitat is in East Clear Creek and Jacks Canyon where cliff faces are ≥ 200 feet high. The ephemeral and permanent waters in the area provide foraging habitat for peregrine falcons.
<i>Accipiter gentilis</i> Northern goshawk	FS sen	All ponderosa pine and mixed conifer above the Mogollon Rim is considered goshawk habitat, including associated pine or mixed conifer stringers that may extend below the rim. Nest stands are typically in later successional stages, especially old growth. Post-fledging family areas (PFAs) have patches of dense trees, developed herbaceous or shrubby understories, snags, downed logs, and small openings, which provide cover and prey. Foraging areas are a mosaic of various successional stages and cover types. Goshawk foraging use is	The nearest PFA is 3.5 miles away from the Hay Lake area. The ponderosa pine/pinyon-juniper transition vegetation type is foraging habitat for northern goshawks, which is located in the west and south sides of the area.

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
		associated with ponderosa pine vegetation. Although juniper or pinyon-juniper habitat types are not heavily used by northern goshawks, some foraging may occur there, especially in transition areas between ponderosa pine and pinyon-juniper habitats.	
<i>Euptilotis neoxenus</i> Eared trogon	FS sen	The eared trogon is a neotropical migrant, which is generally found in northwestern Mexico, but has been documented in Arizona. In Arizona, it generally inhabits pine and pine-oak forests from 6,000 to 10,000 feet in elevation. This species is a very infrequent visitor to the United States, with the majority of sightings occurring in southeastern Arizona.	There are documented occurrences of eared trogons occurring on the Coconino and Tonto National Forests along the Mogollon Rim. No eared trogons have been documented within the area, but habitat for this species occurs where pine and pine-oak vegetation exists, and for Hay Lake that would be in the west and south sides of the area.
AMPHIBIANS			
<i>Rana pipens</i> Northern leopard frog	FS sen	The Northern leopard frog occurs in the northeastern quarter of Arizona, usually in montane streams and wetlands that have aquatic vegetation but also in wet meadows at higher elevations. This leopard frog is generally restricted to permanent waters.	There are no known existing locations of this species within the area. The best potential habitat is at the reservoirs and Hay Lake when it is a functional wetland again.
<i>Bufo microscaphus microscaphus</i> Southwestern (Arizona) Toad	FS sen	The southwestern (Arizona) toad is usually associated with the pine-oak belt, but has been found by sandy banks with willows, cottonwoods, and sycamores at elevations less than 6,000 feet. They generally prefer rocky streams and canyons in upland desert and evergreen woodland plant communities, and occur at elevations ranging from near sea level to 8,000 feet (AGFD 1995).	The southwestern (Arizona) toad has been historically documented in East Clear Creek and near Perry Lake. Potential habitat is at the reservoirs and Hay Lake when it is a functional wetland again.
INSECTS			
<i>Piruna polingii</i> Spotted skipperling	FS sen	Scattered populations of the spotted skipperling occur throughout the southwest in wet meadows, grassy springs in mountainous woody areas, seeps, or riparian canyons in low to mid elevation mountains (Opler & Wright 1999, Pyle 1981, Scott 1986, Wallesz 1999).	The spotted skipperling has a limited range in in Arizona, which includes the Huachucas, Chiricahuas and the Mogollon Rim. It is known to occur on the Mogollon Rim. Potential habitat is the waters in the Hay Lake area.
<i>Speyeria Nokomis nitocris</i> Mountain silverspot butterfly	FS sen	Scattered populations of this species occur throughout the southwest in wet meadows, grassy springs in mountainous woody areas, seeps, or riparian canyons. Habitat is the upper Sonoran to Canadian zone (Scott 1986). Violets are larval host plants for the silverspot butterflies.	Potential habitats are Tremaine Lake, Hay Lake and wet meadows in the area. The closest known location of the mountain silverspot butterfly occurs at Kehl Springs.
<i>Speyeria nokomis Nokomis</i> Blue-black silverspot butterfly	FS sen	Scattered populations of this species occur throughout the southwest in wet meadows, grassy springs in mountainous woody areas, seeps, or riparian canyons. Habitat is the upper Sonoran to Canadian zone (Scott 1986). The blue-black silverspot is more associated with desert landscapes.	Potential habitats are Tremaine Lake, Hay Lake and wet meadows in the area. No locations for the blue-black silverspot butterfly are known within and adjacent to the assessment area.

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<i>Cicindela oregona maricopa</i> Maricopa tiger beetle	FS sen	The Maricopa tiger beetle occurs in open sand or mud flats and stone terraces along permanent or intermittent streams and near temporary and permanent ponds, open soil such as dirt roads and parking lots near water to some distance from water. They have been reported near leaky faucets and pipes, cattle tanks and ponds. They are generally not found on sand or mud bars with dense low-growing vegetation or on streams where cobblestone predominates. The main vegetative associations at collection sites in riparian corridors are ash, sycamore, cottonwood, and willow. Vegetation outside the immediate riparian corridor varies from juniper-chaparral to grassland and Upper Sonoran desert scrub. The elevation at collection sites range from 1,092 to 6,880 feet.	There are no known records for this species within the area. The nearest known location for Maricopa tiger beetles occurs along Pine Creek along the Mogollon Rim (AGFD 1996). The soil types in the analysis area tend to be rocky, however microsites are probably available to support habitat for this tiger beetle. Potential habitat exists at the waters in the Hay Lake area.

Table 11. Threatened and Endangered Species Found Within the Hay Lake Complex.

<i>Species</i>	<i>AMLSA Status</i>	<i>Critical Habitat Present</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<u>MAMMALS</u>				
<i>Mustela nigripes</i> Black-footed ferret	FED END	N/A	Habitat is described as prairies, grassland plains, and surrounding mountain basins up to 10,500 ft. Depend almost exclusively on prairie dog colonies for food, shelter, and denning. Prairie dogs are the ferret's primary food source.	Potential habitat (prairie dog colonies) is present. There are two active prairie dog colonies in the Hay Lake area; one at Hay Lake and another less than four miles away at Red Lake. The size of these colonies is undetermined, and suitability of habitat for black-footed ferrets is uncertain.
<u>BIRDS</u>				
<i>Haliaeetus leucocephalus</i> Bald eagle	FED THR	N/A	Bald eagles are primarily winter visitors to the Coconino National Forest. Wintering eagles arrive in the fall, usually late October or early November, and leave in early to mid-April. They feed on fish, waterfowl, terrestrial vertebrates, and carrion. Eagles are often seen perched in trees or snags near water or next to roadways where they feed on road-killed animals. At night, small groups (usually 2-12) or individual eagles roost in clumps of large trees in protected locations such as drainages and hillsides. Eagles usually roost adjacent to or very near food sources.	There is one bald eagle winter roost in the Hay Lake area. Additionally, there are four man-made perches at Long Lake, and two man-made perches at Soldier Annex Lake. Bald eagles are regular winter residents in the Hay Lake area.
<u>AMPHIBIANS</u>				
<i>Rana chiricahuensis</i> Chiricahua leopard frog	FED THR	N/A	The Chiricahua leopard frog inhabits thermal springs and seeps, wells, intermittent rocky creeks, streams, rivers, backwater ponds, and stock tanks that are free from introduced fish and bullfrogs. This species requires permanent or nearly permanent water sources and is found at elevations ranging from 3,000 to 8,300 feet. Heterogeneous habitat with undercut banks, overhanging terrestrial vegetation, and	Chiricahua leopard frogs were documented historically during surveys of East Clear Creek in 1961, 1971, and 1972. They have not been found since that time. The nearest historical location of this species occurs upstream of the assessment area boundary location in East Clear Creek, approximately 11 miles. There are two other historical Chiricahua leopard frog locations further upstream. Potential

<i>Species</i>	<i>AMLSA Status</i>	<i>Critical Habitat Present</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
			abundant aquatic vegetation is considered optimal.	habitat occurs at the wetlands and reservoirs in the Hay Lake area.

Fisheries

All perennially ponded waters within the assessment area are typically associated with manmade reservoirs. Many of the water bodies labeled as “lakes” are in actuality relatively shallow depressions that collect and hold water on a temporary basis. These “lakes” are generally characterized as temporary wetlands, ephemeral wetlands, or closed basins (see Fleishman 2003 for wetland types and definitions).

Lentic Habitats

Within the Hay Lake Complex, all “lakes” that are manmade water bodies are classified as either reservoirs or semi-permanent wetlands (Fleishman 2003). These reservoirs include: Long Lake (lower), Morton Lake, Soldier Annex Lake, Soldier Lake, and Tremaine Lake. The permanency of these waters has provided the AGFD with the opportunity to establish and maintain them as sportfisheries. All but Morton and Tremaine have long been stocked with a variety of fish species; the most prominent being rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), grayling (*Thymallus arcticus*), channel catfish (*Ictalurus punctatus*), walleye (*Stizostedion vitreum*), largemouth bass (*Micropterus salmoides*), and bluegill (*Lepomis macrochirus*). Ashurst and Soldier Lakes have been stocked on a fairly regular basis since 1935. Morton Lake (first stocked in 1976) also has a history of fish stockings, but not as extensive as it’s upstream companion, Kinnikinick Lake (first stocked in 1936). “Intensive Use”¹ is the term used to describe the current management emphasis for all the above-mentioned lakes (Young 2001).

Tremaine Lake is currently considered fishless; this reservoir has not been stocked by the AGFD. Due to connectivity with Soldier Annex Lake (via a ditch), Tremaine Lake may contain channel catfish. Tremaine Lake has recently been identified for development as a sportfishery to compensate for the loss of the fishery at Stehr Lake caused by the impending decommissioning of the Arizona Public Service Childs / Irving Hydropower Plants in the Verde River Basin.

Despite the warmwater emphasis place on a number of the mesa “lakes”, trout have been (and plan to be) stocked to provide and/or supplement spring, winter, and fall fishing. All perennially ponded waters within the assessment area are typically associated with manmade reservoirs. Many of the water bodies labeled as “lakes” are in actuality relatively shallow depressions that collect and hold water on a temporary basis. These “lakes” are generally characterized as

¹ **Intensive Use**--providing for intensive angling use by stocking catchable (and some fingerling or subcatchable) fish where the demand for harvest cannot be supported by other management techniques, often referred to as “put-and-take” (Noble 1980). These fisheries usually are in areas of high angler demand, such as near campgrounds, day-use areas, or high use areas other than major metropolitan areas. (Young et al. 2001)

temporary wetlands, ephemeral wetlands, or closed basins (see Fleishman 2003 for wetland types and definitions).

Recreation

Over the years, various Forest Service management plans have provided general direction for management of recreation resources on the mesa, and are useful in understanding past recreation management emphasis for Anderson Mesa.

The 1932 (revised 1940) Coconino National Forest (CNF) 'Forest Recreation Plan' recognized several places on the mesa as a part of what was called 'Division 5', and included management information and direction for Ashurst Cabin, Ashurst Lake, Vail Lake, Chavez Well Forest Camp, **Long Lake**, Long Lake Summer Home Group, and **Soldier Lake and Soldier Lake Annex**. In general, direction in this plan was for development of these areas within such constraints as the amount of water flowing from springs or available from wells. While the 1932 plan contained no specific discussion of Anderson Mesa proper, the direction outlined for each area listed above indicated the forest considered the mesa area to be an important part of the overall recreation management picture.

The Chief of the Forest Service has identified several key issues or "threats" to the national forests – fire and fuels (restoration of healthy forests to reduce fire risk), invasive species (protection of ecosystems), loss of open space (conservation of lands susceptible to subdivision and development), and unmanaged recreation (regulate the use of OHV's). At least the last three issues relate directly to recreation management on Anderson Mesa, and could influence the selection of management alternatives.

While other areas of the surrounding regional landscape often dominate the view and receive more recreational use, Anderson Mesa, with its broad, difficult-to-access topography, and with 320 inventoried water bodies, has long been used for recreational activities such as hunting, driving for pleasure, fishing, camping, wildlife viewing, etc. As the population has increased, other more popular areas have become crowded, and Anderson Mesa has been discovered and is receiving increasing recreational use.

In recent years, use of Anderson Mesa for both traditional types of recreational uses and new recreational uses has changed and use has increased dramatically. Because of this, the mesa area has become an important part of the larger forest recreation management picture. Some long-time uses, such as hunting and wildlife viewing, have increased steadily over the years. New uses of the mesa include OHV riding and driving, mountain biking, climbing, orienteering, geo-caching, and others, and use is increasing each year. This increased use, often un-managed, has resulted in impacts ranging from more negligible ones to significant impacts.

The Hay Lake Focus Group, comprised of numerous parties interested in management of the large Hay Lake parcel of land that recently changed from private ownership to national forest, has identified a number of situations within the newly acquired area and other surrounding forest lands that need attention, one of which is recreation access. At issue is the current difficult access to Long Lake, Soldier Lake, Soldier Annex Lake, and Tremaine Lake due to the low standard of roads in the area. The Forest Service, Arizona Game and Fish Department, and Natural Resources Conservation Service would like to improve access to the

roads in the area, particularly to Tremaine Lake, where the group would like to construct an accessible fishing dock and boat launch.

Dispersed Recreation

Use of Anderson Mesa for dispersed recreation purposes is perhaps the most popular recreational use overall, including for hunting big game, waterfowl, small game, upland game birds, driving for pleasure, camping, wildlife viewing, OHV driving and riding, mountain biking, and rock climbing. While overall dispersed recreation use across the mesa is relatively light, fluctuating on a seasonal basis, the broad expanse of the mesa with its various interesting attributes for dispersed recreation activities make this area very popular for these types of uses.

Camping use levels along major routes is moderate, as determined by the campfire rings inventoried during the fall of 2002 for this analysis, with approximately two to eight campsites per mile of road, and within view of the road. Predictably, the density of campsites is higher near developed areas, e.g. along paved roads, near campgrounds and lakes, etc. Noted high-use campsite problem areas are along FR128 at Marshall Lake, FR 125 on its west end near Mormon Lake, FR82E (Ashurst Lake Road), FR126 at the forest boundary, **FR82 near Long Lake, and FR69B at Chavez Pass**, where multiple un-maintained campsites may be found.

Because most dispersed campsites in the area are not routinely maintained, resource problems are often associated with the sites, except for the scattered, more remote sites. In particular, multiple fire rings with ash and litter exist at many sites, and there is often multiple, sometimes-braided roadways leading from the main travel route to the campsite, often with vegetation and soil damage. Some higher use sites suffer from health and sanitation issues, particularly during the busy part of the use season, as no toilets exist at these sites and few people either bring self-contained vehicles or portable toilets.

Driving for Pleasure

Driving for pleasure on Anderson Mesa has been popular for many years.

OHV Use

OHV use has increased on the mesa in recent years, particularly for big game hunting, antler hunting, and recently for long-distance ATV riding. While much of this use is confined to existing roads and trails, some riding and driving, such as searching for antlers, hunting around water bodies, etc., is done off-road, and resultant impacts to wildlife, soils, water and other resources are evident, e.g. bare soil, damaged vegetation, wildlife disturbance, etc. Additionally, use of area roads and trails during periods of inclement weather or road conditions, and with uncontrolled access to the area, results in damage to the roads and soil and water resources.

Hunting

While hunting occurs nearly year-round on Anderson Mesa for many species of upland game birds, waterfowl, small game and big game, each fall hunting use picks up dramatically, especially for big game. With a premier elk herd, and significant populations of deer, bear, antelope, and cougar, most of the Anderson Mesa area has long been a hunting area of choice.

Waterfowl hunting is very popular at the numerous lakes on the mesa, too, particularly during years when sufficient moisture keeps lake levels high.

Fishing

Recreational fishing at Anderson Mesa lakes is very popular, since several of the lakes are the most reliable and best fishing resources in the region, particularly for cold water species such as trout. Although it's often ephemeral nature make it unpredictable, Long Lake and the associated lake complex there, and several other lakes and tanks in the area, also provide both cold and warm water fishing opportunities.

Antler Collecting

Over approximately the past ten years, the collection of elk and deer antlers that are shed in late winter and early spring has become very popular on Anderson Mesa – use is estimated at 2,250 user days per year - mostly for profit and mostly for elk antlers, as dealers purchase antlers for export from the United States

Desired Condition of the Hay Lake Complex

Information gathered at the public meetings in April 2003 relative to what the public wanted the Mesa to look like or be managed for, is incorporated into this section.

The uniqueness of the Hay Lake Complex area, and the opportunity to give the area a hard-look relative to future management direction emphasis is timely. There were 7 categories that captured their values and desires, they were:

Natural and Wilderness Values

Preservation of Undeveloped Open Space

Historic Uses

Preservation of Historic and Prehistoric Values

Wildlife Values

Restoration and Maintenance of Healthy Grasslands, Habitat

Sustainability of the Resources in Balance with Local Economics and Multiple Use Concept

Most of these values and desires can be incorporated into the future management emphasis of Hay Lake to some degree. It must be understood that not all values and management desires can be realized on every acre on the Mesa. Some areas are unique and lend themselves to specific uses, or management. The same rationale can be applied to the Hay Lake Complex.

By virtue of the fact that the NRCS has a 30-year easement on 760 acres to restore pasture back to an ephemeral wetland ecosystem gives some validation to the idea that managing for wildlife and wetlands is a good direction to proceed towards. This would also satisfy the public's desire for an increase in watchable wildlife and an improvement in wetland function. The easement includes another 757 acres of upland that will serve as a buffer to the wetland. The primary purpose is to restore wetland functions and values for the benefit of migratory birds and other wetland dependant species.

Wetlands

No grazing within easement even in the unfenced portion...see map.

Transportation

A logical, long term road system and design plan is in place that addressed a variety of resource uses, such as fishing, hunting/viewing of wildlife, and the protection of archeological resources.

Identify which roads should be designated as remaining open and which ones need surface improvements. Tie to the OHV EIS Implementaton Plan.

Better access to Soldier and Soldier Lake Annex.

Upgrade Forest Road 82 to Long Lake.

Work towards getting 'user created' roads closed.

Break up loop(s) around Long Lake.

Vegetation

Willow found north and west side of Soldier Lake

Need some cover and vegetation in and around Long Lake.

Increase biodiversity by thinning pinyon juniper mesa wide.

Recreation

Provide for a variety of recreational experiences.

Provide for a variety of fish species in the lakes.

Tremaine Lake has the potential to grow warm water fish.

Bawcom Tank has potential as a deep water habitat

Wildlife Viewing on the east side of Hay Lake, Section 29 on top of the ridge.

Long Lake is used heavily by elk hunters

Fishing

Three places are recommended for bird watching, 1) at Hay Lake, 2) one at Tremaine Lake, 3) one at the Tremaine Lake narrows.

Archeological sites will be protected by developing and identifying a road system that works for many users.

Wildlife

The interconnectiveness of the hydro geography relative to several lakes, reservoirs and man made water delivery system (channels and ditches), recreation use, and wildlife use both elk, antelope, avian and fisheries (potential and current), wetlands; the Complex boundary is recommended to be extended beyond the existing Hay lake (newly acquired) boundary, to include other lakes, Soldier Lake, Soldier Lake Annex and Long Lake. See map.

The desired conditions for the assessment area water bodies includes attaining a pure native fishery in Clear Creek, and the continuation of providing angling opportunities to the public in the lentic wetlands on the mesa. The mesa reservoirs provide nearly ideal places to stock non-native fishes to meet a sportfish demand. The habitat conditions found in these lakes lend themselves to a put-and-take, non-native sportfishery. The isolation and/or distance of these mesa lakes from downstream native fish habitat preclude detrimental effects associated with the non-native species. Fish stockings of the mesa lakes are based on the lakes' history of sustaining water to support the non-native sportfisheries.

For the area's wetlands and lakes, the established fisheries continue to be regulated by the AGFD, with cooperation and coordination from the Forest Service. Anglers understand that transporting and stocking undesirable fish species (northern pike – *Esox lucius*) causes detrimental effects to the mesa fisheries, and undermine the AGFD's management strategy for the mesa lakes. Forest recreation management, in cooperation with the AGFD, maintains other resource values while attaining manageable fisheries on Anderson Mesa. The AGFD's desired fish assemblage for each of the more dependable mesa lakes can be viewed in Appendix A.

As part of managing the fisheries, the AGFD has made recommendations for specific water bodies that help to define the desired conditions for the lakes. The following bullet statements present the AGFD recommendations (Young et al. 2001) for specific water bodies in the Hay Lake Complex.

- **Long Lake (lower):** *Work with the Forest Service to maintain and improve the boat ramp and road access, put in one good access and do away with “wildcat” roads.*
- **Soldier Annex Lake:** *Improve road access.*
- **Tremaine Lake:** *Work with the Forest Service to enhance recreation opportunities and improve road access.*

Private Land

A planned road system that will support the following: Water Rights of the area, wildlife, recreation and archeology.

Recommended Management Emphasis's

- Wetlands, Wildlife, Recreation, developing a long-term road design plan, and integrating local economics and sustainability of resources.
- Need to locate the official Congressional directional resource emphasis.