

# Existing and Desired Condition

## Specialist Report

for the

### Anderson Mesa Landscape Scale Assessment

### Wildlife Resources

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**Resource/Subject Matter Analyzed**

January 8, 2004

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## INTRODUCTION

The objective of this report is to identify and describe existing and general desired conditions of wildlife habitat and the status of associated species within the assessment area. Descriptions will tie back to the other specialist reports, particularly vegetation/soils and riparian/wetlands. Disturbances such as fire, insects and disease, ungulate grazing, logging and fuelwooding will also be identified, described and assessed. Appropriate information from this report is expected to be used in the Anderson Mesa Landscape Scale Assessment document. This report will be included in the Project Record in its entirety.

A goal of the Anderson Mesa Landscape Scale Assessment is to complete a comprehensive document that describes the existing and desired conditions for all resources and ecosystem functions of the area. The assessment is not a decision document (EA, EIS, etc.) under the National Environmental Policy Act (NEPA) with proposed projects, but rather a compilation of data that identifies those ecosystem functions in the assessment area that are working and those that are not, with suggestions for restoring functions that are damaged.

Anderson Mesa is a unique area notable for its grassland habitat types. 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 four watershed boundaries; and there are common, repeated vegetative types throughout. It is large in scale, covering approximately 265,000  es.

There are many unique soil and vegetation habitat types identified on the mesa ranging from grasslands and pinyon-juniper woodlands at the lowest elevations to small acreages of mixed conifer at the highest elevations. 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. There are many wetlands (49 sites, 3370 acres) and riparian areas (14 springs, 15 miles of stream) interspersed throughout the assessment area.

This report is organized in four main sections: an introduction section; habitat types and associated wildlife species section; an existing condition section, which describes the current conditions and summarizes inventory and monitoring data; and a desired condition section that outlines current Forest Plan direction (USDA Forest Service 1987 as amended). This report will describe the existing conditions of habitat types for species of concern that are found or can potentially be found in the area. Included in the existing condition section is information pertaining to identification and the status or population trend of each species within the area. The species are identified and grouped as: federally listed as threatened or endangered, Forest Service sensitive, Forest Service management

indicator, or Partners In Flight migratory bird species of concern. Existing condition evaluations will contain supportive information in establishing the capability and long-term desired conditions of the various habitat types to support diverse and viable populations of wildlife species across the landscape.

## **HABITAT TYPES and ASSOCIATED WILDLIFE SPECIES**

There is a large diversity of habitat types and associated wildlife species within the assessment area. The function, productivity, and composition are widely variable. Threatened, Endangered and Forest Sensitive (TES), Management Indicator Species (MIS) and Migratory Birds are addressed in this report. Plant and fish species are addressed in the Vegetation and Soil and Fisheries resource specialist reports, respectively. All species that occur, or where there is potential or suitable habitat for a species within the assessment area, are addressed in this report in table format under the Existing Conditions of Wildlife Resources section (see Appendix I for list of species).

Detailed information on the existing conditions for species that occupy the grasslands, riparian areas and wetlands of Anderson Mesa is presented under the Existing Conditions of Wildlife Resources section. Eleven species are detailed, with primary emphasis on: pronghorn antelope, cinnamon teal, bald eagle, American peregrine falcon, Chiricahua leopard frog and northern leopard frog. Management direction that may result from the landscape scale assessment is not expected to change population trends, or establish protocols for threatened or endangered species.

To analyze wildlife habitat and associated species, the vegetation types as defined in the Vegetation and Soils Resource Specialist Report (PRD#xxx) are used, as is the information in the Riparian-Wetlands Resource Specialist Report (PRD#xxx). Habitat trends and species population trends on the Forest are taken from the “Management Indicator Species Status Report for the Coconino National Forest” (USDA Forest Service 2002a). That MIS report gathered current data at the time, through year 2001. For more detailed information, please refer to those documents.

There are basically seven general habitat types in the assessment area. Each is discussed immediately below. All acreages presented are approximate and were rounded to the nearest five.

- Mixed conifer forest
- Ponderosa pine forest (ponderosa pine, pine/Gambel oak)
- Ponderosa pine and pinyon-juniper ecotone
- Pinyon-juniper woodlands
- Grasslands (mountain meadows, high elevation grasslands)
- Riparian areas (lotic)
- Wetlands (lentic) and wet meadows

## **Mixed Conifer Habitat Type**

Mixed conifer habitat is uncommon within the assessment area (530 acres), existing only along north-facing slopes of hills and canyons. These areas occur on the west side of the assessment area and in canyons such as East Clear Creek and Jack's Canyon. Due to the steepness and inaccessibility of these areas, few impacts on these habitats occur. There is potential for wildfires to occur in these steep areas, and rock climbing occurs adjacent to mixed conifer vegetation types in Jacks Canyon.

### Forestwide Trend

Forestwide, mixed conifer habitat type is represented on a relatively small percentage of the land base, with the majority in wilderness areas. The age class distribution of mixed conifer has changed to some degree during the Forest Plan implementation period (since 1987), mostly due to wildfire. Stand-replacing fires affected approximately 12 percent of mixed conifer and spruce-fir on the Forest. Additional changes to age class distribution of mixed conifer from tree growth and mortality has been relatively minor.

Additionally, a shift in species composition is occurring. Aspen and pine within the mixed conifer are being lost, and the white fir and Douglas-fir components are increasing. In the snowmelt drainages along the Mogollon Rim, the big-tooth maple component of mixed conifer is declining as well (Martin 2002). Fir is more susceptible to insect and disease impacts than pine. As pine is replaced by fir, and the older fir component dies, the future trend of mixed conifer is toward smaller and younger forests.

The USFS Forest Inventory Assessment found 2.6 snags (>18" dbh) per acre (USFS 2001). The trend in snags in mixed conifer is probably increasing due to a number of complex factors, such death of trees from wildfire, insect attacks and disease. The tree mortality rate in the mixed conifer habitat type is the highest on the Forest. The longevity of insect and disease-killed fir is uncertain, and understanding is lacking regarding the persistence of snags versus recruitment rates.

Wildlife species associated with mixed conifer habitat, that are found or where there is potential or suitable habitat in the assessment area, are:

- Elk (management indicator species of early seral stage)
- Hairy woodpecker (management indicator species of snag component)
- Mexican spotted owl (federally listed at threatened)
- Northern goshawk (Forest sensitive)
- Olive-sided flycatcher (migratory bird species of concern)
- Red squirrel (management indicator species of late seral stage)

## **Ponderosa Pine Habitat Type**

In the assessment area there are approximately 16,445 acres of ponderosa pine–Gambel oak habitat type.

### Forestwide Trend

Since 1989, approximately 4.6% of the ponderosa pine vegetation type acres have burned in wildfires on the Forest (M. Suida, database query). About one-half of these burned

acres were stand-replacing fires (R. Zanotto, personal communication). This created early seral stage classes in the ponderosa pine, with some acres burned so severely that they will remain nonstocked for the foreseeable future. Regeneration of ponderosa pine is limited, but is better on limestone soils, which occur primarily on the southern half of the forest.

The age class distribution of ponderosa pine has remained dominated by mid-seral stage stands (70% or more of the acres), and on average has become more dense. In the early 1900's, several years of good cone crops, combined with favorable conditions for germination, resulted in exceptional establishment of ponderosa pine seedlings. These are the trees that now dominate the Forest's age class structure.

There has also been some loss of old-growth and older trees due to both management activities and natural loss. The net result is a decrease in the distribution and number of old ponderosa pine trees within the pine matrix. Approximately 20% of the ponderosa pine type outside of wilderness areas has been treated since 1987. Implementation of the original Forest Plan resulted in old-growth that is more fragmented with smaller stand sizes on areas less than 40% slope. Old-growth is concentrated on slopes greater than 40% slopes, which are in wilderness areas or otherwise unavailable for timber harvest. The 1996 Forest Plan Amendment changed old-growth guidance to provide for old-growth on 20% of the forested landscape, with no minimum stand size.

### Snags

In the latter half of the implementation period of the Forest Plan, since about the mid-1990's, harvest of old ponderosa pines in the pure pine type was much reduced, however, not enough old trees remain on the great majority of the landscape to maintain current densities of cavity nesting birds until the mid seral trees that were established in the early 1900's become late seral (Miller and Benedict 1994). Cavity nesting birds are likely to do better in pine-oak habitat where large oaks contribute to cavity nesting habitat.

Overall, snags in the ponderosa pine type on the Forest are being lost faster than they are being replaced, and large snags are lost at a disproportionate rate to small snags, resulting in a downward trend. This trend is greatest on the northern portion of the Forest, where illegal fuelwood cutting greatly affects snag densities. Areas of a stable to slightly increasing trend are located in protected canyons, wilderness, and portions of the southern end of the Forest, but overall densities are below Forest Plan guidelines.

Wildlife species associated with ponderosa pine habitat types, that are found or where there is potential or suitable habitat in the assessment area, are:

- Abert squirrel (management indicator species for early stages)
- Bald eagle (federally listed as threatened)
- Cordilleran flycatcher (migratory bird species of concern)
- Eared trogon (Forest sensitive)
- Elk (management indicator species for early seral stage)
- Hairy woodpecker (management indicator species for snag component)
- Mexican spotted owl (federally listed as threatened, in pine-oak habitat type)

- Navajo Mountain Mexican vole (Forest sensitive)
- Northern goshawk (Forest sensitive, management indicator species for late seral stage)
- Olive-sided flycatcher (migratory bird species of concern)
- Purple martin (migratory bird species of concern)
- Pygmy nuthatch (management indicator species for late seral stage)
- Wild turkey (management indicator species for late seral stage)

### **Ponderosa pine/Pinyon-juniper Transitional Habitat Type**

There are approximately 35,810 acres of transitional habitat comprised of ponderosa pine/pinyon-juniper/Arizona fescue/blue grama. This is a new vegetation type grouping (Vegetation and Soil Resource Specialist Report PRD#xxx), therefore there are no specifics as to habitat trends.

Wildlife species associated with this ponderosa pine/pinyon-juniper ecotone, that are found or where there is potential or suitable habitat in the assessment area, are:

- Arynxa giant skipper (Forest sensitive)
- Black-throated gray warbler (migratory bird species of concern)
- Early elfin (Forest sensitive)
- Elk (management indicator species for early seral stage)
- Freeman’s agave borer (Forest sensitive)
- Gray flycatcher (migratory bird species of concern)
- Gray vireo (migratory bird species of concern)
- Juniper (plain) titmouse (management indicator species for P-J late seral stage and P-J snag component)
- Mule deer (management indicator species for early seral stage)
- Neumogen giant skipper (Forest sensitive)
- Northern goshawk (Forest sensitive)
- Pinyon jay (migratory bird species of concern)

### **Pinyon-Juniper Habitat Type**

Pinyon-juniper habitat types are some of the most common within the assessment area. Within the assessment area there are approximately 109,630 acres of pinyon-juniper woodlands. There are also approximately 6,665 acres of pinyon-juniper/blue grama woodlands.

#### Forestwide Trend

The age class distribution of pinyon-juniper has been relatively stable throughout the Forest Plan implementation period. Only about 3,100 acres (0.5%) have burned in wildfires (M. Suida, database query), of which, about 1,240 burned hot enough to convert pinyon-juniper to grassland (R. Zanotto, personal communication). Approximately 42,000 acres of pinyon-juniper habitat above and below the Mogollon Rim have been burned using prescribed fire and managed, “let-burn” fires. Of those, approximately 25,000 acres were converted to seral grasslands (R. Zanotto, personal communication).

The net result of fires is that less than 5% of the pinyon-juniper woodlands on the forest have been converted to grassland.

In addition to wildfire effects, some additional change has probably been from tree growth and increased density or infill. Tree growth is relatively slow, so change has not been great since signing of the Forest Plan. Understory components such as grasses, forbs, and browse species are being lost or vigor affected through competition for water and soil nutrients as density of pinyon-juniper increases. In dense areas, loss of an herbaceous understory and vegetative ground cover has resulted in accelerated sheet and rill erosion. Encroachment and re-growth of pinyon-juniper has occurred into grasslands/pushes to some degree. Alligator juniper is favored as fuelwood, and is being selectively cut. Within the pinyon-juniper matrix, older pinyon pine trees are dying out in many areas due to drought conditions and resulting insect outbreaks. Pinyon nuts are important to a variety of wildlife species, including turkeys, so the loss of older, mast producing trees could be significant. In summary, although age class distribution has remained relatively stable, the vigor of understory components continues to be affected, and erosion remains a concern in dense canopy areas.

### Snags

Since implementation of the Forest Plan, the snag component probably has remained relatively stable due to no change in the age class distribution of pinyon-juniper woodlands. However, recent wildfires in year 2003 (Mormon, Padre) and drought and bark beetle infestations have likely increased numbers of pinyon and juniper snags, at least for the short-term. Drought and insect attacks have particularly affected older pinyon trees. Wildfire and insect attacks result in rapid deterioration of snags, affecting their longevity and value to wildlife. Firewood cutting probably reduces snag densities of both pinyon and juniper snags, especially close to Flagstaff.

Wildlife species associated with pinyon-juniper habitat types, that are found or where there is potential or suitable habitat in the assessment area, are:

- Arynxa giant skipper (Forest sensitive)
- Black-throated gray warbler (migratory bird species of concern)
- Early elfin (Forest sensitive)
- Elk (management indicator species for early seral stage)
- Freeman's agave borer (Forest sensitive)
- Gray flycatcher (migratory bird species of concern)
- Gray vireo (migratory bird species of concern)
- Juniper (plain) titmouse (management indicator species for late seral stage and snag component)
- Mule deer (management indicator species for early seral stage)
- Neumogen giant skipper (Forest sensitive)
- Pinyon jay (migratory bird species of concern)

### **Grassland Habitat Type**

High elevation grassland (55,045 acres) and montane meadow (5,510 acres) habitat types are interspersed throughout the assessment area. The dry montane meadows within the

ponderosa pine vegetation type are generally small in size and make up a much smaller proportion of the assessment area acreage. There are also approximately 32,250 acres of non-stocked pinyon-juniper areas where grass production is poor.

#### Forestwide Trend

In grassland and sparse pinyon-juniper habitats above the Rim, some grasslands have been negatively affected by pine or juniper encroachment, overgrazing, and drought. However, fires, improved grazing management, and fuelwood cutting has helped to maintain or improve grasslands in some areas. The overall trend for grasslands on the Forest is considered to be stable to slightly declining. These trends show a lot of variability across the Forest.

Wildlife species associated with grassland habitat types, that are found or where there is potential or suitable habitat in the assessment area, are:

- American peregrine falcon (Forest sensitive)
- *Arynxa* giant skipper (Forest sensitive)
- Black-footed ferret (federally listed as endangered)
- Burrowing owl (migratory bird species of concern)
- Early elfin (Forest sensitive)
- Elk (management indicator species for early seral stage of montane meadows)
- Ferruginous hawk (migratory bird species of concern)
- Freeman's agave borer (Forest sensitive)
- Navajo Mountain Mexican vole (Forest sensitive)
- Neumogen giant skipper (Forest sensitive)
- Pronghorn antelope (management indicator species for early and late seral stages)
- Swainson's hawk (migratory bird species of concern)

#### **Riparian Areas**

Riparian areas (lotic systems) in the assessment area include approximately 15 miles of streams and 14 springs. Stream areas are specifically Jacks Canyon (8 miles) and lower East Clear Creek (7 miles). Only East Clear Creek has persistent flow due to its connectivity to the regional "C" aquifer. Springs are connected to perched aquifers and are susceptible to diminished or non-existent flows with long-term drought, but in general have higher potential for flow than wetland sites. Riparian areas are very important from a wildlife perspective. Many species breed, forage, seek shelter and/or congregate in riparian areas.

#### Forestwide Trend

The Forest Plan and EIS identify high elevation riparian scrub as comprised primarily of willows at greater than 7000 ft elevation, and low elevation (<7000 feet) riparian forest as comprised of deciduous hardwoods such as cottonwood, sycamore, box elder, and walnut. Although riparian habitat condition was a significant issue during development of the Forest Plan, there was greater concern about headwater meadows above the Mogollon Rim than of low elevation riparian habitats (USDA Forest Service 1987b).

A partial inventory indicated that excessive grazing by livestock was adversely affecting riparian habitat above and below the Mogollon Rim, and that heavy elk browsing was complicating attempts to reestablish willows above the Rim (USDA Forest Service 1987a). Since the Forest Plan was signed, actions have been taken to improve riparian conditions. Many riparian areas below 7000 feet elevation were fenced to exclude livestock from streams, and other exclosures have been implemented in portions of some reaches.

Springs and seeps at low elevations, and, on the south end of the Forest, springs and seeps above 7000 ft have generally remained in poor condition, except for a few that have been fenced to exclude livestock and/or wild ungulates. The north end of the Forest does not have as many springs, but many have been fenced or have other grazing and recreation restrictions that contribute to improved conditions.

The condition of high elevation (>7000 feet) riparian areas remains largely unchanged (seventy-six percent of the reaches), but with some trend in improvement, especially from “non-functional” to “at-risk” ratings. Most remain well below potential. The condition of low elevation riparian habitat, overall on the Forest, has improved, but some reaches have not. Since heavy floods in 1993, most low elevation riparian streams have shown marked recovery and improvement of vegetation, with a few reaches as exceptions.

Wildlife species associated with riparian areas, that are found or where there is potential or suitable habitat in the assessment area, are:

- American peregrine falcon (Forest sensitive)
- Bald eagle (federally listed as threatened)
- California floater (Forest sensitive)
- Common black-hawk (Forest sensitive)
- Hairy-necked tiger beetle (Forest sensitive)
- MacGillivray’s warbler (migratory bird species of concern)
- Maricopa tiger beetle (Forest sensitive)
- Red-faced warbler (migratory bird species of concern)
- Southwestern willow flycatcher (federally listed as endangered)

## **Wetlands**

Wetland types (lentic systems) in the assessment area include reservoirs, semi-permanent, seasonal, temporary and ephemeral wetlands. Wetlands are classified based on water inundation period and vegetation associations. These wetlands are susceptible to drying under drought conditions as their only water inflow is from precipitation and runoff (they are not connected to aquifers). Wetlands are also very important from a wildlife perspective. Many species breed, forage, and/or congregate at wetlands.

### Forestwide Trend

Condition of wetlands and open water are primarily driven by the amount and timing of precipitation and long-term climate change. Open water habitats are usually reservoir, man-made habitats and have remained stable, with areas of improvement due to fencing. Semi-permanent wetlands have improved due to management activities that have

managed recreation and grazing. Seasonal wetlands have had less active management and are considered to be stable, but well below potential due to grazing by livestock and wild ungulates, and recreation impacts.

Wildlife species associated with wetlands, that are found or where there is potential or suitable habitat in the assessment area, are:

- American bittern (migratory bird species of concern)
- American peregrine falcon (Forest sensitive)
- Bald eagle (federally listed as threatened)
- Blue-black silverspot butterfly (Forest sensitive)
- Chiricahua leopard frog (federally listed as threatened)
- Cinnamon teal (management indicator species)
- Maricopa tiger beetle (Forest sensitive)
- Mountain silverspot butterfly (Forest sensitive)
- Northern leopard frog (Forest sensitive)
- Southwestern (Arizona) toad (Forest sensitive)
- Spotted skipperling (Forest sensitive)

## **EXISTING CONDITIONS of WILDLIFE RESOURCES**

This section describes the existing conditions for wildlife resources on Anderson Mesa. There is only a general knowledge as to the composition of the vegetation types in the assessment area. For example, in forested areas detailed stand data is not available. Therefore habitat suitability for many species cannot be addressed in detail.

For the purpose of this analysis Anderson Mesa is the area bounded by the Forest boundary on the east, Interstate 40 on the northeast, Forest roads 764, 128 and Cherry Canyon on the northwest, the Anderson Mesa rim on the west, and on the south the boundary follows Jack's Canyon to about Turkey Seep, crossing Highway 87 and following Forest road 319 E to East Clear Creek, [see the Project Map below](#).

[Insert map of project area.](#)

### **Threatened and Endangered Wildlife**

Section 2 of the Endangered Species Act of 1973, as amended 1978, 1979, 1982, and 1988 (16 U.S.C. 1531 et seq.) declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Section 7 directs Federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitats (16 U.S.C. 1536 et seq.). Federal agencies also must consult with the Secretary of the Interior (U.S. Fish and Wildlife Service) whenever an action authorized by the agency is likely to affect a species listed as threatened or endangered or to affect its critical habitat. The Act

mandates conference with the Secretary of the Interior whenever an action is likely to jeopardize the continued existence of any species proposed for listing as threatened or endangered, or whenever an action might result in destruction or adverse modification of critical habitat proposed for listing (16 U.S.C. 1536(a) 4). The Anderson Mesa Landscape Scale Assessment (LSA) does not propose specific on the ground activities and is not a decision document under the National Environmental Policy Act (NEPA). However, this report is a discussion on existing conditions and desired condition, which may lead to Forest Plan amendments, NEPA decisions and on the ground activities.

The Threatened and Endangered Species List for the Coconino National Forest was reviewed and consulted on in 2000. The analysis area provides habitat for five federally listed threatened or endangered species. Table T&E 1 provides the species name, their listing status, whether there is critical habitat within the analysis area, a brief habitat description and the species status within the analysis area. This table is intended to provide the reader with a brief background of T&E species and their status within the analysis area.

**Table T&E 1. Threatened and Endangered Wildlife for the Anderson Mesa Landscape Scale Assessment.**

<i>Species</i>	<i>AMLSA Status</i>	<i>Critical Habitat Present</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<b>MAMMALS</b>				
<i>Mustela nigripes</i> <b>Black-footed ferret</b>	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 7 prairie dog colonies ≥80 acres in size, each within two miles of each other. They are located roughly from Kinnickinick Lake to Ducknest Lake. However there has been large-scale die-off of prairie dogs over the last two to three years due to plague, thus suitability of habitat is uncertain. Other active prairie dog colonies of undetermined size are located on the south end of the assessment area.
<b>BIRDS</b>				
<i>Empidonax trailii extimus</i> <b>Southwestern willow flycatcher</b>	FED END	NO	Southwestern willow flycatchers prefer dense vegetation adjacent to streams, ponds, lakes, and springs. Perennial flow, surface water, or saturated soils are particularly necessary in or adjacent to nesting areas from April through September. Vegetative species commonly present include boxelder, willows, ash, walnut, cottonwood, seep willow, buttonbush, cattails, Russian olive, and tamarisk. This species prefers dense vegetation from the ground up to 20 feet high, with standing water below or next to the vegetation.	Southwestern willow flycatchers have not been documented on the Mogollon Rim or Mormon Lake Ranger Districts. No suitable habitat for this species occurs in the analysis area or in adjacent areas. There is approximately 4.5 miles of potential habitat for this species along East Clear Creek, but this habitat falls within the elevational range (between 3,400 and 7,960 feet) where breeding flycatchers have not been found and exhibit the characteristics of high gradients and steep walled canyons, which scour frequently and do not sustain suitable habitat. Surveys of potential habitat were completed in 1994, 1998, 2000, and 2002. No southwestern willow flycatchers were found.
<i>Strix occidentalis lucida</i>	FED THR	PROP	The Mexican spotted owl was listed as a threatened species in 1993. On the	There are 4 Protected Activity Centers (PACs) within the analysis area, all

<i>Species</i>	<i>AMLSA Status</i>	<i>Critical Habitat Present</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<b>Mexican spotted owl</b>			Coconino National Forest, this species occupies mixed conifer and ponderosa pine-gambel oak vegetation types, usually characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and down woody material. Steep slopes are also an important habitat component. Coconino National Forest lies within the Upper Gila Mountain Recovery Unit.	associated with Jacks Canyon. There are also 7 other PACs adjacent to the analysis area, along the western and northwest edges.
<i>Haliaeetus leucocephalus</i> <b>Bald eagle</b>	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 are nine bald eagle use areas in the analysis area. These areas are winter roosts and significant perching areas. They are located at: Lake Mary complex – 5 perching areas; Mormon Lake (southeast of) – 2 winter roosts, 1 perching area; Tremaine Lake – 1 winter roost. Additionally, there are four man-made perches at Long Lake, and two man-made perches at Soldier Annex Lake. There are potential roost sites throughout the analysis area.
<b>AMPHIBIANS</b>				
<i>Rana chiricahuensis</i> <b>Chiricahua leopard frog</b>	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 abundant aquatic vegetation is considered optimal.	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 habitat occurs in the analysis area.

### **Bald Eagle**

The bald eagle was listed as endangered in March 1967 (USDI Fish and Wildlife Service 1967). That ruling was reiterated in February 1978 (USDI Fish and Wildlife Service 1978) with bald eagle populations listed as endangered in the lower 48 states, except those in the states of Washington, Oregon, Minnesota, Wisconsin and Michigan where the bald eagle was listed as threatened. A recovery plan for the southwestern bald eagle was published in September 1982 (USDI Fish and Wildlife Service 1982). The bald eagle in all lower 48 states was reclassified to threatened status in 1995 (USDI Fish and Wildlife Service 1995). There is no designated critical habitat for the southwestern bald eagle.

Bald eagles are primarily winter visitors to the Coconino National Forest, occupying all habitat types and elevations. Wintering eagles arrive in the fall, usually late October or early November, and leave in early to mid-April. Wintering bald eagle populations in northern Arizona are considered to be apparently secure (NatureServe 2003). In fact, over the last few years, bald eagle numbers have been increasing on the Coconino National Forest.

**Nests:** A small, resident population of bald eagles breeds in Arizona and New Mexico. These eagles place their nests on cliff ledges and in live trees or snags along major rivers and reservoirs. In Arizona, eagles are known to breed along the Salt, Verde, and Bill Williams rivers, on Tonto Creek, and at Roosevelt Lake in central Arizona (USDA Forest Service 2001). Nesting substrates common to nesting bald eagle sites in the southwest are ledges and mature to over-mature cottonwood trees. There are no nesting sites in the assessment area. The only known nesting on the Forest is along lower Oak Creek and the Verde River, approximately 40 miles from the assessment area. However there are riparian areas in East Clear Creek and Leonard Canyon with potential for nest tree development.

**Roosting and Foraging:** Foraging and roosting habitat occur throughout the assessment area. An important habitat factor is the presence of large trees, snags, or ledges for foraging perches. Eagles forage widely and feed opportunistically on carrion, terrestrial vertebrates, waterfowl or fish. 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. Roost sites typically are ponderosa pine groups of large trees (average size of 28.3 inches in diameter and 93 feet tall), 5 to 40 acres in size (old growth clumps 5 to 10 trees per acre), on slopes of 10 to 35%, have canopy closure of 50 to 80 percent, and are near food sources (Dargan 1991).

Precipitation timing and amount and fish stocking by Arizona Game and Fish Department drive waterfowl and fish distribution. Eagles are expected to use any open water that would support waterfowl and/or fish. As described in the Riparian-Wetlands Specialist Report (PRD#xxx), there are five types of wetlands, thirteen springs and nearly fifteen miles of streams in the assessment area. These types are distinguished based on flooding regimes, presence of hydric soils and presence of hydrophytic vegetation. Fish are most likely to persist in the relatively deep perennial reservoirs, such as Ashurst Lake, Coconino Dam and Long Lake complex, which are and/or have been stocked with trout by Arizona Game and Fish Department. Although all waters can be used by waterbirds, abundance and diversity of species will vary by presence of water and water availability, basin size, vegetation composition and habitat interspersions. Carrion is a primary food source for eagles when and where species associated with water are lacking, and when carrion is abundant.

There are nine bald eagle use areas within the assessment area (Anderson Mesa assessment area plus one mile beyond boundary). These use areas are winter roosts and significant perching areas. These bald eagle use areas are located at:

- Lake Mary complex – 5 perching areas
- Mormon Lake (southeast of) – 2 winter roosts, 1 perching area
- Tremaine Lake – 1 winter roost

Additionally, there are four man-made perches at Long Lake, and two man-made perches at Soldier Annex Lake. There are potential roost sites throughout the assessment area.

The roost trees are susceptible to mortality from drought and insects (such as bark beetle attacks) due to tree density, shallow rocky soils and low precipitation patterns of the past few years. Wildfire can destroy roosts and perches. There was an alleged roost in Mormon Canyon that was reported to the Forest Biologist in 1988. After five visits to the roost, the Forest Biologist was unable to confirm the site as a bald eagle roost. This alleged roost was severely impacted by the Mormon Fire the summer of 2003. The roost consisted of 30 large, ponderosa pine trees; after the fire, only four trees remained alive but they were not expected to survive (H. Provencio pers. obser. 2003). Livestock use does not overlap with the primary use period of wintering bald eagles.

**Surveys:** Bald eagle surveys are conducted annually in January on the Forest along seventeen different routes. Most eagle sightings have been around Lake Mary complex, Mormon Lake and the lakes on Anderson Mesa. There are also many bald eagle sightings along I-17, especially during five of the last six years.

There are three survey routes that traverse portions of the assessment area, and one route adjacent to the area (southwest side). These routes have been surveyed every year since 1992, with one exception. The Long Lake Complex route was not completed in 1993.

The routes and range of numbers of eagles sighted over the years are:

- FH-3 (Clint's Well to Mormon Lake), nearby route: 0 to 9
- FH-3 Lakes (Lake Mary complex to Mormon Lake plus Anderson Mesa lakes): 3 to 69
- Long Lake Complex: 2 to 19
- Hwy 87 N (Clints Well north to Forest boundary): 0 to 5

Eagle sightings are strongly influenced by percentage of open water and/or prey availability and viewing conditions, and are variable year to year. The wetlands in the project area are important feeding areas for eagles. The types of wetlands present on Anderson Mesa are described in the Riparian-Wetland Specialist Report (PRD #xxx), and include the following types:

- Reservoir (open water) – Man-made deep perennial water pool most years, no significant hydrophytic vegetation (except for submergents) because of deep pool and/or fluctuations of pool level.
- Semi-permanent Wetland – Shallow water pool responding directly to precipitation with a 6-12 month flooding regime. Hydrophytic vegetation prevalence (cattail, bulrush and some submergents) and hydric soils present.
- Seasonal Wetland – Shallow water pool responding directly to precipitation with a 3-6 month flooding regime. Hydrophytic vegetation prevalence (e.g. spikerush, Carex, Juncus) and hydric soils present.
- Temporary Wetland – Shallow water pool responding directly to precipitation with a 1-2 month flooding regime. Hydrophytic vegetation is not prevalent but upland species can include foxtail barley and western wheatgrass.

- Ephemeral Wetland – Shallow water pool responding directly to precipitation with a 2-6 week flooding regime. Hydrophytic vegetation is not prevalent but upland species can include annual grass and forb species.

All wetland types have some value to wildlife although this may differ depending on individual needs of the species. In general, those basins that are larger, hold water longer, and have a combination of vegetation types will retain wildlife values longer. For winter prey species tied to water sources, the reservoirs, semi-permanent wetlands, seasonal wetlands and stock tanks are important sites for foraging bald eagles. If the wetlands have no water available to waterbirds and fish, these prey species will not be available to bald eagles. Stocking waters with fish offers a food supply for bald eagles. In the early 1990's, a bullhead catfish die-off at Mud Lake attracted close to 50 eagles. Trout stocking at Camillo Tank and Boot Lake in 1973 likewise was beneficial for eagles until the area suffered a drought two years later. Fish stockings in Lower Lake Mary and the Long Lake complex also attract foraging bald eagles.

### **Chiricahua Leopard Frog**

The Chiricahua leopard frog was federally listed as a threatened species in June of 2002 (USDI 2002), due to its population status and threats to habitat. Critical habitat has not been designated for the Chiricahua leopard frog. According to Sredl et al. (1997), the Rim form of the Chiricahua leopard frog has declined dramatically. Only 15 of 871 surveyed sites contained leopard frogs since 1993. Eighty-four percent of historical sites are unoccupied. Four of the 15 occupied sites are on the Coconino National Forest. The status of the Chiricahua leopard frog in Arizona is considered to be vulnerable (NatureServe 2003).

This species 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 abundant aquatic vegetation is considered optimal. Perimeter vegetation provides good cover and foraging habitat. Egg masses are usually laid in shallows and are attached to emergent vegetation or debris. Silt and organic debris is used for hiding from predators as well as for hibernation during the winter months or for aestivation during periods of drought. In addition, organic muck supports a diversity of invertebrates that attract other food sources for frogs. Leopard frogs prefer a variety of water depths. Deep water provides protection from terrestrial predators and is used more often in the winter, while shallow water is important for foraging and egg site attachment.

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. A summary of the surveys completed within and around the assessment area can be found in Table frog-1.

**Table frog-1. Summary of leopard frog surveys completed on the Mormon Lake and Mogollon Rim Ranger Districts.**

AREA SURVEYED	ALLOTMENT	YEARS SURVEYED	LEOPARD FROG SPECIES FOUND <sup>1</sup>	# OF SURVEYS COMPLETED
Al's Lake	Picket Lake	1993	NONE	1
Ashurst Lake	Picket Lake (Ashurst excluded from cattle grazing except north end)	1973, 1976, 1989, 1990, 1991, 1993	RAPI (1973, 1976, 1989)	6
Ashurst Spring	Picket Lake (protected by elk enclosure)	1990	NONE	1
Blue Ridge Reservoir Spillway	Bar T Bar	1990, 1995	NONE	3
Blue Ridge Tank	Bar T Bar	1993	NONE	1
Chilson Tank	Bar T Bar	1991	NONE	1
Clint's Tank	Bar T Bar	1993	NONE	1
Corral Tank	Anderson Springs	1990	NONE	1
Deep Lake	Deep Lake	1993	NONE	1
East Clear Creek at FR 96	Bar T Bar	1962, 1972, 1987, 1990, 1992, 1993, 1999	RACH (1972), RAPI (1972),	9
Kinder Crossing	Bar T Bar	1992, 1993	NONE	2
Kinnikinick Lake	Anderson Springs (excluded from cattle grazing)	1990, 1991	NONE	2
Long Lake/North End	Bar T Bar	1992	NONE	1
Long Lake/South End	Bar T Bar	1992	NONE	1
Mack's Crossing	Bar T Bar	1961, 1971, 1987, 1990, 1992, 1993, 1997, 1998	RANA (1961), RACH (1971), RAPI (1971),	13

<sup>1</sup> RACH = Chiricahua leopard frog, RAPI = Northern leopard frog, RANA = Leopard frog species

AREA SURVEYED	ALLOTMENT	YEARS SURVEYED	LEOPARD FROG SPECIES FOUND <sup>1</sup>	# OF SURVEYS COMPLETED
McClure Lake	Bar T Bar	1993	NONE	1
Mormon Canyon Tank	Picket Lake	1993	NONE	1
Morton Lake	Bar T Bar	1990, 1991	NONE	4
Mud Lake	Anderson Springs	1991	NONE	1
Mud Lake Tank	Anderson Springs	1990	NONE	1
Perry Lake	Anderson Springs (mid-summer grazing only 2002-2004)	1992	NONE	2
Potato Lake/Tank	Pickett Lake	1993	NONE	1
Roqui Tank	Anderson Springs	1990, 1991	NONE	2
Soldier Annex Lake	Bar T Bar	1992	NONE	1
Soldier Lake	Bar T Bar	1992	NONE	1
Tank NE Moqui Lookout Tower	Bar T Bar	1992	NONE	1
Tank NW of Blue Ridge Reservoir	Bar T Bar	1993	NONE	1
The Park	Bar T Bar	1993	NONE	1
Tony's Tank	Anderson Springs	1990	NONE	1
Unnamed Pond on Flying M Ranch	Anderson Springs	1991	NONE	1
VJ Tank	Anderson Springs	1991	NONE	1

Within the assessment area, there is no occupied habitat, but potential habitat exists in wetlands Which are suitable? (including development of Hay Lake into a functioning marsh), stock ponds and East Clear Creek. Historically occupied habitat in East Clear Creek is mostly inaccessible due to steep slopes. There is little potential for unoccupied suitable habitat in the assessment area to become occupied by Chiricahua leopard frogs in the near future, without human intervention. The closest occupied habitat occurs in the Buckskin Hills area, approximately 30 miles southwest from the south-southwestern boundary of the assessment area. Approximately xx% of the assessment area is in satisfactory watershed condition. This includes the East Clear Creek watershed, which drains into historically occupied habitat for Chiricahua leopard frogs.

Threats to this species include predation by non-native bullfrogs, fishes, and crayfish; disease; drought; floods; degradation and destruction of habitat; water diversions and groundwater pumping; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals; fire regimes altered due to livestock and/or wild ungulates grazing and fire suppression; and environmental contamination.

In some cases, practices associated with livestock grazing are thought to result in both creation of habitat, and loss and degradation of habitat. Construction of stock tanks for livestock water has created leopard frog habitat, and in some cases has replaced destroyed or altered natural wetland habitats (Sredl and Jennings, in press). Approximately 63% of the existing Chiricahua leopard frog localities in Arizona occur in stock tanks with only 35% occurring in natural habitats (Sredl and Saylor 1998) suggesting Arizona populations of this species have fared better in stock tanks than in natural habitats. Stock tanks provide small patches of habitat that are often dynamic and subject to drying and elimination of frog populations. However, Sredl and Saylor (1998) also found that stock tanks are occupied less frequently by non-native predators (with the exception of bullfrogs) than natural sites.

Negative effects to the Chiricahua leopard frog and its habitat as a result of livestock grazing and management actions may occur under certain circumstances. These effects include: facilitating dispersal of non-native predators; trampling of egg masses, tadpoles, and frogs; deterioration of watersheds; erosion and/or siltation of stream courses; elimination of undercut banks that provide cover for frogs; loss of wetland and riparian vegetation and backwater pools; and spread of disease (U.S. Fish and Wildlife Service 2000, Belsky et al. 1999, Ohmart 1995, Hendrickson and Minckley 1984, Arizona State University 1979, Jancovich et al. 1997). Creation or maintenance of livestock waters in arid environments may provide the means for non-native predators such as bullfrogs and crayfish to move across landscapes that would otherwise serve as barriers to their movement. Increased erosion in the watershed caused by livestock grazing can accelerate sedimentation of deep pools used by frogs (Gunderson 1968). Sediment alters primary productivity and fills interstitial spaces in streambed materials with fine particulates that impeded water flow, reduce oxygen levels, and restrict waste removal (Chapman 1988). Eggs, tadpoles, and metamorphosing Chiricahua leopard frogs are probably trampled by cattle on the perimeter of stock tanks and in pools along streams (Bartlett 1998, U.S. Fish and Wildlife Service 2000). Juvenile and adult frogs can probably avoid trampling when they are active. However, leopard frogs are known to hibernate on the bottom of ponds (Harding 1997), where they may be subject to trampling during the winter months. Cattle can remove bank line vegetation that provides escape cover for frogs and a source of insect prey. However, dense shoreline or emergent vegetation in the absence of grazing may favor some predators, such as garter snakes (*Thamnophis* spp.), and the frogs may benefit from some open ground for basking and foraging. There is evidence that Chiricahua leopard frog die-offs, and eventual extirpation of a population, have occurred as a result of cattle-associated water quality problems (U.S. Fish and Wildlife Service 2000).

Chytridiomycosis is a disease affecting amphibian populations globally, and has been found in Chiricahua leopard frogs in Arizona and New Mexico. Chytrid fungus can survive in wet or muddy environments and could conceivably be spread by livestock carrying mud on their hooves and moving among frog habitats. Personnel working at an infected tank or aquatic site and then traveling to another site, thereby transferring mud or water from the first site could also spread this disease. Chytrids could be carried inadvertently in mud clinging to wheel wells or tires, or on shovels, nets, boots, or other equipment. Chytrids cannot survive complete drying; if equipment is allowed to thoroughly dry, the likelihood of disease transmission is greatly reduced. Bleach or other disinfectants can also be applied to tools and vehicles and will kill chytrids (Loncore 2000).

Transfer of chytrids could also occur during intentional introductions of fish or other aquatic organisms. Maintenance of roads and tanks needed for livestock grazing could provide fishing opportunities and facilitate tank access by anglers, hunters, or other recreationists. These people (and possibly their dogs) may inadvertently introduce chytrids from other locales, or may intentionally introduce non-native predators for angling or other purposes. Such activities would also facilitate introduction of non-native predators with which the Chiricahua leopard frog cannot co-exist.

### **Southwestern Willow Flycatcher**

The southwestern willow flycatcher is a federally listed endangered species (USDI 1995). Critical habitat has been designated for this species (USDI 1997), but none occurs within or near the assessment area. In the Final Rule for the southwestern willow flycatcher, the Fish and Wildlife Service lists numerous activities that could potentially harm the species. These activities include: 1) unauthorized handling or collecting of the species; 2) destruction or alteration of the species habitat by discharge of fill material, draining, ditching, tilling, pond construction, stream channelization or diversion, or diversion or alteration of surface or groundwater flow into or out of the wetland; 3) livestock grazing that results in direct or indirect destruction of riparian habitat; 4) activities such as continued presence of cattle and fragmentation of flycatcher habitat that facilitate brood parasitism by the brown-headed cowbird; and 5) pesticide application in violation of label restrictions (USDI 1995). The status of the southwestern willow flycatcher in Arizona is critically imperiled (NatureServe 2003).

This bird species is a loosely colonial neotropical migrant that winters in tropical South America and returns to its breeding grounds throughout Arizona in late April and early May. It is a riparian-obligate species. Sites occupied in Arizona range from 456 to 3,358 feet in elevation, and from 7,956 to 8,240 feet in elevation (Spencer et al., 1996). Breeding southwestern willow flycatchers have not been found in mid-elevation riparian habitats from 3,400 to 7,960 feet (Sferra et al., 1995). Spencer et al. (1996) speculate that riparian areas in this elevation zone are typically associated with high gradients and steep walled canyons, which scour frequently and do not sustain suitable habitat. Riparian habitats within the assessment area fall within this mid-elevational range and are found within steep walled canyons.

Southwestern willow flycatchers prefer dense vegetation adjacent to streams, ponds, lakes, and springs. Perennial flow, surface water, or saturated soils are particularly necessary in or adjacent to nesting areas from April through September. Gradients are less than 1%, with quiet water dominating. Vegetative species commonly present include box elder, willows, ash, walnut, cottonwood, seep willow, buttonbush, cattails, Russian olive, and tamarisk. This species prefers dense vegetation, averaging 90% canopy cover (Sferra, et al. 1995), from the ground up to 20 feet high, with standing water below or next to the vegetation. In higher elevation streams, vegetation may be limited to as few as two or three species of willow in dense thickets between 15 and 20 feet tall.

Southwestern willow flycatchers have not been documented on the Mogollon Rim or Mormon Lake Ranger Districts. No suitable habitat for this species occurs in the assessment area or in adjacent areas. There is approximately 4.5 miles of potential habitat (Macks Crossing to the Blue Ridge Reservoir dam) for this species along East Clear Creek, upstream from the assessment area boundary in East Clear Creek, but this habitat falls within the elevational range (between 3,400 and 7,960 feet) where breeding flycatchers have not been found. This potential habitat exhibits the characteristics of high gradients and steep walled canyons, which scour frequently and do not sustain suitable habitat components. Surveys of this potential habitat were completed in 1994, 1998, 2000, and 2002. No southwestern willow flycatchers were found.

### **Sensitive Wildlife (Sen)**

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density, or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5(19))". It is the policy of the Forest Service regarding Sensitive Species to 1) assist States in achieving their goals for conservation of endemic species, 2) as part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species, 3) avoid or minimize impacts to species whose viability has been identified as a concern, 4) if impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the Line Officer, with project approval authority, makes the decision to allow or disallow impacts, but the decision must not result in loss of species viability or create significant trends toward Federal listing), and 5) establish management objectives in cooperation with the State when projects on National Forest system lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the U.S. Fish and Wildlife Service and Arizona State (FSM 2670.32).

Table Sen 1 contains a brief description of sensitive species and their status within the analysis area. The California floater, northern leopard frog, peregrine falcon and the Southwestern Toad are discussed in greater detail below.

**Table Sen 1. Forest Service Sensitive Species and their status within the Assessment Area.**

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<b>MAMMALS</b>			
<i>Microtus mexicanus navaho</i> , <b>Navajo Mountain Mexican vole</b>	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
<b>BIRDS</b>			
<i>Falco peregrinus anatum</i> <b>American peregrine falcon</b>	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 Walnut Canyon and East Clear creek; the falcons can easily forage on Anderson Mesa. 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> <b>Northern goshawk</b>	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 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.	There are 7 PFAs in or adjacent to the assessment area. There are approximately 530 acres of mixed conifer and 51,725 acres of ponderosa pine vegetation types in the assessment area where the northern goshawk can forage, and in some areas find nesting habitat.
<i>Buteogallus anthracin</i> <b>Common black-hawk</b>	FS sen	The common black-hawk has been documented nesting near stock ponds with mature riparian vegetation. Black-hawks are riparian-obligate nesters requiring mature, relatively undisturbed habitat supported by permanent flowing streams. They prefer groves of trees with cottonwood-willow associations and mixed broadleaf (AGFD 1995).	Black-hawks have not been documented within the area, but suitable habitat exists in East Clear Creek and other riparian drainages.
<i>Euptilotis neoxenus</i> <b>Eared trogon</b>	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 throughout the area where pine and pine-oak vegetation exists (51,725 acres).
<b>AMPHIBIANS</b>			
<i>Rana pipens</i> <b>Northern leopard frog</b>	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	There are no known existing locations of this species within the area, however there are 9 historical locations. The best potential habitat is at the springs and wetlands (reservoirs, semi-permanent and seasonal).

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
		generally restricted to permanent waters.	
<i>Bufo microscaphus microscaphus</i> <b>Southwestern (Arizona) Toad</b>	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 springs and wetlands (reservoirs, semi-permanent and seasonal).
<b>INSECTS</b>			
<i>Agathymus arynxa</i> , <b>Arynxa giant skipper</b>	FS sen	Found within arid, but well-vegetated desert canyons, or in canyons with periodic water and open grassy woodlands. Its host plant is agave.	Potential habitat is present. Most agave distributions within the analysis area are associated with archaeological sites.
<i>Agathymus baueri freemani</i> , <b>Freeman's agave borer</b>	FS sen	Requires agaves, especially <i>Agave chrysantha</i> , as host plants. They are far ranging with wide habitat use. They generally inhabit canyons.	Potential habitat is present. <i>Agave chrysantha</i> is very limited within the analysis area, <i>Agave parryi</i> is the more likely host within the analysis area. Most agave distributions are associated with archaeological sites.
<i>Incisalia fotis</i> <b>Early elfin</b>	FS sen	This invertebrate favors roadsides with flowers (Borror and White 1970) and dry areas in mountains. The larva feed on cliffrose. It is locally uncommon among arid plateaus and desert mountains from 6000 to 7000 feet.	Cliffrose occurs along and below the Anderson Mesa rim. Threats to the early elfin are unknown, but impacts to their larval host plant, cliffrose, is a concern. Early elfins are not known to occur on the Anderson Mesa.
<i>Piruna polingii</i> <b>Spotted skipperling</b>	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 Huachuclas, Chiricahuas and the Mogollon Rim. It is known to occur on the Mogollon Rim.
<i>Speyeria Nokomis nitocris</i> <b>Mountain silverspot butterfly</b>	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.	The best habitat is Ashurst Run, Ashurst Spring, Billy Back Spring, Boot Spring, Camillo Lake, East Clear Creek, Elliot Spring, Kinnikinick Spring, Pine Lake, and wet meadows (approximately 465 acres). The closest known location of the mountain silverspot butterfly occurs at Kehl Springs.
<i>Speyeria nokomis Nokomis</i> <b>Blue-black silverspot butterfly</b>	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.	The best habitat is Ashurst Run, Ashurst Spring, Billy Back Spring, Boot Spring, Camillo Lake, East Clear Creek, Elliot Spring, Kinnikinick Spring, Pine Lake, and wet meadows (approximately 465 acres). No locations for the blue-black silverspot butterfly are known within and adjacent to the assessment area.
<i>Agathymus neumoergeni</i> <b>Neumogen's giant skipper</b>	FS sen	The Neumogen's giant skipper occurs from the upper Sonoran or lower Transition Zone in open woodland or shrub-grassland (Wallesz 1999). They range from central Arizona to west-central New Mexico, and from southern New Mexico to west Texas. Their host plant is agave (primarily <i>A. parryi</i> ).	Potential habitat is present. Most agave distributions within the analysis area are associated with archaeological sites.

<i>Species</i>	<i>AMLSA Status</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<i>Cicindela hirticollis corpuscular</i> <b>Hairy-necked tiger beetle</b>	FS sen	The hairy-necked tiger beetle occurs in the Colorado River system in a number of counties in Arizona (including Coconino, Graham, Greenlee, Maricopa, Navajo, and Yuma). It is probably tied to perennial or intermittent streams. Rangewide, this species occupies tidal flats, coastal beaches, and the sandy shores of freshwater rivers or lakes. In the southwest, this species occurrence likely overlaps that of the Maricopa tiger beetle ( <i>C. oregona maricopa</i> ), although the species is also known to occur in sandy habitats far from water (such as sand dunes and sand pits).	Potential habitat is perennial and intermittent streams in the area. Since the hairy-necked tiger beetle occurs in the Colorado River system, East Clear Creek is likely habitat.
<i>Cicindela oregona maricopa</i> <b>Maricopa tiger beetle</b>	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 analysis 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 near springs or tanks at lower elevations.
<b>CLAMS</b>			
<i>Anodonta californiensis</i> <b>California floater</b>	FS sen	The California floater is known to occur in upper elevations from 7,000 to 8,000 feet in undeveloped reaches of the Black River in eastern Arizona.	Shells have been found in the East Clear Creek drainage on the Bar T Bar Allotment. No live clams, however, have been found.

### **American Peregrine Falcon**

The peregrine falcon was removed from the Federal List of Endangered and Threatened Wildlife in August 1999 (USDI 1999a) and is now a Forest Service Sensitive species. The status of the peregrine falcon in Arizona is apparently secure (NatureServe 2003). On the Coconino National Forest, most peregrine falcon nesting areas are on the Red Rock Ranger District.

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 in northern Arizona, *Falco peregrinus anatum*, breeds on isolated cliffs and is a permanent resident on Coconino National Forest. Peregrine falcons do not typically hunt within forested stands, but are aerial predators. Peregrines prey mainly on birds found in wetlands, riparian areas, open areas, and canyons. Prey items also include bats and mammals. The peregrine falcon breeding season is from March 1 to August 31.

Peregrine falcons forage within a 10 to 20 mile radius from the nest site. There are five nesting areas on the Forest where the peregrine falcons could forage in the assessment area. The closest eyries are in Walnut Canyon (2 eyries, 3-4 miles distant), East Clear Creek (2 eyries, 3.5 -6 miles distant), and Pumphouse Wash (1 eyrie, 16 miles distant). Peregrine falcons from Walnut Canyon and East Clear Creek can easily forage on Anderson Mesa. The western part of Anderson Mesa is just within the foraging range of peregrine falcons from Pumphouse Wash. Other potential locations for establishment of eyries are in East Clear Creek and Jacks Canyon where cliff faces are higher than 200 feet.

The ephemeral and permanent waters in the assessment area provide foraging habitat for peregrine falcons. Productivity, distribution and size of wetlands are profoundly affected by the amount and timing of precipitation, influencing whether the basins have water or not; how long they hold water within and between years; and consequently the type of vegetation and wildlife species that can be supported and when. The types of wetlands present on Anderson Mesa are described in the Riparian-Wetland Specialist Report (PRD #xxx, listed above in bald eagle section). All wetland types have some value to wildlife although this may differ depending on individual needs of the species. In general, those basins that are larger, hold water longer, and have a combination of vegetation types will retain wildlife values longer. From a waterbird standpoint, and by definition, semi-permanent and seasonal wetlands have higher values, followed by temporary wetlands and stock tanks. If the wetlands have no water available to waterbirds, waterbirds will not inhabit the area, thus there would be no waterbird prey available to falcons.

The main threat to the peregrine falcon is the continued contamination of its environment by synthetic organochlorine contaminants. These contaminants result in eggshell thinning and direct mortality to this species. Other threats include disturbance from rock-climbing near eyries and mortality from power lines. Grazing, vegetation modification, recreation, and climate can impact the quality of prey habitat (including wetlands, forests and woodlands) thus influences prey availability.

Thinning of forests, which opens-up forest canopies, and clearing woodlands would provide better sight distances for hunting, therefore benefiting foraging falcons. The prey species base in forests and woodlands may shift to species that favor more open habitats.

Effects on peregrine falcons resulting from livestock grazing are generally related to livestock grazing effects on seed production in the forest understory and the effects of grazing on riparian canopy (i.e. effects to regeneration of riparian overstory plants) for prey nesting sites. Peregrine falcons feed heavily on pigeons and doves, as well as a wide range of other bird species, including waterfowl. Grazing around wetlands during waterfowl nesting can result in disturbance and reduced cover for nests and ducklings, which can facilitate predation, thus reducing the prey base for peregrine falcons. Upland grazing can affect vegetative species composition, structure and seed production, all of which vary depending on plant species present and time of livestock use. This can have both positive and negative effects depending on the habitat needs of different prey

species. Within the assessment area, stream riparian habitats are generally inaccessible to livestock grazing due to steep, rocky slopes.

Impacts in non-stream wetland habitats (e.g. natural and human-made ponds, lakes, and reservoirs) from livestock grazing in the assessment area could include disturbance to waterbird nests and nestlings, impacts on seed production and availability, impacts on nest and nestling cover, and changes in plant species composition. Coconino National Forest Plan Standards and Guidelines for Management Area 12 (Riparian and Open Water) provide for waterbird nesting habitat as follows:

*“Wetlands and open water containing emergent vegetation which provide nesting habitat are protected from disturbing uses that will harass nesting birds, such as activities that are noisy or would damage nests or nesting habitat from May 1 to July 15.”*

This does not protect nesting birds in wetland areas that do not have emergent vegetation. Many of the waterfowl that nest near wetlands, nest in upland areas, not in emergent vegetation within the wetland. These are the bird species that would be negatively affected by livestock grazing. In general, habitat for upland nesting species would be negatively affected in areas adjacent to wetlands used by cattle. Although maximum utilization levels are set that would provide for seedhead production and maintenance of cover for many species, areas preferred for nesting by waterfowl generally occur within a few hundred yards of water. These areas become concentration areas for livestock and other animals, and utilization levels are usually much higher than the average utilization levels within a pasture. This can affect prey species in two ways. Depending on the availability of suitable nesting cover in areas adjacent to the wetlands used for nesting, these species may continue to nest and provide prey for peregrines. If utilization levels are so high in these areas that waterfowl no longer nest in an area, then prey availability in these areas would be lessened and impacts on peregrine falcons would occur.

Another consideration for peregrine falcons is that doves and pigeons will frequent water sources on a regular basis, and are generally concentrated where water exists adjacent to food and roost sites. As long as water is available, the average maximum utilization level of 40 to 50% in the assessment area would provide for sufficient seedhead production and forage availability for doves and pigeons, which are the primary prey source for peregrine falcons.

### **California Floater**

The California floater is a Forest sensitive species. The status of the California floater in Arizona is imperiled to critically imperiled (NatureServe 2003). It is known to occur in upper elevations from 7,000 to 8,000 feet in undeveloped reaches of the Black River in eastern Arizona. Shells have been found in the East Clear Creek drainage. No live clams have been found. Habitat for the California floater in the assessment area is mostly inaccessible due to steep cliffs in East Clear Creek.

Threats to the California floater include alteration and destruction of habitat, declining water quality, loss of host fish, and competition with and predation by non-native fish. Impacts are possible in upland areas adjacent to habitat for this species from grazing by livestock and wild ungulates, potential vegetation modification activities, prescribed fire and wildfire. There is potential for increased soil erosion and sedimentation during and immediately following vegetation treatments and prescribed fire, which could provide a short-term negative effect on water quality in East Clear Creek. Best Management Practices (Forest Service Handbook FSH 2509.22 entitled Soil and Water Conservation Practices Handbook) are implemented during vegetation modification activities and prescribed burning, and potential soil loss and sedimentation is minimized and would not be measurable. Over the long-term, a beneficial effect from thinning and burning is expected once understory vegetation becomes established and stabilizes the soil after the treatments are done.

Livestock grazing practices are expected to have minimal effects due to the maximum utilization level of 40% or less being designated in upland areas adjacent to habitat for clams. Approximately xxx acres of the East Clear Creek watershed exists in the assessment area, and this watershed is considered to be in satisfactory condition. Livestock grazing would occur periodically throughout the watershed and is expected to contribute to removal of vegetative cover, soil compaction, decreased infiltration, and enhanced surface runoff. This would result in a slightly increased potential for erosion and sedimentation into East Clear Creek. Due to the small portion of the East Clear Creek watershed that occurs within the assessment area and the existence of satisfactory watershed conditions within this portion of the watershed, the potential for erosion and sedimentation is not expected to contribute a measurable amount of sediment into East Clear Creek.

There is potential for large forest wildfires on the Forest. Large forest wildfires can have widespread impacts to watersheds and species within the watershed. If a large forest wildfire occurred in the East Clear Creek watershed, there could be large-scale soil loss and sedimentation into California floater habitat with negative impacts to the clam and its habitat. Recovery from a large wildfire, such as the Rodeo-Chedeski fire on the Apache-Sitgreaves National Forest in 2002, could take decades.

### **Northern Leopard Frog**

The global status of the northern leopard frog is secure, however, in Arizona its status is imperiled (NatureServe 2003). The northern leopard frog occurs in the northeastern quarter of Arizona, usually in montane streams and wetlands that have aquatic vegetation, and also in wet meadows at higher elevations. This leopard frog is generally restricted to permanent waters, but are also found in semi-permanent and seasonal waters. In the assessment area there are 1397 acres of permanent waters (reservoirs, 8 sites), 421 acres of semipermanent wetlands (9 sites) and 1360 acres of seasonal wetlands (23 sites). Streams, seeps and springs are also important sites. There are approximately 15 miles of streams and 14 springs within the assessment area.

Within the assessment area, there are historic locations of northern leopard frogs Anderson Draw, Ashurst Lake, Ashurst Run, East Clear Creek (FR 96, Macks Crossing), Mud Lake, and Vail Lake (see also Table frog-1 in Chiricahua leopard frog section). Within one mile of the assessment area boundary, this species was historically found near Chilson Tank, in Marshall Lake, and at Sawmill Springs.

Ashurst Lake is largely excluded from grazing, but other conditions at the lake make it questionable as to the suitability of the habitat for leopard frogs. Ashurst Lake has a sizeable crayfish population, a campground on the west end and has a road nearly all the way around it. It is popular for fishing and boating and has little emergent vegetation. The best potential habitat is at the springs, East Clear Creek and at xyz wetlands (including development of Hay Lake into a functioning marsh). Ashurst Spring and Dove Spring are excluded from cattle and elk grazing. Billy Back Spring, Kinnikinick Spring, Turkey Seep and two unnamed springs are considered inaccessible to cattle due to topography. Currently, Anderson Springs, Elk Springs, Elliot Spring, Grapevine Springs, Yellow Jacket Springs and Youngs Spring are accessible to cattle.

Threats to local populations of northern leopard frogs include changes in wetlands, especially the alteration of marshy ponds to reservoirs, and natural local extinctions as ponds dry up during years of low precipitation. Other threats include stocking of predatory fish, alteration of riparian vegetation by livestock grazing, predation and competition by introduced bullfrogs and crayfish (BISON-M Database 1997), and recreation. Threats to Chiricahua leopard frogs also apply to northern leopard frogs.

In some cases, practices associated with livestock grazing are thought to result in both creation of habitat, and loss and degradation of habitat. Construction of stock tanks for livestock water has created leopard frog habitat, and in some cases has replaced destroyed or altered natural wetland habitats (Sredl and Jennings, in press). Stock tanks provide small patches of habitat that are often dynamic and subject to drying and elimination of frog populations. However, Sredl and Saylor (1998) also found that stock tanks are occupied less frequently by non-native predators (with the exception of bullfrogs) than natural sites.

Negative effects to leopard frog habitat as a result of livestock grazing and management actions may occur under certain circumstances. These effects include: facilitating dispersal of non-native predators; trampling of egg masses, tadpoles, and frogs; deterioration of watersheds; erosion and/or siltation of stream courses; elimination of undercut banks that provide cover for frogs; loss of wetland and riparian vegetation and backwater pools; and spread of disease (Belsky et al. 1999, Ohmart 1995, Hendrickson and Minckley 1984, Arizona State University 1979, Jancovich et al. 1997). Creation or maintenance of livestock waters in arid environments may provide the means for non-native predators such as bullfrogs and crayfish to move across landscapes that would otherwise serve as barriers to their movement. Increased erosion in the watershed caused by livestock grazing can accelerate sedimentation of deep pools used by frogs (Gundersen 1968). Sediment alters primary productivity and fills interstitial spaces in streambed materials with fine particulates that impeded water flow, reduce oxygen levels,

and restrict waste removal (Chapman 1988). Eggs, tadpoles, and metamorphosing leopard frogs are probably trampled by cattle on the perimeter of stock tanks and in pools along streams (Bartlett 1998). Juvenile and adult frogs can probably avoid trampling when they are active. However, leopard frogs are known to hibernate on the bottom of ponds (Harding 1997), where they may be subject to trampling during the winter months. Cattle can remove bank line vegetation that provides escape cover for frogs and a source of insect prey. However, dense shoreline or emergent vegetation in the absence of grazing may favor some predators, such as garter snakes (*Thamnophis* spp.), and the frogs may benefit from some open ground for basking and foraging.

Under the Pickett Lake and Padre Canyon Allotment Management Plan Environmental Assessment, there are proposals to construct fencing to exclude cattle from some springs and lakes (Billy Back Spring, Post Lake, Perry Lake, Indian Tank, Ducknest Lake). Vegetative conditions for frogs would improve if fencing is installed.

Recreational use at lakes and other wetlands can impact leopard frogs and frog habitat. Recreational use is expected to increase over time, commensurate with the growth of the Flagstaff, Blue Ridge and Winslow areas. Completion of segments of the Arizona Trail and associated trailheads and parking areas near lakes will also increase recreation use in those areas.

**Southwestern (Arizona) Toad**

The status of the southwestern (Arizona) toad is apparently secure to vulnerable (NatureServe 2003). This 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. This toad generally prefers 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). Arizona toads have been documented north of Perry Lake and at three locations in East Clear Creek (Table toad-1).

Threats to the southwestern (Arizona) toad include loss of riparian habitat, water diversions and manipulations (dams, etc.), heavy grazing in riparian areas, and hybridization with *Bufo woodhousii* (Sullivan 1991) (see northern leopard frog section).

**Table toad-1. Summary of southwestern (Arizona) toads locations on the Mormon Lake and Mogollon Rim Ranger Districts.** BUMIMI = *Bufo microscaphus* microscaphus (southwestern [Arizona] toad).

AREA SURVEYED	ALLOTMENT	YEARS SURVEYED	BUMIMI FOUND
East Clear Creek: Jones Crossing	Bar T Bar	1977, 1991	YES T13N, R10E, Sec 10 SW4SW4
East Clear Creek: immediately below Blue Ridge Reservoir dam	Bar T Bar	1991	YES T14N, R11E, Sec 34 NW4NW4SW4

AREA SURVEYED	ALLOTMENT	YEARS SURVEYED	BUMIMI FOUND
East Clear Creek: Macks Crossing	Bar T Bar	1993	YES T14N, R12E, Sec 8 SE4NE4
Perry Lake (north of)	Picket Lake	1963	YES T19N, R9E Sec 28

### **Management Indicator Species (MIS)**

The 1982 National Forest Management Act Regulations (Planning Regulations) at 36 CFR 219 set forth a process for developing, adopting, and revising land and resource management plans for the National Forest System (CFR 219.1), and identify requirements for integrating fish and wildlife resources in Forest Land Management Plans (CFR 219.13 and CFR 219.19). Key provisions for fish and wildlife resources require that fish and wildlife habitat be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area, where a viable population is considered to be one that has the estimated numbers and distribution of individuals to ensure its continued existence is well distributed through the planning area (CFR 219.19). By definition, the planning area is the area covered by a regional guide or forest plan (CFR 219.3). The Forest Planning Regulations require that certain species, whose population changes are believed to indicate the effects of management activities, be selected and evaluated in forest planning Alternatives (CFR 219.19). Additionally, the Planning Regulations require that the population trends of management indicator species be monitored and relationships to habitat changes determined (CFR 219.19), this is at the forest level.

Specific management direction for Management Indicator Species (MIS) is also found in Forest Service Manual (FSM) 2600. Policy and direction that tiers to CFR 219.19 is provided for MIS for application at the Forest Plan and project levels relative to species selection, habitat analysis, monitoring and evaluation, and other habitat and planning evaluation considerations, in FSM 2620. FSM 2630 provides guidance on improving MIS habitat, and conducting habitat examinations, and project level evaluations for MIS within the project area. Pronghorn, mule deer, elk, and cinnamon teal are MIS that will be discussed in detail later in this report.

The following table describes Management Areas (MA) and their Forest Plan Emphasis. The table contains those MA within the LSA.

**Table MA 1. Anderson Mesa Landscape scale Assessment Management Areas and their Emphasis.**

MANAGEMENT AREA (MA)	FOREST PLAN EMPHASIS
MA-3: Ponderosa Pine and Mixed Conifer, Less than 40% Slopes	Sustained yield of timber and firewood production, wildlife habitat, livestock grazing, high quality water, and dispersed recreation.

<b>MA-4:</b> Ponderosa Pine and Mixed Conifer, Greater Than 40% slopes	Wildlife habitat, watershed condition, and dispersed recreation.
<b>MA-6:</b> Unproductive Timber Lands	Wildlife habitat, watershed condition, and livestock grazing.
<b>MA-7:</b> Pinyon-Juniper Woodland, Less Than 40% slopes	Firewood production, watershed condition, wildlife habitat, and livestock grazing.
<b>MA-8:</b> Pinyon-Juniper Woodland, Greater Than 40% slopes	Wildlife habitat, watershed condition, and dispersed recreation.
<b>MA-9:</b> Mountain Grassland	Livestock grazing, visual quality, and wildlife habitat.
<b>MA-10:</b> Grassland and Sparse Pinyon-juniper Above the Rim	Range management, watershed condition, and wildlife habitat.
<b>MA-12:</b> Riparian and Open Water	Wildlife habitat, visual quality, fish habitat, and watershed condition on the wetlands, riparian forest, and riparian scrub.

A working draft forest-wide assessment entitled "Management Indicator Species Status Report for the Coconino National Forest" dated 7/1/02 summarizes current knowledge of population and habitat trends for species identified as management indicator species for the Coconino National Forest (USDA Forest Service 2002). Population trends need to be monitored as the Forest Plan is implemented, and relationships to habitat changes over time determined (36 CFR 219.19). Table MIS 1 displays management indicator species by management area for the LSA. The table includes a brief description of the habitat each species represents and the species status within the assessment area.

**Table MIS 1. Management Indicator Species for the Anderson Mesa Landscape Scale Assessment area.**

<i>Species</i>	<i>AMLSA Management Area</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
<b>MAMMALS</b>			
<i>Cervus elaphus</i> <b>Elk</b>	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 desert scrub. They are primarily grazers. Elk do well in Arizona's mild climates.	Elk are present and abundant throughout the entire analysis area, and are most plentiful within the conifer habitats. Elk summer and winter on the mesa.
<i>Odocoileus hemionus</i> <b>Mule Deer</b>	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 (152,100 acres).
<i>Antilocapra americana</i> <b>Pronghorn antelope</b>	9, 10	Pronghorn are grassland and opening dependent species. They use areas where	Occupy grasslands and openings throughout the analysis area (xxx acres). Pronghorn

<i>Species</i>	<i>AMLSA Management Area</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
		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.	summer and breed on Anderson Mesa. 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.
<i>Scirurus aberti</i> <b>Abert Squirrel</b>	3, 4, 6	Abert squirrels favor multi-storied stands with scattered large trees mixed with poles. Nests occur in large ponderosa pines 20 to 110 feet tall, with 12 to 41 inches d.b.h. Trees may need to be at least 60 years old for seed production. They feed on bark, buds, flowers, seeds, mushrooms, mistletoe, acorns, insects, carrion, and the phloem of sub-terminal twigs.	Abert squirrel abundance fluctuates with ponderosa pine cone crops (BISON-M 2000). The current status of Abert squirrels on the Coconino National Forest is inconclusive, but is expected to be stable. Some research indicates that Abert squirrels may use pinyon-juniper woodland for foraging. In transition areas between ponderosa pine and pinyon-juniper woodland, Abert squirrels would be expected to occur in low numbers. There are approximately 51,725 acres of ponderosa pine and ponderosa pine/PJ vegetation types in the analysis area.
<i>Tamiasciurus hudsonicus mogollonensis</i> <b>Red Squirrel</b>	3, 4	Red squirrels are found in Arizona where spruce, spruce with Douglas-fir, or white-fir with Douglas-fir occur at elevations above 7,500 feet. Red squirrel nests are often in tree cavities. Preferred mean tree diameters are 14 inches. Dwarf mistletoe creates witches broom, which may be helpful for nesting purposes (Bennetts 1991). They feed on Engelmann spruce, Douglas-fir, white fir, fungi, buds, and fruits. They harvest the cones from trees to get to the seeds. Red squirrels must store and maintain a winter food supply in centralized caches. Large standing snags and large down logs are important sites for caches. Most caches are centered within a group of trees containing at least one or more large dominant conifers. Red squirrels need adequate food supply, protective cover, and moisture and shade for cone storage (Vahle and Patton 1983).	<p>The status of red squirrels on the Coconino National Forest is inconclusive, due to lack of information on populations. Some habitat loss forestwide has occurred, but snags in mixed conifer stands remain abundant. The future trend towards smaller trees could affect red squirrels. Due to the importance of mast producing trees, red squirrel populations probably fluctuate due to weather and cone crops.</p> <p>In the analysis area, limited habitat for this species is available (530 acres). It exists primarily in canyons on north-facing slopes.</p>
<b>BIRDS</b>			
<i>Sitta pygmaea</i> <b>Pygmy Nuthatch</b>	3, 4, 6	<p>The pygmy nuthatch is a management indicator species for late seral ponderosa pine habitat on the Coconino National Forest (USDA Forest Service 1987a). The pygmy nuthatch is generally associated with mature ponderosa pine forest, where it prefers open, park-like stands of yellow pines. It is also found in dense pine forest, as long as large trees and snags are present. The pygmy nuthatch also utilizes old large oak trees.</p> <p>This nuthatch requires dead trees or dead-top trees where it builds nests in cavities. Pygmy nuthatches usually excavates their own nest cavities near the top of the snag, where the wood is well rotted, or in the underside of a dead branch about 5 to 60 feet above the ground. It occasionally nests in aspen snags.</p>	<p>Old trees and snags have declined across the Coconino National Forest. In the analysis area, stands of mature ponderosa pine are uncommon, generally occurring in small patches or in pine stringers in small drainages.</p> <p>Despite concerns about habitat trends for pygmy nuthatches, especially future trends for snag recruitment, data from the Forest, as well as statewide data, indicate that pygmy nuthatch populations are stable on a gross, long-range scale. Dramatic population fluctuations occur on a short-term scale (one to three years). Small local populations, such as those in snowmelt drainages may be temporarily extirpated, indicating a need for a change in management in those areas.</p>

<i>Species</i>	<i>AMLSA Management Area</i>	<i>Habitat Description</i>	<i>Status Within the Analysis Area</i>
		<p>This nuthatch searches for food in the tops of pine trees for insects and conifer seeds. Its diet consists of about 80% insects and spiders. (DeGraaf et al. 1991). In winter, groups of these birds roost communally in tree or snag cavities, an adaptation that provides added protection from cold weather.</p>	
<p><i>Meleagris gallopavo merriamii</i> <b>Wild Turkey</b></p>	<p>3, 4</p>	<p>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 (&gt;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 (&gt;30%) slopes with good canopy and horizontal cover.</p>	<p>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.</p> <p>There are 6 known roosts in the assessment area, there are likely more. 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 on Anderson Mesa (Game Management Units 5A and 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.</p>
<p><i>Picoides villosus</i> <b>Hairy Woodpecker</b></p>	<p>3, 4, 6</p>	<p>Hairy woodpeckers are over-wintering cavity nesters that tend to need larger trees. They are an indicator species for the snag component of ponderosa pine and mixed conifer forests. For nesting purposes, they often select the dead or dying branches of live trees. They show strong selection for aspen snags, use live aspen proportional to availability, and select against non-aspen snags (Schepps et al. unpubl. rep.). Hairy woodpeckers tend to occur more often in burned areas (Block and Finch 1997). Seventy-five percent of food items are insects, including high numbers of wood boring larvae. Other foods include berries and acorns.</p>	<p>Overall, data from the Coconino National Forest, as well as statewide data, indicate that hairy woodpecker populations are stable, or slightly increasing, on a long-range scale. Minor population decreases occur on a short-term scale (one to three years), but are generally followed by a recovery. Habitat trend in ponderosa pine cover type for snags is declining, but the trend in mixed conifer and spruce-fir is increasing.</p>
<p><i>Parus inornatus</i> <b>Juniper (plain) Titmouse</b></p>	<p>7, 8</p>	<p>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</p>	<p>Habitat for this species is common, however as tree densities and canopy cover increase in the pinyon-juniper woodlands, habitat suitability decreases.</p> <p>Recent pinyon mortality, due to bark beetles, has resulted in an increase of nesting habitat for the short-term.</p>

<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> <b>Cinnamon Teal</b>	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 and semi-permanent wetland habitat is improving, but both remain below potential. There are 1360 acres of seasonal wetlands and 421 acres of semi-permanent wetlands within the project area. There are 1397 acres of reservoirs. 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.
<b>MACROINVERTEBRATES</b>			
See Fisheries Resources report	12		

### **Cinnamon Teal**

Cinnamon teal are indicators of lakes and wetlands. Productivity, distribution and size of wetlands are profoundly affected by the amount and timing of precipitation, influencing whether the basins have water or not; how long they hold water within and between years; and consequently the type of vegetation and wildlife species that can be supported and when. The types of wetlands present on Anderson Mesa are described in the Riparian-Wetlands Specialist Report (PRD#xxx) , and include the following types:

- **Reservoir (open water)** – Man-made deep perennial water pool most years, no significant hydrophytic vegetation (except for submergents) because of deep pool and/or fluctuations of pool level.
- **Semi-permanent Wetland** – Shallow water pool responding directly to precipitation with a 6-12 month flooding regime. Hydrophytic vegetation prevalence (cattail, bulrush and some submergents) and hydric soils present.
- **Seasonal Wetland** – Shallow water pool responding directly to precipitation with a 3-6 month flooding regime. Hydrophytic vegetation prevalence (e.g. spikerush, Carex, Juncus) and hydric soils present.
- **Temporary Wetland** – Shallow water pool responding directly to precipitation with a 1-2 month flooding regime. Hydrophytic vegetation is not prevalent but upland species can include foxtail barley and western wheatgrass.
- **Ephemeral Wetland** – Shallow water pool responding directly to precipitation with a 2-6 week flooding regime. Hydrophytic vegetation is not prevalent but upland species can include annual grass and forb species.

All wetland types have some value to wildlife although this may differ depending on individual needs of the species. In general, those basins that are larger, hold water longer, and have a combination of vegetation types will retain wildlife values longer. From a waterbird standpoint, and by definition, semi-permanent and seasonal wetlands have higher values, followed by temporary wetlands and stock tanks. Teal nest in seasonal and semi-permanent wetlands. They may use the other wetland types and stock tanks for resting and feeding when water is present.

Cinnamon teal is a summer resident in northern Arizona and feeds on plants and invertebrates (Terres 1991). They nest within 100 meters of seasonal and semi-permanent wetlands, choosing taller and denser cover for nesting. Since Forest Plan implementation, open water habitats have remained stable, semi-permanent wetlands have improved and seasonal wetlands are stable, but well below potential. Some habitat has improved and some has been acquired (Coconino National Forest 2002, USDA Forest Service 2002b). Since Forest Plan implementation, drought conditions in several years have resulted in many wetlands being unavailable for waterfowl use (NOAA 1975-1993). Wetlands on Anderson Mesa are disconnected from groundwater and thus are completely reliant on precipitation for water input. Therefore, wetlands can fluctuate wildly from being basically non-existent in dry periods to being highly productive, lush wetlands in wet periods (Riparian-Wetlands Specialist Report, PRD#xxx).

The Forest-wide population trend for cinnamon teal is inconclusive, however there appears to have been lower numbers of breeding pairs in the mid 90's compared to the early 1980's. The Breeding Bird Surveys between 1980-2000 suggest a downward trend statewide although the sample size is small (USDA Forest Service ----). Population data for cinnamon teal on the forest is limited to two studies on Anderson Mesa which reported low nest success and low reproductive success, compared to other areas in Arizona and the U.S., largely as a result of nest losses to avian predators (Myers 1982, Gammonley 1996). It is interesting to note that these studies were conducted during high precipitation periods, times in which wetlands would be highly productive and lush (however see discussion below about impacts to wetlands).

There are approximately 1,360 acres of seasonal wetlands (23 sites), 421 acres of semi-permanent wetlands (9 sites), 189 acres of temporary wetlands (6 sites), and 1,397 acres of open waters (8 reservoirs) within the assessment area (Riparian-Wetlands Specialist Report PRD#xxx). Stock tanks occur within and outside wetland basins across the landscape. The seasonal and semi-permanent wetlands are considered to be existing or potential teal nesting habitat. Temporary wetlands would be used for feeding and resting habitat. The open water sites, like Kinnikinick Lake, would be used for resting during migration. Waterfowl nesting season is May 1 to July 15. The majority of wetlands in the assessment area have been modified by creation of tanks or dams within the natural lake basins. Stock tanks are often deeper than the surrounding wetland basin and hold water well past the time when the surrounding more shallow lake basin has dried up. Surface area, aquatic and emergent vegetation interspersed and aquatic macroinvertebrate production is often less in a stock tank. Stock tanks can provide better-distributed, longer lasting, and more reliable waters than unaltered wetlands, and

are of great benefit to many wildlife species. However they do not provide the quality or quantity of feeding or nesting habitat present in other wetlands in a good to moderate water year.

Nesting success and teal habitat is influenced by climate, grazing, recreation, and predation. Development of dense cover is influenced by temperature and the amount and timing of precipitation. The quality and quantity of wetlands are directly affected by precipitation received during the winter and spring. In wet years, many wetland basins are watered and provide feeding and nesting sites for teal and other waterbirds. In drought years, wetland basins may have little to no water resulting in greatly reduced surface area for waterbirds or none at all. No water, no waterbirds.

Grazing, recreation, predation, and climate influence habitat for teal and subsequent nesting success. Development of dense cover is influenced by temperature, and the amount and timing of winter and spring precipitation. Grazing can have two primary effects on waterbirds and their habitat. Cattle presence during nesting and incubation can crush nests and eggs or disturb hens, causing them to flush, facilitating nest predation. Cattle and wildlife grazing during the nesting season may reduce nest hiding cover, facilitating predation. Fall grazing around key lake basins can reduce the amount of residual vegetation available in April and the amount of residual vegetation would vary by the amount of regrowth that would occur following grazing. Cattle grazing may reduce potential nest sites to isolated patches of cover often associated with unpalatable plant species.

Recreational activities can result in nest damage, habitat deterioration or disturbance that can result in nest loss, abandonment, facilitated predation or death, particularly if vehicles, dogs or dispersed use comes in direct contact with habitat or teals. The nearly xxxx acres of motorized vehicle closures in the area during all or part of the waterfowl nesting and spring migratory season includes a number of important nesting areas for teal. Motorized vehicle use in the remainder of the area is largely unregulated and varies by season and area. Recreational use is expected to increase over time, commensurate with the growth of the Flagstaff, Blue Ridge and Winslow areas. Completion of segments of the Arizona Trail and associated trailheads and parking areas near lakes will also increase recreation use in those areas.

Predation is a key factor in teal breeding success and predator success is influenced by a number of factors. The number of crows and ravens in the project vicinity may be increasing in response to increased human development and increased food availability from an urban setting. Wetlands in the project area tend to be small and unconnected, especially when compared to the White Mountains of Arizona or more productive nesting areas in the United States. Wetland basins and their associated uplands can be incorporated in regular search patterns once they have been identified as potential foraging sites by aerial predators. Crows and ravens fly at low levels over wetlands and can easily detect nests prior to the growth of dense vegetation. They forage along shorelines seeking invertebrates and frogs and in the wheatgrass zone of the basin upland.

Ponderosa pine trees are frequent perch sites adjacent to water. Predation pressure can be intense within 100 m of water, which is preferred by nesting teal.

**Pronghorn** (The majority of this section was taken from the Anderson Mesa Pronghorn Plans, Arizona Game and Fish Department, Region II, Flagstaff AZ. July 1, 2002).

**Background:** Antelope are a management indicator species for early and late seral grassland type, which is represented by Management Areas (MA) 9 and 10 within the LSA. Pronghorn were selected as indicators of grassland modification and were raised as a public issue during development of the Forest Plan (Goodwin 1980). The Pronghorn habitat for the LSA is located in Game Management Units (GMUs) 5A and 5B. A large percentage of the pronghorn habitat in these Game Management Units has state and private ownership.

There is approximately 55,045 acres of MA 10 (Grassland and sparse pinyon juniper), and 5,510 acres of MA 9 (mountain meadows).

Pronghorn are rangeland dependent. If rangelands have the right combination of habitat factors, they have the potential to produce optimum numbers of pronghorn. Throughout their range, they typically use areas where slopes are less than 10%; slopes greater than 20% are generally avoided. Highest pronghorn densities appear to be in habitats averaging 8-15" of annual precipitation, and water every 2 to 4 miles (Sundstrom 1968, Ockenfels et al. 1994, Clemente et al. 1995). Pronghorn prefer the new succulent forage growth in areas recovering from fire. Low vegetative structure, averaging 10 to 18 inches in height is preferred. Vegetation over 25 inches in height is typically avoided, and vegetation taller than 30" is infrequently used (Lee et al. 1998). Pronghorn in the Southwest often use areas of trees if the canopy cover averages less than 20% (Ockenfels et al. 1994).

Does usually breed for the first time at 16-18 months of age. The gestation period averages 252 days, which is long when compared to animals of similar size. In Arizona pronghorn normally breed in late August and early September (Hoffmeister 1986). Fawns are born in May and twins are not uncommon.

### **Pronghorn Herd History (Adapted from Neff and Woolsey, 1979)**

U. S. Army expedition reports of the 1850's indicate that pronghorn were common and widely distributed across northern Arizona, including the Little Colorado River valley, the glades around the San Francisco Mountains, Chino Wash, the Big Sandy, and Bill Williams River (Davis 1973).

C. Hart Merriam (1890) on his biological survey of the San Francisco Mountains, 1889, found pronghorn were common. Small herds of 2 or 3 to a dozen were frequently seen in parks and in the pine forest, with the greatest abundance seeming to be in the pinyon juniper belt. Merriam reported that numbers had declined due to heavy hunting by both whites and Indians.

Army Surgeon Edgar Mearns (1907) reported pronghorn to be abundant on the plateau and in Chino Valley in 1884, but comparatively rare by 1888 because of heavy hunting pressure and human disturbance of habitat. Pronghorn were reported to be largely eliminated by 1907.

Merriam and Mearns agreed as to the cause and timing of pronghorn decline in the late 1880's. However, the situation as to number and trends in the teens and 1920's seems to have been in dispute, with some public officials reporting very small numbers of pronghorn, but the stockmen recalling much larger numbers. In view of the subsequent astonishingly rapid increase in pronghorn numbers, it would seem probable that the cowboys were closer to the fact than were the officials.

In February 1935, the Forest Service counted 2300 head of pronghorn on Anderson Mesa (Taylor 1936). McGregor (1935) states pronghorn numbers peaked in 1932 or 1933, with a decline thereafter. McGregor (1935) also refers to winter loss as severe in the winter of 1931-32, and says the very high herd levels no doubt accentuated it. An aerial survey in 1932 estimated 3,000 head and Forest Service estimates ran as high as 5,000. It is not clear how these surveys fit in with McGregor's narrative, as it is hard to comprehend how the peak would follow so rapidly after severe winter losses.

Rush (1939) described an enormous winter concentration of pronghorn located east of Chavez Pass and estimated the herd to contain at least 3,000 head. Winter losses were again severe in 1936-37 after heavy snowfall in December and January. " In the Anderson Mesa area they were reported as being cornered by fences where they died in droves and on lower ranges they were reported to be starving because of depleted browse conditions" (Knipe 1944). A group of livestock and pronghorn died against the fence north of Boot Lake that winter (Herb Metzger, personal communication with Don Neff).

Antelope herd trends and concurrent land use events and practices are summarized from Neff and Woolsey (1979) with some additions in Table Pronghorn 1.

**Table Pronghorn 1. Summary of pronghorn herd trends on Anderson Mesa, 1850-2001 (Adapted from Neff and Woolsey 1979).**

Period	Trend or status	Major Influences
1850-1876	High density, wide distribution	-No Homesteads on the Mesa -No Livestock only transient sheep bands -Wolf and coyote present -Drought and blizzard losses.
1876-1907	Decline	-Introduction of sheep and livestock, fully stocked and overstocked ranges. -Early water development efforts. -Construction of transcontinental railroad and Mineral Belt railroad south to Mormon Lake. -Development of logging industry -Farming in "open parks" -Uncontrolled market and subsistence hunting.

Period	Trend or status	Major Influences
		-Predation control status uncertain, wolves present
1907-1924	Continued decline? Slow increase?	-Forest Service grazing management started. -Active homestead farming on and east of the Mesa -Active predator control -No market hunting, no open season , law enforcement limited -Elk transplanted from Yellowstone
1924-1933	Very rapid increase.	-Grazing allotments and Forest boundary fenced -Grazing by sheep and cattle -Decline in homestead farming -Intensive predator control -Improved game law enforcement.
1933-1950	High density, variable trend	-Improved grazing management, sheep still competing with pronghorn -Construction of stock tanks -Intensive predator control, including eagles -Legal hunts resumed in 1941
1950-1967	Slow decline, declining fawn survival	-Cattle grazing only -Increased fencing, rotational grazing implemented -Continued stock tank construction -Roads improved increased recreational traffic.
1967-1968	Winter die-off	Heavy winter snow followed by prolonged cold temperatures result in die-off
1968-1974	Recovery, good fawn survival	-Increasing elk population? -End of predator control using toxicants
1975-1991	More animals observed during surveys, but a reduced fawn survival	-Coyote control by shooting in three year increments -Continued development of stock tanks -Roads continue to improve, recreational traffic increases -Elk numbers increase.
1992-2000	Slow decline in the number of pronghorn observed during surveys Low fawn survival	-Increased fencing for rotational grazing -Recreational traffic continues to increase -Elk numbers increase through 1994.

### **The Current Population**

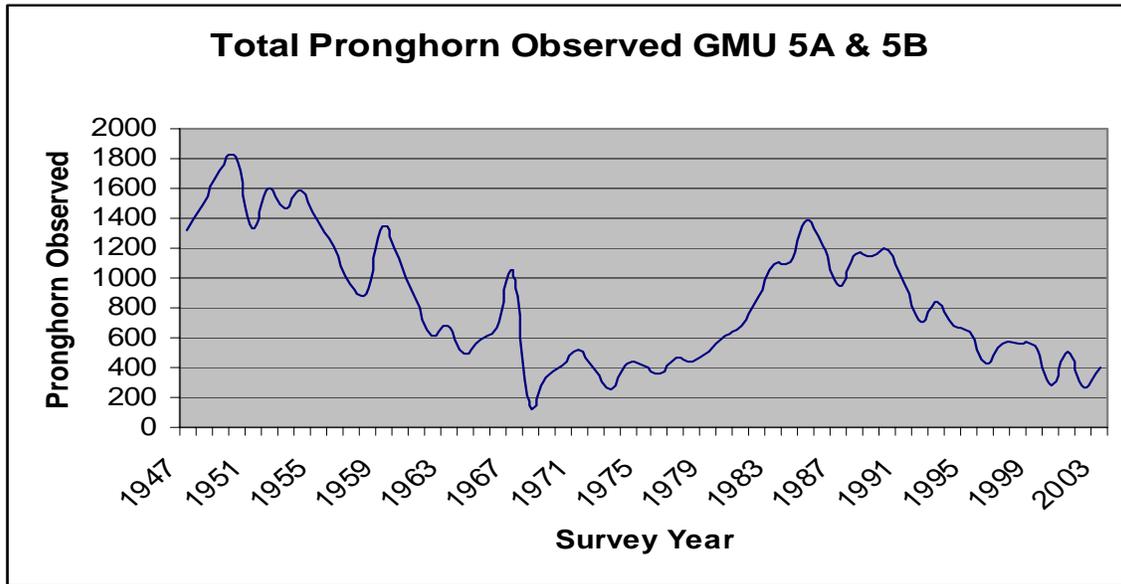
The herd of pronghorn is functionally split in two. One group of pronghorn spends the winter in the lower elevation lands and spends the rest of the year on Anderson Mesa. The second group lives year-round in the lower elevation habitat. We are referring to these as functionally separate because they breed and give birth in separate areas. They all winter in the same grasslands and shrub lands, primarily on State Land Department and private lands to the east of Anderson Mesa. We know very little about interchange of

pronghorn between these herds, but ongoing research by the game and fish should help to clarify this relationship.

### Discussion of Pronghorn Herd Trends

Aerial surveys began in 1944 and have continued to the present on a regular annual schedule. Results of these surveys and pronghorn harvests for GMUs 5A and 5B combined are presented in Table Pronghorn 2, below. Even before the die-off in the winters of 1967-68 the pronghorn herd had fluctuated. Neff and Woolsey indicated there were pronghorn herd declines in the 1880's, 1920's, and in the 1930's.

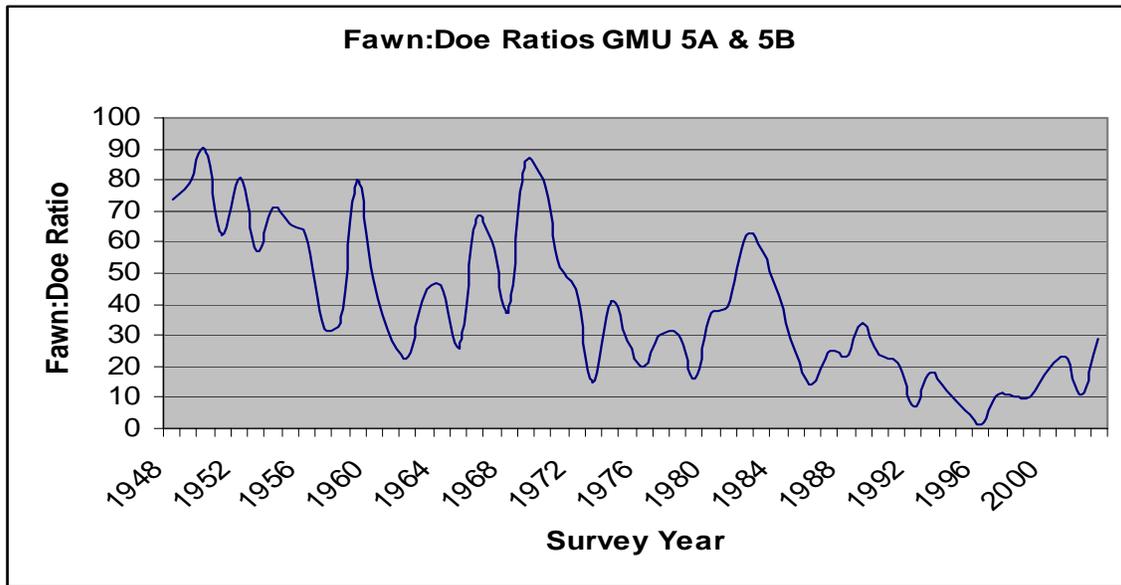
**Table Pronghorn 2. Pronghorn Observed During Aerial Surveys from 1947-2000**



The 1967-68 die off was aggravated by fencing, which stopped pronghorn drifting into what may have been traditional wintering areas. Pronghorn are reported to have piled up along fences and died. That winter, pronghorn from Anderson Mesa may have gone as far as Winslow where a large concentration of pronghorn occurred at the airport.

Recovery in fawn recruitment occurred from 1969 to 1974. Since 1990 the trend in numbers of pronghorn observed on surveys has been down. The decline in fawns per 100 does has been especially worrying since the ratio was 21 or lower for a ten year period. The average fawns per 100 does from 1991 to 2000 were 12. Shaw (2001) reviewed pronghorn survey data from 5A and 5B, and believes the decline in fawn recruitment actually began before the 1967-68 die off. This decline in fawn recruitment may be the primary cause of herd decline.

**Table Pronghorn 3. Fawn:100 Doe Ratio From 1948-2000**



An important trend is the low fawn recruitment. Research results from other populations of pronghorn have shown pronghorn normally conceive and carry two fawns. Even where fawn numbers have been very low when surveyed, birth rates always have been over 100 fawns per one hundred does. Neff and Woolsey (1979) in their research on Anderson Mesa also showed a high birth rate compared to what was seen on surveys. Assuming this is still true, there are three possibilities for the poor recruitment:

- ❖ Fawns are being born healthy and are being killed.
  - Birth synchrony is affecting predation rates.
- ❖ Fawns are being born weak or diseased and cannot live long after birth.
- ❖ Does are dropping viable young but not in adequate physical condition, or do not have the nutritional basis to provide for the nursing fawns.

A fourth possibility remains, since research has not addressed a population which has as low a recruitment rate as was seen here from 1991 to 2000. It is possible that pronghorn does are conceiving and then reabsorbing or aborting the embryos. Both juniper and snakeweed have been shown to cause these effects in other animals when they are a high proportion of the diet. Although, a survey conducted in 1931 on the “Hay Lake Antelope Range” indicate that stomach analysis of pronghorn showed a good percentage of juniper. At that time “many old-time hunters who killed great numbers of these animals before there was much disturbance of range conditions declare antelope have always browsed juniper (Nichol 1931).” Suggesting that juniper was a normal part of the pronghorn diet at that time. Because juniper, snakeweed and rabbit brush was so abundant and the pronghorn population was “increasing very rapidly”, Nichol (1931) was concerned that pronghorn on the “Hay Lake Antelope Range” might experience “overpopulation and overproduction”. Even though pronghorn were feeding heavily on juniper and snakeweed, it does not appear that the pronghorn were reabsorbing or aborting embryos at that time.

At least one cause for the decline in fawn recruitment is known. Neff and Woolsey (1979) clearly show coyotes have been a factor for fawn recruitment on Anderson Mesa. David Brown, Adjunct Professor at Arizona State University, concluded that coyote predation was also a significant factor in annual variations of fawn survival, and that the long term population is dependent on the nutritional value of the vegetation, this is based on information from Sheldon/Hart Mountain National Antelope Refuge and Anderson Mesa (D. E. Brown personal communication with H. Provencio, 12/15/03).

Other factors that may reduce fawn recruitment include: invasion of grasslands by juniper and pine, direct competition with livestock and /or elk, poor nutrition, disease, restricted range due to fencing, and conflicts with recreational uses.

Hunter harvest peaked at 421 in 1954, which was a uniquely high harvest. Normal hunter kills before 1967 ranged between 50 and 250 bucks. Since 1968 the harvest has slowly declined. In 2003 the Game and Fish Department issued a total of 6 permits in GMU 5A and 15 in GMU 5b.

An analysis of fawn recruitment data from 1991 to 1998, did not find any significant differences in fawn recruitment within sub areas in 5A and 5B, which suggests whatever is causing the poor recruitment is happening throughout the GMUs. It is likely that no single factor is affecting fawn survival, but rather the effect is caused by multiple factors acting in synergy. Because of the uncertainty of what factors have been causing the low pronghorn fawn recruitment, the following discussion addresses some of the potential causes.

## **PRONGHORN MANAGEMENT ISSUES**

### **Fawn Recruitment**

The primary management issue for the Anderson Mesa Pronghorn Herd is low fawn recruitment. Information from literature on pronghorn suggests several potential causes including predation, competition, disease, nutrition and disturbance. From 1991 to 2000 the ratio of observed fawns:100 does varied from between 1 and 21. The point where recruitment is balanced with mortality varies. The breakeven point is most likely to be in the range of 20 to 35 fawns per 100 does. A long period of low recruitment, such as that in the 1990s, raises higher concerns when coupled with the normal losses of does to age.

### **Plant Diversity and Health**

The Arizona Game and Fish Department conducted a state wide habitat assessment for pronghorn (Ockenfels et al 1996). The habitat assessment involved visiting each section (one square mile) of habitat, rating the habitat and listing major observed problems with the habitat. As a result of this assessment the Department published this information by Game Management Unit. This assessment is a major source of information for this document. Ockenfels et al (1996), found that plant community diversity and health was a major issue within these GMUs. Ockenfels et al (1996) described this issue as a combination of tree and shrub encroachment, and plant species richness. Plant community diversity translates for pronghorn into both nutrition and fawn hiding cover.

The historic plant diversity on Anderson Mesa is not well known. Some soil types probably have had stable grama grass communities since at least the early 1900's. Other soil types might have seen larger changes in vegetation, however the records do not tell us much about their original vegetation. Even though major vegetation changes had occurred in the Flagstaff area by 1893 (Hughes 1893, in Cooper 1960), Forest Service vegetation maps from 1913 probably give us the best available information on historic plant communities. The 1913 maps show where grasslands once occurred, by comparison we can map the invasion of grasslands by pinyon – juniper, or pine.

The Forage Resource Study Group has identified habitat along the base of Anderson Mesa as a particular problem area. This area is used by pronghorn, livestock and elk and shows more obvious grazing impact than areas either east or west of the rim. Habitat Partnership projects continue to removed invading juniper to promote browse growth.

### **Fawn Hiding Cover**

Increasing hiding cover for fawns could also improve fawn survival. There is a debate among stakeholders on the question of whether fawning cover can be significantly improved. On much of Anderson Mesa the dominant grass is blue grama, which is a very low growing warm season grass. The debate hinges on whether the diversity of grasses might increase in areas with reduced livestock and elk grazing.

Because Anderson Mesa proper does not have any tall perennial shrubs, pronghorn fawns there are largely dependent on grass, forbs, rocks and topography for cover. The best places for fawning cover on the Mesa will be where cool season bunch grasses dominate. This is due to their season of growth and growth form, which provides more effective fawn cover. Area ranchers are also strongly interested in increasing cool season bunch grasses on their ranches and are working on projects and grazing systems designed to promote cool season grasses.

Pronghorn on the state and private lands generally have access to vegetation with more perennial shrubs and better cover. On these lands fawn hiding cover will generally be less of a concern.

Weather greatly affects fawn hiding cover on Anderson Mesa. A warm wet spring encourages plant growth while cool dry springs inhibit plant growth. After a “normal” winter much of the standing vegetation has been pressed to the ground by snow and ice. However after a dry winter and either a dry or a very cool spring, residual vegetation from the previous summer can be all there is for fawn hiding cover.

Concerns have been raised over the effect of elk grazing on fawn hiding cover and nutrition. A potential solution is the reduction of the elk herd. Fortunately pronghorn fawning habitat is primarily in the large grassland openings, which are not used as heavily by elk as are smaller openings. In the early spring elk use may have proportionately more effect because of the slow growth rate of plants in the early spring. Monitoring the impacts of elk on fawning cover is an essential element of any discussion

of elk reductions aimed at improving pronghorn fawning cover. Any changes in harvest would happen through the hunt permit recommendation process already in place and will include opportunities for public input.

Potentially fawn hiding cover could also be increased by changes in livestock management. Leaving grass cover standing in the fall in selected pastures can provide fawn hiding cover the next spring under some conditions. After wet winters the residual pronghorn fawn cover may not be as useful if the grass cover is packed down by snow and ice.

Another source of fawn hiding cover is new spring growth. The amount of growth before fawns are born varies a great deal and is dependent on weather conditions. Deferring or reducing the amount grazing by elk and livestock until pronghorn fawns are out of the “hiding phase” would provide the maximum cover value from spring growth.

### **Nutrition**

Nutritional needs can be approached both through management and research. Nutrition has proven important to raising and maintaining birth rates in livestock in the general region around Flagstaff, and may be important in pronghorn as well. Nutrition during the last 2.5 months of pregnancy has been shown to be very important to pronghorn. Various pronghorn management guidelines emphasize the need for a diversity of forbs for pronghorn in late pregnancy and following birth. Forb diversity has been considered to be problem in pronghorn habitat throughout Arizona.

Three methods have been proposed for improving nutrition: 1), burning, 2), cutting pinyon, juniper, and pine where trees have invaded grasslands or have become denser on savannas, and 3), altering grazing practices.

Burning projects are attractive because they can be effective the spring following the burn. Prescribed burns can improve plant diversity, and increase the nutritive value of existing plants. Effects of burning on nutritive value are short lived, generally lasting less than five years, but the effects on plant diversity can last much longer. Most of the grassland and shrub lands in the area can be very difficult to burn because fuels are sparse. Some prescribed fire specialists are concerned that they will not be able to get fire to burn across pastures on Anderson Mesa. Other concerns about the effects of burning include:

- potential effects on Anderson Mesa soils, such as reducing already low organic matter,
- burns on Anderson Mesa may create monocultures of a single grass species,
- burns may cause spread of noxious weeds.

Concentrating burns in grasslands, with deep soils, and near water will maximize benefits to pronghorn does. Burning scattered areas across the mesa will maximize the probability of the desired vegetative change and increase the probability that does will find the burns.

Plant diversity and potentially pronghorn nutrition can be improved through projects that remove encroaching pinyon and juniper or ponderosa pine from meadows, and savannas. Tree removal projects are an effective method to improve nutrition in the mid term, because the plant response is more rapid than any changes resulting from wildlife or livestock grazing changes, and because the effects persist for many years.

Both burning and ground disturbance associated with tree removal can produce a relatively high proportion of forbs, which are the preferred food of pronghorn and essential for pregnant does. Slash disposal methods can affect the nutritional value and diversity of plants. When the slash is piled and burned most nutrients will be lost and the invasion by noxious weeds is likely. When slash is scattered then burned the resulting fire is less intensive and can improve the nutrient value of post-fire forage. If the slash is not treated it can reduce a pronghorn's visibility and provide cover for predators.

Nutrition can also be addressed by reducing competition from elk and livestock. Elk populations in Units 5A and 5B peaked in 1993-1994 and have since been reduced to below 1988 population levels. Reductions have continued through the 2003 hunting season. The Department continues to monitor populations and impacts. The Forest Service through the Allotment Management Planning process is considering changes in cattle use. Changes in plant communities from reduced grazing pressure are usually slow, and may take up to thirty-five years to complete. Changes in vegetative height can be immediate but grazing cage monitoring studies on the Coconino have shown plants often take three years of rest to reach their full vigor.

Recent Allotment Management Planning on Anderson Mesa has proposed the fencing of several semi-permanent wetlands in order to reduce disturbance from cattle to nesting birds. Concerns have been raised that fencing of these wetlands would reduce the nutritional value of the available forage within these exclosures to the detriment of pronghorn. The concern is based on the fact that cattle grazing stimulate new growth which has a higher nutritional value than the decadent residual forage that would result from cattle exclusion. The proposed exclosures are very small in comparison to the size of the available pronghorn habitat within the LSA, most of which is grazed by livestock. Any nutritional decreases resulting from the proposed exclosures will be offset by the increase in available hiding cover for fawns and nesting birds, additionally grass species diversity and macro-invertebrates may increase.

Other grassland restoration techniques may be worth testing for effects on nutrition, such as, seeding, or fertilizing. The Flying M Ranch has used heavy fall grazing on selected pastures to ensure a flush on new growth the next spring, intending to concentrate spring elk grazing on those pastures. The ranch believes pronghorn have also been attracted to these pastures in the spring. Research has shown new growth provides better nutrition than mature grass. This technique may be worth investigating for potential benefits to pronghorn.

## **Fawn Predation**

Predation on pronghorn fawns has been shown, by past research, to be a serious problem on Anderson Mesa. One remedy that has shown an effect is to kill coyotes, which worked 3 years in five during research, but is not popular with much of the public. Killing coyotes only yields a short-term gain in fawn recruitment, and must be repeated for a number of years to be effective. Coyote control should only be proposed as part of a larger integrated management package, but may be necessary until other solutions can take effect.

There are two possible alternatives to killing coyotes that may be worth investigating: predator swamping and aversive conditioning.

- Predator swamping proposes taking advantage of the behavior of the pronghorn. When pronghorn fawns are first born they avoid predators by hiding for the first ten days to two weeks. This hiding period is when most fawn predation is believed to occur. Predator swamping would provide other food for coyotes, such as road killed deer and elk, to distract the coyotes from hunting fawns during the time when the majority of fawns would be hiding. The idea is untested with coyotes and pronghorn; and could attract additional predators to the area.
- Aversive conditioning would attempt discouraging coyotes from hunting pronghorn by teaching coyotes to associate the smell of pronghorn with a bad experience. In practice baits are made up of a piece of pronghorn hide containing a chemical which tastes very bad or which makes the coyotes sick to their stomach. This idea has received some pen testing in Arizona, however the most likely chemical is not registered for this field use.

### **Disease**

The possibility of having disease present in the herd, and its effect on the herd, and also possible remedies, can best be addressed through research. Research conducted at the Sheldon/Hart Mountain National Wildlife Refuge concluded that disease and condition were not a major influence on pronghorn mortalities (Dunbar et al., 1999). Disease research could help explain what is happening to the herd, however if disease were problematic, developing an effective response would probably require further research.

### **Movements**

The ability of pronghorn to easily move throughout their home range is another management concern in this herd. Pronghorn are unique among Arizona's big game (excluding black bear) in that they normally go under fences. Net wire fences, fences with low bottom wires or even well built fences close on both sides of a highway are barriers to most pronghorn movement. Snow drifts along fences during the winter of 1967-68 prevented pronghorn movements to lower elevations resulting in high losses of pronghorn.

The ability to move between pastures as well as between winter and summer ranges is very important. Even low levels of interchange between populations can be very important in avoiding genetic problems.

The height of the bottom wire is the most important factor when considering fence standards for pronghorn. The Coconino National Forest Plan states that the bottom wire of a fence be at least 18 inches above the ground. Forest Service and Game and Fish Department personnel monitored large portions of fences on Forest Service land during the summers of 2001-2003 for compliance with these standards. Of the approximately 200 miles of fences monitored by Game and Fish and Forest Service crews in 2001, about half met or exceeded the 18 inch bottom wire fence standard.

“Goat bars” are four foot sections of PVC pipe that are slid onto the bottom wire of a fence. In 2001 about 60 miles of fence were improved by adding “goat bars”. Goat bars are usually wired up to the next lowest wire of the fence, in order to increase the distance between the bottom wire and ground. During the 2001 fence monitoring on average four goat bars were installed per mile. Observation and research has shown pronghorn use “goat bars” where they are available. The installation of “goat bars” on problem fences is a first step to improving pronghorn passage while fence renovation continues.

Work to bring fences up to Forest Plan Standards needs to continue. Emphasis should be placed on the fences within pronghorn habitat, particularly those along migration corridors. Fence projects that include the: installation of let down panels in critical areas, modification of existing fences and building new fences to wildlife standards can all help to remedy pronghorn barriers. Fences that are no longer needed for management should be removed, as was recently done at Raymond Ranch Wildlife Area. Opening corridors or lanes through dense trees may be beneficial to pronghorn and can easily be included in tree removal, wild fire risk reduction, or control burning projects.

### **Water Availability**

The quantity of water consumed by pronghorn varies with body size, sex, health, lactation, and physical activity, as well as humidity and ambient temperatures of the environment, and succulence of forage (Lee et al., 1998). Water is especially important for pregnant and lactating does. Pregnant does prefer to fawn within one half mile of water and may sacrifice good quality fawning habitat without water for lower quality fawning habitat with water.

Water is well distributed and fairly dependable within the analysis area. On the adjacent state and private lands there is less information on water distribution. Some research suggests water quality may be important as well as water availability. Water is variable from year to year within the analysis area. Despite a good distribution of stock tanks, wetlands and springs, in a dry year most of these sources are dry. Both the Department and ranchers haul water to fill stock tanks and drinkers during the dry season. The practice is both costly and not particularly efficient, but it does help to get animals through the worst droughts. Unfortunately, there is little consideration to the effects of sustaining an artificial population of animals on a habitat that, because of a lack of water, wouldn't normally be able to sustain these animals.

Other considerations include provision of water in drinkers and troughs that are at or near ground level since it has been noted in research that pronghorn are reluctant to use water

from high sill tanks and troughs. Also the water lot fencing used on most livestock waters may be interfering with the free access to water that pronghorn require due to their reluctance to enter into confined and low sight distance situations.

### **Human Disturbance**

Disturbance has long been recognized as a potential impact on the pronghorn of Anderson Mesa. A spring motor vehicle closure near Pine Hill is intended to prevent disturbance of fawning pronghorn on a portion of Anderson Mesa fawning habitat. Compliance has been reasonably good and complaints have been rare.

Recreational impacts have been increasing rapidly across the forest. A recent study in Oregon (Gregg et al 2001) found that disturbance during breeding could reduce fawn recruitment. The study found disturbance tended to prolong the fawning period. With fawning prolonged, coyote were able to take more fawns. The Department and the Forest Service may consider implementing fall motorized vehicle closures in selected areas of pronghorn habitat. In order to know if breeding or fawning season motorized closures are effective, we need to know where the pronghorn does which breed in the closure area, fawn. This could be learned by radio-tagging pronghorn does and is currently being done by Department researchers.

### **Pronghorn Hunting**

Some have expressed concern that the current pronghorn hunts may be harming the herd because of its apparent low population size. There seems to be an assumption that hunting could harm the population by removing too many bucks, or through the accidental killing of does, or simply by increasing disturbance.

The Department has responded that such a low kill will have no effect on the population and that the disturbance only lasts a few days. Although, as mentioned above, the combined disturbance resulting from scouting and hunting of deer, elk and pronghorn during the pronghorn breeding season could result in disturbance, which could effect the birth synchrony and increase predation of fawns. The response by the Department does not satisfy those with concerns; additionally few requests to end the hunt are received each year. There are a few options, which might help relieve the concerns. The Department could:

- Temporarily suspend the hunt.
- Educate the public of the effects of hunting low density populations
- Continue with current management practices.

The Department has already made a temporary change in the hunt guidelines for the 2001 hunts and could extend that change to reduce any potential significant negative impacts on the pronghorn herd. The Department will continue to review the hunt design and permit numbers yearly through the existing public process.

### **Elk**

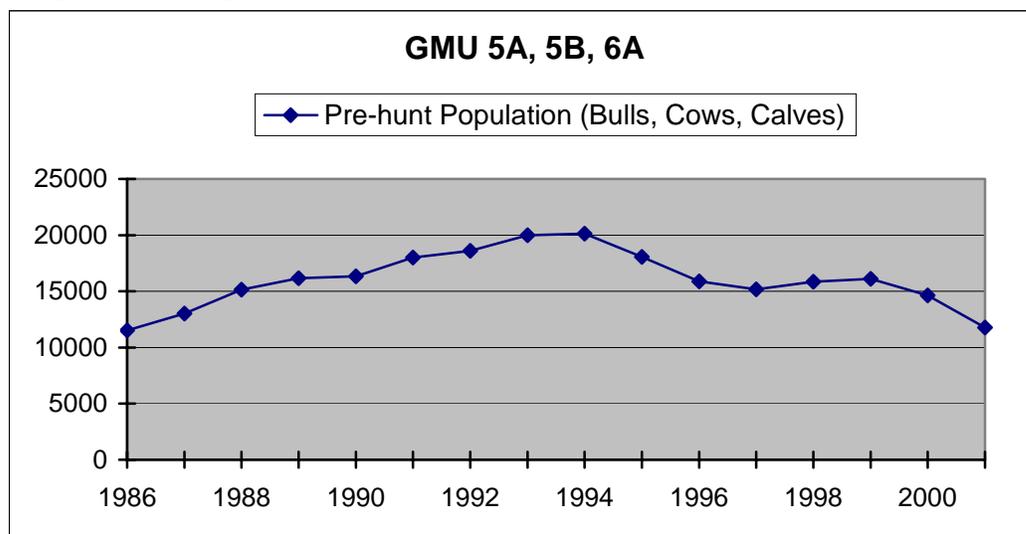
Elk are indicators of early seral ponderosa pine, mixed conifer and spruce fir. While early seral stages of ponderosa pine and mixed conifer are important, elk are generalists, and use a wide variety of seral stages and habitats (USDA Forest Service 2002a). The

elk of today are reported to be descendents of Rocky Mountain elk transplanted from Yellowstone National Park beginning in 1913. Recent DNA analysis of Rocky Mountain elk and the extirpated Merriam's Elk has failed to show a difference between the two subspecies, but further tests are needed to provide a definitive answer. By 1928, 217 elk had been released into several remote areas of Arizona. These elk rapidly expanded their numbers and their range, and in 1935 the first hunting season was instituted. The hunting that was thought to have extirpated the Merriam's elk also took a toll on predators including mountain lion, wolves, and bear. The main factors controlling elk populations became hunting and starvation. By 1981, elk populations in Arizona had reached more than 10,000 animals despite a yearly harvest of about 1,500 animals. By 1989, the elk population had increased to 30,000. Evidence of elk impacts on vegetation was first noticed in riparian meadows and areas that had been seeded following timber harvest.

By 1992, harvest practices were initiated to reduce the elk population due to concerns over vegetation damage. In GMU 5B & 6A harvest management focused on reducing population numbers to the 1991 level. Statewide the elk harvest more than doubled from 3,415 in 1985 to 7,881 in 1995.

The analysis area provides both summer and winter range for elk. During the summer, elk tend to stay in the higher elevations in the ponderosa pine habitat types. They move into the pinyon-juniper woodlands during the cold winter months when the available forage is covered by snow. In years when winters are mild, elk remain in the higher elevations and never move to their winter range. This results in yearlong grazing throughout most of the analysis area. Water developments in the Pinyon-juniper woodland have enabled elk to use these habitats year round impacting available forage on their wintering habitat.

**Graph Elk 1. Population Estimates For GMU 5A, 5B and 6A.**



Despite reductions in the elk population since 1993, impacts to meadows and riparian areas can be substantial and additive to that of livestock use. Elk and livestock grazing reduce the cover and vigor of highly palatable plants and contribute to trampling and soil

compaction. Most of the stock tanks and natural lakes within the analysis area provide elk with an intermittent water source. Once these sources of water are depleted elk are forced to concentrate their use to the limited springs, lakes and riparian areas within the LSA. Additionally, tree and shrub encroachment has reduced the availability of forage over large areas. Combined these affects funnel elk into sensitive areas such as meadows, riparian areas, and grasslands and can result in unacceptable impacts to these important areas.

Elk populations have been the most closely monitored of all the game species. Analysis of population trend shows an increase in elk numbers in the early to mid 1990's, with a gradual decline to roughly the late 1980's level. As a result of abnormally wet years, habitat conditions were favorable for elk in the late 1980's and early 1990's. As populations increased, the Department and the Forest Service became concerned over habitat impacts and cooperatively decided to reduce elk numbers, which has resulted in the decline of elk in the late 1990s. The lower calf crops may indicate that habitats are not providing adequate nutrition (USDA Forest Service 2002a).

## **Mule Deer**

### **Indicator Habitat**

The mule deer was selected as an indicator species of early-seral stages of aspen and pinyon-juniper woodlands. Early-seral stages of ponderosa pine, mixed-conifer, and chaparral habitats are also important for this species. Mule deer typically summer at higher elevations in aspen and ponderosa pine forests, and winter in pinyon-juniper woodlands found at lower elevations (Hoffmeister 1986). Mule deer are also found in the ecotone of the ponderosa pine forest and the pinyon-juniper woodland during the summer. Mule deer are browsers and prefer herbaceous, green shoots and fruits of shrubs and trees. This species also feeds on forbs and grasses (Burt and Grossenheider 1976, Hoffmeister 1986).

### **Population Trend**

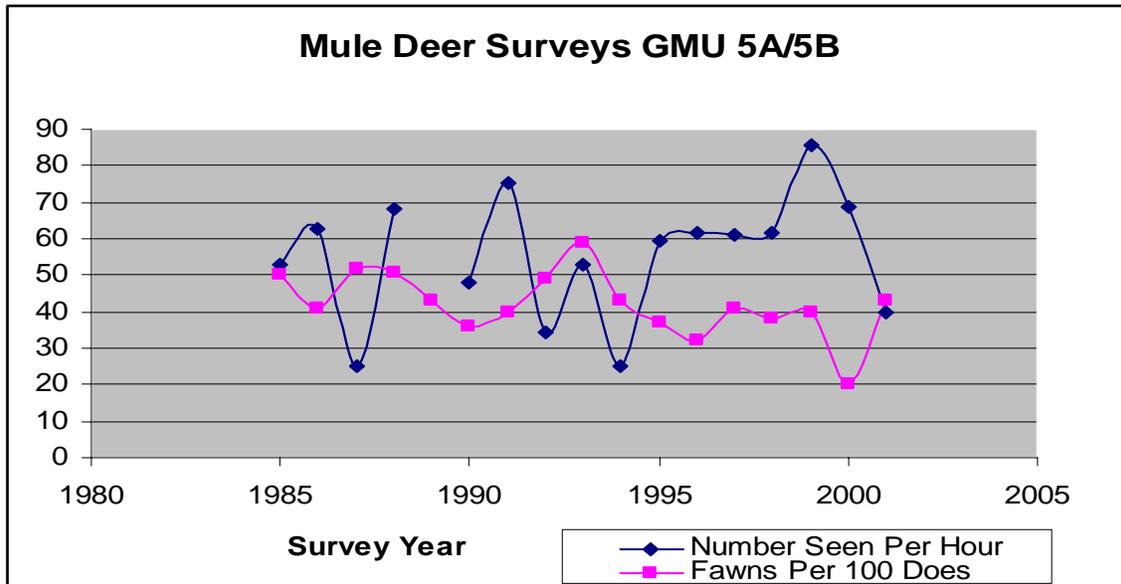
Mule deer is listed as G5, N5, and S5 (NatureServe, 2001). The species is considered to be demonstrably widespread, abundant, and secure, globally, nationally (USA), and statewide (AZ).

Data were compiled from files at the Flagstaff regional office of the Arizona Game and Fish Department in order to determine population trends on the Coconino National Forest. Two indicators for mule deer population trend are 1) number of deer seen per hour on surveys, and 2) number of fawns per 100 does. These two indicators are used because they are more reliable than absolute population numbers. Absolute population numbers of mule deer are too variable and do not give a true account of population trend (Rick Miller, personal communication). Forest wide population estimates of mule deer were made in the 1980's and ranged from around 8800-11,000; populations were thought to be increasing (USDA Forest Service and Arizona Game and Fish Department (AGFD)

1981, USDA Forest Service and AGFD 1990, USDA Forest Service 1982; USDA Forest Service 1987).

Mule deer herds on the Forest occur in GMU 5A/5B, 6A, 6B, and 7. Some of these herds traverse game management units. Over the past 15 years, statewide trends show a decline in mule deer populations (Arizona Game and Fish Department 2001). A declining trend has also been observed on the Coconino National Forest. An exception occurs in unit's 5A/5B, which make up the LSA. The trend in number of mule deer seen per hour is variable, but indicates a slight increase, while the trend in the number of fawns per 100 does is slightly declining, see Table MD 1.

**Table MD 1. Mule Deer Surveys in GMUs 5A/5B from 1985-2001.**



**Habitat Trend**

Although age class distribution has remained relatively stable in pinyon-juniper, the vigor of understory components such as grasses, forbs, and browse species continues to be affected in dense areas. Loss of herbaceous understory and vegetative ground cover has resulted in accelerated sheet and rill erosion. Drought related mortality in the pinyon-juniper woodlands will likely continue given the current drought conditions. In June 2003, the Lizard and Mormon fires burned approximately 7,500 acres of pinyon-juniper habitat in the northern portion of the LSA. The intensity of these fires was exacerbated by the amount of dead trees in the area. Drought and fire in the woodlands of the LSA will help to reduce the tree density and stimulate browse production.

Aspen stands generally dominated by old trees and are declining due to both natural causes and management actions. Aspen continues to be lost as pine and fir continue to take over aspen stands. Management activities have not been implemented to a level, or

over enough area, to prevent loss of aspen patches across the landscape and to provide for adequate aspen recruitment.

Although an indicator of early seral aspen and pinyon-juniper, mule deer also use ponderosa pine, and treatments in the ponderosa pine have favored grazers over browsers both in the scale of treatment and in the degree of openness of the treatments. Where grazing has reduced vegetative diversity, elk have been favored over deer.

## **Summary**

Mule deer populations have not done well on the Coconino since plan implementation, possibly due to many factors, such as disease, poaching, climatic conditions, and habitat changes. Creation of early seral aspen and pinyon-juniper has not occurred at a sufficient scale to positively influence browse production that would benefit mule deer.

The future outlook for early seral aspen is poor, as aspen regeneration is not sufficient to provide replacement habitat for stands lost to natural causes or management actions. AGFD efforts to reduce the elk population in order to increase aspen regeneration have not been sufficient, although some minor hopeful signs such as patches of young aspen have been seen on isolated small areas. Dry years have not helped the situation.

## **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 analysis 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 analysis area. The following describes each habitat type found within the analysis area and the associated bird species of concern (Table MB 1).

## **Mixed Conifer Habitat Types**

There are approximately 530 acres of mixed conifer habitat type, a small portion of the assessment area. Three species of concern have been identified for mixed conifer habitat type: northern goshawk, Mexican spotted owl, and olive-sided flycatcher. The northern goshawk and is addressed in Table Sen 1 in the sensitive species section. The Mexican spotted owl is addressed in Table T&E 1 in the threatened and endangered species section.

**Pine Habitat Types**

Ponderosa pine and ponderosa pine/pinyon-juniper transitional habitat types cover a substantial part of the assessment area (51,725 acres). Four species have been identified as species of concern in pine habitats. They are northern goshawk, olive-sided flycatcher, Cordilleran flycatcher, and purple martin. The northern goshawk is addressed in Table Sen 1.

**Pinyon-juniper Habitat Types**

Pinyon-juniper habitat types are some of the most common within the assessment area (116,290 acres). Five species have been identified as priority species of concern. These are gray flycatcher, pinyon jay, gray vireo, black-throated gray warbler, and juniper titmouse. The juniper titmouse is addressed in Table MIS 1 in the management indicator species section.

**High Elevation Grassland Habitat Types**

High elevation grassland and montane meadow habitat types are interspersed throughout the assessment area (93,265+ acres). The dry montane meadows within the ponderosa pine vegetation type are generally small in size and make up a much smaller proportion of the assessment area acreage. Four species have been identified as species of concern for high elevation grasslands. They are ferruginous hawk, Swainson’s hawk, burrowing owl, and grasshopper sparrow.

**High Elevation Riparian Habitat Types**

High elevation riparian habitat types (above 4000 feet elevation) make up a very small, but important, percentage of the assessment area. East Clear Creek and portions of Jack’s Canyon, as well as several springs make up the high elevation riparian habitat types (about 15 miles of streams and 14 springs). Four species have been identified as species of concern for this habitat type in the assessment area. They are common black hawk, southwestern willow flycatcher, MacGillivray’s warbler, and red-faced warbler. The common black hawk and the southwestern willow flycatcher are addressed in Table Sen 1 and Table T&E 1, respectively.

**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. Reservoirs, semi-permanent wetlands and seasonal wetlands provide marsh habitat in the assessment area (about 3190 acres). One species for the assessment area has been identified as a species of concern, the American bittern.

**Table MB 1. Migratory Birds and their status within the Assessment Area.**

Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
<b>Migratory birds – mixed conifer habitat priority species.</b>				
<i>Contopus borealis</i> <b>Olive-sided Flycatcher</b>	-Ponderosa pine, Douglas-fir. -Multi-level, mature forest, fairly open canopy, “clumpiness:.” -Dead branches for foraging.	-May occur on higher areas of slopes. -Often occur at edge of early post-burned areas for	-Prefers forest edges and openings.	This species is known to be declining throughout its range. Breeding bird survey data indicates

Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
	-Live mature pines for nesting. -Snags important.	foraging and singing. -Most common in patchy areas of closed and open habitats. Patch size not important. -Most common where tall conifers overlook ridges and canyons.	-Arrival on breeding ground generally (may be as late as June).	that this species exists in low numbers, but is stable to slightly increasing within the assessment area.
<b>Migratory birds – pine habitat priority species.</b>				
<i>Contopus borealis</i> <b>Olive-sided Flycatcher</b>	See Above Mixed conifer species	See Above Mixed conifer species	See Above Mixed conifer species	See Above Mixed conifer species
<i>Empidonax difficillis</i> <b>Cordilleran (Western) Flycatcher</b>	-Ponderosa pine, Douglas-fir, maple, oak, aspen. -Dense canopy closure. -Mid-late successional.	-Drainages to create a cool microclimate	Snags and downed trees for nesting. -Rare cowbird host.	Species considered to be on the increase, but at risk due to concerns about loss of suitable habitat and habitat components such as snags, downed logs, and loss of closed canopy. Within the assessment area, it is expected that this species is static to increasing.
<i>Progne subis</i> <b>Purple Martin</b>	-Ponderosa pine. -Open canopy. -Open midstory cover. -Open understory cover. -High snag density.	-Large snags, cavities. -Open space for flying. -Snags need to be close to or in open areas. -Just above and below the Mogollon Rim. Mormon Lake area.	-Often prefers habitat near open water. -Prefers tall snags adjacent to open areas.	This species has nearly been extirpated from ponderosa pine forests due to much denser conditions and logging has reduced the number of snags and large old trees. BBS data indicates that this species is static to slightly declining in the assessment area.
<b>Migratory birds – pinyon-juniper habitat priority species.</b>				
<i>Empidonax wrightii</i> <b>Gray Flycatcher</b>	-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> <b>Pinyon Jay</b>	-Breeds in pinyon and ponderosa pine. -Usually in pinyon-juniper where pinyon is dominant.	-Nest and cache on south side of trees. -Elevation 5,000 to 7,500 ft.).	-Roost and nest colonially up to 250	Mixed stands of pinyon-juniper occur over large areas and pinyon heavily impacted

Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
	<ul style="list-style-type: none"> <li>-Over 85% of nests found in bottom half of canopy.</li> <li>-Commonly in extensive stands of pinyon-juniper with open physiognomy.</li> <li>-May increase as mid and understory decrease.</li> </ul>	<ul style="list-style-type: none"> <li>-May key in on warmest microclimate for nesting.</li> <li>-Mid-late successional (pine nuts in mature trees).</li> <li>-Use extensive stands for foraging, colony may have up to an 8 sq mi. home range.</li> </ul>	<ul style="list-style-type: none"> <li>individuals.</li> <li>-Only one nest per tree, usually.</li> <li>-Communal feeders of fledglings between 3-6 weeks old.</li> <li>-Long-term pair bonds.</li> <li>-Co-evolved with pinyon trees.</li> <li>-May suffer from common raven predation.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<i>Vireo vicinior</i> <b>Gray Vireo</b>	<ul style="list-style-type: none"> <li>-Pinyon-juniper with broad-leafed shrubs.</li> <li>-Utah serviceberry, single-leaf ash.</li> <li>-Open, not in stands greater than 280 trees/ha.</li> <li>-Usually nest and forage at &lt;2 m. (29 in.-8 ft.).</li> </ul>	<ul style="list-style-type: none"> <li>-Rocky, drier sites.</li> <li>-Moderate to steep slopes (canyon/mesa slopes).</li> <li>-Elevation 3,200 to 6,800 ft.</li> <li>-Not usually found in chained/young PJ.</li> <li>-Patch size small.</li> <li>-Plumbeous vireo move in when structure is denser, patch size larger.</li> </ul>	<ul style="list-style-type: none"> <li>-Frequent cowbird parasitism.</li> <li>-Low foliage gleaner for insects.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
<i>Dendroica negrescens</i> <b>Black-throated Gray Warbler</b>	<ul style="list-style-type: none"> <li>-Mostly pinyon.</li> <li>-Also commonly occurs in Madrean oak/pine-oak in southeastern AZ w/ shrub component.</li> <li>-In taller and denser PJ woodland.</li> <li>-Usually nest 2-15 ft.</li> <li>-Low to mid-story nester.</li> <li>-Prefers relatively heavy conifer cover.</li> <li>-Forage most often in pinyon.</li> </ul>	<ul style="list-style-type: none"> <li>-Not found where juniper becomes dominant.</li> <li>-In PJ, usually between 6,500 and 8,000 ft. in AZ.</li> <li>-Locally below 6,500 ft in PJ.</li> <li>-Commonly found in lower elevations in SE AZ habitats.</li> <li>-May prefer woodlands w/ interspersed shrubby openings.</li> <li>-Successional stage: mid to late pinyon woodland.</li> <li>-Unknown if fragmentation has an effect on species.</li> </ul>	<ul style="list-style-type: none"> <li>-Brown-headed cowbird parasitism occurs, but effect unknown.</li> <li>-Forages low to mid-canopy, foliage gleaner.</li> </ul>	<ul style="list-style-type: none"> <li>This species is thought to be stable or slightly increasing in Arizona. They are common within the assessment area and are considered to be stable to increasing.</li> </ul>
<b>Migratory birds – high elevation grassland habitat priority species.</b>				
<i>Buteo swainsoni</i> <b>Swainson's Hawk</b>	<ul style="list-style-type: none"> <li>-More grass and less small woody shrubs than Ferruginous Hawk habitat.</li> <li>-Sparse shrublands, small, open woodlands</li> <li>-Nest trees include: cottonwood, catclaw acacia, tall cholla, juniper</li> <li>-Will forage in agriculture fields, but</li> </ul>	<ul style="list-style-type: none"> <li>-Elevation 4,900 to 7,000 ft, locally to 9,500 ft. in the White Mountains.</li> <li>-Prefer large expanses of grasslands with interspersed trees or large shrubs.</li> <li>-Primarily a tree nester, but</li> </ul>	<ul style="list-style-type: none"> <li>-Eat grasshoppers during migration and on wintering grounds.</li> <li>Foods:</li> </ul>	<ul style="list-style-type: none"> <li>Swainson's hawks occupy grassland habitats within the assessment area, although habitat is limited to short grass prairie habitats. Woodland</li> </ul>

Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
	<p>the crop cannot be taller than local grass; prey difficult to locate.</p> <ul style="list-style-type: none"> <li>-Nest in small trees in smaller clumps, wind breaks, woody washes esp. when adjacent to red-tailed hawks.</li> </ul>	<p>also nest on utility poles, windmills.</p>	<p>lizards, snakes, birds, ground squirrels, voles, pocket gophers.</p> <ul style="list-style-type: none"> <li>-Non-breeders hunt communally and eat primarily insects.</li> <li>-not as sensitive to human activity as ferruginous hawk.</li> </ul>	<p>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.</p>
<p><i>Buteo regalis</i> <b>Ferruginous Hawk</b></p>	<ul style="list-style-type: none"> <li>-Scattered, isolated junipers for nesting</li> <li>-Sparsely vegetated grassland.</li> <li>-Nest on elevated areas</li> </ul>	<ul style="list-style-type: none"> <li>-Elevation: 4,900 to 6,200 ft.</li> <li>-Nest sites in isolated junipers, ledges, knolls, rock outcrops or pillars, cliffs faces.</li> <li>-Nests are placed in open with grand view.</li> <li>-Shows no preference for shading.</li> </ul>	<ul style="list-style-type: none"> <li>-Occur where larger populations of prairie dogs, ground squirrels, rabbits, and pocket gophers exist.</li> <li>-High sensitivity to human disturbance around nests.</li> </ul>	<p>No known nesting. Fall migratory use in grasslands on Anderson Mesa. This species is expected to be static within the assessment area.</p>
<p><i>Athene cunicularia</i> <b>Burrowing Owl</b></p>	<ul style="list-style-type: none"> <li>-Grasses and plant communities in early succession.</li> <li>-Grasses and plant communities in early successional stage.</li> <li>-Rock outcrops that attract burrowing mammals to provide burrows.</li> </ul>	<ul style="list-style-type: none"> <li>-Elevation 4,900 to 7,000 ft.</li> <li>-Little to no slope.</li> <li>-Dry, open, shortgrass, treeless plains, often associated with burrowing mammals.</li> <li>-Need perches: fencepost, mounds, powerlines, etc.</li> <li>-Early successional stage (grassland).</li> </ul>	<ul style="list-style-type: none"> <li>-Limited to areas with active small and/or burrowing mammals, such as prairie dogs.</li> <li>-Food: insects (grasshoppers, crickets, beetles) and small mammals, herps, birds.</li> </ul>	<p>Habitat is limited to grasslands. Documented in area. Considered to be declining throughout 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>, <b>Grasshopper Sparrow</b></p>	<ul style="list-style-type: none"> <li>-Plains lovegrass, sacaton sp., black grama, vine mesquite, little bluestem, agave.</li> <li>-Taller (12 – 20 inch) mixed tall bunchgrass and turf grass or sodgrass.</li> </ul>	<ul style="list-style-type: none"> <li>-Elevation 4,900 – 6,500 ft.</li> <li>-Moderately open grassland areas w/patchy bare ground, flat to gently rolling hills.</li> <li>-Some level of shrub component.</li> <li>-Territory size not sure in AZ, but 0.6 – 1.4 ha. From eastern North America.</li> <li>-Need low perches such as fences, posts, taller grass,</li> </ul>	<ul style="list-style-type: none"> <li>-During breeding season feed on grasshoppers, and other insects</li> <li>-During winter, feed primarily on grass seeds.</li> <li>-Sing two entirely</li> </ul>	<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</p>

Priority Species	Vegetation Composition/Structure	Abiotic/Landscape Factors	Special Factors	Status In The Project Area
		low shrubs. -Tall grass components esp. during breeding season.	separate songs.	the plains grasslands of Chino Valley in Yavapai County (Latta, et al. 1999).
<b>Migratory birds – high elevation riparian habitat priority species.</b>				
<i>Oporornis tolmiei</i> <b>MacGillivray's Warbler</b>	-Mesic/marshy willow thickets. -Wet meadows/edges -Ribes sp. (gooseberry). -Nests under new growth of Gambel oak, snowberry. -Needs dense understory	-Elevation 6,000 – 9,000 ft. -Associated w/riparian habitat at the edges of conifer and deciduous forests.	-Obligate understory (dense) nester. -Primarily breed in the White Mountains and locally above the Mogollon rim, in a relatively small geographic area.	Potential habitat in springs, East Clear Creek, and wet meadows.
<i>Cardellina rubrifrons</i> <b>Red-faced Warbler</b>	-Maple, oak, sycamore, willow (and associated conifers). -Midstory important, dense preferred. -Not nec. tied to dense understory.	-Elevation 7,000 – 9,000 ft. -Steep gradients. -Sloped riparian edges. -Mostly in steep canyons	-Ground nester.	Potential habitat in springs, East Clear Creek, Jacks Canyon, and wet meadows.
<b>Migratory birds – freshwater marsh habitat priority species.</b>				
<i>Botaurus lentiginosus</i> <b>American Bittern</b>	-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. -Areas of freshwater wetlands with tall emergent vegetation, shorelines, and vegetative fringes.	-The bird prefers beaver-created wetlands to those of glacial origin. - Southern populations occupying regions where temperatures are milder, however, appear to be non-migratory. -Changes in wetland isolation and stabilized water regimes are also eroding habitat quality.	-Little is known about migration patterns of the species. -Members of the species appear to be highly asocial, with minimal pair bonds between the sexes. Foraging is completely solitary.	-potential habitat is marshy areas in reservoirs, semi-permanent and seasonal wetlands - population is undergoing a substantial decline due to loss and degradation of habitat. -The US Fish and Wildlife Service listed the species as a Nongame Species of Management Concern in 1982 and 1987.

## DESIRED CONDITIONS for WILDLIFE RESOURCES

### MANAGEMENT AREA 9

#### Mountain Grassland

**Description:** Mountain grasslands are meadows varying in size from just a few acres to well over 1,000 acres. Natural meadows are located in frost pockets or have soil or moisture conditions not conducive to conifer growth. A wide variety of species of grasses and forbs characterize the vegetation which varies according to soil moisture and temperature.

**Desired Conditions Outside of the Forest Plan:**

- 1) Establish Key Areas to monitor grazing by livestock, and wildlife.
  - i) These Key Areas will be used to determine production and utilization during livestock management.
- 2) Establish elk monitoring sites, which will be used as a tool during hunt recommendations for GMU 5A, 5B and potentially 6A.
- 3) Reduce road density across the LSA to xx miles per section.
- 4) Implement the AZG&F Pronghorn Plan.
- 5) Manage all fires using a “Confinement” strategy.

**MANAGEMENT AREA 10**

**Grassland and sparse Pinyon-Juniper Above the Rim**

**Description:** This area is made up of the grasslands and pinyon-juniper with less than 10 percent cover between ponderosa pine and pinyon-juniper, primarily on Anderson Mesa.

**Desired Conditions Outside of the Forest Plan:**

- 6) Establish Key Areas to monitor grazing by livestock, and wildlife.
  - i) These Key Areas will be used to determine production and utilization during livestock management.
- 7) Establish elk monitoring sites, which will be used as a tool during hunt recommendations for GMU 5A, 5B and potentially 6A.
- 8) Reduce road density across the LSA to xx miles per section.
- 9) Implement the AZG&F Pronghorn Plan.
- 10) Manage all fires using a “Confinement” strategy.

**MANAGEMENT AREA 12**

**Riparian and Open Water**

**Description:** Riparian areas are wetland ecosystems that have a high water table because they are close to surface or subsurface water. Riparian areas usually occur in the transition between aquatic and terrestrial ecosystems, but have distinct vegetation and soil characteristics.

There are eight types of riparian areas: intermittent streams, perennial streams, wet meadows, marshes, rivers, ponds, lakes, seeps and springs.

**Desired Conditions outside of the Forest Plan:**

Establish seasonal timing restrictions around wetlands for nesting birds: protect nesting birds at least 300 feet from the high water line of the wetland from May 1 through July 15

Maintain at least 80% of the potential herbaceous vegetation cover at least 300 feet or more from May 1 to July 15 at key wetlands (would benefit waterfowl, grassland birds, frogs and pronghorn antelope).

Identify wetlands that offer suitable habitat for leopard frogs, and ?.... Take measures to protect suitable habitat, particularly during breeding seasons for species. Improve habitat where needed.

Use only native species if any seeding or planting is to be done.

Discontinue seeding waterfowl islands, or constructing waterfowl islands and potholes.

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## APPENDIX I

### Appendix I. Species checklist for Anderson Mesa Landscape Scale Assessment area.

SPECIES BREAKOUT FOR ANALYSIS ANDERSON MESA LANDSCAPE SCALE ASSESSMENT	combination of Flagstaff Center and Mogollon Rim RD lists				
	STATUS	No Suitable Habitat Present	Potential Habitat Present	Occupied /Suitable Habitat Present	Critical Habitat Present
<b>FEDERALLY THREATENED and ENDANGERED, and FOREST SENSITIVE SPECIES</b>					
<b><u>Mammals</u></b>					
Black-footed ferret, <i>Mustela nigripes</i>	FED END		x		n/a
Navajo Mountain Mexican vole, <i>Microtus mexicanus navaho</i>	FS sen			x	
Wupatki Arizona pocket mouse, <i>Perognathus amplus cineris</i>	FS sen	x			
<b><u>Birds</u></b>					
American peregrine falcon, <i>Falco peregrinus anatum</i>	FS sen			x	
Bald eagle, <i>Haliaeetus leucocephalus</i>	FED THR			x	n/a
Mexican spotted owl, <i>Strix occidentalis lucida</i>	FED THR			x	proposed
Northern goshawk, <i>Accipiter gentilis</i>	FS sen			x	
Common Black-hawk, <i>Buteogallus anthracinus</i>	FS sen		x		
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i>	FED END		x		no
Eared Trogon <i>Euptilotis neoxenus</i>	FS sen		x		
<b><u>Reptiles and Amphibians</u></b>					
Narrow-headed gartersnake, <i>Thamnophis rufipunctatus</i>	FS sen	x			

Northern leopard frog, <i>Rana pipiens</i>	FS sen			x	
Chiricahua Leopard Frog <i>Rana chiricahuensis</i>	<b>FED THR</b>		x		n/a
Southwestern (Arizona) Toad <i>Bufo microscaphus microscaphus</i>	FS sen			x	

**Fishes (see fisheries resource report)**

Roundtail Chub <i>Gila robusta</i>	FS sen		X		
Gila Trout <i>Oncorhynchus gilae</i>	<b>FED END</b>	X			
Spikedace <i>Meda fulgida</i>	<b>FED THR</b>	X			
Loach Minnow <i>Tiaroga cobitis</i>	<b>FED THR</b>	X			
Little Colorado River Sucker <i>Catostomus Spp. 3</i>	FS sen		X		
Little Colorado Spinedace <i>Lepidomeda vittata</i>	<b>FED THR</b>		X		

**Plants (see vegetation resource report)**

Rusby's milk vetch, <i>Astragalus rusbyi</i>	FS sen		x		
Arizona bugbane, <i>Cimicifuga arizonica</i>	FS sen		?		
Arizona sneezeweed, <i>Helenium arizonicum</i>	FS sen		x		
Bearded gentian, <i>Gentiana barbellata</i>	FS sen	x			
Cliff fleabane, <i>Erigeron saxatilis</i>	FS sen		x		
Crenulate moonwort, <i>Botrychium crenulatum</i>	FS sen	x			
Flagstaff beardtongue, <i>Penstemon nudiflorus</i>	FS sen		x		
Flagstaff pennyroyal, <i>Hedeoma diffusum</i>	FS sen		x		

San Francisco Peaks groundsel, <i>Senecio franciscanus</i>	<b>FED THR</b>	x			
Sunset Crater beardtongue, <i>Penstemon clutei</i>	FS sen	x			
Disturbed (Tusayan) rabbitbrush, <i>Chrysothamnus molestus</i>	FS sen			x	
Mt. Dellenbaugh Sandwort <i>Arenaria aberrans</i>	FS sen		?		
Eastwood Alum Root <i>Heuchera eastwoodiae</i>	FS sen		?		
Mogollon Thistle <i>Cirsium parryi ssp. mogollonicum</i>	FS sen		?		
<b><u>Insects</u></b>					
Arynxa giant skipper, <i>Agathymus aryxna</i>	FS sen		x		
Freeman's agave borer, <i>Agathymus baueri freemani</i>	FS sen		x		
Neumogen giant skipper, <i>Agathymus neumoegeni</i>	FS sen		x		
Early elfin, <i>Incisalia fotis</i>	FS sen		x		
Hairy-Necked Tiger Beetle <i>Cicindela hirticollis corpuscular</i>	FS sen		x		
Maricopa Tiger Beetle <i>Cicindela oregona maricopa</i>	FS sen		x		
Obsolete Viceroy Butterfly <i>Limenitis archippus obsoleta</i>	FS sen	x			
Spotted skipperling, <i>Piruna polingii</i>	FS sen		x		
Mountain silverspot butterfly, <i>Speyeria nokomis nitocris</i>	FS sen		x		
Blue-black silverspot butterfly, <i>Speyeria nokomis nokomis</i>	FS sen		x		
<b><u>Clams</u></b>					
California Floater <i>Anodonta californiensis</i>	FS sen			x	

<b>MANAGEMENT INDICATOR SPECIES</b>	Management Area	No Suitable Habitat Present	Potential Habitat Present	Occupied /Suitable Habitat Present
Abert Squirrel	MA 3, 4, 6			x
Goshawk	MA 3, 4			see sensitive species
Pygmy Nuthatch	MA 3, 4, 6			x
Turkey	MA 3, 4			x
Elk	MA 3, 4, 6, 7, 8, 9			x
Hairy Woodpecker	MA 3, 4, 6			x
Mexican Spotted Owl	MA 3, 4			see T&E
Red Squirrel	MA 3, 4			x
Red-naped (Yellow-bellied) Sapsucker	MA 5	x		
Mule Deer	MA 5, 6, 7, 8			x
Juniper (Plain) Titmouse	MA 7, 8			x
Antelope	MA 9, 10, 11			x
Lincoln's Sparrow	MA 12	x		
Lucy's Warbler	MA 12	x		
Yellow-breasted Chat	MA 12	x		
Macroinvertebrates	MA 12			x
Cinnamon Teal	MA 12			x

<b>MIGRATORY BIRDS</b>	Habitat Type	No Suitable Habitat Present	Potential Habitat Present	Occupied /Suitable Habitat Present
Northern goshawk	mixed conifer, ponderosa pine			see sensitive species
Mexican spotted owl	mixed conifer			see T&E
Olive-sided flycatcher	mixed conifer, ponderosa pine			x
Cordilleran flycatcher	ponderosa pine			x
Purple martin	ponderosa pine			x
Gray flycatcher	pinyon-juniper			x

Pinyon jay	pinyon-juniper			x
Gray vireo	pinyon-juniper			x
Black-throated gray warbler	pinyon-juniper			x
Juniper titmouse	pinyon-juniper			see MIS
Swainson's hawk	high elevation grassland			x
Ferruginous hawk	high elevation grassland			x
Burrowing owl	high elevation grassland			x
Grasshopper sparrow	high elevation grassland		?	
Lucy's warbler	low elevation riparian	x		
Common black-hawk	low and high elevation riparian		see sensitive species	
Southwestern willow flycatcher	low and high elevation riparian		see T&E	
Elegant trogon	high elevation riparian	x		
MacGillivray's warbler	high elevation riparian			x
Red-faced warbler	high elevation riparian			x
American bittern	freshwater marshes			x