CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction
This chapter describes the environment being affected by the alternatives described in Chapter 2 and documents the scientific and analytical basis for the comparisons made between the alternatives. It also briefly describes the history of human use with reference to its effect on current conditions which led to the purpose and need for the project.

Applicability of the Forest Plan, Laws, Regulations, Policies and Other Direction

Plans of Other Agencies
The Council for Environmental Quality regulations implementing NEPA require a determination of possible conflicts between the Proposed Action and the objectives of federal, state, and local land use plans, policies, and controls for the area. The Buckhorn Allotment Nonpoint Source Pollution Control and Habitat Partnership projects do not conflict with objectives of other Federal, State, and local land use plans, policies and controls for the area. Instead they help to implement policies and plans of the Arizona Department of Environmental Quality and the Arizona Game and Fish Department.

Forest Plan Management Direction and Consistency
This document tiers to the Final Environmental Impact Statement and the Land and Resource Management Plan (Forest Plan) for the Coconino National Forest (Record of Decision, 1987) and all subsequent amendments. The Forest Plan provides direction for all resource management programs, practices, uses, and protection measures for the Coconino National Forest. The action alternatives are consistent with the direction listed in the Forestwide standards and guidelines, and with the standards and guidelines for Management Areas (MA) 7 Pinyon Juniper on Less than 40% Slopes, MA 10 Grassland and Sparse Pinyon Juniper, and MA 11 Verde Valley.

The proposed action and action alternatives are consistent with the Coconino National Forest Plan. The following standards and guidelines (S&G's) are specifically addressed as a part of this project, both as Forestwide S&G's and those for individual Management Areas.

Forestwide -

- Maintain current satisfactory watershed conditions and improve any unsatisfactory conditions to satisfactory by 2020.

- Implement resource improvement projects that are cost-effective and/or are beneficial for maintaining and improving water quality, quantity, and soil productivity.

- Evaluate the need for closures or restrictions on off-road driving on soils that are receiving damage to the extent that soil productivity will be significantly impaired. Close when adverse resource impacts are occurring.

- Cooperate with the Arizona Game & Fish Department (AGFD) to at least achieve habitat management goals and objectives specified in the Arizona Wildlife and Fisheries Comprehensive Plans and strategic plans.

- Manage forage to increase threatened and endangered species and management indicator species where it is determined appropriate through the IRM and NEPA process.

Management Area 7 – area above rim in Boulder, Bald Hill, and Indian Flat Pastures, untreated areas in Painted Tank Pasture and portions of Buckhorn Pasture.

- Manage for the indicator species of plain titmouse, mule deer, and elk.

- Areas needing additional forage for elk and mule deer are given first priority in wildlife habitat improvement projects, with emphasis to areas away from intensive development and high road densities.

- Where seral grasslands are maintained eliminate invading vegetation on a maintenance schedule averaging once every 25 years.

Management Area 10 – Previously treated areas in Painted Tank and Buckhorn pastures.

- Manage for the indicator species of antelope.

- Maintain a seral grassland state on previously treated areas except where corridors of cover are needed. Maintain seral grasslands in a savannah-like state that emphasizes a diversity of habitats to enhance forage for livestock and wildlife. Retreatment on approximately a 25 year schedule.

Management Area 11 – Wickiup and Winter Pastures

- Where watershed condition is unsatisfactory plan, design, and implement projects by the end of the second decade following watershed condition inventory and subsequent prioritization.

- Stabilize gullies, scarify the soil, and seed disturbed soils with a species mix tailored for the site, emphasizing high production, shade tolerant, and multi-growing season species. Control livestock grazing through management and/or fencing to allow for adequate revegetation.

History of Human Use

The following briefly summarizes the known information on prehistoric and somehistoric human use of the area and is an overview of human occupation.

Paleo-Indian Period

Little archaeological evidence of Paleo-Indian (12,000-8,000 B.C.) use of the Verde Valley has been recorded; however, Pleistocene megafauna, including horse, mastodon, and mammoth, have been found along the Verde (Tagg 1986). Given the recent alluvial deposition in the valley, evidence of Paleo-Indian use of the area is most likely deeply buried.

Archaic-Dry Creek Phase

Evidence of Archaic Period (8,000 B.C. – A.D. 1) occupation of the Verde Valley is more abundant. The Dry Creek Site, believed to date to the late Archaic, is located just west of Sedona (Pilles and Stein 1981:608; Shutler 1950). Dry Creek phase sites have been identified along Dry Creek, Spring Creek, Oak Creek, and Coffee Creek; most of them reflect hunting and plant gathering activities. Artifact assemblages include ground stone, scrapers, choppers, knives, and hammer stones. Oval one-hand manos and basin metates, as well as small less formal ground stone implements, are ubiquitous on these late Archaic sites. No Archaic-period structures have been identified.

Squaw Creek Phase

Breternitz (1960) has suggested that shallow pit houses and surface dwellings were first built in the Verde Valley during the Squaw Creek phase (A.D. 1-800). Associated material culture resembles artifacts from San Pedro Cochise and Basketmaker II sites. Ceramics, which appear for the first time in this area at the end of the Squaw Peak phase, include Snaketown and Gila Butte Red-on-buff, Lino Gray, and Lino Black –on-gray. The shift from small basin metates and one-hand manos to larger manos and trough metates near the end of the phase has been attributed to a shift to a more sedentary life style and a greater reliance on agricultural products (Pilles 1981a:8).

Immigration into the region by Hohokam people, may have contributed to dramatic cultural changes that occurred in the Verde Valley around A.D. 700 (Pilles and Stein 1981:8-12). Hohokam Buff Ware and Pimeria Brown Ware ceramics, shell bracelets, clay figurines, and stone palettes, as well as Hohokam-style ballcourts, houses, cremation burials, and irrigation technology have been identified. Other studies suggest that the presence of Hohokam material culture should be attributed to intensive trade rather than immigration (Fish and others 1980).

Camp Verde Phase

Many sites dating to the Camp Verde phase (A.D. 800-1125) have been located in the Upper and Middle Verde Valley. These sites are generally thought to have been occupied by the Southern Sinagua, and extension of the Sinagua cultural tradition identified in the area around Flagstaff. The Southern Sinagua were sedentary farmers of corn, beans, squash, and cotton. Pottery manufactured by the Southern Sinagua was

primarily undecorated Alameda Brown Ware, constructed with a paddle and anvil technique.

Two site types have been identified for this period: 1) small sites at elevations between 4,500 -5,000 ft. and 2) larger sites on the floodplain (Macnider and others 1991:5). The floodplain sites are often very large and include ballcourts, mounds, and other public architecture. The early Camp Verde phase is characterized by Kana'a Black –on-white, Santa Cruz Red-on-buff, and Deadmans Black-on-red ceramics.

The late Camp Verde phase (A.D. 1000-1125) is marked by continued Hohokam influence in the Middle Verde Valley including red-on-buff ceramics, shell and stone ornaments, and clay figurines. Larger sites also often include Hohokam style houses, ballcourts, cremation burials, and adobe-capped mounds (Fish and Fish 1977; Pilles 1976). In the Upper Verde Valley, Hohokam influence seems to have ended by this period. Imported ceramics include mainly Winslow and Kayenta types, while plain wares are almost entirely Alameda Brown Ware (Fish and Fish 1977).

Honanki Phase

The Honanki phase (A.D. 1125-1300) is marked by changes in settlement patterns, architecture, and material culture. Sites dating to the Honanki phase tend to be located at higher elevations than sites from earlier phases and consist of small pueblos and cliff dwellings, pit houses, and contiguous masonry rooms. Hilltop sites, often with thick outer walls, also occur during the Honanki Phase, and some researchers believe them to be defensive sites or forts (Fish and Fish 1977; Wilcox and others 2001). Hohokam ceramics do not appear in assemblages from Honanki-phase sites.

Tuzigoot Phase

During the Tuzigoot phase (A.D. 1300-1425) the previously dispersed population aggregated; as may as 40 pueblos with at least 35 rooms each have been recorded. Tuzigoot, Montezuma Castle, and Hatalacva are the three larges sites attributed to this phase (Jackson and Van Valkenburgh 1954; Spicer and Caywood 1934). Trade and influence in the Verde Valley seems to be mainly from the Flagstaff, Kayenta, and Winslow areas. Trade wares include Tusayan Black-on-white, Jeddito Black-on-yellow, and later proto-Hopi and Hopi wares. Wilcox (2001:158) has posited a Verde Confederacy, an alliance of large sites that stretched from Perkinsville to Davenport Wash along the Verde River, which was formed to protect the region against potential aggression by inhabitants of Perry Mesa. Wilcox (2001) also includes three pueblo sites located along Fossil Creek in the Verde Confederacy.

Protohistoric Yavapai

Until recently, the Verde Valley was thought to have been abandoned about A.D. 1425, but the Yavapai had obviously entered the Verde Valley prior to A.D. 1540 and perhaps as early as 1300 or before. Five protohistoric Yavapai sites have been reported from the Jacks Canyon area near the Village of Oak Creek (Logan and others 1996:1108-1109). Yavapai sites are likely underrepresented in archaeological site inventories, as they are difficult to identify. Yavapai material culture was easily transported and mostly

perishable. Structures consisted of brush wickiups with rock placed outside the circle of brush; once the superstructure has disintegrated little would remain other than a small cleared area and possibly an arc or circle of rocks. A single course of rock is easily disguised by erosion, alleviation, or trampling by grazing herbivores. Don Keller and Pat Stein (1995) documented a twentieth-century Yavapai wickiup site near Prescott, Arizona. Even with archival data, historic photographs, and informant consultations, Keller and Stein (1995:4) had trouble distinguishing the structures.

Agave was a Yavapai staple, and roasting pits were constructed to cook it. Agave was also a staple of the Southern Sinagua, and roasting pits not directly associated with diagnostic artifacts have seldom been the subject of detailed studies that might determine cultural association.

Historic Yavapai and Apache

Historic use of the Middle Verde and Fossil Creek drainages included both Yavapai and Apache groups. Fur trappers observed the Southeastern (Kewevkapaya) and Northeastern (Wipukpaya) Yavapai and Northern Tonto Apache in the Verde Valley (Basso 1983; Khera and Marella 1983). Both Yavapai and Apache followed a pattern of seasonal encampments located near ripening plant foods, and both groups supplemented their diets with agricultural crops. Ceramics from this period consist of Tizon Brown Ware, and projectile points are small triangular points referenced as Desert Side-notched (Fish and Fish 1977; Pilles 1981A: 168-170).

In 1871, the Camp Verde Indian Reserve was established along the Verde River near present day Camp Verde; in 1875, the Federal government forcefully moved the Yavapai and Apache people then living in the Verde Valley to San Carlos (Stein 1981:23). The original Camp Verde Indian Reserve was simply eliminated, and Anglo settlers and miners laid claim to the lands. In the early 1900s, the Yavapai and Apache were allowed to return to the Verde Valley and in 1910, the Camp Verde Reservation was established (Munson 1981).

Euro-Americans

The first incursion into the Verde Valley by Europeans was Espejo in 1583. The Espejo Expedition traversed the Middle Verde River and portions of central Arizona in search of minerals (Whittlesey et al. 1997:283). Limited, brief forays up the Verde River were made by explorers and fur trappers in the 1820's (Schroeder 1974:106), but it wasn't until the 1860's that the mining boom and the passage of the 1862 Homestead Act resulted in significant Euro-American occupation of the Valley (Macnider et. al 1989:35). Mining, ranching, and farming were the primary activities of the early settlers and communities were established at Camp Verde in 1865, Sedona in 1876, Jerome in 1876, Cottonwood in 1987, and Clarkdale in 1912.

Historical Land Use and Effects

A discussion of land use and the occurrence of flooding and erosion events in the Verde Valley in the late 1800's and early 1900's is included in Barnett and Hawkins (2002). European settlement of the Verde Valley began in the 1860's and by the mid 1870's

settlers had begun to import large numbers of domestic livestock. Numbers generally increased through the 1880's with the majority of land used for grazing being public domain (federal) as well as checkerboard railroad grant sections. Some estimate the number of cattle in the Verde Valley and associated side drainages as high as 40 thousand by about 1890 (Munson, 2000). By 1888 the Prescott livestock newspaper *Hoof & Horn* warned:

> *"Many portions of the Territory are now overstocked to an alarming extent, and the continual driving of stock here places the future pasturage for stock in a very important condition. All available ranges where a natural supply of water can be had are now located and settled upon, and those seeking ranges are compelled to either buy or intrude on other parties' property"* (Cline, 1976).

The natural cycles of drought and floods in the late 1800's had superimposed upon them the most widespread human impacts in recent history with livestock using and overusing virtually all of the available rangeland. Settlers who had moved to the Southwest from more humid environments were generally not prepared for the intensity of the "boom and bust" cycles of precipitation and plant growth. Although large floods were documented in the 1860's and 1870's prior to large numbers of livestock, the impacts of grazing combined with drought were cited as the reason for flooding and channel cutting in the 1890's by many early settlers, e.g., Willard (1975). Arroyo cutting in ephemeral drainages such as Wickiup Draw probably began during the period of 1880 to 1910 which included both very severe droughts and the largest measured flood (1891) in more than 100 years of record on the Verde River.

At about the turn of the 20th century much of the public domain land was withdrawn as Forest Reserves. The Black Mesa Forest Reserve, withdrawn in 1898, included the area currently in the Buckhorn grazing allotment. In 1905 the area became National Forest. One of the early tasks of Forest Service Rangers was to issue grazing permits, generally based on historic and existing area use. Groups of livestock owners grazing a general area in common continued until the early 1920's when assignment of allotments to individual ranches, and development of fences to separate allotments began. The open-range situation was gradually eliminated. The 50 year permittee on the Buckhorn Allotment, Irvin Walker, began livestock operations on the Coconino National Forest in 1905 dealing with wild horses, continuing until 1915 when he was issued a grazing permit for cattle.

At the time the National Forests were established it was recognized that the ranges had been greatly overstocked in the 1880's and 1890's resulting in damage to both the vegetation and soil. As a result there was an emphasis on reducing numbers of livestock permitted in order to achieve vegetation and soil recovery. However during World War I, and again in World War II, there was a national directive to increase production of food and fiber from public lands and many previous reductions were reversed.

Fires which had occurred both naturally from lightning and, to some degree, from Native American ignitions, virtually ceased in the late 1800's. Heavy livestock grazing removed the herbaceous fuels that had carried fires. Subsequently, the emphasis on fire suppression by the Forest Service and settlers allowed more tree seedlings and saplings to

become established and eventually grow into denser overstory stands where this had not been the case at the time of European settlement. As the canopy cover increased, many trees and shrubs outcompeted the native grasses and forage production decreased. Once established with their deeper root systems the trees and shrubs continued to outcompete native grasses.

Following World War II, as a part of the post-war boom (1950's to 1960's), rangelands throughout the West were mechanically treated to reduce the pinyon-juniper woodland overstory and to restore areas which had once been grasslands or grassland savannahs. These efforts to restore and maintain these vegetative communities in a mid-seral condition improved forage conditions dramatically. This, coupled with implementation of rest rotation grazing systems and construction of more stock waters, allowed the Forest Service to grant small increases in livestock numbers on many allotments. Many thousands of acres were treated on the allotments to the north and south of the Buckhorn Allotment. On the Buckhorn Allotment about 300 acres were treated in the same manner as areas on the adjacent allotments. Subsequent treatments through fuelwood harvest were done on another approximately 600 acres; however, the degree of treatment toward mid-seral stage was substantially less.

Soils

Soil characteristics and conditions are discussed in detail in the Project Assessment of watershed conditions. Soil and watershed condition was refined from that displayed in the Coconino National Forest TES report by expanding to include three components – hydrologic function, stability, and nutrient cycling. Stability was expanded to include on-site visually identifiable indicators of water erosion, in addition to the modeled existing and tolerable rate of erosion. The categories of condition are:

> **Satisfactory** - Indicators signify that soil function is being sustained and the soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.
> **Impaired -** Indicators signify a reduction of soil function. The ability of the soil to function properly and normally has been reduced and/or there exists an increased vulnerability to degradation. An impaired category should indicate to land managers that there is a need to further investigate the ecosystem to determine the cause and degree of decline in soil functions. Changes in land management practices or other preventative actions may be appropriate.
> **Unsatisfactory -** Indicators signify that loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions."
> **Satisfactory – Inherently Unstable** - These soils have calculated natural erosion exceeding tolerable limits. Based on the Universal Soil Loss Equation (USLE) these soils are eroding faster than they are renewing themselves but are functioning properly and normally. Almost all acreage in this class occurs on slopes greater than 40 percent

Because field review found a high percentage of the analyzed area rated as impaired, a modifier of plus and minus was used where conditions were borderline between categories.

Because of their significantly different characteristics the soils are discussed separately for the treatment areas below the Mogollon Rim (areas 1-4) and those above the Rim (areas 5-22).

Below Rim

Affected Environment

In the Wickiup and Winter Pastures there are approximately 1400 acres in TES units of less than 15 percent slope, or that which is generally considered suitable for treatment. The majority are derived from the Verde Formation of Tertiary age. Most are highly calcareous lake bed deposits interbedded with some volcanic deposits such as ash, tuff, etc. Calcic and Calciorthidic Ustochrepts make up the majority of the acreage proposed for treatment and surface soil textures are generally loams and sandy loams. Watershed condition is generally impaired, with some inclusions of unsatisfactory along channels where active gully erosion is occurring. Acreages of conditions include:

Category	Acres	TES Units
Impaired -	510	385, 402, 403
Impaired	468	381, 383, 417
Impaired +	420	447, 462

Current vegetative ground cover is significantly less than the soils are capable of producing and maintaining. Following a wet winter and/or spring season annuals such as filaree and red brome may appear to be abundant; however, they dry, wither and provide little effective cover by the time the summer monsoon season occurs. Litter is present under portions of the canopy cover of individual juniper or pinyon trees. However, the interspaces, which make up the majority of the soil surface, have very limited herbaceous growth or litter. For example TES Unit 381 can naturally support 30-35 percent ground cover; however field measurements in treatment Area 2 found only 10-15 percent. As a result there is evidence of increased surface runoff, sheet erosion and channel headcutting from high intensity storms.

In limited areas there has been some personal use woodcutting with direction to lop and scatter slash. Where the slash has been lopped and scattered evenly, rather than simply thrown out of the way, there has been a response with new herbaceous growth under the slash. Both annuals and perennials – where natural seed is still present and viable – are present.

Erosion is currently active in a number of the channels. Within the Wickiup Pasture Wickiup Draw is incised below the level of adjacent terraces. Some sections of the channel banks are actively eroding on the outside of meanders with alternate block slumping and removal of the material by subsequent storm flows. Other portions appear to be healing with lower side slopes approaching the angle of repose and vegetation

partially stabilizing the slope. Many tributary and smaller drainages have active headcuts, varying from 1-2 feet deep and wide to as much as 8 feet deep and 50 feet across. Downstream from the project area on the adjoining Walker Basin Allotment Wickiup Draw has some very large headcuts in a discontinuous gully system.

Environmental Effects

The following table compares the predicted effects of the three alternatives on soil and watershed condition over a ten year period.

Acreage by Condition Class of Treated Portions of Areas 1-4

		Condition after 10 Years		
Condition Class	Current Condition	No Action	Alt. B	Alt C
Unsatisfactory	0	295	0	0
Impaired -	270	90	0	0
Impaired	115	0	0	0
Impaired +	120	120	0	80
Satisfactory	0	0	505	425
Total Acres	505	505	505	505

Opportunities for improvement of soil condition are not equal for all TES units. Soil characteristics of depth, texture, structure, profile development, organic matter, fertility, alkalinity, etc. affect the soil's basic potential. When combined with existing conditions the opportunity for improvement is determined. Proposed treatments have been selected based on physical/biological opportunity for improvement combined with management feasibility.

No Action – The no action alternative will have no immediate effect. Over time the existing situation will continue with accelerated soil erosion and increased surface runoff from intense rainfall events, primarily summer thunderstorms. With the advantage of the woody vegetation – juniper, pinyon, and mesquite – in outcompeting herbaceous vegetation for soil moisture and nutrients, this will continue and slowly increase in effect. Long-term soil and vegetative productivity, composition and diversity will remain static or decline in both the short and long-term. The channel headcuts will continue to advance episodically with sediment transported through channels, eventually to the Verde River. Some portions of Treatment Areas 1 and 4 are expected to move from current Impaired Minus to Unsatisfactory due to continued headcut advancement and lateral expansion to additional first order channels. Area 2 would move from Impaired to Impaired Minus. In considering cumulative effects, the impacts of increasing off road motorized use, already causing an effect, would be expected to contribute to moving Area 3 from Impaired and Impaired Minus to Unsatisfactory. Although the multi-Forest off road vehicle management plan may eventually preclude this the easy access and established use will make protection difficult.

Alternative B – The soil scarification for seeding will break up the existing surface crust and will make soil particles vulnerable to displacement by raindrop impact for a brief period of time. However the increased surface roughness and irregularity

caused by the scarification should compensate for this by reducing the slope length for surface runoff to a very short distance. Placement of lopped and scattered juniper and pinyon branches (and mesquite branches in Area 2) will intercept some of the raindrop impact and will provide shade and wind reduction at the soil surface, aiding seedling establishment. Germination and growth of herbaceous vegetation will begin to provide some soil protective cover by the following season. The lopped and scattered slash will be visible for several years and will break down and organify into the soil over time. The proposed action will result in reduced competition for soil moisture and increased herbaceous plant growth and litter production. Growth of native perennial grasses & forbs will result in improved soil and watershed condition. Headcut treatment should stabilize the channels treated and reduce the amount of sediment available for transport downstream. Protection from off road motorized vehicle use, especially in Areas 2 and 3 will aid in achieving increased ground cover. The area directly treated should reach satisfactory condition. There should be some indirect effects on adjacent areas. For example in Treatment Area 1 the gentler slope ridgetops of TES Unit 447 will be treated but the adjacent side slopes will not. Reduced surface runoff from monsoon storms will reduce overland flow and sheet erosion on these adjacent untreated areas which make up about an equal area with that treated. Approximately 3.8 miles of channels will be stabilized and/or maintained through maintenance of old structures and construction of new check dams & headcut armoring. Other factors outside the scope of this project which could affect soil function and condition include dispersed recreation use, e.g., horseback riding and hunting, plus grazing/browsing use by wildlife, e.g., elk. Monitoring will be needed to ensure that they do not reduce the project recovery. The magnitude of the current and expected effects of these uses on vegetative plant cover and soil condition is much less than the expected improved conditions from the treatments so that it will not contribute to a significant cumulative effect.

Application of the herbicide triclopyr is planned for the 80 acres in Treatment Area 2 at a rate of 0.033 to 0.23 pounds per acre acid equivalent, and a mean of 0.11 pounds/acre, based on varying densities of mesquite. Triclopyr is absorbed through the cambium layer of the cut stems and translocated to the root system within the soil. It is hydrolyzed to triclopyr acid after entering plant tissue. Any which reaches the soil is also degraded to triclopyr acid which is reported to have an average half life within soil of 30 days (Tu 2001). Higher temperatures increase the rate of decomposition and reduce the residence time. Risk assessment models, based on application via spraying, calculated that 1 pound per acre application with 15 inches annual rainfall would produce an amount in the soil two to three orders of magnitude lower than that which had been found to affect soil fungi (USDA 2003). Consequently, no effect on soil function is expected and it would not contribute to cumulative effects.

Alternative C – The effects are the same as for Alternative B, with the exception of not scarifying and seeding areas with the more dense stands of mesquite shrubs and not lopping and scattering the mesquite branches and treating cut stumps with herbicide. The expected benefits in Treatment Area 2 will be reduced due to less herbaceous ground cover. Headcut treatment will enable Area 2 to improve from Impaired to Impaired Plus.

Above Rim

Affected Environment

The five pastures above the rim comprise about 7200 acres, of which about 4700 are in TES units of less than 15 percent slope. They are derived primarily from basalt flows. Typic Haplustalfs and Argiustolls are the most common, with clay loam and clay textures. The Argiustolls are higher in organic matter in the soil profile, indicating that they developed in conjunction with grassland and/or grassland savannah vegetative condition. Current conditions vary from Impaired Plus to Satisfactory. TES unit 462, the most common, is classified as Impaired, Impaired Minus, and Impaired Plus, varying with mapping unit component and location, as well as past treatment and management. The primary impairment is due to reduced hydrologic function of infiltration and permeability. It has a vegetative cover of juniper, with some pinyon – though much of the pinyon has been killed by drought and bark beetles in the last few years, and has limited herbaceous ground cover. By contrast, TES unit 466, which was treated to create a seral grassland, is in satisfactory condition. Increased ground cover provides more soil surface protection and greater organic matter in the surface soil results in more soil pores and improved infiltration and permeability. TES unit 492, in Treatment Areas 18-22, is the highest elevation and most productive. It is currently partly in Satisfactory condition and partly in Impaired Plus, again due to hydrologic function rather than stability.

Environmental Effects

The following table compares the predicted effects of the alternatives on soil and watershed condition over a ten year period.

Acreage by Condition Class of Treated Portions of Areas 5-22

		Condition after 10 Years	
Condition Class	Current Condition	No Action	Alt. B & C
Unsatisfactory	0	0	0
Impaired -	125	125	0
Impaired	70	150	0
Impaired +	405	325	170
Satisfactory	440	440	870
Total Acres	1040	1040	1040

No Action – There will be no immediate effect. However, over time Area 9 will shift from Impaired Plus to Impaired as canopy cover of junipers continues to expand at the expense of herbaceous vegetation. Areas 7 and 8 are also currently in Impaired Plus; however, they are located on rockier soils and the surface rock fragments will continue to provide enough soil protection so that the threshold of condition class will not be crossed. Areas 13-15 will continue as Impaired Minus. The existing tree canopy in the other areas is not currently at the stage where expansion in the next 10 years is expected to increase enough to cause the areas to cross a threshold of condition class. Other factors which may contribute to a cumulative effect include use by grazing ungulates, both permitted livestock and elk, plus increased off road vehicle recreation use (until such time as a multi-Forest management plan is completed and implemented)..

Alternatives B and C – These two alternatives would be the same for the above the Rim treatment areas. Scarification for seeding would be done in Treatment Areas 15, 21, 22 and a few acres in Area 9. Equipment movement and distribution of slash would provide some short-term surface soil disturbance in Areas 7-9, 13, 14, and 18. However, the amount of surface rock in these soils, the surface roughness, and the cohesiveness of the clay loam will limit the displacement of soil particles.

In the long-term treated areas currently in Impaired and Impaired Plus condition are generally expected to reach satisfactory condition due to improved soil hydrologic function and more herbaceous and litter ground cover. Treatment areas 13, 14, and 15 are currently in Impaired Minus condition. Area 15 would be improved to Satisfactory as treatment is to move it to a seral grassland comparable to the adjacent area. Areas 13 and 14 will have a treatment emphasizing browse and forbs in a savannah. Improvement to Impaired Plus in these two areas is expected within ten years.

As in the No Action alternative, other factors affecting soil function and condition include the grazing of ungulates and recreational off road vehicle travel which could potentially operate in the opposite direction of the treatments. The magnitude of the current and expected effects of these uses on vegetative plant cover and soil condition is much less than the expected improved conditions from the treatments so that it will not contribute to a significant cumulative effect.

Water

Affected Environment

The project area is within the Verde watershed, with all but one treatment area being totally within the West Clear Creek 5th code watershed. The northern portion of area 1 drains to Wet Beaver Creek via Russell Wash; however, it is managed within the same pasture as Area 2 and is separated by only a very flat drainage divide. Treatment Areas 2, 4, and the southern part of 1 drain to Wickiup Draw, an ephemeral tributary of West Clear Creek which enters within the eastern portion of Camp Verde. Area 3 and Areas 5-8 drain to Hance Spring Draw which enters West Clear Creek just upstream from the West Clear Creek Campground. Areas 9-22 drain to West Clear Creek via a number of ephemeral tributaries which drop into West Clear Creek above Bull Pen and the USGS stream gage.

Water yield from portions below the Mogollon Rim is predominantly a result of storm runoff, both summer monsoon storms and winter frontal storms which are less intense but much longer in duration and greater in areal extent. Above the Rim, precipitation increases with increasing elevation to the east and water yield increases as well. In addition to surface runoff from rainfall events, some groundwater recharge occurs through fractures in the underlying volcanic strata. The low density of drainage common to the basalt flows suggests that snow melt and low intensity rainfall events make some contribution to eventual ground water in the portion above the Rim.

West Clear Creek is a perennial stream above irrigation diversions within the Camp Verde Town limits. West Clear Creek has water quality standards for the designated uses of Aquatic & Wildlife – warmwater fishery, Fish Consumption, Full Body Contact, Agricultural Irrigation, and Agricultural Livestock Watering. The Arizona Department of Environmental Quality 2004 Assessment of Water Quality classified it as "inconclusive" meaning that information is insufficient to assess it as "attaining", "threatened", "impaired", or "not attaining". The monitoring locations specified are upstream from the confluence with Wickiup Draw. The Verde River downstream from West Clear Creek was previously identified as having exceedances of turbidity (ADEQ 2002). The standard for turbidity has been replaced by suspended sediment and not enough data has been collected to determine compliance. The portion of Beaver Creek downstream from the point at which Russell Wash enters was also previously identified with turbidity exceedances and is currently listed as "inconclusive".

The project watershed assessment documented the fact that current conditions result in more frequent peak flows of the same magnitude than would occur under the conditions of vegetative ground cover which the sites can support. For example a small watershed in treatment area 2 is currently producing specific size peak flows about three times as frequently as would occur under "natural", rather than degraded, conditions. The effect of the more frequent storm flows is reflected in accelerated channel erosion with accompanying sediment transport to West Clear Creek and the Verde River.

Environmental Effects

No Action Alternative – Under this alternative existing contributions to suspended sediment will continue in the lower portion of West Clear Creek, Beaver Creek downstream from Russell Wash, and downstream reaches of the Verde River.

Alternative B - Improvement of water quality through reduction of nonpoint source pollution is the primary objective of treatments in areas 1-4 and, to a lesser degree, is expected to be a secondary benefit from treatments in areas 5, 6, 13, 14, 15, 18, 21, 22, and a portion of 9. Sheet erosion will be reduced in all of these treatment areas, with the most reductions in areas 1-4. Channel erosion, primarily from advancing headcuts and lateral bank cutting, will be reduced in areas 1-4. There will be some indirect effects in the portion of Wickiup Draw downstream from the project area due to reduced peak flows from summer thunderstorms and lessened energy of storm flows for headcutting.

Herbicide treatment in Area 2 is not expected to affect water quality. Methods of reaching water would be primarily by surface runoff from thunderstorms shortly after application. This would require the washing off of triclopyr from mesquite stumps before it could be absorbed into the wood and before dissipation by photodegradation, volatization or other mechanisms. With no shading photodegradation would maximize. Under midsummer sun photolysis has been found to reduce the half-life of triclopyr acid to two hours. Leaching of triclopyr through the soil to ground water is not expected. The depth to ground water in the treatment area is predicted to be approximately 60-100 feet based on the nearest wells. Because of the low precipitation ground water recharge is not

expected in the area where mesquite stumps will be treated. Therefore no direct or cumulative effect to water quality is expected from this application.

No significant change in water quantity is expected. Research from the nearby Beaver Creek Watershed found no significant increases in water yield by mechanical removal of pinyon and juniper trees (Clary, et al 1974). Removal of the mesquite shrubs in Treatment Area 2 is not expected to increase water yield as they are not in a riparian position such as mesquites in mesquite bosques which often have their roots reaching the water table.

Alternative C – Effects will be slightly less than Alternative B as the reduction of sheet erosion in Treatment Area 2 will be less. However, the reduction due to channel headcut treatment will be present.

There are many factors affecting turbidity and suspended sediment in the Verde River and in the lower reaches of West Clear Creek and Beaver Creek. The Verde River watershed upstream from the USGS stream gage located below the confluence of West Clear Creek is more than 4,600 square miles in area. The West Clear Creek watershed above the USGS stream gage is 240 square miles. All of the land uses contributing sediment to the creeks and river upstream aggregate to the sediment load and the amounts which are transported and/or deposited. The treatment effects from this project are expected to reduce suspended sediment reaching these streams during periods of storm flow; however because of their relative magnitude compared to the watershed totals and because they are reducing adverse effects they are not expected to contribute to a significant cumulative effect.

Air Quality

Affected Environment

The Yavapai-Apache Reservation is a Class 1 Airshed under the Clean Air Act and is protected from significant deterioration in visibility. It is located approximately 7 miles to the west. The West Clear Creek Wilderness is a Class 2 area by its designation as wilderness. The prevailing winds across the project area are from the southwest, away from populated areas. However, winter nighttime inversions can move from the project area to the lower elevations of the Verde Valley and to the Town of Camp Verde. The primary effect on air quality from the project area is the periodic addition of particulate matter from dust and pollen, especially juniper pollen, to which many individuals are allergic. However, the amount added is insignificant in relation to that in the airshed.

Environmental Effects

No significant effects on air quality are expected from any of the alternatives. A limited amount of dust and vehicular emissions will occur during project implementation but it is not expected to extend beyond the project area. However, this is not expected to be at times when temperature inversions would cause it to add to pollutants in the lower Verde Valley. A small area of jackpot burning may be done in Areas 7, 8 and 9. Best Management Practices and permitting requirements from the Arizona Department of

Environmental Quality should minimize smoke effects. There will be slight reductions in juniper pollen from the action alternatives but it will be insignificant in comparison to the overall amount available in the airshed.

Although there are many sources of particulate matter in the airshed in the Verde Valley, the distance of the project from the sensitive areas, the very limited amount of particulate matter produced and the general prevailing winds away from sensitive areas lead to the conclusion that it will not contribute to significant effects on the air resource. The airshed in this area is not close to the threshold for impairment. Thus it will not contribute to significant cumulative effects.

Vegetation and Invasive Species

Affected Environment

Vegetation within the project ranges from semi-desert shrub and grassland on the western end of the project area to alligator juniper on the eastern, higher elevation side. Treatment Areas 1-4 are the lower elevation with Utah juniper, some pinyon pine, and velvet mesquite as the most common tree species. However, most of the mesquite is in locations where it does not reach the normal tree size of mesquite due to not being in riparian locations. Common shrubs and cacti include fourwing saltbush, catclaw, barberry (algerita), turbinella oak, skunkbush, desert ceanothus, mountain mahogany, cliffrose, crucifixion thorn, prickly pear, and banana and soaptree yuccas. Perennial herbaceous species are quite limited due to competition with the woody plants. Where present they include black grama, sideoats grama, tobosa, sand dropseed, three awn, needlegrass and snakeweed. The introduced annual species of red brome and filaree (aka stork's bill) are often the most obvious herbaceous plants in the spring.

In the treatment areas above the Mogollon Rim (5-22) the dominant trees vary from Utah juniper and pinyon pine on the western, lower elevation side to alligator juniper in the eastern edge of the Buckhorn Pasture. Turbinella oak is the most common shrub throughout these treatment areas. Skunkbush is also found throughout the areas. Silktassel is common in areas 5-9. Mountain mahogany is found in limited settings, usually on rocky sites, and cliffrose even more limited. All three of these latter species are heavily browsed and often decadent where present. The recent drought has affected woody species with mortality to a high percent of pinyon pines and some observed topkill of turbinella oak in drier exposures. Banana yucca is common and agave is present, particularly in dry, rocky sites. Past pinyon-juniper treatment via fuelwood sales and pushing, followed sometimes by burning, has created several areas of seral grassland and greatly reduced tree density in others. In the majority of the seral grassland area western wheatgrass, a cool season species (winter and spring grower), is dominant. In other portions blue grama, sideoats grama, and snakeweed are the most common herbaceous plants, along with some squirreltail, junegrass, and shrubby buckwheat. However, as the pinyon-juniper canopy increases, the herbaceous plant component is reduced until there is very little remaining. Red brome (aka foxtail) is common in disturbed areas with pinyon-juniper canopy where there is not an understory of native perennial grasses. However, it was not commonly observed in the seral grassland dominated by western wheatgrass. In Treatment Area 2 it was observed to be very common under clumps of mesquite shrubs.

A survey for invasive weed species was conducted and the report is included in the project record. Several non-native species were identified. Red brome (*bromus rubens*) is the only one included on the Coconino National Forest invasive weeds list. It is considered to be similar to cheatgrass (*bromus tectorum*), another introduced annual which is on the three forest list of weeds of concern, ranked 22nd in priority among 29 species (USDA 2005). The Coconino National Forest management objective is to contain, i.e., to contain spread to present population size or decrease population. Red brome is very widely distributed throughout the region, both on public and private land, as well as throughout much of the western United States. It is an opportunist, becoming established following fire and other disturbances. The increase in wet winters since 1976 has been reported to have contributed substantially to its spread (Betancourt 1996). Weakening of herbaceous plant communities through prolonged drought, followed by wet fall and winter seasons provides opportunity for its expansion.

Environmental Consequences

Alternative A, No Action – In treatment Areas 1-4 the existing herbaceous plant community will continue to be very sparse and slowly decline with the slow increase in canopy cover of pinyon-juniper (and mesquite in Area 2). The amount and condition of desirable browse plants in treatment areas above the Mogollon Rim are expected to continue at their current levels and possibly slowly decline under continued ungulate browsing.

With no action the existing populations of the invasive plant red brome will continue and possibly expand on an opportunistic basis if stressing dry periods alternate with wet winters.

Alternative B – In Treatment Areas 1-4 reduced competition from pinyon-juniper (and mesquite in Area 2), along with site preparation, seeding, and partial shading with slash will increase perennial herbaceous plant cover. Establishment of a mix of warm and cool species perennial herbaceous plants will reduce the available area for expansion of red brome and other non-native species such as filaree. Favorable establishment may reduce opportunities for these annuals to continue to reseed each year in some areas. Application of the BMP's for weed management will minimize the likelihood of introducing other species of weeds into the project area.

In the area above the Mogollon Rim browse plants should be increased in number and many of the existing mature and overmature plants stimulated to produce new growth, especially in Treatment Areas 5-9.

Use of the herbicide triclopyr in Area 2 will prevent sprouting of the cut mesquite shrubs and allow establishment of the seeded herbaceous species. This herbicide has little effect on grasses. Because of the cut stump method of application the four-wing saltbush plants scattered thoughout this area will not be exposed to the herbicide.

Alternative C – Similar in effect to Alternative B except that the benefits in Treatment Area 2 will be greatly reduced. The current abundance of red brome under the canopy of mesquite shrubs will continue unless native perennial herbaceous species are able to outcompete it. With red brome's very early cool season growth and prolific seed production it is difficult for native species to compete.

Other methods of weed introduction include transport by vehicle from infested areas and dropping off along roadways (or off road from off road vehicles), being contained within hay accompanying recreational horses or mules, within sand, gravel or other borrow material brought into the area, etc. Activities which create bare soil areas without establishment of herbaceous vegetation provide an opportunity for existing weeds, e.g., red brome, to spread. Because the action alternatives are not expected to increase weeds they will not contribute to a cumulative impact.

Wildlife and Sensitive Species

The affected environment and environmental consequences are described in detail in the Wildlife Specialist Report for Listed, Proposed, Sensitive, and Management Indicator Species; Neotropical Migratory Birds; and General Wildlife. This includes a detailed bibliography used for the analysis.

General Wildlife Species

Affected Environment

Game species in the Buckhorn project area include elk, mule deer, white-tailed deer, bear, mountain lion, bobcat, gray fox, coyote, javelina, cottontail and jackrabbits, and squirrels. Elk are primarily found in mixed conifer and ponderosa pine woodlands during the spring, summer and fall months but move into pinyon-juniper woodlands during the winter, especially when deep snows preclude access to forage in the higher country. Deer, mountain lion, bobcat, coyote, fox, javelina, cottontails and jackrabbits occur throughout the project area.

Non-game mammal species include chipmunks, mice, woodrats, voles, skunks, porcupine, and numerous species of bats. Hooded skunks occur primarily within desertscrub and grasslands. Cliff chipmunks, white-footed mouse, and white-throated woodrat are a few small mammal species that occur within the chaparral and pinyon-juniper habitats. Rock squirrel, cliff chipmunk, western harvest mouse, and brush mouse are other small mammals that likely occur in the Buckhorn project area.

Approximately 20 species of bats may occur in the Buckhorn project area. Roosts likely occur in natural structures such as underneath loose bark on snags, in tree and snag cavities, under rocks, in the cracks and crevices of cliffs. All of the bat species occurring or potentially occurring in the area are insectivorous. Water sources such as earthen stock tanks, springs, seeps, and streams are important for bat foraging due to the abundance of insects found flying above the water.

Various species of birds occur in the Buckhorn project area. The wildlife specialist report lists a number of species likely to be found within the project area. The majority

of these birds are passerines but other groups of birds include waterfowl, fowl-like birds, raptors, and various non-passerine birds such as kingfishers, doves, hummingbirds, and woodpeckers.

Many of the birds in the Buckhorn project area (14 of the 30 species listed in the specialist report) are neotropical migrants and spend only a portion of each year (spring and summer) in this area. These birds travel each year from their wintering grounds in Mexico, Central and South America, and the Caribbean to North America to breed during the spring and summer months. Precipitous declines in neotropical migratory bird populations have occurred due mainly to habitat loss and modification in the wintering grounds, breeding grounds, and along migrational routes.

Amphibian and reptiles in the Buckhorn project area include several species of toads, frogs, lizards, and snakes. Amphibians include canyon tree frogs and red-spotted toads. Numerous species of lizards occur in the area; collared, fence, earless, side-blotched, horned, and tree. Snake species that occur in the area include: various garter snakes such as the black-necked and wandering; whip snakes; king snakes; gopher (bull) snake; and rattlesnakes such as the Mohave and Western diamondback.

Environmental Consequences

Treatments occurring within the Buckhorn project area involve the use of machinery including chainsaws, agra-axe, brush saw, ATV or tractor to pull a harrow, heavy machinery to place boulder and create barriers, and limited jackpot pile burning. These activities can directly affect wildlife species when workers, vehicles, and machinery cause aural and visual disturbance to individuals that may be present in the project area. Most bird, mammal, reptile, and aerial invertebrate species are mobile and are capable of dispersing from disturbance, however disturbance that is frequent or of long duration can result in the abandonment of the area, which is equivalent to loss of habitat. Individuals incapable of dispersal (nestling, terrestrial invertebrates, altricial young) or individuals unwilling to disperse (adults with immobile young) can experience negative affects such as: trampling and crushing; increased physiological stress; flushing of birds from incubating eggs thus increasing potential for eggs to become unviable; premature fledging of young from nests; and increased potential for predation. Proposed activities under the action alternatives can directly affect wildlife habitat through the loss, alteration, or fragmentation of vegetation. The timing of the work (August – December) will be after the primary nesting season for birds, thus reducing potential disturbance effects on reproduction.

The no action alternative will have no impact on wildlife species.

Alternative B includes treating mesquite shrubs in the 80 acre Treatment Area 2 with the herbicide triclopyr on cut stumps. Triclopyr is a moderately toxic compound. The oral LD50 levels in rats have been reported in the range of 630 to 729 mg/kg (OSU 1996). Acute toxicity LD50 values for mammals are reported to be 310 to 713 mg/kg, and ducks were reported to have an oral LD50 of 1,698 mg/kg (Infoventures, 1995). The acute dermal LD50 has been reported to be >2,000 mg/kg in rabbits. Triclopyr is considered to be a slight irritant to the skin and eye.

Studies summarized in OSU (1996), Infoventures (1995), and USDA FS (1996) indicated that triclopyr does not pose a carcinogenic, mutagenic, reproductive, developmental risk to animals or humans at doses anticipated for this project.

Human health and ecological risk assessments for the application of herbicides to control noxious weeds and other unwanted vegetation have been prepared for the Forest Service most recently during the period 1992 through 2003. These risk assessments evaluate the potential for impacts on terrestrial wildlife from exposure to herbicides. There are difficulties in assessing possible risks because toxicity testing is often performed on laboratory animals, which may not be representative of free-ranging wild animals or only a few wildlife species are tested. Also, the controlled exposures in the laboratory may not resemble the conditions under which wildlife might be exposed. Possible routes of exposure of terrestrial wildlife to herbicides include direct contact (spray), ingestion of contaminated food items and water, grooming, or indirect contact with contaminated vegetation or substrate.

Given these limitations, ecological risk assessments typically employ exposure estimates that yield conservative assessments of possible risk (i.e., overestimate the potential exposure). The available risk assessments for triclopyr generally conclude that under recommended application rates and conditions, the potential risks to individual wildlife are low.

According to a 1992 risk assessment (USDA FS 1992), estimated exposures exceed high risk only under extreme assumptions for one species, the long tail vole, during the use of 2,4-D, dicamba, and triclopyr (USDA FS 1992). The wildlife risk assessment was considered to overstate potential risks from pesticide exposure because many of the assumptions used were quite conservative. For instance, no degradation of herbicides was assumed to occur and all sprayed herbicide was assumed to be biologically available. Doses were calculated based upon multiple exposure routes including oral, dermal, and through inhalation. Typical dose estimates triclopyr and carriers/additives were below USEPA low risk criterion (less than 1/5 LD50) for all species. The risk assessment concluded that the low probability of extreme exposures and rapid degradation of the herbicides in the environment preclude the possibility of significant adverse effects on wildlife populations or communities.

Small mammals consuming vegetation contaminated with triclopyr immediately after application could suffer impaired kidney function (USDA FS 1996). These extreme-exposure cases are unlikely and there are no available data to determine their feasibility. Because the only vegetation receiving triclopyr would be the cut stumps of mesquite shrubs, with no application to the foliage or fruits, exposure would be very minimal.

Risks to birds are primarily through consumption of contaminated vegetation and contaminated insects. Since mesquite stumps are the only contaminated vegetation, this is not expected to create an effect. Contaminated insects, normally contaminated by being sprayed or coming in contact with sprayed foliage, would have to become contaminated by crawling over the cut stumps before the solution was absorbed and/or dried. The number of ants or other insects which might be contaminated would not

provide enough diet to produce either an acute or chronic exposure above the No Observed Adverse Effect Level. No effect is expected.

The honey bee is the standard test organism for assessing the potential effects of pesticides on terrestrial invertebrates. Acute contact toxicity studies on honey bees reported LD50 values of over 100 µg/bee. As a result the EPA has classified triclopyr as practically non-toxic to bees. No effect is expected.

In summary, risk assessments suggest that wildlife, including amphibians, will not be affected by the herbicide triclopyr at the expected exposure levels. Also, there will be a buffer zone around water (such as intermittent drainages that have water and stock tanks) where herbicides will not be applied. This mitigation will minimize the potential for amphibians to be exposed to herbicides, during sensitive developmental stages. Because there are no direct or indirect effects there will be no cumulative effects.

Special Status Species

Rare wildlife species that are known to occur, or have existing or potential habitat within the project area include 1 Federally listed species, 11 Forest Service sensitive species, and 3 Forest Service Management Indicator Species (MIS) (Table 2).

Table 2: Threatened, Endangered, Proposed, Sensitive, and Management Indicator Species for the Buckhorn Project Area.

Common Name	Scientific Name	Status
Federally Listed (End, Thr, Proposed) (1)		
Bald Eagle	*Haliaetus leucocephalus*	T,WC,Sen,MIS
Sensitive Birds (1)		
American Peregrine Falcon	*Falco peregrinus anatum*	WC, Sen
Sensitive Reptiles (1)		
Arizona Night Lizard	*Xantusia vigilis arizonae*	Sen
Sensitive Invertebrates (6)		
Freeman's Agave Borer	*Agathymus baueri freemani*	Sen
Neumogen's Giant Skipper	*Agathymus neumoegeni*	Sen
Aryxna Giant Skipper	*Agathymus aryxna*	Sen
Early Elfin	*Incisalia fotis*	Sen
Comstock's Hairstreak	*Callophrys comstocki*	Sen
Spotted Skipperling	*Piruna polingii*	Sen
Sensitive Plants (3)		
Tonto Basin Agave	*Agave delamateri*	SC, Sen
Hualapai Milkwort	*Polygala rusbyi*	Sen
Verde Valley Sage	*Salvia dorrii mearnsii*	Sen
Management Indicator Species (3)		
Antelope	*Antilocapra americana*	MIS
Mule Deer	*Odocoileus hemionus*	MIS
Juniper Titmouse	*Baeolophus ridgwayi*	MIS

Table Legend

E	=	Federally listed as Endangered under Endangered Species Act (ESA)
EXNE	=	Federally Endangered, Experimental, Non-essential
T	=	Federally listed as Threatened under ESA
P	=	Federally Proposed for listing under the ESA
C	=	Federally designated as Candidate for listing
WC	=	Wildlife of Special Concern in Arizona (AGFD draft 3/16/96)
Sen	=	On Regional Forester's Sensitive Species List (7/21/99)
HP	=	High Priority Species; "at high risk of imperilment" (Western Bat Species Regional Priority Matrix (1998)
MIS	=	Tonto and Coconino Management Indicator Species from the Respective Forest Plans
SC	=	Federal Species of Concern (former C2 species).

Bald Eagle (T, WC, Sen, MIS)

Affected Environment

Nesting bald eagles do not occur within the project area. The nearest nesting bald eagles occur along the Verde River over seven miles away. Although nesting bald eagles could forage this distance from their breeding area, nesting bald eagles are likely to remain closer to the Verde corridor while foraging.

Wintering bald eagle populations tend to be scattered and highly mobile, usually foraging and roosting in small groups. Wintering eagles tend to concentrate in areas of plentiful food resources, usually near water, although individual or small groups of eagles occur in terrestrial habitats not associated with water, especially when lakes freeze over.

Mid-winter surveys were conducted on the Coconino National Forest in 1979-1985 and 1992- present. The Beaver Creek route occurs along Wet Beaver Creek from the gauging station down to the confluence with the Verde. Survey results for the Beaver Creek route show that an average of one bald eagle is sighted along the route each year. Wintering bald eagles are found in more abundance on Cedar Flat, particularly during the hunting seasons. Multiple bald and golden eagles, along with numerous ravens, have been seen foraging on elk carcasses and gut piles.

There are no ponderosa pine or mixed conifer stands within the project area that may support bald eagle roosts. However, due to the density of wintering bald eagles on Cedar Flat, it is likely they use pinyon and juniper trees to roost overnight. These trees would not likely support communal roosts, but may be used by single birds for night roosts.

Environmental Consequences

The no action alternative will not affect the bald eagle. Since there are no nesting bald eagles within seven miles of the project area, neither alternative B nor C will affect nesting bald eagles. Wintering bald eagles may occur throughout the project area while foraging, but foraging conditions are most suitable on Cedar Flat when hunters leave behind animal carcasses and gut piles. Vegetative treatment activities proposed under alternatives B and C may result in aural and visual disturbance to wintering bald eagles. Treatments are scheduled to occur before wintering bald eagles arrive in mid-October. However, should treatment activities occur between October 15 and April 15, when wintering bald eagles are present, there could be short-term disturbance to wintering bald eagles resulting in temporary displacement from individual gut piles of harvested elk or deer. The herbicide application, called for under alternative C, will occur on mesquite below the rim in the Wickiup area. Since the concentration of foraging bald eagles occur on Cedar Flat, herbicide application on mesquite will not affect the bald eagle.

American Peregrine Falcon (WC, Sen)

Affected Environment

The essential habitat for peregrine falcon includes rock cliffs for nesting and a large foraging area. Suitable nesting sites on rock cliffs have a mean height of 200 to 300 feet.

Peregrines prey mainly on birds found in wetlands and riparian areas within a 10 to 20 mile radius from the nest site. Prey items include mainly birds, especially passerines, doves, and small raptor, as well as bats, and other mammals. Although there are no known nesting peregrine falcons and suitable cliffs for nesting are not within the project area, foraging peregrine falcons may occur within the project area.

Environmental Consequences

The no action alternative will not affect the peregrine falcon. Since there are no nesting peregrine falcons in the project area, neither alternative B nor C will affect nesting peregrines. Foraging peregrines may occur throughout the project area and vegetative treatment activities proposed under alternatives B and C may result in aural and visual disturbance to foraging peregrines. Peregrine falcons have large foraging areas and treatment activities will occur in such a small portion of a peregrine foraging range, the potential for disturbance is anticipated to be minimal, of short duration, and inconsequential. Although peregrines may forage in Wickiup draw, the herbicide application to mesquites, called for under alternative C, will not impact the peregrine.

Arizona night lizard (Sen)

Affected Environment

Habitat for this secretive lizard is arid or semiarid lands, where it lives beneath fallen branches of Joshua trees, dead clumps of various other species of *Yucca*, *Nolina*, *Agave* and cardons and is also found in rock crevices, beneath cow chips, soil-matted dead brush and other debris, and beneath logs (Stebbins 1985). Arizona night lizards are seldom found in the open away from cover (Stebbins 1985).

No surveys have been done in the project area for this species and there are no known records of its occurrence. However, it is listed as a fairly common, permanent resident of desert scrub and grasslands on the Coconino National Forest and suitable conditions for hiding cover occur within the project area.

Environmental Consequences

Project activities associated with both alternatives B and C may impact this species where present by; trampling or driving over individuals, crushing, or burning substrate underneath which these lizards hide. The herbicide treatment under Alternative C will not impact this lizard.

Special Status Invertebrates

Affected Environment

Six species of special status invertebrates may possibly be present within the project area, all within the general category of butterflies and each associated with specific vegetative species and/or communities. The Freeman's agave borer, Neumogen's giant skipper, and Aryxna giant skipper are associated with agave plants. Treatment areas on the western part of Cedar Flat, i.e., areas 5-15 have agave plants, with greater density in the westernmost areas. They are potential habitat for these three giant skippers.

The early elfin (aka desert elfin) is found with the host plant, cliffrose, and its projected range in Arizona may be restricted to the northern portions of Coconino County (Wallesz 1999), making its presence in the project area unlikely, however, no surveys have been conducted for this species.

The Comstock's hairstreak has been confirmed from Navajo and Mojave Counties in Arizona. No surveys within the project area have been done; however, the widespread presence of several species of buckwheat (Eriogonum), which is the host for larva, suggests that there could be possible habitat within the project area.

The habitat of the spotted skipperling consists of moist meadows and streamsides in low to mid elevation mountains. The species has been seen congregating on moist cliffsides. Orchard grass (*Dactylis glomerata)* is a strongly suspected food plant. There is no known orchard grass within the project area.

Environmental Consequences

Special status invertebrates such as the agave borer, elfin, hairstreak, skipperling, and two skippers can be equally affected by project activities proposed under alternatives B and C when these activities modify vegetation, especially those host plant species upon which these invertebrates are dependent. The herbicide application on mesquites in Alternative C will have no additional impacts to these species or their host plants, since best management practices will preclude the potential for drift to occur and the target plant, mesquite, is not a host plant for any of the special status invertebrate species. A mitigation measure for both of the action alternatives requires the avoidance of agave plants and will therefore minimize impacts to the agave borer and two skippers. The no action alternative will not impact any of the special status invertebrate species.

Special Status Plants

Affected Environment

There are three special status plant species which may have some potential habitat within the project area – Tonto Basin agave, Hualapai milkwort, and Verde Valley sage. The Tonto Basin agave is often found in association with archeological features. It has been primarily reported between the elevations of 2,800 and 3,400 feet. The Cedar Flat area with known agave populations is above 5,000 feet. Both the Hualapai milkwort and Verde Valley sage have been found in other parts of the Verde Valley on limestone from the Verde Formation. Areas 1-4 may contain some potential habitat for these two species.

Environmental Consequences

Terrestrial special status plants such as the Hualapai milkwort and Verde Valley sage can be affected by activities described in both action alternatives when proposed activities destroy or modify individual milkwort and sage plants, should they occur in the area. A mitigation measure for both of the action alternatives requires the avoidance of all agave plants; therefore none of the alternatives will impact Tonto Basin agave. Since the use of

herbicide, as called for in alternative C, will not be conducted under conditions that will allow for drift and mesquite is the only target plant, none of the sensitive plant species will be affected by herbicide application.

Management Indicator Species

Management Indicator Species (MIS) are defined as those plant and animal species, communities or special habitats selected for emphasis in planning and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the population of other species with similar habitat needs that they may represent.

The Coconino National Forest Land and Resource Management Plan, as amended, identifies 17 Management Indicator Species. Three of these represent habitats within the project area., mule deer, pronghorn antelope, and juniper titmouse.

Mule Deer (MIS)

Affected Environment

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 are browsers and prefer herbaceous, green shoots and fruits of shrubs and trees, and also also feeds on forbs and grasses. Habitat for mule deer occurs though out the project area. Treatments in units 5-14 and 18-22 will specifically benefit mule deer. Of the 1434 acres in these units, up to 715 acres will be treated. Treatments are tailored to increase growth of browse and forbs.

A declining population trend has been observed on the Coconino National Forest over the period of 1985-2001. In good years, fawn production has been at levels minimal to sustaining populations, but in poor precipitation and forage years, fawn production has not kept up with mortality rates. This general trend has also been seen in game management unit (GMU) 6A, which contains the project area.

Vegetation components are analyzed in addressing habitat condition and 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 an herbaceous understory and vegetative ground cover has resulted in accelerated sheet and rill erosion.

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.

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.

Environmental Consequences
The no action alternative will result in no change to the forest wide trend for mule deer. Alternatives B and C will treat up to 715 acres of mule deer habitat to enhance forage production and will have a positive result for the species. Because of the interspersing of cover with the areas of forage enhancement, the actual acreage of habitat affected will be considerably more. Therefore alternatives B and C will contribute to the forest-wide goal of an increasing trend for mule deer on the Coconino National Forest.

Antelope (MIS)

Affected Environment
Pronghorn antelope are a management indicator species for early and late seral grassland type in the Coconino National Forest Plan. A number of factors have been identified that affect pronghorn including severe weather, amount and timing of precipitation, long-term climatic trends, habitat fragmentation, diet overlap with other grazers, reductions in fawn hiding cover, woody vegetation encroachment, fences, human disturbance and development, water availability, predators, parasites and diseases, and nutritional concerns. Antelope occur on Cedar Flats but mostly north of the project area. Antelope habitat is the emphasis in treatment areas 15-17.

On the Coconino National Forest current grassland condition trends vary greatly, with an overall trend since completion of the Forest Plan in 1987 of stable to declining. Cool season grasses and species diversity have increased. Tree encroachment, increasing canopy cover, fire suppression, long-term climatic changes, short-term drought, and ungulate grazing are mainly responsible for declining trends. These same factors are present within the project area and the adjacent antelope habitat to the north.

Although absolute population numbers of antelope are too variable and do not give a true account of population trend, the fawn-doe ratios and number of sightings of antelope in regular surveys indicate a slow decline in population throughout the majority of the Coconino National Forest suitable habitat, including GMU 6A. In particular, fawn-doe ratios below the break-even point of 20-35 fawns per 100 does is a concern because of its influence on long term productivity of a population and its ability to maintain itself.

Environmental Consequences
The no action alternative will have no impact on the forest-wide trend for antelope. Implementation of either action alternative would remove encroaching juniper trees in the grassland ecosystem, improving habitat for pronghorn. Up to 310 acres of antelope habitat will be enhanced, ultimately expanding suitable habitat further south on Cedar Flat. Therefore, the proposed project is anticipated to have a positive affect on antelope that exist on Cedar Flat and will therefore contribute to the goal of increasing the trend for antelope on the Coconino National Forest. When combined with the planned maintenance treatment on a much larger area on the adjacent Walker Basin Allotment the

cumulative effect will be a very positive increase in area of contiguous antelope habitat with visual security, i.e., vision unrestricted by vegetation over 24 inches in height.

Juniper Titmouse (MIS)

Affected Environment

Juniper titmice are indicators for late seral pinyon-juniper, particularly the snag component. They are year round residents of Arizona and are obligate inhabitants of pinyon-juniper woodlands. Juniper titmouse breeding bird density has been documented to decrease with increased tree density, increasing total bird densities, increasing proportion of junipers in a stand, and increasing canopy cover. Habitat for the juniper titmouse occurs throughout the project area.

The age class distribution of pinyon-juniper has been relatively stable throughout the plan implementation period. Some change in pinyon-juniper has probably been from tree growth and increased density or infill, although tree growth is relatively slow, so change has not been great since signing of the Forest Plan. The vigor of understory components decreases as density increases. Some encroachment and re-growth of pinyon-juniper has occurred into grasslands/pushes. Within the pinyon-juniper matrix, older pinyon pine trees are dying out in many areas due to drought conditions and resulting insect outbreaks. This has been observed in much of the project area.

The Forest-wide trend for the juniper titmouse is stable to slightly decreasing. Analysis done at the time of the original Forest Plan, predicted slight declines in habitat capability for the Juniper titmouse as a result of implementing the Plan. This was the only MIS where trends were predicted to decrease. Old age classes of pinyon-juniper were expected to decrease as treatments were implemented to increase the amount of early successional habitat.

Environmental Consequences

The no action alternative will not affect the current forest-wide trend for juniper titmice. Because either of the action alternatives will result in the modification (reduction) of juniper over 1,493 acres, either of the action alternatives will contribute to the forest-wide trend for juniper titmice. However, the treatments planned are not aimed at the late seral stage of pinyon-juniper but rather the early and mid stages.

Herbicides in the Environment

The effect of herbicide application of triclopyr within the 80 acres of Treatment Area 2 in Alternative B has been specifically discussed for soil, water, vegetation, and wildlife. There is an additional area of analysis which is risk of human exposure. Effect of herbicides is discussed in the Wildlife Specialist Report and in the Herbicide Application Analysis. In addition the specific discussion of triclopyr and its characteristics, applications and risks in the recent three forest Noxious Invasive Weeds EIS (USDA 2005) is adopted and incorporated by reference, including discussion of cumulative effects.

Affected Environment

Currently there are no herbicides in use within the project area. Individuals who work or recreate within the project area may or may not have contact with herbicides in other locations, e.g., their yard and/or garden.

Environmental Consequences

Alternative A, No Action – The project area would have no herbicide application and there would be no human exposure to herbicides as a result of it.

Alternative B – The primary risk of exposure is to workers doing the handling and application of the herbicide. Following the required Best Management Practices, including wearing of Personal Protective Equipment (PPE), will minimize potential for exposure. Risk analyses and actual studies have found that dermal contact is the most likely route of exposure. Because of application by the cut stump method, rather than spraying, potential exposure by dermal contact is much less than in studies that have been used to evaluate risks. Risk characterization developed from exposures via spray application, show that workers would have exposures less than the acute (one day) and chronic (many day) levels of concern. The chronic level of concern is 1/20 of the one day level. Only a few days of exposure are expected.

Adjutants and surfactants are commonly used with herbicides to aid in application. One of the inert ingredients accompanying the active ingredient triclopyr is kerosene. The risk assessment (USDA 2003) states that "*the acute lethal potency of kerosene is approximately 16 times less than the acute lethal potency of triclopyr*." In regard to inhalation of kerosene while applying triclopyr via backpack sprayer the report says that "*plausible levels of exposure to kerosene during applications of Garlon 4 are approximately 30,000-100,000 below the NOEL* [no observed effect level] *for kerosene in experimental mammals.*." (USDA 2003, page 3-13).

Alternative C – There would be no herbicide application.

The risk of public exposure is very low. One of the Best Management Practices to be implemented is signing the treatment area to prevent public entry, including pets, during and immediately following the actual treatment. There are no roads within it and the season of treatment is not a time when there is normally significant recreation use within the area. Exposure would require dermal contact with treated cut stumps or clothing contact with dermal transfer. The small diameter would preclude attempting to sit or stand upon the stumps and the sharp edges of the cut stumps would discourage contact. No identifiable effect is expected.

Cultural Resources

The National Historic Preservation Act, the Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act, and the National Environmental Policy Act require that the effects of any federal undertaking on cultural resources be examined. In addition, National Forest Service management policies and cultural resource management guidelines call for the consideration of cultural resources in planning proposals. Significant cultural resources exit within the project area and adjacent areas and could be affected by the alternatives. Therefore, analysis was performed for archaeological resources, ethnographic resources, and cultural landscape resources, including historic sites and structures**.**

Archaeological Resources

The methodology for assessing impacts to historic resources is based on the procedures outlined for cultural resources. This methodology includes: 1) establishing an Area of Potential Effect; 2) assessing the background information regarding historic properties within this area and conducting any necessary surveys, inventories, and resource evaluations; 3) comparing the location of the impact area with that of resources listed, eligible , or potentially eligible for listing in the National Register of Historic Places; 4) identifying the extent and type of effects; 5) assessing those effects according to procedures established in the Advisory Council on Historic Preservation's regulations; and 6) considering ways to avoid, reduce, or mitigate adverse effects.

Archaeological resources are typically considered eligible for inclusion in the Nation Register of Historic Places under criterion d of 36 Code of Federal Regulations Part 60, for the information they have or may be likely to yield. Any change in the physical attributes of an archaeological site is considered irreparable, adverse, and permanent. Adverse impacts to archaeological resources most often occur as a result of earthmoving activities within an archaeological site, soil compaction or increased erosion, unauthorized surface collection, or vandalism. Beneficial impacts to archaeological resources can occur when ongoing impacts, which would otherwise continue to degrade archaeological resources, are reduced or arrested due to changes in visitor use patterns or management practices in the vicinity of archaeological resources. Direct impacts can occur as a result of grading, trenching, or other activities that damage the structure of an archaeological site. Indirect impacts can occur as a result of increasing visitor or management actions in the vicinity of an archaeological site, leading to such occurrences as artifact collection, accelerated soil compaction, or erosion.

The intensity of impact to an archaeological resource would depend on the potential of the resource to yield important information, as well as the extent of the physical disturbance or degradation. For example, major earthmoving at an archaeological site with low data potential might result in a minor adverse impact. Negligible impacts would be barely perceptible and not measurable and would usually be confined to archaeological sites with low data potential. Minor impacts would be perceptible and measurable and would remain localized and confined to archaeological sites with low to moderate data potential. Moderate impacts would be sufficient to cause noticeable change and would generally involve one or more archaeological sites with moderate to

high data potential. Major impacts would result in substantial and highly noticeable changes involving archaeological sites with high data potential.

For archaeological resources, mitigation includes avoiding sites through project design or recovering information that makes the sites eligible for inclusion in the National Register of Historic Places.

Affected Environment

There are 149 previously identified archaeological sites that are located within the 1,545 acre Area of Potential Effect (APE)/project area. The site types include: agricultural sites, artifact scatters, bedrock milling stations, cavates, one cliff dwelling, historic erosion control structures, historic foundations, field houses, lithic scatters, pit houses, pueblos, a quarry, rock art, roasting pit, and a prehistoric wall. A project clearance document will be in place to insure that the as yet unsurveyed treatment areas within the APE will be surveyed by Cultural Resource Specialists prior to implementation and all archaeological sites flagged for avoidance. Additional sites are expected to be located during the upcoming archeological surveys of the portions of the project area that have yet to be surveyed.

Environmental Consequences

Alternative A (No Action) - Under Alternative A, no specific actions would be taken to change the existing conditions. Under this alternative, no effect is anticipated at any of the sites listed above, or any of the sites that may be located, as the existing conditions and settings would not change. Some sites would continue to experience negligible to minor impacts as a result of the further degradation of the herbaceous ground cover and continued erosion and compaction or deflation where the ground cover has been completely lost, and by continued use by recreationists and herbivorous animals. The evidence of thousands of years of human occupation would be unaffected. Overall, Alternative A would result in local, long-term, negligible to minor, adverse impact to archaeological resources.

Summary of Alternative A Impacts. There would be no change in the treatment and management of archaeological resources as a result of Alternative A. The impaired or unsatisfactory soil and watershed conditions would continue and could have a long-term adverse effect on archaeological resources within the proposed project area. Any site-specific planning and compliance actions would be performed in accordance with stipulations in the forest's Programmatic Agreement. Overall, Alternative A would result in local, long-term, negligible to minor, adverse impact to archaeological resources. Cumulative impacts to archaeological resources are based on analysis of past, present, and reasonably foreseeable future actions in the project areas, in combination with potential effects of this alternative. Some sites would continue to experience impacts as a result of the ongoing degradation of the herbaceous ground cover and continued erosion and compaction or deflation where the ground cover has been completely lost, and by continued use by recreationists and herbivorous animals. The impaired or unsatisfactory soil and watershed conditions would continue and could have a long-term negligible to minor adverse effect on archaeological resources within the proposed project area.

Alternative B (Proposed Action) - Under Alternative B, the M-Diamond Ranch and Forest Service propose to implement a group of erosion control and wildlife habitat improvements within the Buckhorn Allotment. Each of the 22 treatment areas will receive one or several of the above treatments as specifically described in Chapter 2. All archaeological sites will be flagged by cultural resource specialists and avoided during project implementation by any mechanical treatments. Cultural resource specialists will periodically monitor any activities within archaeological site boundaries. There may be some hand thinning of brush on selected archaeological sites to remove heavy slash and debris that would put the archeological site at higher risk during wildfires, but no mechanical equipment will be allowed and nothing will dragged away, any large slash would be carried away from the site. No seeding with other than herbaceous plants will be allowed.

Seeding of herbaceous plants (grasses and forbs) will take place with no soil preparation on archaeological sites which will reduce the efficacy of the seeding but will allow for some minor improvement in soil stabilization. There may be beneficial effects to proposed treatments of the area, a reduction in erosion and stabilization of the soils on the sites with the increase in ground cover.

Burning of slash piles would take place outside the site boundaries of any archaeological site. All slash will be hand carried from archaeological sites to the pile areas for burning.

Channel stabilization treatments will not take place within any archaeological sites. It is expected that reduction in water velocity and headcutting will protect archaeological sites both upstream and downstream from the proposed treatments by reducing the possibilities of channel related erosion if the soil and watershed impairments continue.

Since no ground disturbing activities will be allowed within or immediately adjacent to any archaeological sites, there should be No Adverse Effect to cultural resources.

Ground disturbing activities would not be allowed on any archaeological sites. Any thinning or seeding activities on select archaeological sites would be done by hand and monitored by a Cultural Resource Monitor. The impaired or unsatisfactory soil and watershed conditions would improve and could have a long-term beneficial effect on archaeological resources within the proposed project area. Any site-specific planning and compliance actions would be performed in accordance with stipulations in the forest's Programmatic Agreement. Overall, Alternative B would result in local, long-term, negligible to minor, beneficial impacts to archaeological resources.

The cumulative effects of the proposed project activities will result in an increase in grazing area for both domestic and wild herbivores and a reduction in both sheet and channel erosion. The overall effect of treatment should result in a reduction in erosion across treatment areas resulting in less erosion on the individual archaeological sites. Alternative B would result in local, long-term, negligible to minor, beneficial impacts to archaeological resources.

Alternative C - Alternative C is identical to Alternative B with the exception of removal of the herbicide Treatment proposed for Treatment Area 2 from the selection of treatment options. The effects on archaeological resources are similar to Alternative B in that it would result in local, long-term, negligible to minor, beneficial impacts to archaeological resources.

Because it is not anticipated that this alternative would lead to disturbance of archaeological resources, the cumulative impact analysis for archaeological resources in Alternative C is the same as described under Alternative B. See the discussion of cumulative impacts under Alternative B.

Recreation

Affected Environment

Dispersed recreation use within the project area includes camping, hunting, hiking, horseback riding, firewood gathering, searching for shed elk and deer antlers, some off-road vehicle travel, and driving for pleasure. There are no developed recreation sites within the area. The trailhead for Trail 17, which enters the West Clear Creek Wilderness, is near Treatment Area 9 and is accessed by a primitive road. There is an increasing trend of motorized recreation as the population of the Verde Valley increases and more visitors from the metropolitan Phoenix area use the area. On the adjacent Walker Basin Allotment off road vehicle use has greatly increased in the last few years and increases have been observed in the project area, especially in Treatment Areas 3 and 2. Some personal use fuelwood harvest has recently occurred in Treatment Area 1.

Environmental Consequences

Alternative A, No Action – The existing dispersed recreation would continue to increase with increased population pressures. Off road vehicle (ORV) use is expected to expand, especially in Treatment Areas 2 and 3, until the multi-Forest Off Road Vehicle management plan (ORV Plan) is completed and implemented. Currently in draft form, this would restrict ORV use to designated routes or areas. The current proposal does not include routes or designated open areas in these two Treatment Areas.

Alternative B – ORV use in Treatment Areas 1-4 would be restricted upon implementation of the project. This would include physical barriers at strategic locations to prevent unauthorized ORV access. Restrictions would occur earlier than expected under the multi-Forest ORV Plan. The lop and scatter of pinyon and juniper would result in scattered branches and small tree skeletons across the treatment areas that would persist for several years. Eventually these tree remnants would break down and organify into the soil and/or be hidden from view by grasses, other herbaceous plants, and shrubs, depending on the specific sites and treatment emphasis.

Alternative C – Similar to Alternative B. In addition Treatment Area 2 would be signed to restrict entry during and immediately following the application of herbicide to mesquite cut stumps. Expected restricted entry is one week or less. This Treatment Area contains no roads and does not commonly receive recreation use during the late summer season when the treatment will occur.

Range Management

Affected Environment

The project is located within portions of 7 of the approximately 20 pastures within the Buckhorn Range Allotment. These are the Wickiup and Winter Pastures below the Mogollon Rim and the Boulder, Bald Hill, Indian Flat, Painted Tank, and Buckhorn Pastures above the Rim. It is managed under a deferred rotation system. The majority of the pastures are used each year and a few are rested for an entire year. For calendar year 2005 the grazing schedule includes approximately 35 percent of the total use within these seven pastures, almost half of that is within the large and productive Buckhorn Pasture. By contrast the small Wickiup, Indian Flat and Painted Tank Pastures each constitute between 2 and 4 percent of the year's grazing. The large Winter Pasture is scheduled for about 8 percent. Neither the Boulder nor Bald Hill Pastures are scheduled for grazing during 2005; however, both were grazed in 2004, providing about 3 and 14 percent, respectively, of that year's grazing. For approximately half of the year the small bull herd is grazed separately from the main cow herd, necessitating use of a different pasture. Some grazing occurs on the Ranch's headquarters private land.

Environmental Consequences

Alternative A, No Action – Under this alternative the existing deferred rotation system would continue. Each pasture would be grazed with monitoring by the Ranch and Forest Service personnel to assure meeting the specified allowable use percentage.

Alternative B – Areas seeded in Treatment Areas 1-4 would require exclusion from livestock grazing until vegetation is well established and monitoring determines that a specified amount of grazing may occur. Treatment Areas 1 and 2 are within the Wickiup Pasture and constitute a major portion of its capacity. This pasture would be expected to be rested from grazing for 2-3 years, with the possibility that it could be longer if drought conditions resume. Areas 3 and 4 are within the Winter Pasture. The seeded portion of Area 3 will be protected by construction of a fence to exclude it from grazing during recovery. Area 4 includes the small "Wickiup Trap" pasture which has frequently been used as a horse pasture. This will be rested during recovery. Although the Wickiup Pasture and the portions of the Winter Pasture which will be protected from grazing during recovery make up a relatively small portion of the allotment grazing capacity, it may be necessary for the Ranch to reduce the amount of livestock grazing on National Forest during the winter seasons through the recovery period, particularly if drought conditions as experienced in recent years recur.

Treatment Areas 13-15 within the Indian Flat Pasture will require protection from livestock until seeding is successful. This pasture is used twice yearly in moving cattle between winter and summer grazing. During the one to two seasons expected for recovery livestock will need to be herded through the pasture to avoid the newly seeded areas.

Over the mid to longer term, range condition is expected to improve as a result of the treatments, especially in areas 1-4.

Alternative C – Similar to Alternative B, except that improvement of range condition in Treatment Area 2 will be less.

Environmental Justice

The Forest Service looked at the social, economic, and environmental impacts of this project and determined that none of the alternatives considered in this analysis would have a disproportionate impact on any minority population in the immediate area, within the surrounding counties or in the Northern Arizona region. This includes any effects on dispersed recreation.

Costs

The direct costs budgeted for the project are approximately $365 thousand. Of that amount approximately $224 thousand is a 319(h) grant from the Arizona Department of Environmental Quality, and grants from the Habitat Partnership program of the Arizona Game and Fish Department comprise about $59 thousand. The Ranch is responsible for the majority of the remaining $82 thousand. The University of Arizona Cooperative Extension Service and School of Natural Resources both are providing support in terms of technical and professional services.

Following the implementation of the project the Ranch will have significant costs for subsequent monitoring. In addition they may have costs for purchase of forage during periods when treated areas are being excluded from grazing and other forage is not available within the range allotment.