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Environmental Assessment for Windmill West Allotment

Coconino National Forest

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Chapter 1 – Purpose and Need

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- **Introduction:** The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- **Comparison of Alternatives, including the Proposed Action:** This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- **Environmental Consequences:** This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- **Agencies and Persons Consulted:** This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental assessment.

This EA is a summary document containing the relevant conclusions the Responsible Official needs in order to make an informed decision. Supporting documentation (maps, data, detailed specialist reports, etc.) is on file in a project record at the Flagstaff Ranger District in Flagstaff, Arizona. This EA includes summarized information based on analyses from specialist reports from each resource. These reports are available upon request in the project record. In some situations, the EA presents the information in a slightly different manner. In these situations, the EA was the instrument used to inform the decision-making process. Specialist reports are still important reference sources for more detailed information on affected environment, methodology, and analysis that was not included in this document. This is based on the Council for Environmental Quality's NEPA regulations (Section 1508.9), which identifies and Environmental Assessment as a "concise public document" to include "brief discussions" of the proposal, alternatives, environmental impacts of the alternatives, and a listing of agencies and persons consulted.

Upon completion of that decision document, if grazing is to continue, a new Term Grazing Permit (TGP), valid for 10 years, would be issued to reflect that decision. A new Allotment Management Plan (AMP) would then be developed for the Windmill West Allotment. The TGP, along with the AMP are the documents which implement the selected alternative. Then, every year, Annual Operating Instructions (AOIs) would be developed with the permittee, outlining the specific instructions for livestock grazing and allotment operation for that particular year, based current

and expected forage and range conditions as determined through allotment inspections and monitoring. AOIs may be modified throughout the grazing season based on variables including precipitation and climate, forage growth, and unexpected events such as wildfire.

Background

The Windmill West Allotment is located on the Flagstaff and Red Rock Ranger Districts of the Coconino National Forest (sometimes abbreviated as COF), and is administered and managed by the Flagstaff Ranger District. The allotment is generally located west of Flagstaff and Sedona, and is roughly bounded by Highway 89A to the east, the Coconino National Forest Boundary to the west, the city of Cottonwood to the south, and Woody and Mooney Mountains to the north (Figure 1). The Windmill West allotment and the Windmill allotment to the east used to be managed as one allotment but were split in 2009 because of changes in ranch operations.

Elevations range from approximately 3,300 feet to 7,500 feet and vegetation adheres to typical elevation regimes: ponderosa pine, mountain meadows and mixed conifer forests are present in the higher elevations (also referred to as the summer range); pinyon/juniper woodlands and chaparral dominate the mid-elevations; and semi desert grasslands and desert scrub are typical at the lower elevations (also referred to as the winter range).

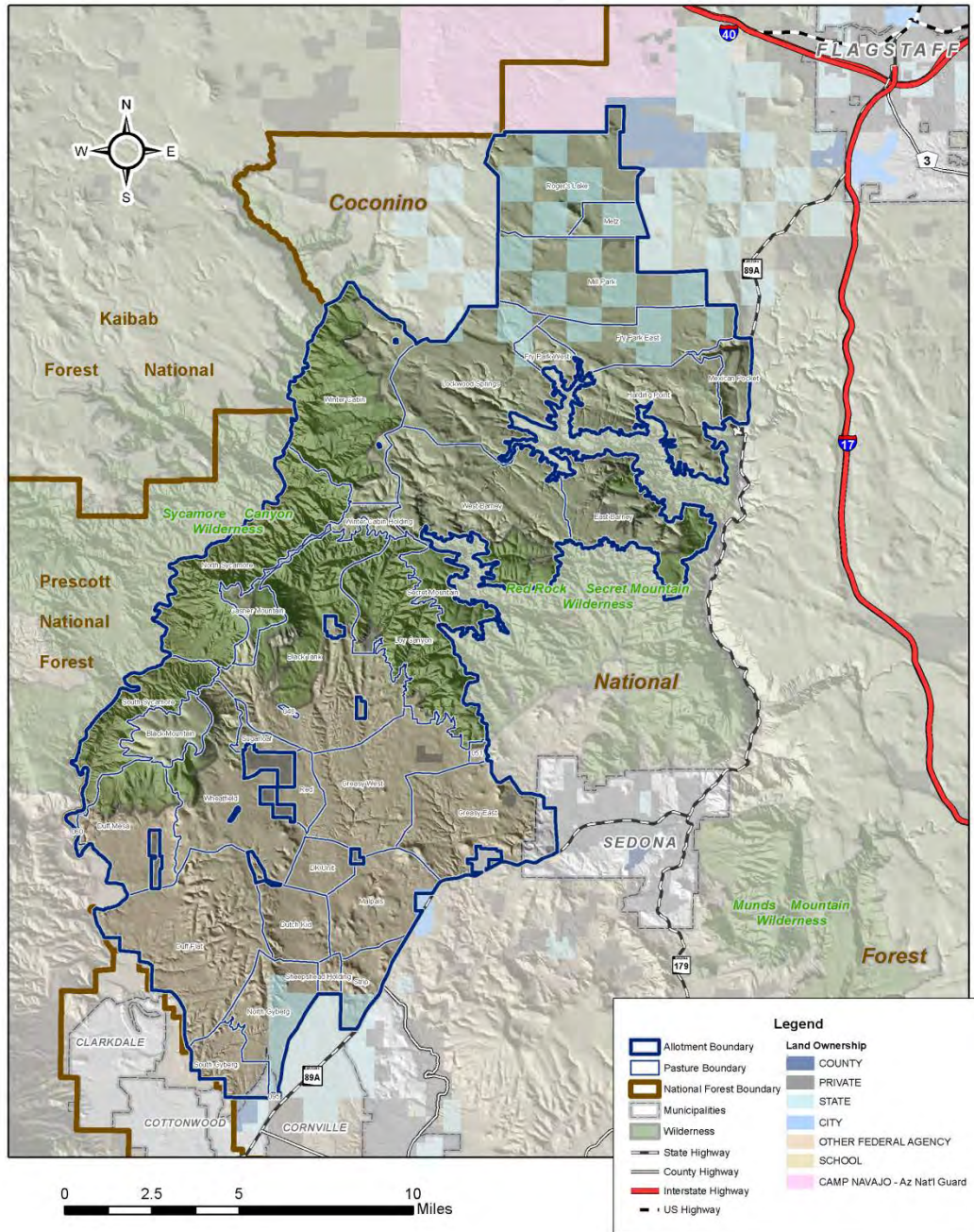
Much of the analysis in this document extends beyond the project area to take into account and disclose the effects of the alternatives to watershed areas outside the allotment, interconnected upland and riparian areas that function together as an ecological unit, wildlife habitat outside of the allotment that is important to species that occur within the allotment, and surrounding areas that are culturally and economically affected by activities that occur within the allotment. Land ownership within the Windmill West Allotment includes Forest Service, Arizona State Trust land, and private land. The Forest Service only has management jurisdiction over Forest Service acreage, the remaining acreage is managed by either the Arizona State Land Department or private land owners. Therefore, while the allotment is approximately 156,000 acres in size, the Forest Service manages about 142,000 acres with the remaining 14,000 acres managed by either the Arizona State Land Department or private land owners. Of the 142,000 acres managed by the Forest Service, approximately 34,600 acres have not been actively grazed in the past ten years.

Grazing Management and History

The allotment is divided into two distinct ranges along the elevation break: the summer range (above the Mogollon Rim) and the winter range (below the Mogollon Rim) The allotment is further divided into 34 main grazing pastures, and contains several small livestock management pastures and water lots that are less than 100 acres in size.

The current season of use is yearlong, with roughly seven months spent in the winter range and five months spent in the summer range. Current permitted livestock numbers are 565 head of adult cattle or 6,780 Animal Unit Months (AUMs). Grazing intensity levels (the amount of herbage removed or trampled during the grazing season) are managed at the light to moderate level (21 to 50 percent) for both the summer range and the winter range. Utilization levels, measured at the end of the growing season, are managed at the conservative level (35 percent) for herbaceous and non-riparian woody vegetation in the summer range and at the moderate level (50 percent) for herbaceous and non-riparian woody vegetation in the winter range.

Figure 1: Vicinity Map of the Windmill West Allotment on the Coconino National Forest



Current grazing management for Windmill West allotment uses a deferred/rest rotation schedule. For the summer range, at least two pastures are rested each season. Pastures in the winter range may or may not be rested; this decision is based on stocking levels, forage production and plant

dormancy during winter. The number of planned days each pasture is grazed varies due to current year's stocking rate, existing and predicted forage production, and past year's utilization. The actual number of days each pasture is grazed is dependent on stocking rate, forage production and grazing intensity. Due to plant dormancy during winter and persistent snow above the rim, pastures grazed during winter months typically have a longer graze period than pastures grazed during summer months.

Livestock grazing has occurred in the area since the late 1870s. Permitting began around 1908, following the establishment of the National Forests. No specific documentation is available regarding the type and number of livestock grazed in the early years on the Windmill West Allotment. However, the grazing history on the Coconino National Forest indicates that stocking rates have decreased over the decades to a fraction of previous levels once managed. For example, head months of cattle, horses and sheep on the Coconino National Forest changed from 539,000 head months in 1910 to 99,028 head months in 2000 (USDA Forest Service 2001).

Historic grazing practices have resulted in changes to the land, which are still apparent on the landscape today. Highly saturating the landscape with livestock in the late 1800's and early 1900's accelerated processes of hill-slope erosion and may have contributed to or caused expansion of woody species into areas dominated by desert grasslands (Davis and Turner 1986). Over several decades grazing at unsustainable levels has been clearly shown to decrease the abundance of plant species, increase canopy cover of woody species in some environments, reduce the amount of herbaceous cover, decrease riparian cover, decrease the abundance of small mammals and bird species, and degrade aquatic habitats and reduce the abundance and diversity of species that depend on them (Bock et al. 1984, Fleischner 1994, Krueper 1996, Belsky 1999).

Encroachment by pinyon and juniper vegetation in areas that were previously grassland dominated and an increase in tree density in pinyon and juniper woodlands linked to the exclusion of fire have been observed in the allotment. As a result, overstory of these species has increased and herbaceous ground cover has decreased (See Rangeland Resources and Fuels and Fire for more information). This both decreases the amount of grassland cover and increases areas with bare soil, which affects soil condition by making areas more susceptible to erosion.

Actual use on the Windmill West Allotment over the past twelve years has been more variable from year-to-year in the winter pastures than in the summer pastures. In the summer pastures, actual use averaged 81.1 percent of permitted numbers with a range from 1,785 to 2,842 AUMs from 2000 to 2012. In winter pastures, actual use averaged 78.7 percent of permitted numbers with a range from 2,307 to 4,056 AUMs from 2000 to 2012. Reductions in stocking level during this period were primarily in response to operational requirements and dry years. Changes in authorized numbers were the result of different factors, including, drought and other environmental conditions and/or permittee convenience or business practices.

Forest Plan Capacity

Full Capacity lands is defined as "Lands that are presently stable because effective ground cover is holding soil loss to an acceptable level and are, therefore, suited for grazing and can support a livestock operation" in the Forest Plan (page 260). Determining factors in the Forest Plan definition are "effective ground cover" and "holding soil loss to an acceptable level." The district range specialist and hydrologist determined that areas on less than 40 % slopes with satisfactory or impaired soil conditions would meet the definition of holding soil loss to acceptable levels.

Soils classified as satisfactory or impaired¹ condition generally do not experience accelerated erosion.

Impaired soils were considered in the determination of capacity because these areas generally do not experience accelerated erosion and most of them were evaluated as satisfactory soil conditions in the 1995 TES. Other impaired soils were reclassified based on field assessments that reflect current conditions within the TEU.

Utilizing the criteria identified above for determining effective ground cover and an acceptable level of soil loss, there are 89,885 acres of Full Capacity lands on the Windmill West Allotment.

The Forest Plan Compliance Supplement for Windmill West Allotment EA document provides greater detail on how lands that meet the Forest Plan definition of Full Capacity were used as a basis for project-level analysis. It also documents how relevant standards and guidelines from the Forest Plan are addressed in the alternatives. This document is located in the project record, and is also posted on the project website. Hard copies are available upon request from the Flagstaff Ranger District office.

Project-level Rangeland Capability and Capacity

The grazing capability of a land area is dependent upon the interrelationship of the soils, topography, plants (including forage production) and animals. It is a qualitative expression of the ability of an area to support grazing on a sustained basis. Grazing capability is expressed as one of three capability classes (see Glossary

for definitions): Full Capability, Potential Capability, and No Capability (Region 3 Rangeland Analysis and Management Training Guide; July, 1999; 2.8-2.10). Capability classes are assigned based on soil condition rather than stability because of updated direction in the 2013 Region 3 Rangeland Analysis and Management Training Guide. The new training guide was finalized in November 2013; several months after the determination of capability and the estimate of grazing capacity were completed for the allotment. The interdisciplinary team used draft versions of the guide and communicated with regional office staff to incorporate the best available science into the process for this project.

Some lands designated as “Full Capacity” at the Forest Plan level were assigned “potential capability” or “no capability” within the project level evaluation when their specific attributes were evaluated in detail. No value for estimating grazing capacity was given to “no capability” areas or “potential capability” areas with unsatisfactory soils. This approach results in fewer acres being assigned capacity than what is estimated in the Forest plan and is more conservative than the programmatic level decision; therefore this estimate of project-level capacity is in compliance with the Forest Plan. See the Rangeland Resources affected environment in chapter 3 for more information on grazing capability.

¹ In the TES manual (Miller et al. 1995), there was no impaired soil condition class; all soils were classified as unsuited, unsatisfactory or satisfactory based on USLE soil loss estimates. The 1999 Soil Condition Rating Guide included an “impaired” category. The Soil Scientist for the Coconino NF re-classified satisfactory soils as impaired based on field evidence of hydrologic functioning and nutrient cycling.

Project-level estimates of capacity is the total number of livestock and/or wildlife which may be sustained on a management unit, and is defined in the Coconino National Forest Land Management Plan (Forest Plan), 1987 as amended as the maximum level at which animals can graze an area without damage to the vegetation or related uses (Forest Plan, pg. 245). Estimated grazing capacity is expressed in Animal Unit Months (AUMs). An AUM is defined as the amount of forage required by an animal unit (mature cow with or without a nursing calf) for one month; approximately 800 pounds of forage per AUM (Manske 1998). Estimated grazing capacity is used to support the proposed permitted numbers.

Existing Conditions

This section provides a brief summary of the descriptions of the Affected Environment found in Chapter 3 of this document. The information in this section is intended to provide enough background to enhance the reader's comprehension of the alternatives and issues described in Chapter 2 and is not a complete assessment of these resources.

Climate

Climate on the Windmill West Allotment is characterized by a bimodal precipitation pattern with about 60 percent of precipitation occurring as frontal systems in the winter from December to March and about 40 percent occurring as monsoons in the summer from July to September. The summer period (July-September) is characterized by localized high intensity, short duration thunderstorms. The winter period (December-March) is characterized by frontal activity resulting in widespread gentle rains in the lower elevations and snow in the higher elevations.

Climate conditions are a major contributing factor affecting range condition and trend in the southwestern United States. Large year-to-year differences in rainfall and forage production are characteristic of southwestern ranges (Martin 1974). Climate model projections for the southwest United States predict average temperatures will continue to rise as will the potential for an increase in the frequency of extreme heat events (Crimmins et al. 2007). Regional models have shown temperatures increasing from 2 to 20 degrees on average over the next 50 years (Smith 2010 and TACCIMO 2012). Changes in precipitation are less predictable, with some models calling for increases of 5 percent and other models calling for decreases of varying degree from 3 to 40 percent over the next 50 years (Smith 2010 and TACCIMO 2012). Other models suggest that an average annual precipitation in the Southwest will likely decrease 6 to 12 percent by 2100 (USDA Forest Service 2012a).

Fire frequency and severity will likely increase if temperatures rise and precipitation decrease (USDA Forest Service 2010). The resulting changes in vegetation cover and soil characteristics can dramatically increase flooding and mass wasting, with severe impacts to downstream infrastructure and aquatic ecosystems (Furniss et al. 2010). Consequently, these extremes may pose additional risk to vegetation and soil productivity from decreased cover that may result in higher risk of accelerated erosion and sediment delivery. Therefore, it is critical to reduce overall soil disturbance by implementing appropriate resource protection measures including soil and aquatic BMPs.

Changes in climate may affect the vitality and productivity of rangeland plants, and thus the overall conditions of both wildlife habitat and ecosystem conditions (USDA Forest Service 2010). Increased temperatures combined with decreased precipitation would lead to lower plant productivity and cover, which in turn would decrease litter cover. The reduction in plant and litter

cover would make the soils more susceptible to wind and water erosion. Drought will likely increase and the increase will likely intensify as temperature increases (USDA Forest Service 2012a). Climate change will likely increase the establishment of invasive plants in the U.S. Forests (USDA Forest Service 2012a).

Timing of moisture can lead to shifts in dominance from warm to cool season plant species or vice-versa (Conley 1999). Past changes in species composition have occurred due to changes in the amount and timing of moisture. From the early 1900s to the 1950s, cool season grasses increased with the increase in winter and spring moisture. Since the 1990s, warm season grasses have increased with the decrease in winter moisture and increase in summer moisture (Ruyle 2003). Currently we are observing a shift to warm season species dominance in many areas of northern Arizona as a result of lower winter moisture and higher summer moisture. Therefore, vegetative ground cover has shifted to be a greater percentage warm season grasses, as species such as blue grama have increased. Shifts in forage productivity and the presence of exotic plant species in grasslands will likely affect forage quality and fire frequency (USDA Forest Service 2010).

Coupled with changing forage conditions, there may be a general scarcity of water for cattle (USDA Forest Service 2010). Water supplies are projected to become increasingly scarce and seasonal as snowmelt occurs earlier in the year. The Colorado River, Rio Grande, and several other southwestern rivers have stream flows that appear to be peaking earlier in the year, suggesting that the spring temperatures in these regions are warmer than in the past, causing snow to melt earlier. Some of the most notable observed effect of climate change occur in the Western United States and include an increase in the size and intensity of forest fires, bark beetle outbreaks killing trees over enormous areas, accelerated tree mortality from drought, and earlier snowmelt and runoff (USDA Forest Service 2012a).

Regional trend and projections of changing climatic conditions for the West include lower precipitation in Arizona. More frequent rain on snow flooding in some areas, decreased soil productivity, reduced vegetative cover and a highly variable climate with exceptionally wet and dry periods (USDA Forest Service 2010).

Rangeland Resources

The ability of rangelands to produce adequate forage for livestock and wildlife, while maintaining soil productivity, is the main focus of assessing rangeland resource conditions. Wildlife grazing, shrub and tree encroachment, and climatic fluctuations also influence the amount of vegetative ground cover present on a given site and therefore its ability to sustain satisfactory soil and rangeland conditions.

Pinyon and/or juniper encroachment of western U.S. rangelands has been identified as one of the most extensive changes currently occurring in this vegetative community (Davenport, et.al., 1998). These changes have been observed in the winter range of the Windmill West Allotment. Under some conditions, pinyon and/or juniper encroachment has been accompanied by loss of herbaceous ground cover and subsequent accelerated erosion within the inter-canopy areas (Davenport, et.al., 1998). Studies conducted by Huber, et.al. (1999) suggest that understory productivity rapidly declines when pinyon-juniper crown cover exceeds 20 percent to 30 percent. Observations made by resource specialists on the Coconino National Forest and on the Windmill West Allotment affirm this understory response to pinyon- juniper canopy encroachment (Steinke 2012).

Montane meadows and riparian areas above the Mogollon Rim often experience high utilization by wild ungulates. Arizona Game and Fish Department estimates the elk herd utilizing the Windmill West allotment is approximately 900 animals (Leudecker 2013). Wildlife grazing on lands within the project area create localized impacts of seasonal reductions in plant height and canopy cover.

Watershed and Water Resources

All pastures associated with the allotment are within the Upper Verde River sub-basin (4th code watershed) drained by the Verde River. Watersheds (5th code watersheds) which contain pastures that are proposed for continued livestock grazing within the Windmill West allotment include Oak Creek, Sycamore Creek, Grindstone Wash-Verde River, and Cherry Creek-Verde River. Four of the sub-watersheds (those drainage basins nested within 5th code watersheds) are classified as functioning properly, seven as functioning at risk, and two as impaired.

Dry Creek is the only stream course within the analysis area for which attainment of water quality standards has been assessed. However, ADEQ determined that there are insufficient samples or core parameters to assess any designated use for this stream course.

The analysis area is upstream or is connected by tributaries to Spring Creek, Verde River located to the southwest of the analysis area, Sycamore Creek located to the west of the analysis area, and Oak Creek, including the West Fork of Oak Creek Canyon. The only current water quality issue in these stream courses is elevated *E. coli* levels in Spring Creek and Oak Creek.

Soils

Soils within the summer range portion of the analysis area occur within the ponderosa pine vegetation community and are generally satisfactory owing to high amounts of effective vegetative ground cover (litter and herbaceous plants); however, reduced nutrient cycling may be occurring where ponderosa pine densities exceeding historic densities limit herbaceous cover. Soils classified as impaired or unsatisfactory are generally found within Terrestrial Ecosystem Survey (TES) map units (also called TEUs) 50 and 55 corresponding to montane meadows, the soils of which have been observed to exhibit compaction and reduced nutrient cycling (Steinke 2012).

Within the winter range portion of the analysis area, soil conditions classified as unsatisfactory are generally located within the semi-desert grassland vegetation community. Impaired soil conditions are generally found within semi-desert grasslands, desert communities and pinyon-juniper woodlands where indicators of hydrologic functioning and nutrient cycling suggest that, although soil productivity is being maintained, improvements to soil structure and plant species diversity could occur. In many areas classified as having impaired or unsatisfactory soil conditions, the presence of a large amount of surface rock fragments are likely to be preventing accelerated erosion. Surface rock fragments can protect the soil from raindrop impact and prevent the development of surface crusts that impede water infiltration thereby reducing soil erosion (Weltz et.al. 1998).

Wetlands, Springs and Riparian Vegetation

Roger's Lake and Fry Lake are the only wetlands identified within the analysis area. These wetlands are seasonal wetlands that mainly support herbaceous plants with no woody riparian species present or considered to be part of their natural plant community. Roger's Lake occupies

approximately 1,200 acres with roughly 80 acres on NFS lands. The remainder of the wetland is owned by the County and private landowners. Fry Lake is seasonally-flooded wetland created or modified by a human-made barrier or dam which obstructs the inflow or outflow of water.

There are 14 formally named springs appearing on USGS quadrangle maps and one informally named spring (Rattlesnake Spring), for a total of 15 springs identified within the analysis area. Several of these springs are not persistent and were observed to lack surface flow and associated riparian and/or wetland habitat as noted during field visits conducted in 2012 and 2013. Several other springs are inaccessible to livestock due to steep topography (i.e., Maple, Buzzard, and Bunker Hill Springs) or are located in pastures that are not currently being grazed by livestock and are being proposed for removal from the grazing allotment. As a result, Lockwood and Rattlesnake are the only springs that could be affected by the alternatives considered in this analysis.

There are 11 identified riparian reaches within the allotment. Within a typical riparian reach, woody riparian plant species are present but the density and diversity of such vegetation is limited by the short duration of surface flow. One of these reaches is Functional-At-Risk, one is unknown, one is not rated and 4 are in Proper Functioning Condition. Several stream reaches identified as riparian in the COF riparian geodatabase were not included because they did not meet the Forest Service definition of riparian area or because they are inaccessible to cattle.

Wildlife, Aquatic and Botanical Resources

The Windmill West Allotment includes occupied or potential habitat for a large number of wildlife, fish, and plant species including 12 species listed or proposed for listing under the Endangered Species Act of 1973 (ESA). Arizona cliffrose, an endangered species, and Mexican spotted owl, a threatened species, are the only listed species known to occur on the allotment. In areas adjacent to the allotment, the remaining 10 species (2 bird, 2 gartersnake, and 6 fish species) are known to occur or suitable habitat exists adjacent to the allotment.

Forest Service sensitive plant species found in the allotment are Arizona bugbane, Flagstaff pennyroyal, Tonto Basin agave, Phillip's agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn's sage.

The allotment includes all or portions of 22 Mexican spotted owl protected activity centers (PAC) in both forested and canyon habitats. Additionally, the allotment contains approximately 36,616 acres of designated as Mexican spotted owl critical habitat. All PACs and acres of critical habitat are located on the summer range.

The Windmill West Allotment provides suitable habitat for some species on the U.S. Forest Service Region 3 sensitive wildlife species list and species identified as management indicator species (MIS) in the Forest Plan. On the summer range, this includes northern goshawks, wild turkey, and Navajo Mogollon vole while the winter range has suitable habitat for golden eagles, yellow-breasted chat, and Lucy's warbler. Species known to occur on both the summer and winter range include pronghorn, elk, bald eagle, American peregrine falcons, and several bat species.

Aquatic habitats accessible to livestock on the allotment are limited to earthen stock ponds, two springs, two seasonal wetlands, and a handful of intermittent and ephemeral creeks. These habitats have the potential to support northern leopard frog on the summer range and lowland leopard frog on the winter range. The lack of perennial streams on the allotment precludes the 10

remaining species protected under ESA from occurring in the analysis area. These species have been documented or have the potential to exist in the Verde River and its tributaries including Oak, Spring, Sycamore, and West Fork of Oak Creeks, immediately adjacent to the Windmill West Allotment.

Desired Conditions

The need for a change in management was identified by comparing specific descriptions of what is desired across the landscape to what currently exists. Desired conditions are the on-the-ground resource conditions management is working towards achieving. The Coconino Land and Resource Management Plan (hereafter referred to as the “Forest Plan”) sets forth in detail the direction for managing the land and resources of the forest. The desired conditions for the project are based on Forest Plan objectives, goals, standards and guidelines (1987, as amended). Desired conditions can also be derived from agency range management policy, shared interagency resource goals, and direction relevant to wildlife, water quality, and cultural resource laws and regulations.

The Forest Plan also includes specific language to manage grazing to limit impacts to threatened and endangered species, soil condition, riparian areas, and other resources. There are many factors that may affect resource conditions. Livestock grazing is but one of many activities that occur on the allotment. However, since this analysis is specific to livestock grazing, it discusses the management of livestock in response to those resources and how livestock grazing may or may not be used to address resource desired conditions. Other forest uses that affect other forest resources are taken into consideration and discussed in the cumulative effects sections in this EA.

The desired conditions in Table 1 are primarily based on Forest Plan direction (See Chapter 1 of the Forest Plan Compliance Supplement for Windmill West Allotment EA, for full list of Forest Plan management direction), which incorporates law and regulation and often provides more specific direction for livestock grazing and resource protection. Table 2, which located after Table 1, provides more detailed desired conditions for rangeland resources and soil condition.

Table 1: General Desired Conditions for the Windmill West Grazing Allotment

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
Upland vegetation and rangeland	Forest Plan, p. 67	“Permitted use and capacities are maintained in balance for the allotments by increasing or decreasing numbers of livestock, by changing the management intensity levels, and by initiating changes in livestock class, season of use, and rotation patterns.”	There is a desired condition to maintain or improve vegetative and forage condition over the long-term through monitoring and adaptive management techniques.

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
Upland vegetation and rangeland	Forest Plan, p. 67	“Do production and utilization surveys at least every 9 to 13 years for capacity determinations.”	
	Forest Plan, p. 68	“Manage grazing use to maintain or enhance condition classes of full capacity rangelands.”	
Soil Conditions	Forest Plan, p. 23,	“Maintain or, where needed, enhance soil productivity and watershed condition.”	There is a desired condition to maintain satisfactory soil conditions and improve unsatisfactory and impaired soil conditions so that they meet or move towards satisfactory conditions using appropriate range management techniques. Vegetative ground cover meets or exceeds tolerable vegetation cover (as displayed in table 2), where it is possible to do so, in order to maintain or improve soil productivity.
	Forest Plan, p. 68	“Full capacity rangeland in unsatisfactory condition that has potential for improvement is treated through appropriate structural and nonstructural range improvements and pasture stocking rate adjustments as described in the AMP'S”	
	Forest Plan, p. 74	“Implement resource improvement projects that are cost-effective and/or are beneficial for maintaining and improving water quality, quantity, and soil productivity.”	There is a desired condition to improve resource conditions by implementing activities that improve water quality, quantity, and soil productivity.
Watershed Condition and Water Quality	Forest Plan, p. 23,	“Maintain or, where needed, enhance soil productivity and watershed condition.”	There is a desired condition for water quality in perennial streams to meet or exceed Arizona Clean Water Act standards and support identified designated beneficial uses and native aquatic species. There is a desired condition to

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
<p>Watershed Condition and Water Quality</p>	<p>Forest Plan, p. 71</p>	<p>“Ensure compliance with PL 92-500 ‘Federal Water Pollution Control Act’ and Arizona Water Quality Standards through the implementation of Best Management Practices (BMP) to prevent water quality degradation.”</p>	<p>improve water quality in those areas that are currently not meeting Arizona state water quality standards.</p>
	<p>Forest Plan, p. 74</p>	<p>“Implement resource improvement projects that are cost-effective and/or are beneficial for maintaining and improving water quality, quantity, and soil productivity.”</p>	
<p>Riparian Condition</p>	<p>Forest Plan, p. 69 and 174</p>	<p>“Establish woody riparian vegetation as defined in FSH 2509.23 in wet meadows and other riparian areas. Control livestock grazing through management and/or fencing to establish vegetation and eliminate overuse.”</p> <p>Maintain at least 80 percent of the potential overstory crown coverage.</p> <p>Maintain at least three age classes of woody riparian species, with at least 10 percent of the woody plant cover in sprouts, seedlings, and saplings.</p> <p>Maintain at least 80 percent of the potential shrub cover in high elevation areas.</p> <p>Maintain at least 80 percent of the potential emergent vegetation cover from May 1 to July 15 in key wetlands.</p>	<p>There is a desired condition to move riparian areas, to proper functioning condition or make improvements toward proper functioning condition where not currently properly functioning. Possible management tools such as adaptive management and exclosure fencing may be used to help riparian areas move towards proper functioning condition.</p>

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
Wildlife	Forest Plan, p. 66-1	“Forage use by grazing ungulates will be maintained at or above a condition which assures recovery and continued existence of threatened and endangered species.”	There is a desired condition to support the recovery of endangered and threatened species by maintaining or improving vegetative conditions in riparian and upland areas.
	Forest Plan, p. 65-5	” Implement forest plan forage utilization standards and guidelines to maintain owl prey availability, maintain potential for beneficial fire while inhibiting potential destructive fire, maintain and restore riparian ecosystems, and promote development of owl habitat. Strive to attain good to excellent range conditions.”	There is a desired condition to manage forage to increase threatened and endangered species and MIS, where appropriate.
	Forest Plan, p. 66	“Manage forage to increase threatened and endangered species and management indicator species (MIS) where it is determined appropriate through the IRM and NEPA process.”	
	Forest Plan, p. 64-1	“Evaluate potential resource impacts on T&E and sensitive species habitat by projects and activities through a biological assessment (FSM 2670) and conduct appropriate consultation (FSM 2670) when necessary. Provide appropriate protection or enhancement.”	

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
Fisheries and Aquatic Resources	Forest Plan, p. 115-1	“River characteristics necessary to support the existing classifications of Wild or Scenic shall be protected during all management activities (47 CFR 173, 9/82) (PL 90-542, Section 2(b)(1 and 2)).”	There is a desired condition to protect aquatic habitat and native fish species from sediment derived from accelerated erosion on lands within the Windmill West allotment and are tributary to the Verde River and Oak Creek.
Economic and Social Values	Forest Service Manual 2203.1; 36 CFR 222.2(c)	“Where consistent with other multiple use goals and objectives, there is congressional intent to allow grazing on suitable lands”	There is a desired condition to continue to facilitate livestock grazing on National Forest System lands where livestock grazing is managed to maintain or improve range conditions over the long-term.
	Forest Service Manual 2202.1	“It is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing, consistent with land management plans. It is also Forest Service policy to continue contributions to the economic and social well-being of people by providing opportunities for economic diversity and promoting stability for communities that depend on range resources for their livelihood.”	There is a desired condition to contribute to the economic and social well-being of communities that depend on range resources.
Cultural and Historic Values	Forest Plan, p. 49	“Ground disturbing projects receive cultural resources clearance. This includes projects proposed in areas that have been previously cleared for other projects. Projects, not areas, receive clearance. Projects receive clearance without additional archaeological field work whenever sufficient prior field work has been done to clear the project.”	There is a desired condition to avoid all impacts to cultural and historic resources.

Resource	Relevant source	Specific Management Direction or resource goal/objective	Desired Conditions
Cultural and Historic Values	Forest Plan, p. 50	“Cultural resource sites are located and protected from project activities according to direction in FSM 2360...”	
Invasive Species	Forest Plan, p. 23	“Prevent any new noxious or invasive weed species from becoming established, contain or control the spread of known weed species, and eradicate species that are the most invasive and pose the greatest threat to the biological diversity and watershed condition.”	There is a desired condition to prevent new invasive species from becoming established and remove invasive species that cause the greatest effect to Forest resources.

Desired conditions can also be evaluated by comparing current conditions to potential plant community data from the Terrestrial Ecosystem Survey (TES) and considering what conditions could be achievable in a 10 year timeframe. The terrestrial ecosystem units (TEUs) in Table 2 account for approximately 96,348 acres (89 percent of the proposed allotment size) within the allotment. All 1,957 acres of the South Gyberg Pasture in alternative 3 are accounted for in Table 2. Desired conditions are based on a range of species richness, vegetative cover, species composition, and soil conditions. For more detailed description of existing, desired and potential conditions by TEU, see Appendix 4.

TEU-specific desired conditions were not developed for those TEUs of which the majority are over 40 percent slope, whose acreages do not meet key area requirements (See Glossary

), and where there is no existing condition data which could be compared to potential TEU parameters for the development desired conditions. For these portions of the allotment, only the allotment-wide desired conditions in Table 1 above apply.

Table 2: Desired Conditions for Major TEU Groupings in Windmill West Allotment

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
55	Mountain grasslands located on valley plains on the northern region of the Windmill West allotment with a slope of 0-5 percent. Typical grass species include blue grama, carex, Arizona fescue, mountain muhly, spike muhly.	5-10 species 39-73 percent canopy cover cool season species composition 40-60 percent warm season species composition 40-60 percent	7-16 species 15-30 percent canopy cover	0-1 species <0.5 percent canopy cover	0-1 species <0.5 percent canopy cover	Vegetative ground cover ² greater than or equal to 20 percent

² Effective ground cover for existing conditions is the sum of litter >0.5” in depth and vegetation basal area. Effective ground cover for desired conditions is greater than or equal to the tolerable vegetation cover (Tol.) found in table three of TES for each TEU group. Tolerance soil loss rate is the rate of soil loss that can occur while sustaining inherent site productivity. The Tol. value listed in table three of TES indicates the percentage of effective ground cover necessary to meet the tolerance soil loss rate.

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
381, 385	Verde Valley desert communities located on valley plains on the southern region of the Windmill West Allotment with a slope of 0-10 percent. Typical grass species include aristida, black grama and needle-and-thread. There are approximately 9,400 acres in these aggregated TES units.	3-10 species 5-30 percent canopy cover Cool season species composition 5-35 percent Warm season species composition 65-90 percent	2-10 species 1-2 percent canopy cover	10-14 species 9-16 percent canopy cover	0-1 species 0-1 percent canopy cover	Vegetative ground cover greater than or equal to 10 percent
402, 403, 404	Verde Valley desert communities located on valley plains and in wilderness areas on the southern region of the Windmill West allotment with a slope of 0-20 percent. Typical grass species include tobosa, blue grama and side oats grama. There are approximately 8,000 acres in these aggregated TES units.	4-10 species 15-35 percent canopy cover Cool season species composition 5-15 percent Warm season species composition 60-75 percent	5-10 species 2-7 percent canopy cover	3-12 species 1-10 percent canopy cover	0-2 species 0-8 percent canopy cover	Vegetative ground cover greater than or equal to 15 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
414, 417	Verde Valley desert communities located on valley plains and in wilderness areas on the southern region of the Windmill West Allotment with a slope of 0-5 percent. Typical grass species include tobosa, blue grama and aristida. There are approximately 5,750 acres in these aggregated TES units.	5-10 species 2-20 percent canopy cover Cool season species composition 5-33 percent Warm season species composition 65-90 percent	5-9 species 5-20 percent canopy cover	8-15 species 10-20 percent canopy cover	0-2 species 0-7 percent canopy cover	Vegetative ground cover greater than or equal to 15 percent
418	Verde Valley desert communities located on valley plains and in wilderness areas on the southern region of the Windmill West allotment with a slope of 15-20 percent. Typical grass species include needle and thread, black grama and squirrel tail. There are approximately 5,030 acres in these aggregated TES units.	7-11 species 7-23 percent canopy cover Cool season species composition 14-25 percent Warm season species composition 65-85 percent	5-6 species 1-3 percent canopy cover	7-14 species 16-28 percent canopy cover	1-2 species 5-7 percent canopy cover	Vegetative ground cover greater than or equal to 25 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
457, 458	Verde Valley desert communities located on valley plains on the southern region of the Windmill West Allotment with a slope of 0-30 percent, Some acreage is located in wilderness areas. Typical grass species include side oats grama, black grama and tobosa. There are approximately 17,400 acres in these aggregated TES units.	2-8 species 8-17 percent canopy cover Cool season species composition 2-20 percent Warm season species composition 75-90 percent	2-5 species 1-7 percent canopy cover	7-10 species 10-18 percent canopy cover	2-4 species 9-15 percent canopy cover	Vegetative ground cover greater than or equal to 15 percent
447	Verde Valley desert communities located on valley plains on the southern region of the Windmill West allotment with a slope of 0-10 percent. Typical grass species include side oats grama, blue grama and needle and thread. There are approximately 1,900 acres in this TES unit.	3-10 species 10-23 percent canopy cover Cool season species composition 25-33 percent Warm season species composition 66-75 percent	5-7 species 1-2 percent canopy cover	2-10 species 5-10 percent canopy cover	0-2 species 0-10 percent canopy cover	Vegetative ground cover greater than or equal to 10 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
536, 546, 549	Ponderosa pine and mixed conifer communities located on elevated plains and hills and in wilderness areas on the northern region of the Windmill West Allotment with a slope of 0-30 percent. Typical grass species include Arizona fescue, muttongrass, mountain muhly. There are approximately 14,200 acres in these aggregated TES units.	4-12 species 4-32 percent canopy cover Cool season species composition 36-75 percent Warm season species composition 25-50 percent	3-13 species 1-11 percent canopy cover	1-3 species <0.5-1 percent canopy cover	1-2 species 5-50 percent canopy cover	Vegetative ground cover greater than or equal to 30 percent
550, 582, 584, 585	Ponderosa pine and mixed conifer communities located on elevated plains and hills and in wilderness areas on the northern region of the Windmill West allotment with a slope of 0-55 percent.	7-10 species 7-28 percent canopy cover Cool season species composition 50-80 percent Warm season species composition 20-50 percent	4-10 species 1-11 percent canopy cover	1-3 species <0.5-3 percent canopy cover	1-3 species 22-55 percent canopy cover	Vegetative ground cover greater than or equal to 30 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
572	Ponderosa pine and mixed conifer communities located on elevated plains and hills and in wilderness areas on the northern region of the Windmill West Allotment with a slope of 0-10 percent. Typical grass species includes Arizona fescue, muttongrass, mountain muhly. There are approximately 1,430 acres in these aggregated TES units; 1,400 acres on slopes less than 40 percent and 30 acres on slopes greater than 40 percent.	6-10 species 8-15 percent c. cover Cool season species composition 30-45 percent Warm season species composition 50-66 percent	5-9 species 1-5 percent canopy cover	1-4 species <0.5-5 percent canopy cover	2-4 species 21-30 percent canopy cover	Vegetative ground cover greater than or equal to 10 percent
586	Ponderosa pine and mixed conifer communities located on elevated plains and hills and in wilderness areas on the northern region of the Windmill West Allotment with a slope of 0-30 percent.	4-11 species 12-24 percent c. cover Cool season species composition 56-64 percent Warm season species composition 36-44 percent	8-15 species 9-15 percent c. cover	1-3 species <0.5-3 percent c. cover	1-3 species 20-50 percent c. cover	Vegetative ground cover greater than or equal to 10 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
567, 578, 579	Ponderosa pine and mixed conifer communities located on elevated plains and hills and in wilderness areas on the northern region of the Windmill West Allotment with a slope of 0-10 percent. Typical grass species include Arizona fescue, muttongrass, and mountain muhly. There are approximately 3,700 acres in these aggregated TES units.	6 species 14-86 percent canopy cover Cool season species composition 50 percent Warm season species composition 50 percent	2-8 species 1-4 percent canopy cover	1-5 species <0.5-5 percent canopy cover	3-4 species 10-54 percent canopy cover	Vegetative ground cover greater than or equal to 30 percent
350	Desert shrubland located on hills/escarpments on the southern region of the Windmill West Allotment with a slope of 35-40 percent. Typical grass species includes three awn, black grama and stipa comata. There are approximately 5,000 acres in this TEU; 4,200 acres on slopes less than 40 percent and 800 acres	4-10 species 15-24 percent canopy cover Cool season species composition 10-25 percent Warm season species composition 67-80 percent	4-8 species 1-3 percent canopy cover	9-12 species 14-19 percent canopy cover	1-2 species 2-25 percent canopy cover	Vegetative ground cover greater than or equal to 25 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
	on slopes greater than 40 percent.					
420,430	Desert shrubland located on hills on the southern region of the Windmill West Allotment with a slope of 20-25 percent. Typical grass species includes side oats grama, black grama and bottlebrush squirreltail. There are approximately 5,000 acres in this TEU; 4,000 acres on slopes less than 40 percent and 1,000 acres on slopes greater than 40 percent.	3-8 species 4-26 percent canopy cover Cool season species composition 5-25 percent Warm season species composition 75-95 percent	4-8 species 0.5-2 percent canopy cover	6-10 species 6-17 percent canopy cover	1-2 species 5-10 percent canopy cover	Vegetative ground cover greater than or equal to 30 percent
462, 463, 495	Desert shrubland located on hills/scarps on the southern region of the Windmill West Allotment with a slope of 20-25 percent. Typical grass species includes side oats grama, blue grama and bottlebrush squirreltail. There are approximately 3,100 acres in this TEU; 3,000	4-10 species 4-17 percent canopy cover Cool season species composition 20-30 percent Warm season species composition 70-80 percent	4-8 species <0.5-1 percent canopy cover	5-10 species 11-18 percent canopy cover	1-3 species 13-30 percent canopy cover	Vegetative ground cover greater than or equal to 20 percent

TEU	Description	Grasses	Forbs	Shrubs	Trees	Soil (Ground Cover %)
	acres on slopes less than 40 percent and 100 acres on slopes greater than 40 percent.					

Purpose and Need for Action

The Windmill West Allotment is scheduled for an environmental analysis of grazing use on the Coconino National Forest, as required by the Rescissions Act (1995). This analysis is required in order to ensure that livestock grazing is consistent with goals, objectives and the standards and guidelines of the Coconino National Forest Plan (1987 as amended).

The purpose of this project is to authorize livestock grazing in a manner that maintains and/or moves the area toward Forest Plan objectives and desired conditions, including improving vegetation and soil conditions and trends on the allotment.

Proposed Action

The Modified Proposed Action has been developed to meet the project's purpose and need. The original Proposed Action that was included in the scoping letter is an Alternative not Considered in Detail. The modified Proposed Action consists of six components: **authorization, improvements, vegetation treatments, monitoring, adaptive management, and resource protection measures**. The modified proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making). Detailed information on the proposed action is in Chapter 2.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to make the following decisions:

- Would livestock grazing be reauthorized on all, part, or none of the project area?
- What management prescriptions would be applied to ensure that desired condition objectives are met or that movement occurs towards those objectives in an acceptable time frame?
- What types of associated activities (range improvements) would occur?
- What design criteria, mitigation measures, and monitoring would apply to the project?
- Is a more in-depth analysis (Environmental Impact Statement) needed?

Public Involvement

The proposal has been listed in the quarterly published and online versions of the Schedule of Proposed Actions (SOPA) since the fall of 2011. The proposal was provided to the public and other agencies for comment during scoping on December 10, 2012 to over 50 individuals and organizations (see the project record for more details). Six public comments were received and the concerns raised in these comments are summarized under Issues in the following section. In addition, as part of the public involvement process, a 30-day comment period on the proposed action and assessment of effects summarized in this EA is being initiated with a legal notice published in the Arizona Daily Sun.

The permittee was kept informed of the project through regular meetings during the analysis period. Permittee input was used to develop several elements of the modified proposed action alternative and alternative 3.

Issues

An issue is an unresolved conflict related to effects on a physical, biological, social, or economic resource. An issue is not an activity in itself; instead, it is the projected effects of the activity that create the issue. For example, livestock grazing is an activity, but its effects on a resource can form an issue.

Issues were identified from internal and external scoping efforts. Issues are stated to capture concerns or potential impacts expressed in scoping responses and are not conclusions based on the analysis in this document. This analysis identifies key issues, which are those that directly or indirectly caused by implementing the proposed action for which a cause and effect relationship has been identified. Many key issues were addressed by incorporating resource protection measures or other requirements into the modified proposed action in addition to evaluation under each alternative. Other issues are addressed in this EA through the analysis of potential effects of livestock grazing.

1. **Economic Issue:** The proposed action includes the installation of range improvements including fencing, spring protection/restoration activities, and vegetation treatments. The public voiced a concern over the cost to taxpayers, and requested specification on which infrastructure the permittee is obligated to maintain. The Economics Report and the EA will discuss the costs associated with the proposed range improvements as well as maintenance responsibilities.
2. **Climate Change and Drought Management Issue:** The public voiced concern over the effects of climate change and extended drought stress on rangeland resources. The Range Specialist Report and EA will discuss how adaptive management as implemented through the Allotment Management Plan and Annual Operating Instructions takes into account drought and other factors including vegetation regrowth on an annual basis, and will include examples from the history of the allotment to illustrate this.
3. **Forest Plan Consistency Issue:** Multiple comments brought forth concerns over consistency with the Forest Plan. A table detailing how each relevant standard and guideline of the plan is address can be found in Chapter 1 of the Forest Plan Compliance Supplement for Windmill West Allotment EA. Chapter 2 of that document and the Range Specialist Report will disclose information on factors considered in assigning “no capability,” “potential capability,” and “full capability” within the allotment.
4. **Riparian Areas Issue:** The allotment contains several natural springs and earthen stock ponds; however there are no perennial streams. Impacts to riparian areas are a concern of both the interdisciplinary team (IDT) and the public; the Soil and Water report and EA will include a discussion of the location and impacts to riparian areas.
5. **Cumulative Effects Issue:** The public is concerned about the cumulative effects of the proposed action combined with motorized recreational use, forest vegetation management projects and other activities on soils, hydrology, and wildlife. The EA, Appendix C and specialist reports will include these activities in their effects analysis.
6. **Arizona Cliffrose Issue:** The Arizona cliffrose, an endangered species, is present on the Windmill West Allotment within the South Gyberg and North Gyberg Pastures. The proposed action states that North Gyberg would be grazed following the Arizona

Cliffrose Recovery Plan; and that South Gyberg would remain closed to grazing³. Also, the permittee requested that an alternative be developed that would allow grazing in South Gyberg (under the Recovery Plan) in the same way that North Gyberg would be open to grazing. The IDT will analyze an alternative that reflects this (see Alternatives section below), and the Botany Specialist Report and EA will discuss hybrids and the Recovery Plan.

7. Wetlands Issue: Arizona Game and Fish Department requested inclusion of Fry Lake in the analysis as there is wetland vegetation present. Based on a field visit and information in the National Wetlands Inventory, Fry Lake has been included in the wetlands description for the allotment, and relevant adaptive management has been incorporated into the modified proposed action. The Department expressed some confusion based on the content in the proposed action on the location and accessibility of Buzzard Spring, the proposed fencing by Paterson Springs/Rogers Lake, and actions proposed at Lockwood Springs. The EA will include clarification on these topics.

In addition, the Department requested that the IDT evaluate an existing soil stabilization fence at Big Draw Tank in the Lockwood Spring Pasture to determine if it is still needed, and if so, whether to include in the proposed action. This issue is outside the scope of reauthorizing grazing on the Windmill West allotment and will be considered for a separate decision at a later time.

8. Vegetation Treatment Issue: The Arizona Game and Fish Department voiced concern over whether the proposed method of lopping and scattering pinyon-juniper would inhibit movement of some species of wildlife. The Wildlife Specialist Report and EA will include a discussion of slash height and wildlife movement to address this concern.
9. Heritage: The Hopi Tribe identified the protection of heritage resources as an issue for this project. The Heritage report and process of consulting with the State Historic Preservation Office and American Indian tribes will address this issue.

³ The permittee voiced a concern over whether the Arizona cliffrose within the allotment is actually a pure variety, or if it is a hybrid; however, hybrids are also protected under the Recovery Plan. Therefore this concern did not rise to the level of an issue.

Chapter 2 - Alternatives

This chapter describes and compares the alternatives considered for the Windmill West Allotment project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (e.g., fence construction) and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

Alternatives Considered in Detail

Alternative 1: No Action

A no action alternative is required by NEPA to be developed as a benchmark against which the agency can evaluate the proposed action. No action in livestock management planning equates to no permitted livestock grazing (FSH 2209.13, Ch. 90). This is because no action would be taken to renew the Term Grazing Permit (TGP). The TGP would be cancelled and livestock grazing would no longer be authorized. Livestock would be removed, existing structural range improvements would not be maintained and no new range improvements would be implemented, including vegetation treatments, fence construction, and spring restoration activities.

Selection of this alternative would not mean that livestock grazing could not be authorized on this allotment sometime in the future. The allotment and pasture fences and all other structural range improvements would remain in place. A separate analysis and coordination with adjacent permittees and other agencies would be necessary to determine whether to remove or maintain these improvements.

Alternative 2: The Modified Proposed Action

This section includes technical terminology used in allotment administration and rangeland science. Definitions for these terms can be found the Glossary

.

Summary

Under the modified proposed action, livestock grazing would continue on Windmill West Allotment under deferred rotational grazing systems, which includes conservative forage utilization guidelines. Additionally, there are specific structural rangeland improvements, specific restoration projects, specific vegetation treatments, and specific management alternatives to implement based on adaptive management scenarios. See Table 6 for a summary of the difference between the original Proposed Action and the Modified Proposed Action.

The Forest Service and grazing permittee have used forms of adaptive management over the years, including the adjustment of livestock numbers to address resource needs. This alternative would continue and expand the use of adaptive management by identifying specific scenarios and the possible management responses.

In summer range, the modified proposed action would establish a conservative to moderate grazing intensity (30-50 percent) and a conservative utilization level (30-40 percent forage

utilization as measured after the end of the growing season). In the winter range, the modified proposed action would establish a conservative grazing intensity (30-40 percent) and a conservative utilization level (30-40 percent forage utilization as measured after the end of the growing season).

Annual Operating Instructions (AOIs) would be developed in the early spring for the summer grazing period (generally May to October) and early fall for the winter grazing period (generally November to May), but they could be modified later in the season to respond to environmental changes and/or monitoring results. Depending on weather and snow conditions, the summer and winter grazing periods may vary in length by several weeks.

The modified proposed action consists of six components: authorization, drought management strategy, pastures removed from the allotment, structural range improvements, vegetation treatments, monitoring, adaptive management, and resource protection measures. The proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making).

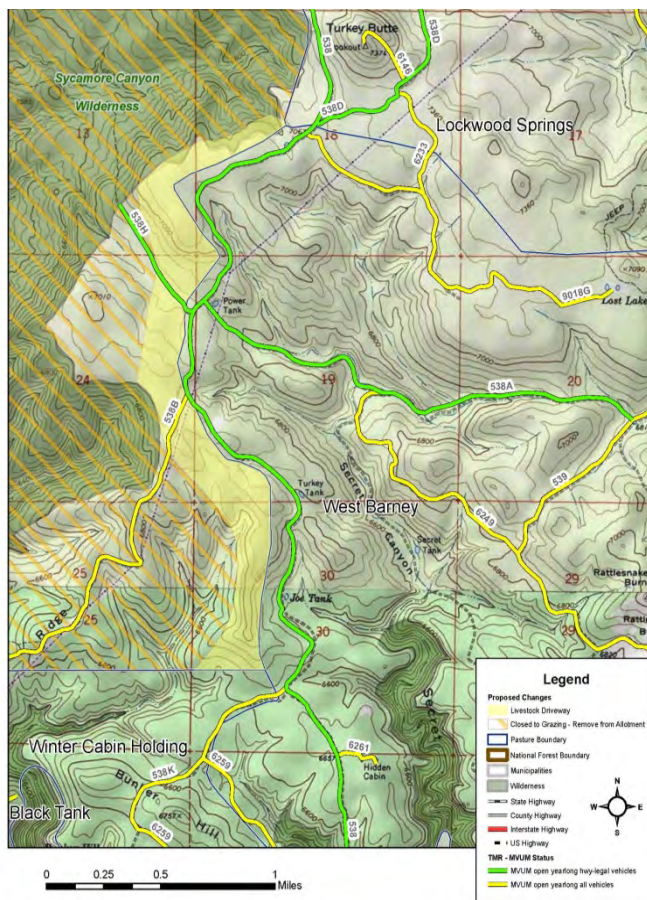
Authorization

The Coconino National Forest proposes to continue to authorize yearlong livestock grazing for the Windmill West Allotment under the following terms:

- **Permitted livestock numbers** in the Term Grazing Permit would be a maximum of 565 head of adult cattle or 6,780 AUMs. This is a conservative stocking rate and is based on existing conditions.
- **Annual authorized livestock numbers** would be based on existing conditions, available water and forage, and predicted forage production for the year. Annual authorized livestock numbers would not exceed permitted numbers and therefore would always be between 0 and 6,780 AUMs. Adjustments to the annual authorized livestock numbers and AUMs (increase or decrease) may occur during the grazing year, based on conditions and/or range inspections.
- **The permitted season of use** would be yearlong.
- **Grazing Management:** Grazing would occur, using deferred rotational management systems, which would allow for plant growth and recovery. Having the option to use either the deferred rotation or deferred rest rotation grazing system would allow the Forest to adjust management depending on monitoring and conditions. Generally pastures would be grazed only once during the grazing year. However, pasture re-entry may be needed to facilitate livestock movement on the allotment. Pastures would be grazed no more than once per year unless authorized by the Responsible Official when conditions warrant. Pasture re-entry would only be authorized if it has been determined through range inspections that soil, water and vegetation conditions are appropriate, and that utilization guidelines for the pasture would not be exceeded as a result of re-entry.
- **Utilization:** A management guideline of conservative use (31-40 percent forage utilization as measured at the end of the growing season) would be employed to maintain or improve rangeland vegetation and long term soil productivity. Within riparian areas, allowable use would not exceed 20 percent on the woody vegetation. Both allowable use and the woody vegetation utilization guidelines take into account the cumulative browsing effects of wildlife and livestock.

- Grazing Intensity:** Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the growing period. Grazing intensity would be managed to allow for the physiological needs of plants. For the summer range, the Forest would manage for conservative to moderate grazing intensity (31-50 percent) in the late spring to early summer months when sufficient opportunity exists for plant regrowth. During the remainder of the summer grazing period, grazing intensity would be managed at conservative levels (31-40 percent) when the potential for plant regrowth is limited. For the winter range, the Forest would manage for conservative grazing intensity (31-40 percent). On both summer and winter ranges, grazing intensity would be managed to allow for the physiological needs of plants.
- Pasture Use Periods:** The length of the grazing period would be approximately 5 to 60 days within each pasture and would be based upon climatic conditions, existing and predicted forage production, pasture size, authorized livestock numbers and the need to provide for plant regrowth following grazing. Other factors that may occasionally affect the grazing period include drought and wildfires. Movement between the summer and winter ranges would also be based on vegetation, climatic conditions, and operational needs of the permittee but would generally be for approximately six months at a time in each range⁴.

Figure 2: Winter Cabin Livestock Driveway



⁴ This would allow the permittee to extend their time in the summer pastures by up to a month, when weather and vegetative conditions allows.

- **Trailing:** Cattle are currently moved between the summer range and winter range via the Historic Mooney Livestock Trail in the Black Tank Pasture (typically for one day). Use of the Mooney Trail would continue as part of this proposed action. The Mooney Trail is about 4.5 miles long, extending from T 19N R 4E Sec 35 on the Flagstaff Ranger District south to T18N R4E Sec 16 on the Red Rock Ranger District and is located on the Casner Mountain and Black Tank Pastures. About ½ mile of the trail on the Red Rock District is located on private land. The Mooney Trail has been used to drive cattle between the summer and winter ranges since the early 1900s. Also, the Winter Cabin Livestock Driveway would be retained as part of the allotment and used to move livestock between Winter Cabin Holding and Lockwood Springs Pastures (Figure 2). Winter Cabin Holding Pasture would not be used as part of the rest-rotation system in the allotment.
- **Grazing Periods:** The AOI would state the planned graze period for each pasture for each grazing year. However, the actual grazing period within each pasture would depend on current growing conditions and the need to provide for plant recovery following grazing. The length of the grazing period within each pasture would also be dictated by the allotment-wide allowable use guidelines.

Drought Management Strategy

Allotment management would be adjusted during drought conditions. Following FSH 2209.13, the Grazing Permit Administration Handbook, the Standardized Precipitation Index (SPI), combined with site-specific information, would be used to assess moisture conditions. Using the SPI as a baseline and combining it with site-specific information from monitoring plots, a determination for drought would be made, and adaptive management alternatives would be evaluated.

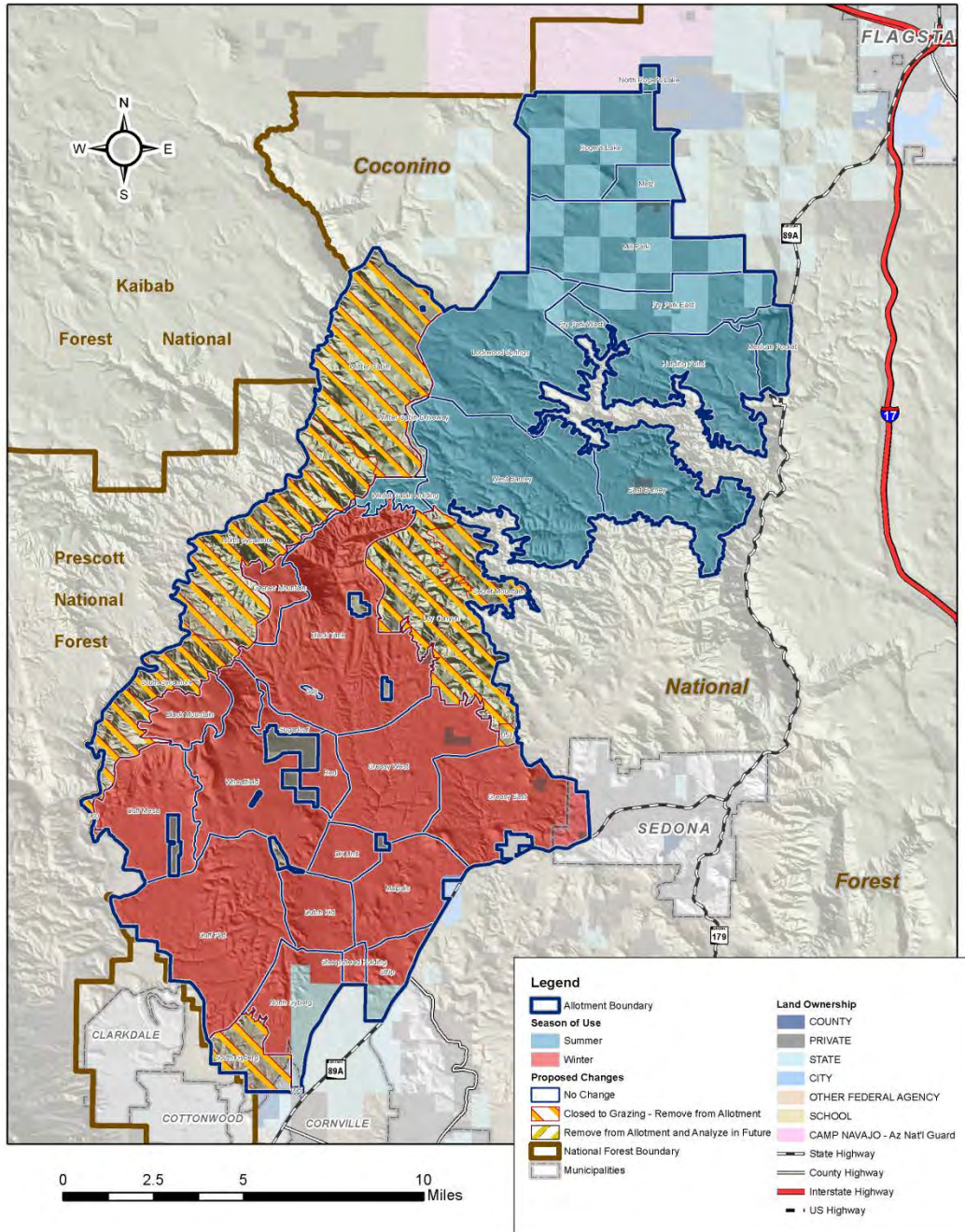
Region 3 and Coconino National Forest drought management policies identify numerous adaptive management actions for mitigating grazing effects during drought. The following management actions would be used on the Windmill West Allotment during periods of drought:

- Stocking levels (livestock numbers) may need to be reduced. Reductions may be necessary prior to the permitted season of use and/or during the permitted season of use.
- Season of use may need to be shortened. Depending on the severity of the drought and the stocking level, a reduced grazing season may be necessary.
- Pasture use periods may need to be shortened. Pastures would not be grazed twice during the same grazing season and this may ultimately result in an early exit from the allotment.
- Pastures may need complete rest from livestock use. How long a pasture, or pastures, would be rested depends on the severity of the drought.
- Utilization and/or grazing intensity levels may need to be reduced. Depending on the severity of the drought and the stocking level, reduced utilization and/or grazing intensity levels would likely result in shortened pasture use periods and may ultimately result in an early exit from the allotment.
- Lack of livestock water, or poor distribution of livestock water, may result in reduced pasture/allotment use periods.
- Livestock use of planned rested pastures due to drought would not be authorized.

Any adaptive management actions necessary due to drought conditions would be made by the Responsible Official in consultation with the range specialist and the permittee.

Pastures Removed from the Allotment

Figure 3: Proposed Pasture Changes for Summer and Winter Ranges



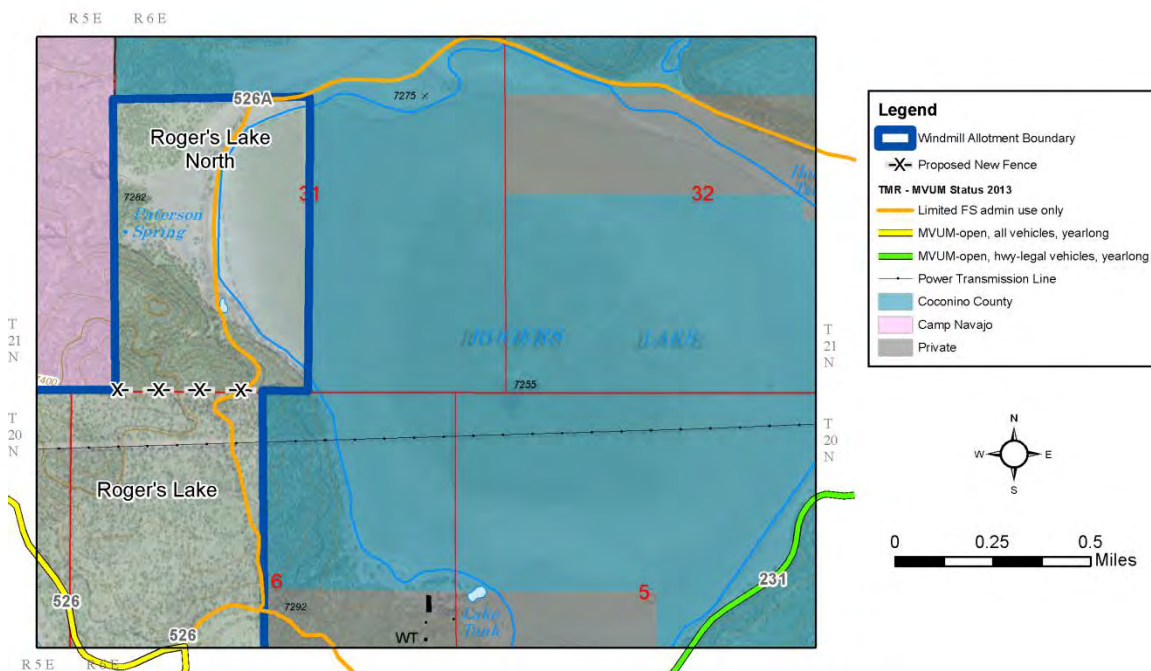
Of the 142,000 acres managed by the Forest Service in the Windmill West Allotment, approximately 34,600 acres have not been actively grazed in the past ten years. Most of this area is proposed to be closed to grazing under this alternative. North Sycamore, South Sycamore, Loy Canyon, Secret Mountain, South Gyberg, #60, #51 and part of the Winter Cabin Pasture would be removed from the Windmill West Allotment and closed to grazing for the following reasons:

- North Sycamore, South Sycamore, Loy Canyon, Secret Mountain, #60, #51 and part of Winter Cabin have not been grazed in the past 10-15 years due in part to how difficult it is to manage livestock in these areas due to terrain and the difficulty in maintain water sources. These pastures would be officially closed to grazing under this proposal. However, a portion of Winter Cabin, approximately 280 acres located on the eastern side of the pasture, would remain in the Windmill West Allotment to continue serving as a livestock drive way between adjacent pastures (Figure 3).
- South Gyberg Pasture would be removed from the Windmill West Allotment and closed to grazing. South Gyberg Pasture has not been grazed in the past 10 years for protection of Arizona cliffrose, an endangered species.

Structural Range Improvements

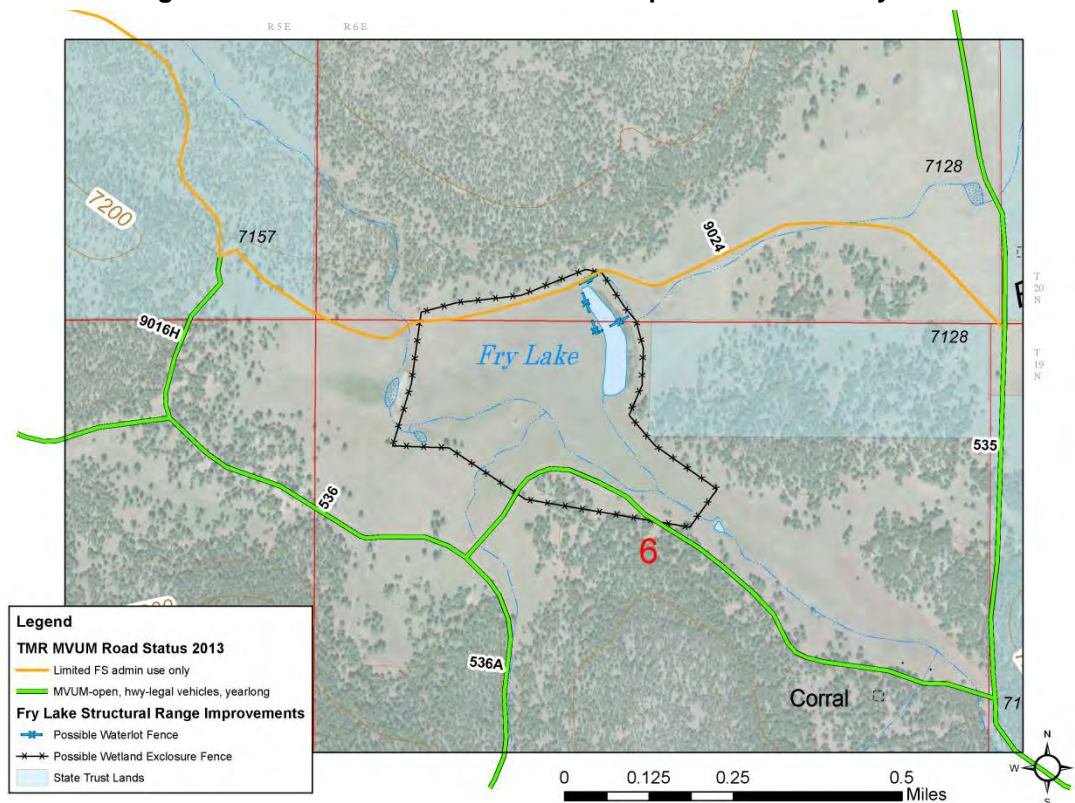
In order to protect the wetland vegetation in Roger’s Lake, about 0.5 mile of fence would be constructed along the section line between sections 31 and 6 in the Roger’s Lake Pasture to create a new pasture, North Roger’s Lake (Figure 4). This fence help would exclude livestock from section 31, when appropriate, while allowing livestock to graze the rest of current Roger’s Lake Pasture. A gate would be constructed along the fence to allow livestock grazing to occur a) after July 15 to protect waterfowl nesting habitat and b) if wildlife utilization of riparian species in Roger’s Lake has not exceeded 20 percent utilization of woody vegetation or 40 percent utilization of other emergent vegetation. The proposed fencing would be constructed to wildlife specifications to facilitate safe wildlife passage.

Figure 4: North Rogers Lake Proposed Pasture Fence



If necessary to protect wetland vegetation in Fry Lake and to permit grazing of the Fry Lake East pasture (Location on Figure 1) prior to July 15, approximately 1.5 miles of livestock enclosure fence may be constructed (Figure 5). The livestock enclosure fence would include a fenced lane to the existing earthen stock pond in Fry Lake to allow for livestock watering. The fenced lane will not include woody riparian vegetation because Fry Lake does not support woody riparian plant species. For the first 2 years, grazing would not occur in the Fry Lake East Pasture until after July 15. Afterwards, as part of the adaptive management options, upland vegetation in Fry Park West, Harding Point, Mexican Pocket, and Mill Park Pastures would be monitored for condition and trend. This monitoring would be used to determine if use of these pastures for multiple years during the same time of the grazing season is resulting in a downward trend in native plant community abundance and diversity in these pastures. If such a trend is found, or if the permittee requests increased flexibility in pasture rotations, the emergent vegetation and surrounding upland buffer would be fenced for Fry Lake.

Figure 5: Potential Wetland Structural Improvements for Fry Lake



Fifteen springs are known to occur on the Windmill West Allotment, nine of which occur on pastures proposed for closure from grazing (Table 3 **Error! Reference source not found.**). Of the remaining springs, Buzzard Spring (Figure 6 **Error! Reference source not found.** on right) and Maple Springs are located in canyons and are generally inaccessible to livestock, and Bunker Hill occurs in the Winter Cabin Holding Pasture, which is only used roughly less than 10 days a year. Barney Spring (Figure 6 on left) and Paterson Spring are currently not functional because of lack of water and so no additional protections are being proposed at this time. In addition, Paterson Spring is located in the North Rogers Lake Pasture which is proposed for infrequent use of livestock for the purpose of maintaining riparian condition and function. Because of the lack of access, water and restriction grazing period, effects to these springs would not be measureable. Restoration activities, including fencing, for Lockwood Spring are proposed to aid in the restoration of riparian vegetation, and to protect the spring and associated riparian areas from domestic livestock and wildlife browsing. Proposed restoration activities include exclosure fencing that would still allow livestock and wildlife access to the existing drinkers but would restrict access to Lockwood Spring, and may also include plumbing the spring box to allow a portion of the water to discharge near the spring’s natural emergence area.

Table 3: Springs located within the Windmill West Analysis Area

Spring Name	USGS Quadrangle Map	Pasture	Proposed Pasture-level Management
Summers Spring	Sycamore Basin	South Sycamore	Close to grazing
Sycamore Spring	Loy Butte	North Sycamore	Close to grazing
Bunker Hill Spring	Loy Butte	Winter Cabin	Allow grazing/ Inaccessible
Maple Spring	Dutton Hill	East Barney	Allow grazing/ Inaccessible
Buzzard Spring	Dutton Hill	East Barney	Allow grazing/ Inaccessible
Winter Cabin Spring	Sycamore Point	Winter Cabin	Close to grazing *
Lockwood Spring	Dutton Hill	Lockwood Springs	Allow grazing
Dorsey Spring	Sycamore Point	Winter Cabin	Close to grazing *
Babes Hole Spring	Sycamore Point	Winter Cabin	Close to grazing *
Kelsey Spring	Sycamore Point	Winter Cabin	Close to grazing *
Geronimo Spring	Sycamore Point	Winter Cabin	Close to grazing *
Black Spring	Flagstaff West	Black Springs	Close to grazing
Paterson Spring	Bellefont	North Roger’s Lake	Allow grazing/No water
Rattlesnake Spring**	Page Springs	South Gyberg	Close to grazing
Barney Spring	Wilson Mountain	East Barney	Allow grazing/No water
<p>*A portion of Winter Cabin Pasture would remain within the allotment to serve as a livestock driveway between adjacent pastures; Only Bunker Hill spring is located within this area.</p> <p>**Unnamed on maps</p>			

Figure 6: Photos of existing conditions at Barney Springs (left) and Buzzard Spring (right)



All range improvements would follow the site-specific Construction Guidelines. The Forest Service uses plan direction, Forest Service Manual 2200 Chapter 2240 and a number of sources to come up with specific guidelines for each project; some of the sources include:

- Sanderson, H. Reed; Quigley, Thomas M.; Swan, Emery E.; Spink, Louis R. 1990. Specifications for structural range improvements. Gen. Tech. Rep. PNWGTR-250. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 120 p.
- USDA Forest Service, USDI Bureau of Land Management. 1999. Fences. 210 pp.
- AZGFD. 2011. Wildlife Compatible Fencing. Arizona Game and Fish Department, Phoenix, AZ. 34 pp.

Vegetation Treatments

Vegetation treatments are proposed to improve soil condition, herbaceous cover, and watershed health on **up to 3,179 acres**⁵ of unsatisfactory and impaired soil conditions within the winter range of the Windmill West Allotment (see Table 4). These treatments would improve range conditions in areas being impacted by juniper tree encroachment.

Under the modified proposed action, treatments to reduce the density of juniper trees and associated canopy cover are being proposed on up to 3,179 acres in the winter range in order to improve soil conditions, herbaceous cover, and watershed health. Proposed treatments would be hand thinning of juniper trees to reduce the canopy cover of these species toward the canopy

⁵ The proposed action originally identified 2,500 acres for treatment but updated soils information led to a modification of the proposed action that better addressed the areas experiencing juniper encroachment that is impacting range conditions on the south end of the allotment.

cover conditions identified in the relevant TEU. Lopping and scattering of the resultant slash on site would be employed to aid in soil protection and nutrient cycling.

Observations of plant recovery in previously treated areas similar to the ones proposed indicate minimal impacts on herbaceous vegetation recovery by ongoing cattle grazing; however, if post-treatment monitoring shows cattle are congregating in treatment areas and impacting herbaceous vegetation establishment or recovery, pastures being treated may be deferred or rested from grazing through use of the rest-rotation schedule for up to one year after treatment to facilitate vegetation recovery. In areas where pre-treatment canopy cover exceeds 40%, seeding may be necessary to facilitate vegetation recovery because the ground under the juniper canopy may lack adequate seed stock of grasses and herbaceous species. Hand broadcast seeding would be done with a native grass and herbaceous seed mix consistent with TES potential vegetation data.

Thinning treatments are being proposed in the pastures with the largest percent area that has impaired or unsatisfactory soil conditions and where potential juniper canopy cover, as identified in TES, is less than 10% and current juniper canopy cover exceeds 10%. These conditions have been noted in portions of 6 pastures: Greasy West, Greasy East, Malpais, Black Tank, Red, and DK Unit⁶.

For analysis purposes, LANDFIRE was used to estimate current conditions and identify areas within these pastures that meet the above criteria for treatment. Use of repeat aerial imagery and field surveys would be used in conjunction with LANDFIRE in an iterative process to further define treatment areas for implementation. Treatment may extend into adjacent TEUs for operational efficiency. The modified proposed action identifies a maximum number of acres that may be treated in each pasture. Even though there may be a larger area within the allotment meeting the criteria for vegetation treatment described in this section, the total acres treated within the allotment would not exceed 3,179 acres over 10 years because limited resources and the expense of hand thinning. The acres for each pasture in Table 4 show where initial modeling identified areas in need of treatment. These acres may be shifted to DK Unit or Red Pastures and are not a maximum treatment area for each pasture. Exact locations for treatments are not identified prior to implementation because of limitations in the accuracy of the modeling used to identify the potential treatments area.

⁶ These pastures were identified because they were adjacent to each other (facilitating more efficient thinning operations), had more than 15% of the pasture in unsatisfactory soil conditions and had a significant contiguous area with greater than 10% potential canopy cover.

Table 4: Pastures with identified areas of Proposed Pinyon Juniper treatments

Pasture Name¹	Predicted Acres of Vegetation Treatments
Black Tank	1,151
Greasy East	280
Greasy West	113
Malpais	1,635
Total	3,179
1) No acres were identified in DK Unit and Red Pastures because of difficulty in defining the differences between Juniper Woodlands and Juniper Shrublands in the LANDFIRE Vegetative Type data. However, treatments acres may still be shifted to these pastures as part of the Windmill West allotment decision based on field assessments during implementation.	

Monitoring

Two types of monitoring would be used, implementation and effectiveness monitoring. Implementation monitoring would be conducted on an annual basis and would include: permit compliance livestock actual use data, grazing intensity evaluations during the grazing season (within key areas), forage utilization at the end of the growing season (within key areas), assessments of forage production and ground cover and precipitation monitoring.

Utilization monitoring would occur at the end of the growing season within each of the main grazing pastures. Utilization is defined as the proportion or degree of current year's forage production that is consumed or destroyed by animals (including insects). Utilization is measured at the end of the growing season when the total annual production can be accounted for and the effects of grazing in the whole management unit can be assessed.

Utilization measurements would be taken in key areas which reflect grazing effects within an entire pasture. A minimum of one key area would be established within each main grazing pasture, at existing long-term monitoring sites if possible, to represent overall pasture utilization. Utilization guidelines are not intended as inflexible limits. Utilization measurements can indicate the need for management changes prior to this need being identified through long-term monitoring. Utilization data would not be used alone, but would be used along with reporting of the number of AUMs grazed (actual use), climate and condition/trend data, to determine stocking levels and pasture rotations for future years.

Effectiveness monitoring to evaluate the success of management in achieving the desired objectives would occur within key areas on permanent transects at an interval of 10 years or less. Effectiveness monitoring may also be conducted if data and observations from implementation monitoring indicate a need. Monitoring frequency of vegetation and soil condition and trend would be accomplished collaboratively by Forest Service personnel, permittee, and cooperating agencies as funding, personnel, and time are available. Both qualitative and quantitative monitoring methods would be used in accordance with the Interagency Technical References,

Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Handbook.

Soil assessments and monitoring for utilization of Arizona cliffrose would also be performed on the allotment in coordination with the soil and botany programs.

Adaptive Management

The modified proposed action includes adaptive management, which provides a menu of management options that may be needed to adjust management decisions and actions to meet desired conditions as determined through monitoring. If monitoring indicates that desired conditions are not being achieved, management would be modified in cooperation with the permittee. Adaptive management allows the Forest Service to adjust the following: the timing, intensity, frequency and duration of grazing; the grazing management system, and livestock numbers. If adjustments are needed, they are implemented through the Annual Operating Instructions, which may be amended throughout the grazing season. Examples of situations that could call for adaptive management adjustments include: livestock numbers or grazing duration are decreased during the grazing season as a result of persisting drought conditions; projects by other agencies that may be conducted to attempt restoration of riparian and other wildlife habitat.

Table 5, below, identifies several examples of management evaluation points and management options to describe scenarios when adaptive management would be used as part of implementation. This is not an all-inclusive list.

Table 5: Management Evaluation Points and Adaptive Management Options

Management Evaluation Point The “If” Statement	Adaptive Management Response Options The “Then” Statement
If existing and predicted forage production falls below average because of climatic conditions,	Authorized livestock numbers may be reduced, the grazing season may be adjusted, pasture use period may be adjust or any combination of these options.
If available water is below average,	Authorized livestock numbers may be reduced, the grazing season may be adjusted, pasture use period may be adjust, water hauling for livestock use may be required or any combination of these options.
If grazing utilization is in compliance with the 30-40 percent guideline,	Continue current management system.

Management Evaluation Point The “If” Statement	Adaptive Management Response Options The “Then” Statement
<p>If grazing utilization is NOT in compliance with the 30-40 percent guideline,</p>	<p>The strategy for that pasture the following year may be either be to rest it, graze it at lighter intensity, or shorten the use period.</p> <p>The season of use or timing of grazing the next year may be changed</p> <p>The permittee would be required to implement additional strategies to more evenly distribute forage use such as use of salt blocks .</p>
<p>If grazing intensity is NOT in compliance with the 30-50 percent guideline,</p>	<p>Livestock might leave that pasture early</p> <p>The strategy for that pasture the following year may be to rest it, graze it at lighter intensity, or shorten the use period.</p> <p>The season of use or timing of grazing the next year may be changed</p> <p>The permittee would be required to distribute use better.</p>
<p>If wildfires and/or prescribed burning occur in pastures,</p>	<p>Based on the severity and extent of the fire and the condition of the vegetation afterwards, resting or deferring pastures may be considered.</p>
<p>If livestock use of woody vegetation within riparian areas exceeds the Forest Plan guideline of 20 percent,</p>	<p>Livestock management changes could be used to reduce utilization, including early removal from the pasture affected or a change in timing of pasture use. If management changes do not work, fences and exclosures may be used if identified by the current or a future NEPA decision.</p>
<p>If PFC assessment shows that livestock grazing is contributing towards a decline in riparian condition,</p>	<p>Livestock management changes would be used to improve condition. If management does not work, fences and exclosures may be used if identified by NEPA decision. The exception to this is for springs where the water rights and/or claims are tied exclusively to livestock use in Arizona Department of Water Resources records.</p>

Management Evaluation Point The “If” Statement	Adaptive Management Response Options The “Then” Statement
If these pastures around Fry Lake are showing decreased abundance and diversity of native vegetation or permittee wants to use the pasture prior to July 15 for ranch management purposes,	A fence with a lane to access water would be considered around Fry Lake to allow for use of the pasture before July 15.
If long-term monitoring shows that unsatisfactory soils are not trending towards vegetative ground cover tolerance thresholds ¹ ,	<p>The strategy for that pasture may be either to rest it, graze it at lighter intensity, or shorten the use period.</p> <p>The season of use or timing of grazing may be changed.</p> <p>The permittee would be required to distribute use better (Ex. riding and herding, salting, etc.)</p>
If field surveys or repeat aerial imagery identify areas for vegetation treatment in the Greasy West, Greasy East, Malpais, Black Tank, Red, and DK Unit pastures, that are outside the area identified by LANDFIRE,	A review of the effects disclosed for wildlife and plants would be conducted prior to implementation of vegetation treatments to ensure that all effects have been considered and disclosed. ²
<p>1. TEUs that have unsatisfactory soil conditions are identified in Appendix B.</p> <p>2. Because all vegetation treatments would be hand treatments, additional archeology clearance would not be needed even if the location analyzed in this document changes.</p>	

Resource Protection Measures

The modified proposed action is designed to comply with Forest Plan standards and guidelines, as amended. Design features would be incorporated into the project to protect forest resources of soil, water, scenery values, cultural resources, wildlife and aquatic habitat, and rare plants. Mitigation measures and best management practices would be implemented to prevent the introduction and spread of invasive plants, to retain water in earthen stock ponds for wildlife, to protect heritage resources, and to protect public health and safety during project implementation. Specific design features include but are not limited to the following:

- Prevention measures from the State of Arizona Aquatic Invasive Species Management Plan (AZGFD 2011) would be required to avoid spreading aquatic invasive nuisance species and pathogens during tank cleaning activities.
- At least 60 days prior to the start of maintenance of earthen stock tanks, the permittee would be required to contact the District so biological surveys can be completed, if needed and mitigation measures for the protection of aquatic species including northern leopard frogs could be implemented.
- Any construction of new or replacement fencing would be done in accordance with specifications developed to facilitate wildlife passage.

- Archeological surveys and clearances would be obtained prior to ground disturbing activities.
- North Gyberg Pasture would be grazed in accordance with Arizona Cliffrose Recovery Plan guidance, which currently states that the pasture would be rested every other year, only grazed from October-January, and that monitoring would occur (USDI FWS, 1995). The Recovery Plan also states that utilization of individual plants should not exceed 20 percent. If the Recovery Plan is updated, management of the North Gyberg Pasture would reflect any change in guidance. If additional populations of Arizona cliffrose are detected outside of North and South Gyberg Pastures, protective measures would be implemented in compliance with the Arizona Cliffrose Recovery Plan to avoid and minimize impacts by cattle if necessary.
- Follow the guidance of the Arizona Bugbane Conservation Assessment and Strategy (USDA Forest Service 1995). Maintain fence to protect Arizona bugbane population in Lockwood Pasture (Fernow Draw). The Coconino National Forest, in cooperation with the permittee and FWS, would collaborate and decide the appropriate action for long-term persistence of the species through revisions of the Conservation Strategy.
- Surveys should be conducted for Region 3 sensitive plants during the appropriate time of year⁷ before any restoration or construction activities are conducted
- Avoid damaging or destroying agaves during structural improvement construction and maintenance and vegetation treatments.
- To minimize disturbance to the Mexican spotted owl (MSO), the use of mechanized equipment such as chainsaws and ATV/UTVs; spring branding and fall gathering; new construction of fences, corrals, or buildings; or cleaning, maintenance, or construction of stock tanks and drinkers with pipelines and storage would not be permitted inside of PACs during the breeding season (March 1st – August 31st).
- Work on projects, such as pipelines, trick tanks, fences, powerline, and roads, when soils are dry enough to support heavy equipment without creating compaction or ruts. Exceptions should be made in emergencies and when higher soil moisture is needed as part of the maintenance or improvement.
- Use grazing best management practices in keeping with Arizona Administrative Code R18-9-501. Grazing management and mitigation practices which could be considered for these allotments are described in the National Management Measures to Control Nonpoint Source Pollution from Agriculture published by EPA in 2003. This publication can be downloaded at <http://www.epa.gov/owow/nps/agmm/index.html>.
- Prevent spread of potential and existing noxious or invasive weeds by vehicles used in management activities by cleaning vehicles before entering the area and by avoiding weed infestations during travel. Identify and treat noxious or invasive weed populations that may occur in areas of proposed structural improvements.
- Incorporate the Best Management Practices for noxious or invasive weeds as listed in Appendix B of the 2005 Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds into all management actions.

⁷ The appropriate time of year is the time of year when plant identification is more accurate. Usually it is either the growing season or when the plant is blooming depending on the plant.

- Water would be left in troughs when cattle leave the pastures per forest-wide Forest Plan direction and in Management Areas 7,8,10 for winter range.
- All new and existing open storage tanks and drinkers would be fitted with entry and escape ramps for wildlife. These ramps would be built to current Bat Conservation International specifications and installation would be coordinated with both the range and wildlife staff.
- Salt, mineral or protein supplements would generally not be placed within 1/4 mile of riparian areas unless their temporary use complies with the Forest Plan guideline to meet specific management objectives for the enhancement of riparian area. Guidelines for Arizona cliffrose habitat do not allow use of supplements within 1/2 mile of a population.
- Management practices which tend to concentrate livestock (and most likely wild ungulates) such as placement of salt, haying, placement of water troughs, etc., would be located away from cultural resources
- When the Mooney Trail is in use as a livestock driveway, close the trail to public access. Conduct a trail assessment, by a Forest Service trail specialist, before and after the livestock drive for safety of the permittee and the general public.
- All of the new ground disturbing activities that are planned to be implemented within two years and can be identified on the ground would be surveyed and cleared prior to authorizing grazing on the allotment as per Section 93.2 of the Region 3 Issuance Forest Service Handbook 2209.13, Grazing Permit Administration Handbook, Chapter 90, Rangeland Management Decision-making, and following the First Amended U.S.D.A., Forest Service, Region 3 Programmatic Agreement Regarding Cultural Property Protection and Responsibilities, dated Approved September 27, 2007.
- Before initiating any of the ground disturbing activities that are part of this project, the District Archaeologist would be notified to ensure the proposed activities have cultural resource clearance and project personnel are aware of the conditions specified in the final Windmill West Allotment Cultural Resource Clearance Report. Any additional ground disturbing activities that are proposed in the future must receive archaeological clearance prior to implementation.
- Located sites would be marked for avoidance and will be avoided during construction. If any new sites are discovered during construction activities, they are to be reported to the district or forest archeologist and ground-disturbing work halted.
- Management practices that tend to concentrate livestock, such as placement of salt, construction of fences, etc., would be located away from cultural resources.
- The preferred fencing material for spring improvements is welded steel pipe that would develop a rusty exterior over time, or a combination of wooden posts and steel pole fencing in order to maintain the scenic integrity of Lockwood Springs. The least preferable material is wire fencing.

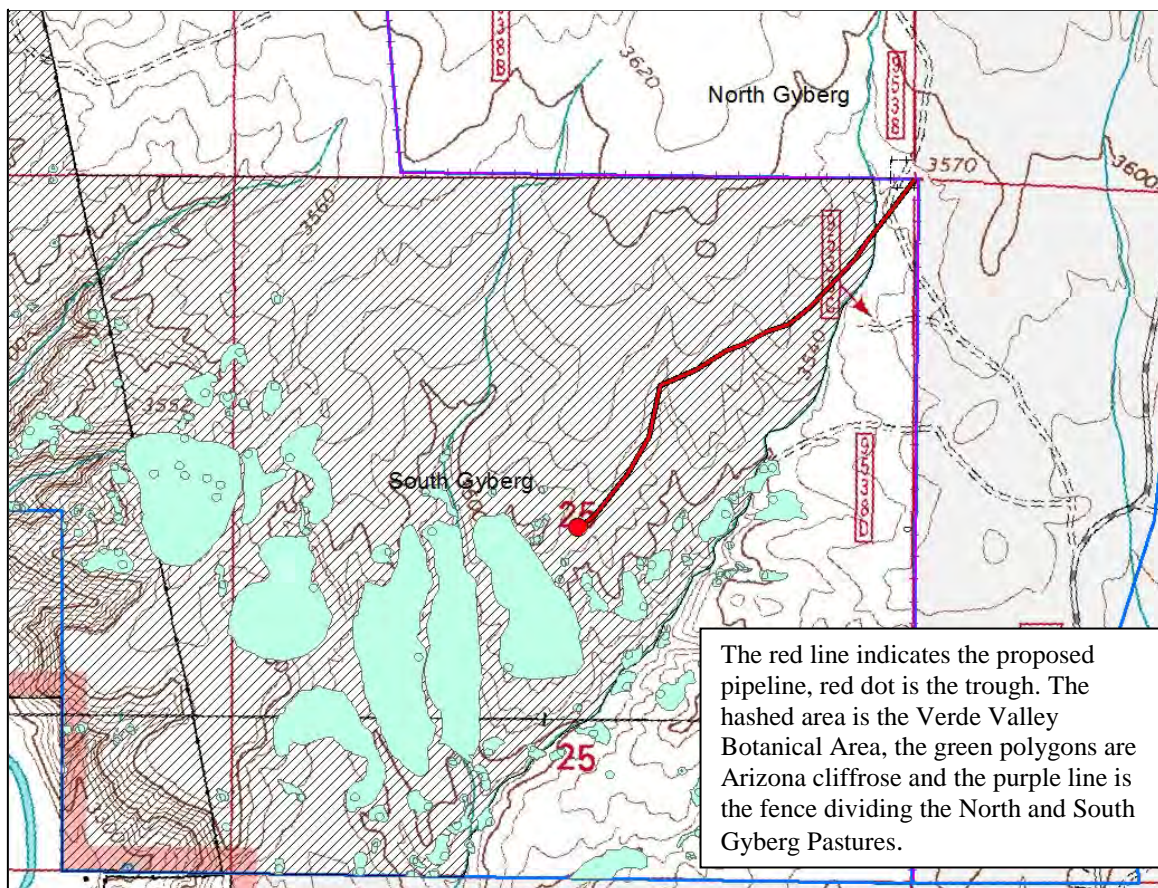
Alternative 3: Modified Proposed Action with South Gyberg Pasture

This alternative is similar to Alternative 2: Proposed Action, except that the South Gyberg Pasture would not be removed from the allotment, and would instead be included in the grazing rotation in the same manner as is proposed for North Gyberg: in accordance with the Arizona Cliffrose Recovery Plan. The Recovery Plan currently states that the pasture would be rested every other year, only grazed from October-January, and that monitoring would occur (USDI FWS, 1995). If

the Recovery Plan is updated, management of the South and North Gyberg Pastures would reflect any change in guidance.

If Rattlesnake Springs, which is located within the South Gyberg Pasture, would be accessible to livestock, all mitigations and adaptive management options relative to utilization of riparian woody vegetation would apply (See Table 5). Additional structural range improvements would be necessary to improve livestock distribution because there is currently no water within the allotment. These improvements would 1) approximately 0.75 miles of water pipeline; 2) placement/construction of 1 to 2 water troughs; and 3) construction of approximately 600 feet to 1,200 feet of water lot fencing (Figure 7).

Figure 7: Location of proposed trough, fence and pipeline in Alterative 3



South Gyberg Pasture would also rested every other year, only grazed from October-January, and that monitoring would occur in accordance with Arizona Cliffrose Recovery Plan guidance (USDI FWS, 1995). The Recovery Plan also states that utilization of individual plants should not exceed 20 percent. If the Recovery Plan is updated, management of the South Gyberg Pasture would reflect any change in guidance. All monitoring specifications, design features and mitigation measures for Alternative 2: Proposed Action as shown in Table 5 applies to alternative 3 as well.

Alternatives Considered But Eliminated From Detailed Study

Three additional action alternatives were considered, but not carried forward for more detailed analysis because they didn't meet the purpose and need or because they addressed issues already covered in an action that was carried forward for analysis.

Continue Current Management

Per FSH 2209.13 92.31 – “Current Management should also be analyzed in detail as an alternative to the proposed action if current management meets the stated purpose and need for action.”

Under the Current Grazing Management alternative, current management of the Windmill West Allotment would continue under current utilization and intensity rates. No new range improvements would occur, including fence construction, spring restoration, or vegetation treatments. This alternative was determined to not meet the purpose and need for the project, specifically, to “authorize livestock grazing in a manner that maintains and/or moves the area toward Forest Plan objectives and desired conditions, including improving vegetation and soil conditions and trends on the allotment” because it does not address need for resource protection measures at Roger’s Lake, and Fry Lake, and does not address the need for improvement of unsatisfactory and impaired soil conditions in the winter range.

Proposed Action

The Proposed Action that was included in the scoping letter on December 10, 2012 included light utilization guidelines in Malpais and Strip Pastures. This was based on 1991 TEU data that showed unsatisfactory soils conditions in over 40 percent of these pastures. Field verification of current soil condition showed that there are much lower percentages of unsatisfactory soil conditions (7 percent in Malpais and 18 percent in Strip) than indicated by 1991 course-scale data. The majority of areas mapped as unsatisfactory soil conditions have impaired conditions in the updated soil condition assessment.

Table 6: Differences between the Proposed Action and the Modified Proposed Action

Topic	Proposed Action	Modified Proposed Action
Utilization guidelines in Malpais and Strip Pastures	Light	Conservative
Vegetation treatments	2,500 acres in Wheatfield, Strip, Duff Mesa, Malpais, Sheepshead Holding, and Greasy East Pastures	Up to 3,179 acres in Black, tank, DK Unit, Greasy East, Greasy West, Malpais and Red Pastures

Vegetation treatments were also proposed in the Wheatfield, Strip, Duff Mesa, Malpais, Sheepshead Holding, and Greasy East Pastures. The updated soil condition assessment showed that some of these pastures have less extensive canopy cover than expected and soil conditions that are outside of desired condition. With this updated information, the IDT identified that other parts of the allotment have a higher priority need for treatment because they have more extensive

areas of unsatisfactory and impaired soils that are in part a result of increased canopy cover. Therefore, vegetation treatment areas were redistributed to other pastures in the Modified Proposed Action.

Black Springs Pasture was proposed to be removed from the Windmill West grazing allotment in the scoping letter, and analyzed in a future Environmental Analysis. However, a 1987 decision by the District Ranger removed this pasture from the allotment and the GIS data was incorrect. Therefore, this pasture is outside the scope of this analysis.

Proposed Action with Streambank and Riparian Vegetation Mitigations

A comment was submitted that requested an alternative that incorporated the following:

- Damage to riparian vegetation, stream banks and channels should be prevented
- Degraded riparian vegetation should be moved toward good condition
- Eliminate streambank impacts
- Eliminate use effects to riparian herbaceous or woody vegetation
- Avoid salting within 0.25 mile of water, riparian areas or stream channels
- Do not use riparian pasture for livestock holding or trailing, or for drought relief
- Do not divert water from intermittent or perennial surface waters

The points denoted above are incorporated into Alternative 1: No Action and Alternative 2: Proposed Action as much as possible. The Windmill West Allotment modified proposed action does not include any perennial streams and therefore consideration of water diversions is not appropriate for this project. Given the lack of persistent surface water in stream courses, streambank impacts are not expected to occur. There is riparian vegetation in and around springs and wetlands. Alternative 2 addresses affects to these resources through structural range improvements, adaptive management options and resource protection measures, including moving soil and vegetation toward improved condition and limiting effects to these resources.

It is a standard part of Forest Service permits and AOIs to avoid salting within ¼ mile of riparian areas and so this issue is addressed in all alternatives (See alternative 2 resource protection measures). Windmill West currently has no riparian pastures but alternatives 2 and 3 propose the creation of North Rogers Lake. This pasture would only be used by livestock a) after July 15 and b) if wildlife utilization of riparian species in Roger's Lake has not exceeded 20 percent utilization of woody vegetation, or 40 percent utilization of other emergent vegetation. The pasture would not be used for livestock holding or trailing, or for drought relief. As the relevant points brought forth in this comment are already included in alternatives that will be fully analyzed, there is no need to further analyze these issues under a separate alternative.

Comparison of Alternatives

This section provides a summary of the alternatives and the potential effects of implementing each alternative considered in detail. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 7: Comparison of Effects

Measure	Alternative 1	Alternative 2	Alternative 3
Permitted numbers	0 AUMs	565 head or 6,780 AUMs	565 head or 6,780 AUMs
Number of pastures grazed	0	26	27
New improvements	None	Approximately 2 miles of fencing	Approximately 2.25 miles of fencing, 1-2 water troughs, 0.75 miles of pipeline
Vegetation treatments	0 acres	3,179 acres	3,179 acres
Vegetation diversity and density	Static or move upwards during favorable climatic conditions, except where overstory limits improvement potential	Static or move upwards during favorable climatic conditions	Static or move upwards during favorable climatic conditions
Vegetation production and quality for forage plants	Not expected to be maintained or enhanced over a large portion of the allotment	Maintained or enhanced over a large portion of the allotment	Maintained or enhanced over a large portion of the allotment
Vegetation production and quality for non-forage plants	Stable	Stable	Stable
Water sources available for wildlife	Decreased because of lack of maintenance of perennial waters.	Stable/maintained except for Lockwood Springs	Stable/maintained, except for Lockwood Springs 1 additional water source in South Gyberg

Measure	Alternative 1	Alternative 2	Alternative 3
Changes in soil condition	Stable/no improvement	Improvement of 3,179 acres of impaired and unsatisfactory soil conditions	Improvement of 3,179 acres of impaired and unsatisfactory soil conditions
Biological soil crusts	No effect	Incidental damage	Incidental damage
Water quality in Oak Creek	Slight improvement	Stable- no improvement	Stable- no improvement
Water quality in Spring Creek	Slight to no improvement	Stable- no improvement	Stable- no improvement
Water quality in Verde River	No effect	No effect	No effect
Utilization of woody riparian species by livestock	None	Less than 20 percent	Less than 20 percent
Conditions at Lockwood Springs	No improvement	Improved plant species richness, robustness, and diversity	Improved plant species richness, robustness, and diversity
Wildfire potential	Increase gradually	Reduction in potential of crownreplacing fire in 3,179 acres of pinyon juniper	Reduction in potential of crownreplacing fire in 3,179 acres of pinyon juniper
Arizona cliffrose	No impact from grazing activities	Potential impacts to 2% of the known population of Arizona cliffrose on the Coconino NF	Potential impacts to 75-80% of the known population of Arizona cliffrose on the Coconino NF
Complies with recommendations in the Arizona Cliffrose Recovery Plan	Yes	Yes	No

Measure	Alternative 1	Alternative 2	Alternative 3
FS Sensitive Plant species	No effect on FS sensitive plant species	<p>No Effect on Flagstaff pennyroyal and Lyngholm’s brakefern</p> <p>May impact individuals of Arizona bugbane, Tonto Basin agave, Phillip’s agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn’s sage but is not likely to result in a trend toward federal listing or loss of viability.</p>	<p>No Effect on Flagstaff pennyroyal and Lyngholm’s brakefern</p> <p>May impact individuals of Arizona bugbane, Tonto Basin agave, Phillip’s agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn’s sage but is not likely to result in a trend toward federal listing or loss of viability.</p>
Invasive weeds control and detection	<p>Reduced control needs</p> <p>Lower rates of detection</p>	<p>Control needs similar to current conditions with use of BMPs during construction of improvements</p> <p>Similar rates of detection</p>	<p>Control needs similar to current conditions with use of BMPs during construction of improvements.</p> <p>Potential to facilitate expansion of Lehmann lovegrass in South Gyberg Pasture</p> <p>Similar rates of detection</p>
Mexican spotted owl findings	No impact	Minimal impacts to owls from noise disturbance and reductions in quality of prey habitats	Minimal impacts to owls from noise disturbance and reductions in quality of prey habitats
Critical habitat for Mexican spotted owl findings	No impact	Minimal impacts to levels of residual plant cover below what is necessary to maintain fruits, seeds, and allow plant regeneration to support owl prey	Minimal impacts to levels of residual plant cover below what is necessary to maintain fruits, seeds, and allow plant regeneration to support owl prey

Measure	Alternative 1	Alternative 2	Alternative 3
Southwestern willow flycatcher findings	No impact	Minimal impacts from to flycatchers from brood parasitism, noise disturbance and reductions in quality of prey habitats	Minimal impacts from to flycatchers from brood parasitism, noise disturbance and reductions in quality of prey habitats
Critical habitat for southwestern willow flycatcher findings	No impact	Minimal impacts to insect prey populations in Verde River	Minimal impacts to insect prey populations in Verde River
Western yellow-billed cuckoo findings	No impact	Minimal impacts to cuckoos from noise disturbance and reductions in quality of prey habitats	Minimal impacts to cuckoos owls from noise disturbance and reductions in quality of prey habitats
Northern Mexican gartersnake findings	No impact	Minimal impacts to snakes from noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease	Minimal impacts to snakes from noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease
Proposed critical habitat for northern Mexican gartersnake findings	No impact	Minimal impacts to viability of populations of native amphibian and fish prey species in the Verde River	Minimal impacts to viability of populations of native amphibian and fish prey species in the Verde River
Narrow-headed gartersnake findings	No impact	Minimal impacts to snakes from noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease	Minimal impacts to snakes from noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease

Measure	Alternative 1	Alternative 2	Alternative 3
Proposed critical habitat for narrow headed gartnersnake findings	No impact	Minimal impacts to viability of populations of native amphibian and fish prey species in the Verde River	Minimal impacts to viability of populations of native amphibian and fish prey species in the Verde River
Forest Service Sensitive wildlife species findings	No impact	May impact individuals of these species but are not likely to result in a trend toward Federal listing or loss of viability of the species	May impact individuals of these species but are not likely to result in a trend toward Federal listing or loss of viability of the species
Bald and Golden Eagle Act Compliance	Would not result in take of golden eagles or bald eagles	Would not result in take of golden eagles or bald eagles	Would not result in take of golden eagles or bald eagles
MIS – Pronghorn antelope habitat quality	No change	Increased by 3,179 acres	Increased by 3,179 acres
MIS –Lucy’s warbler habitat quality	No change	Decreased by 40 acres	Decreased by 40 acres
MIS –Yellow-breasted chat habitat quality	No change	Decreased by 15 acres	Decreased by 15 acres
MIS – Cinnamon teal habitat quality	No change	Increased by 94 acres	Increased by 94 acres
Migratory Birds	Would not result in unintentional take of individuals and would not lead to a decline in migratory bird populations.	Would potentially result in unintentional take of individuals but would not lead to a decline in migratory bird populations.	Would potentially result in unintentional take of individuals but would not lead to a decline in migratory bird populations.

Measure	Alternative 1	Alternative 2	Alternative 3
Threatened and Endangered fish species findings	No impact	Minimal indirect impacts to prey availability in Verde River in perennial streams adjacent to the allotment	Minimal indirect impacts to prey availability in perennial streams adjacent to the allotment
Critical Habitat for Threatened and Endangered fish species findings	No impact	Minimal indirect impacts to primary constituent elements related to prey availability in the Verde River	Minimal indirect impacts to primary constituent elements related to prey availability in the Verde River
Forest Service sensitive fish and macroinvertebrate findings	No impact	May impact individuals of these species but are not likely to result in a trend toward Federal listing or loss of viability of the species	May impact individuals of these species but are not likely to result in a trend toward Federal listing or loss of viability of the species
Effects to Scenic Resources	No effect	Minimal short term effects from construction and maintenance of improvements In the long term, existing scenic integrity maintained and moving towards desired landscape character	Minimal short term effects from construction and maintenance of improvements In the long term, existing scenic integrity maintained and moving towards desired landscape character
Uses on the Mooney trail	Recreation only	Recreation and livestock trailing	Recreation and livestock trailing
Effects to Recreation Opportunity Spectrum	No effect	No effect	No effect
Wilderness character	No effect	No effect	No effect

Measure	Alternative 1	Alternative 2	Alternative 3
Eligibility of wild and scenic rivers	No effect	No effect	No effect
Effects to heritage resources	No effect	No effect	No effect
Economics - Direct and Indirect Jobs*	0	6.44 jobs	6.44 jobs
Economics - Federal Payments to Counties**	0	\$2,288.25	\$2,288.25
Benefit/Cost Ratio for Forest Service	NA	0.75	0.69
Benefit/Cost Ratio for the Permittee	NA	2.70	2.57
Benefit/Cost Ratio for all partners	NA	2.11	2.00

Chapter 3 - Affected Environment and Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. More detail for these resources areas is provided in the specialist reports located in the project record and available for review by contacting the Flagstaff Ranger District office. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

Acres discussed in the analysis for the Windmill West Allotment may differ slightly depending on which resource is being analyzed. In general these acreage differences are less than 0.1 percent of the project area and are a result of rounding errors and slight boundary differences that occur when combining multiple geospatial data layers.

Rangeland Resources

Affected Environment

Rangeland condition is evaluated by measuring how well ecosystem processes are functioning on the land. Evidence of properly functioning processes is expressed largely through the vegetative and soil components of each community.

Vegetative Cover Type

Within the Windmill West Allotment, the Potential Natural Vegetation Types (PNVT) with the largest extent are Desert Communities, Semi-Desert Grassland, Pinyon Juniper Evergreen Shrub, Interior Chaparral, and Ponderosa Pine. There are 581 acres of Cottonwood, Willow Riparian Forest, Mixed Deciduous Riparian Forest, and Montane Willow Riparian Forest within the allotment but not all of these acres are functional riparian areas because of limited water availability and lack of perennial streams (see Wetlands, Springs and Riparian Resources section for more information).

One of the many contributing factors of watershed function, soil condition and rangeland health is the encroachment other woody species into grasslands and expansion of woody species within woodlands. Productive grasslands and open pinyon juniper woodlands with a healthy understory component have been altered over time by the encroachment/expansion of juniper and other woody species which decreases perennial grasses, exposes larger areas of bare soil, and results in accelerated erosion and decreases overall watershed and soil function. This loss of perennial vegetative ground cover is primarily due to the increase in canopy cover which suppresses understory vegetation due to competition for limited soil moisture and nutrients. Approximately 40 percent of the Windmill West Allotment is in potential vegetation types for pinyon juniper and semi-desert grasslands which are the vegetation types most likely to experience tree encroachment (see the Range Specialist Report located in the project record for more information).

Another factor contributing to forage conditions in the allotment and particularly in riparian areas and wetlands such as Roger's Lake, is utilization of these areas by elk and other wild ungulates. Elk has the most dietary overlap with livestock of the wild ungulates within the allotment. The herd size in the allotment is estimated to be 900 elk (Leudecker 2013).

Range Condition and Trend

Data from a total of 20 long term monitoring plots and 9 inventory locations were used in this analysis. Inventory plots and long term monitoring plots are located in key areas. Key areas are selected because of their location, grazing or browsing value, or use. These areas are located on slopes less than 40 percent.

Table 8: Comparison of long term monitoring data and Range Desired Conditions by TEU

TEU groupings ¹	Acres of TEU in allotment	Do existing conditions meet desired conditions? ²			
		Perennial grass canopy cover	Number of Perennial Grass Species	Vegetative Ground Cover ³	Composition of cool and warm season grasses
55	1,286	Yes	Yes	Yes	Yes
350	5,171	Yes	Yes	No	Yes
381, 385	8,425	Yes	Yes	Yes	Yes
402, 403, 404	7,372	Yes	Yes	No	Yes
414, 417	5,735	Yes	Yes	No	Yes
418	5,067	Yes	Yes	No	No
420, 430	1,837	Yes	Yes	No	Yes
457, 458	11,357	Yes	Yes	Yes	No
447	3,294	Yes	Yes	No	Yes
462, 463, 495	1,286	Yes	Yes	Yes	Yes
536, 546, 549	13,763	Yes	Yes	Yes	Yes
550, 582, 584, 585	17,687	Yes	Yes	Yes	Yes
572	482	Yes	Yes	Yes	Yes
567, 578, 579	939	Yes	Yes	Yes	Yes
586	3,562	Yes	Yes	Yes	Yes

1) TEU groupings were determined based on similar species composition, species richness, parent material and slope. In some instances, one or two of these criteria were not similar, however the TEUs were grouped due to the strong similarity of the remaining criteria.
2) Desired Conditions are identified in Table 2 in Chapter 1.
3) These desired conditions are based on the TEU-estimated tolerable ground cover which includes graminoid basal area plus litter greater than 1" in thickness but does not include rock fragments.

The Windmill West Allotment permanent monitoring plots and inventory plots are located on 15 of 30 TEU groups (Table 8). Since monitoring plots were established prior to the publication of TES, not all TEUs are represented by long term monitoring. Table 8 does not display information on TEUs for which there is no range monitoring data, such as TEU 50. There may be soil

assessment data or other data sources concerning these TEUs discussed in other sections of the EA. The 15 TEU groupings discussed in Table 8 represent approximately 91,000 acres (84 percent) of the Windmill West Allotment, and therefore it is assumed that conditions observed at long term monitoring plots and inventory plots are characteristic for all TEUs in both the winter and summer ranges of the Windmill West Allotment. Conclusions in this section are based on data collected in 2008, 2009 and 2013. Range condition and trend data within the Windmill West Allotment is examined in greater detail in the Range Specialist Report.

Perennial grass canopy cover: All TEU groups in the summer range and winter range show existing percent canopy cover of perennial grass species to be within the range for the desired condition.

Number of Perennial Grass Species: All TEU groups in the summer range and winter range show existing numbers of perennial grass species to be within the range for the desired condition.

Vegetative Ground Cover: Vegetative ground cover is evaluated as part of the assessment of rangeland conditions to determine the potential for accelerated erosion. Although vegetative ground cover is not the only cover component capable of protecting the soil from wind and water erosion, it is the cover component that can be influenced by management. TES defined tolerable vegetative cover as the vegetative cover including vegetation basal area and litter that is necessary to prevent annual long-term soil loss from exceeding estimated tolerable annual long-term soil loss rates without consideration of rock fragments that may also prevent soil loss rates from exceeding tolerable levels. Desired conditions for vegetative ground cover were based on TES-defined tolerable vegetative ground cover levels even though vegetative ground cover levels less than tolerable may not be causing accelerated erosion.

All of the TEUs associated with the summer pastures had vegetative ground cover that met or exceeded their desired conditions. Only one TEU in the summer range is listed as unsatisfactory condition, TEU 50, which is Roger's Lake and makes up 87 acres of the allotment⁸. Existing condition data on vegetative ground cover is not available for this TEU but the impact of wildlife grazing has led to the proposal to fence this area separately into the North Roger's Lake Pasture in alternatives 2 and 3 (See Soils section for more information).

By contrast, three out of nine TEU groups in the winter range met the desired condition for percent vegetative ground cover. For the six TEU groups that did not meet desired condition for vegetative ground cover, one TEU is within three percentage points of the desired condition (TEU 447). TEU 447 is in impaired soil condition and so the lack of vegetative ground cover may not have signs of accelerated erosion. Two TEU groups are within 10 percentage points of the desired condition (TEU groups 402,403,404 and 414,417). These TEUs are in impaired or unsatisfactory soil condition. Because of the natural variation within TEUs and potential for measurement error, plots with 5-10 percent difference between observed and desired percent have estimates that fall within the potential range of vegetative ground cover. Also, considering rock fragments can be a substantial portion of the ground cover on sites within these TEUs, it is likely that the total ground cover minimizes the risk of accelerated erosion.

⁸ There is no desired condition for TEU 50 in Table 2 because it is such a small portion of the allotment and there is no existing condition data available from monitoring plots or inventory sites for this TEU.

Vegetative ground cover on three TEUs or TEU groups is within 20 percentage points of the desired condition (TEU 350, TEU 418, and TEU group 420,430). In the soil condition assessment of TEU 350, soil condition was found to be satisfactory on slopes less than 40 percent and satisfactory but inherently unstable on slopes exceeding 40 percent. Therefore the lack of vegetative ground cover recorded at the long term monitoring location may not be indicative of typical conditions for this TEU. Soil condition for TEU 430 is classified as Satisfactory but Inherently Unstable, by definition the natural rate of erosion for this TEU is greater than “tolerable”. Neither current livestock management nor proposed changes in livestock management are likely to affect the rate of erosion for TEU 430.

TEU 418 covers approximately 5,024 acres of primarily semi-desert grasslands within the DK Unit, Red, Greasy West, Black Tank, and Sugarloaf Pastures of the winter range. The TES for the Coconino National Forest rates 418 as unsatisfactory based on a Universal soil Loss Equation predicted long-term annual soil loss rate of 7.9 tons/hectare/year that exceeds the estimated tolerable soil loss rate of 6.7 tons/hectare/year for this map unit. TES determined tolerable vegetative cover to be 20%. An on-site soil condition assessment of TEU 418 was conducted at a single location within the DK Unit Pasture in March 2013. Although the overall soil condition rating was “impaired,” indicators of soil stability including the presence of actively expanding rills/gullies and pedalling of trees/shrubs were assigned an “unsatisfactory” condition. These signs of accelerated erosion were attributed to the expansion of juniper trees and shrubs. Juniper cover was approximately 17% on site whereas the TES natural juniper canopy cover was estimated to be 5%. Vegetative ground cover was estimated to be 19% whereas bare soil was estimated to be 70%. In August 2008 within TEU 418 in Black Tank Pasture, vegetative ground cover and juniper canopy cover was 5.1% and 7%, respectively, at a single pace-frequency transect, which is a more quantitative method of site evaluation. Bare soil was 40% at this site with surface rock cover of 29%. These monitoring results demonstrate the variable cover conditions found within TEUs and the influence of canopy cover on bare soil and evidence of accelerated erosion. In the site evaluated in DK Unit, the vegetative cover was near desired conditions however, the increased canopy cover resulted in more bare soil and signs of accelerated erosion. In the Black Tank site, even though vegetative cover was 15% lower than desired conditions the high percentage of rock armors the surface and prevents accelerated erosion from occurring. Therefore, effective vegetative ground cover is not, by itself, reflective of the ability of this TEU to support grazing activities while holding soil loss to an acceptable level.

TEU 420 covers approximately 3,654 acres of primarily semi-desert grasslands within Greasy West, Duff Mesa, Greasy East, DK Unit, Malpais, Strip, Sheepshead Holding, and Dutch Kid Pastures. The 1991 TES identified TEU 420 as “unsatisfactory” based on a USLE predicted long-term annual soil loss rate. However, field evaluations of TEU 420 rated the soils condition as impaired. TES determined tolerable vegetative cover to be 20%, however; on-site soil condition assessments suggest that vegetative ground cover levels less than 20% are adequate to prevent accelerated erosion. On-site soil assessments of TEU 420 were performed at four different locations within Duff Mesa, Malpais, and Greasy West Pastures with overall soil condition ratings of “satisfactory” or “impaired”. Evidence for active erosion was generally lacking though erosion pavement was present at two of the sites. Vegetative ground cover ranged from less than 5% to over 30% at three pace-frequency vegetation monitoring locations within TEU 420 sampled in April 2013. In every case, the amount of bare soil was less than 30% with total ground cover exceeding 50%. As a result, low vegetative ground cover did not result in a loss of soil stability because surface rock cover was present in sufficient amounts to prevent accelerated erosion. This

condition was seen consistently enough in TEU 420 to result in the reclassification of the TEU to impaired soil condition forest wide.

Only one TEU in the winter range is listed as unsatisfactory condition for which there is no existing condition data available. TEU 280 makes up 14 acres of the North Gyberg Pasture. (See Soils section for more information).

There are at least several possible reasons that some TEU groups are not meeting desired conditions for vegetative ground cover based on range monitoring data. Some TEU groups have been impacted by historic land management (i.e. fire suppression, past livestock grazing activities) which may have contributed to unsatisfactory or impaired soil conditions currently observed within these TEUs. Wildlife grazing, shrub and tree encroachment, and climatic fluctuations also influence the amount of vegetative ground cover present on a given site. Finally, TEUs exhibit variability in their attributes including vegetative cover.

Composition of cool and warm season grasses: All TEU groups in the summer range currently meet the desired conditions for the ratio of cool to warm season grasses determined in TES. Seven out of nine TEU groups in the winter range currently meet the ratio of cool to warm season grasses determined in TES. However the absence in the long term monitoring plots of some species listed in TES may be attributed to their rare occurrence within a TEU or variability between TES plots used to define natural vegetative cover and long term range monitoring plots. Plants listed as trace (T) or present (P) in Table 2 of Terrestrial Ecosystems Survey of the Coconino National Forest (where T=<0.01 percent canopy cover, and P=present in the area, but not recorded in the plot) have a possibility of not being recorded in the long term monitoring plots due to limited and sporadic occurrences within the area.

Range Trends

Trend data collected between the 1950s and 2009 show variations in ground cover and canopy cover over time. These variations are further emphasized by the annual data collected between 2007 and 2011 at the Dutch Kid C4 plot. Four summer and two winter TEU groups are showing an upward trend for basal vegetation cover. Four summer and seven winter TEU groups are showing a downward trend for basal vegetation cover. Three winter TEU groups are showing static trends for basal vegetation cover. Five summer and five winter TEU groups show an upward trend for litter cover. Five summer and three winter TEU groups show a downward trend for litter cover. One summer and one winter TEU group show static trends for litter cover.

Precipitation strongly influences plant yield, and “even the slightest reductions from normal precipitation can cause severe reductions in plant yield” (Holechek et al. 1989); this combined with changing temperature and precipitation patterns can lead to a change vegetative canopy cover and vegetative and litter ground cover. Comparing vegetation trend data to precipitation trend data and permitted/ authorized numbers shows that variations in vegetative ground cover and canopy cover for the plots discussed above can be mostly attributed to the variable precipitation. Trend data analyzed for this project seems to show no correlation between permitted/authorized livestock numbers and changes in ground cover during the time period data were collected at these monitoring sites.

Grazing Capability

Grazing capability of a land area is dependent upon the interrelationship of the soils, topography, plants and animals. Grazing capability is a qualitative expression of the inherent ability of an ecosystem to support grazing use by various classes of livestock on a sustained yield basis. The analysis of grazing capability on the Windmill West Allotment indicates that the major factors in determining and classifying capability are soil condition, slope, and site productivity.

Table 9: Grazing Capability for Summer Pastures, Winter Pastures and South Gyberg

Grazing Capability Classification	Summer Pasture Acres	Winter Pasture Acres	South Gyberg Pasture Acres	Allotment Total
Full Capability	36,726	5,173	240	42,139
Potential Capability – Impaired Soil Conditions	1,286	44,118	539	45,943
Potential Capability – Unsatisfactory Soil Conditions	87	1,641	0	1,728
No Capability	5,942	13,148	1,178	20,268
Total	44,041	64,080	1,957	110,078

The ‘No Capability class’ was determined to apply to areas, “...not capable of being grazed by domestic livestock under reasonable management goals,” ...although, “light livestock use may occur” per the definition in the Glossary

. For this project, this category was applied to slopes of 40% or greater, satisfactory but inherently unstable soils, and to TEUs that had measured or estimated forage production of less than 100 lbs. of forage per acre per year. Satisfactory but inherently unstable slopes are not able to hold soil loss to acceptable level because of natural erosive processes associated with the TEU. Areas over 40 % slope were considered No capability because the Forest Plan the states that, “Slopes exceeding 40 percent where high probability for damage exists,” (replacement page 206-70) and defines “No capacity” lands as areas including lands over 45 percent slopes. The full capability lands would be “producing a minimum of 100 pounds of dried forage per acre per year” per the definition used for this analysis. Also lands within Management Area 17 in the South Gyberg Pasture were assigned no capability because they are specifically called out in the Forest Plan as having No Capacity at the plan level.

The Potential Capability class was assigned to impaired and unsatisfactory soils on less than 40% slope. Unsatisfactory soils were included in the potential capability class because it includes areas which could be used by grazing animals under proper management but where there is impaired soil stability, lack of water, steep terrain, lack of access and/or there is insufficient vegetative ground cover to protect the soil, but if treated, developed, or properly managed, could become

fully capable (USDA Forest Service 1997). However, these areas were not assigned a value for estimating grazing capacity.

Full capability acres were identified as those with satisfactory soil conditions on less than 40 percent slopes.

Grazing Capacity

Grazing capacity is a function of grazing capability, forage production, topography, allowable use, and the level of management that may be applied. The estimated grazing capacity represents the ability of the Full Capacity lands within the Windmill West Allotment (per the Forest Plan definition) to provide forage for wildlife and livestock use. Only full capability and potential capability areas that were not in unsatisfactory soil condition were used to estimate grazing capacity. This is a more conservative approach to calculating grazing capacity because there are fewer acres in these categories than the estimated area of Full Capacity acres on the allotment.

Based on the factors used in this analysis, the estimated grazing capacity for wildlife and livestock in the Windmill West Allotment is approximately 4,597 Animal Unit Months (AUMs) in the summer pastures and 4,673 AUMs in the winter pastures; total estimated grazing capacity for the Windmill West Allotment is 9,370 AUMs.⁹

When elk use¹⁰ is estimated, the portion of grazing capacity available for livestock use is approximately 8,076 AUMs (See Forest Plan Compliance Supplement for Windmill West Allotment EA for assumptions and associated calculations). This estimate demonstrates that the proposed permitted numbers for the modified proposed action of 6,780 AUMs would be low enough to reasonably provide adequate wildlife forage. However, in a given year, fewer cows may be stocked based on monitoring. The Annual Authorized Use application and the Annual Operating Instructions (AOI) would adjust numbers of cattle and/or length of grazing season to match forage production in a given year within the grazing system to meet the goals of maintaining or improving conditions. Summer and winter authorized AUMs vary depending on the use period.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

Vegetation

Under this alternative, livestock grazing would not occur and as a result, there would be no direct or indirect effects from cattle grazing on upland vegetation.

How much of the change in range condition and trend under this alternative could be attributed to the absence of livestock grazing would be difficult to estimate because a wide range of outcomes

⁹ For details see Chapter 2 of the Forest Plan Compliance Supplement for Windmill West Allotment EA, located in the project record

¹⁰ Estimated elk use on the Windmill West allotment is approximately 1,324 AUMs; between 874 AUMs in the summer pastures and between 477 AUMS in the winter pastures. Estimated use based on estimated elk population numbers provided by Arizona Department of Game and Fish.

have been documented (Courtois et al 2004, Baxter 1977, Loeser 2006). Under this alternative, range condition and trend, as measured by changes in vegetation density (number of plants per unit area) and vegetation diversity (number of different plant species present in a given area), is expected to remain static or move upward during periods of favorable climatic conditions, except in areas where over story species limit improvement potential or in areas that are continually grazed by wildlife. During periods of unfavorable climatic conditions, range condition and trend is expected to decline. The ability for improvement in range condition and trend would be most affected by climatic conditions (Sprinkle, et al, 2007).

Climate conditions would likely be the driving factor in the long term condition and trend. The exception would be on the 3,179 acres where vegetation treatments would occur under the proposed action. Without treatment, these areas would continue to experience juniper encroachment and a lack of understory vegetative ground cover (Wilcox et al. 1995). Decreases in understory vegetation would result in a decrease in vegetation diversity, vegetation density, and vegetation production.

Under this alternative, livestock grazing would not occur and as a result, vegetation production and the quality of forage species would not be maintained or enhanced over a large portion of the analysis area. Forage species require periodic disturbance and canopy reduction to maintain and improve vegetation production and quality. Holechek (1981) reported that forage production and quality is maintained and enhanced by light to moderate grazing. Patton, et al (2007) found that low to moderate levels of grazing can increase vegetative production over no grazing, but that the level of grazing that maximizes vegetation production depends upon the growing conditions of the current year. Changes in vegetation production and quality of non-forage vegetation species is expected to remain unchanged under this alternative.

Range Improvements and Trails

Under this alternative, the grazing permittee would no longer maintain existing structural range improvements, such as earthen stock ponds and fences. This would result in an immediate loss of available water for wildlife in the winter pastures since the existing pipeline/drinker system would no longer be operated. Indirect effects due to the lack of improvement maintenance would be realized through a long-term loss of water available for wildlife as earthen stock ponds fill with sediment and as the pipeline/drinker system in the winter pastures is no longer operated and degrades. Additionally, as fences degrade due to lack of maintenance, they would likely become an entanglement/impalement hazard for wildlife. Since there would be no livestock grazing, the Mooney Trail would no longer be used as a livestock driveway and there would be no grazing permittee to assist with trail maintenance.

Alternative 2: Modified Proposed Action

Vegetation

Under this alternative, managed livestock grazing would occur and as a result, there would be direct and indirect effects from cattle grazing on upland vegetation. Adaptive management and monitoring would be used to mitigate the direct and indirect effects of livestock grazing, as well as the effects of climate variability.

Under this alternative, livestock grazing would not occur in Winter Cabin, South Gyberg, North Sycamore, South Sycamore, Loy Canyon, Secret Mountain, #60, and #51 Pastures. Because these pastures have not been grazed in 10-15 years, direct, indirect, and cumulative effects for these

parts of the current allotment would be the same as described for the entire allotment in the No Action alternative.

Under this alternative, range condition and trend (as measured by changes in vegetation diversity and density) is expected to remain static or move upward during periods of favorable climatic conditions. Livestock grazing's temporary effects to vegetation occur through a reduction in plant height and canopy cover as a result of livestock consumption or trampling but under favorable climatic conditions, these conditions recover and therefore do not have a long term effect on density and diversity under the proposed grazing management. The livestock grazing effects of reducing plant height and canopy cover are primarily managed through the length of the grazing period (how long plants are exposed to livestock grazing), frequency of grazing (how often plants are exposed to livestock grazing), grazing intensity (how much of a plants growth to date is removed during the grazing period; determined at the end of the grazing period), and forage utilization guidelines (how much of a plants annual growth is removed; determined at the end of the growing season). Reductions in herbaceous plant height and canopy cover would also continue in localized areas as a result of wildlife use.

The modified proposed action has guidelines for these factors that would mitigate the impacts of grazing on vegetation height and canopy cover and vegetation diversity and density. During the growing season, the proposed grazing intensity guidelines maintain forage on site to reproduce, grow to maturity, build necessary root mass, produce seed heads, produce litter important for nutrient cycling, and propagate and move into new areas. The conservative (30 to 40 percent) utilization guideline accounts for the need for wildlife forage and would leave enough forage at the end of the growing season for protection of the site (Galt et al. 2000). More specific utilization guidelines would protect riparian areas and rare plants. Grazing guidelines would limit pasture re-entry and rest the North Gyberg Pasture every other year in order to allow adequate time for Arizona cliffrose plant recovery, which would also support maintenance or improvement of vegetation diversity and density for other species. Proposed grazing intensity guidelines would also maintain forage on site to reproduce, grow to maturity, build necessary root mass, produce seed heads, produce litter important for nutrient cycling, and propagate and move into new areas.

Livestock grazing can have an effect in improving or decreasing plant species composition depending on the timing of grazing. By alternating the livestock use and rest periods on cool and warm season species, plant species composition would be maintained or improved. Additionally, adaptive management and annual implementation monitoring would provide the necessary resource information and management options to adjust the timing, intensity, frequency and duration of livestock grazing to ensure that vegetation condition is maintained or improved.

Under favorable climatic conditions, the management guidelines for grazing periods, frequency of grazing, forage utilization, and grazing intensity are expected to maintain or improve vegetative canopy cover and vegetative ground cover, maintain soil condition within the areas currently identified as having satisfactory soil condition, improve soil condition within the areas currently identified as having impaired or unsatisfactory soil condition except in those areas where overstory species limit the improvement potential. Adaptive management and annual implementation monitoring would provide the ability to modify the management guidelines as needed to maintain vegetation height and canopy cover during periods of unfavorable climatic conditions. During periods of unfavorable climatic conditions, the management guidelines for grazing periods, frequency of grazing, forage utilization, and grazing intensity would be managed adaptively based on the conditions as described in Table 5 to maintain, or minimize the reduction

of, vegetative canopy cover and vegetative ground cover and maintain, or minimize the reduction of, vegetation necessary for soil stability.

Under this alternative, managed livestock grazing would occur and as a result, vegetation production and vegetation quality of forage species would be maintained or enhanced over a large portion of the analysis area over the period of the TGP (Holechek 1981, Loeser et al. 2004, Patton et al. 2007). Changes in vegetation production and quality of non-forage vegetation species is expected to remain unchanged under this alternative, given moderate climatic conditions. Vegetation production is expected to be average to above average during periods of favorable climatic conditions. During periods of unfavorable climatic conditions, vegetation production is expected to decline. When utilization is exceeded because of wildlife use, these effects are not likely to persist for multiple years because livestock grazing timing and intensity would be adjusted using adaptive management to address areas where concerns have developed.

Vegetation treatments and potential native seeding on up to 3,179 acres would reduce the overstory canopy of juniper trees which would increase upland vegetation density and diversity within the treatment areas (Willcox and Davenport, 1995). Plant height and canopy cover would be reduced in the immediate area due to treatment activities, but would recover with favorable climate conditions. The increase in upland vegetation within the treatment areas would include an increase in forage species which would improve allotment conditions and allow for more flexibility in grazing management. All other factors being equal, the increase in forage production would improve livestock distribution and result in reduced grazing intensity and forage utilization levels. The reduced grazing intensity level would provide for an increase in the pasture grazing period which would provide the opportunity to allow for rest or seasonal deferment for other pastures.

Range Improvements and Trails

Maintaining existing structural improvements would allow for the implementation of managed livestock grazing and provide the necessary infrastructure to control grazing periods, frequency of grazing, grazing intensity, and forage utilization. The operation and maintenance of existing structural range improvements would have short-term direct effects to upland vegetation. Plant height and canopy cover would be reduced in the immediate area due to maintenance activities; however, plant height and canopy cover would recover with favorable climate conditions.

Annually maintaining existing fences would reduce the chance of entanglement/impalement for wildlife (AZGFD, 2011). Existing fences may be modified or upgraded to current wildlife specifications. When existing fences reach the end of their functional lifespan they will be reconstructed to current wildlife specifications.

Existing earthen stock ponds would be maintained and water distribution systems (wells, pipelines, water storage tanks, and troughs) would be maintained and operational. Functional livestock water developments are necessary for managed livestock grazing but they also provide important/critical water sources for wildlife. In the winter range, leaving water in troughs would improve the availability of water for wildlife in the late spring, when surface water sources are often dry.

Under this alternative, a new pasture fence would be constructed in the northeast corner of the Rogers Lake Pasture; this will create the North Rogers Lake Pasture. The construction of this pasture fence would have short-term direct effects to upland vegetation. Plant height and canopy

cover would be reduced in the immediate area due to fence construction activities; however, plant height and canopy cover would recover with favorable climate conditions. The proposed pasture fence is designed to reduce livestock grazing effects to riparian/wetland vegetation and to protect duck nesting habitat by eliminating livestock use of the Rogers Lake wetland prior to July 15. Under this alternative, livestock use will not occur within the new North Rogers Lake pasture before July 15 and only if wildlife utilization on riparian/wetland species is less than 40 percent. Due to heavy elk utilization of the Rogers Lake wetland, it is not expected to be able to graze the North Rogers Lake pasture with livestock.

Another new range improvement that is part of the adaptive management strategy in this alternative is wetland exclosure fence at Fry Lake. Initially, managing livestock grazing effects to riparian/wetland vegetation and protection of duck nesting habitat would be accomplished by deferment of livestock grazing in the Fry Park East pasture until after July 15. A wetland exclosure fence would be constructed at Fry Lake if monitoring reveals a decline in upland vegetation diversity and density in the Fry Park East pasture, or any of the surrounding pastures, or a decline in riparian/wetland vegetation at Fry Lake as a result of the continued mid to late season livestock use of the Fry Park East pasture. Another possible scenario is that the grazing permittee may request the ability to use Fry Park East pasture early in the summer grazing period (prior to July 15) to meet the operational needs of the allotment. The wetland fence could provide deferment from early season livestock use in the surrounding pastures or improve the livestock management efficiency on the allotment. Protection of riparian/wetland vegetation and duck nesting habitat at Fry Lake would be also accomplished by the proposed adaptive management strategy. A fenced lane to the existing earthen stock pond which would allow for livestock watering would be a required design feature of the wetland exclosure fence. Concentrating livestock within this lane would result in compacted soils and reduced upland and riparian/wetland vegetation¹¹ within the lane area. The proposed wetland exclosure fence would be designed to reduce livestock grazing effects to riparian/wetland vegetation and to protect duck nesting habitat. Improvement of the wetland and riparian vegetation at Fry Lake would largely be dependent on elk use and on climatic conditions.

Under this alternative, spring restoration activities would occur at Lockwood Spring. Restoration of Lockwood Spring would include construction of an exclosure fence that would protect the spring and the associated riparian area but would still allow livestock and wildlife access to the existing troughs and re-plumbing the spring box to allow a portion of the water to discharge near the spring's natural emergence area. These activities would have short-term direct effects to upland and riparian/wetland vegetation. The proposed fencing and re-plumbing activities would be designed to aid in the restoration of riparian vegetation, reduce livestock grazing effects to riparian/wetland vegetation re-growth, improve the vigor and extent of riparian/wetland vegetation at the site, and provide water at developed troughs for livestock and wildlife. Improvement of the riparian and wetland vegetation within the exclosure at Lockwood Spring will largely be dependent on climatic conditions.

Under this alternative, the Mooney trail would continue to be used to drive cattle between the winter and summer pastures. This would result in direct effects to recreational users of the

¹¹ Fry Lake does not support woody riparian vegetation and the 20% utilization standard in the Forest Plan does not apply to this fenced lane.

Mooney trail two days per year; one day in May/June and one day in October/November. Grazing permittee would also continue to provide assistance with maintenance of the trail.

Alternative 3: Modified Proposed Action with South Gyberg

The proposal and effects of livestock grazing for alternative 3 are the same as alternative 2 except for how livestock grazing is managed in the South Gyberg pasture.

Vegetation

Under this alternative, South Gyberg pasture would not be removed from the Windmill West Allotment and the area would not be closed to livestock grazing. Arizona cliffrose (*Purshia subintegra*), an endangered species, occurs in the South Gyberg pasture and livestock grazing will be authorized and managed in accordance with the Arizona Cliffrose Recovery Plan requirements listed in Chapter 2. Timing restrictions and utilization guidelines for the North Gyberg pasture under alternative 2 would be applied to South Gyberg under this alternative and therefore the effects to vegetation would be the same.

Range Improvements and Trails

In addition, several new structural range improvements would need to be constructed to facilitate livestock management in the South Gyberg pasture (see Chapter 2 for details). The construction of these structural range improvements would have short-term direct effects to upland vegetation. Plant height and canopy cover would be reduced in the immediate area due to construction activities; however, plant height and canopy cover would recover with favorable climate conditions. The creation of a water lot and the placement/construction of water troughs will concentrate livestock and result in compacted soils and reduced upland vegetation within the immediate area.

Cumulative Effects

The past, present, and reasonably foreseeable future activities considered in the cumulative effects analysis for upland vegetation include: timber sales, fuels reduction projects, dispersed recreation, firewood gathering, weed treatments, hunting, roads, off-highway vehicle (OHV) use, and wildlife use. The geographical extent of the cumulative effects analysis is confined to the Windmill West Allotment boundary. The timeframe selected for this analysis is 20 years; 10 years in the past and 10 years in the future.

Common to all Alternatives

Wildlife would continue to graze within the analysis area, creating localized impacts which would include areas of excessive utilization, especially adjacent to areas with water such as Fry Lake and Roger's Lake. Timber sales and fuels reduction projects would continue within the analysis area and would result in temporary reductions in vegetation density and canopy cover. These effects would be temporary and recovery would occur under favorable climatic conditions. Additionally, these activities would improve vegetation density, vegetation diversity, and canopy cover by reducing the overstory canopy. The other activities identified would also continue, creating localized impacts to upland vegetation.

Changes in road management and motor vehicle use through the Travel Management Plan has reduced the amount of off-road travel and is expected to effectively close dozens of miles of road within the project area over the next decade. In addition major vegetation management projects

will include road decommissioning after the mechanical treatments within those areas are completed. The change in combination with each alternative would cumulatively lessen the impact to the upland vegetation across the Windmill West Allotment.

Vegetation density, diversity, production and canopy cover fluctuate naturally in response to inter-annual and longer periods of climate variability. Periods of favorable climatic conditions result in increased vegetation density, diversity, production and canopy cover. Periods of unfavorable climatic conditions result in decreased vegetation density, diversity, production and canopy cover.

Under all alternatives, livestock grazing would be officially removed from the Sycamore Canyon Wilderness below the rim of the canyon in addition to the fact that there is already no grazing on the portions of the wilderness that are part of the Kaibab and Prescott National Forests. There are no anticipated cumulative effects from this change because the Coconino portion of the Wilderness has not been grazed for more than 10 years and therefore there are no direct or indirect effects from this action.

Climate change is predicted to result in periods of extreme climatic conditions in both temperature and precipitation. Climate change in the North American southwest is predicted to lead to decreased winter precipitation throughout the current century (Seager and Vecchi 2010). This decline in winter precipitation could lead to a decrease in vegetation dependent on winter precipitation. Although winter precipitation is important for annuals and cool season grasses as well as replenishment of soil moisture, rangeland productivity in the southwest is primarily controlled by summer precipitation delivered by the North American monsoon (McCollum et.al. 2011). The effect of climate change on the North American Monsoon, which accounts for roughly half the precipitation on the Windmill West Allotment, is uncertain, however; recent research suggests a delay in the onset of the monsoonal activity with no change in total precipitation (Cook and Seager 2013).

Alternative 1: No Action

This alternative provides the least cumulative impact to upland vegetation by not authorizing livestock grazing which would be additive to the other activities. Under this alternative, there would be no direct or indirect effects from cattle grazing on vegetation density, vegetation diversity, production, and canopy cover and as a result, there would be no cumulative effects related to cattle grazing or effects additive to climate change.

Wildlife would continue to graze on lands within the project area, creating localized impacts of seasonal reductions in plant height and canopy cover. Within these localized areas, recovery of plant height and canopy cover is expected under favorable climatic conditions except in areas that are continuously grazed by wildlife.

Due to their palatability and early season availability, cool-season plant species would continue to receive a disproportionate share of the grazing by wildlife under this alternative. This could affect the vegetative diversity within portions of the analysis area as cool-season plants are either allowed to recover from the effects of wildlife grazing or they are continually grazed. In the case of continual grazing, the eventual result may be a reduction in cool-season species which would reduce plant species diversity (Archer and Smeins 1991; Briske D.D. 1991; Szaro, et al 1999; Vavra, et al 1994).

Provided the wildlife use is seasonal and transitory, vegetation production and quality of forage species would be maintained in small, localized areas. If wildlife use within these areas occurs continuously throughout the year, vegetation production and quality would not be maintained as a decrease in vegetation diversity and density would likely occur.

However, removing cattle grazing from the Forest Service portion of the allotment may influence the management of non-federal lands that are grazed as part of the Windmill West rest-rotation system. The Windmill West Allotment contains approximately 11,500 acres of State Trust Land that are managed in coordination with NFS lands. If grazing continues on the State Trust lands, it is unknown as to what level of livestock use would occur as those are management actions that would be determined by the Arizona State Land Department. However, it is likely that additional fencing and water developments would be constructed on State Trust Land to facilitate livestock grazing. It is also possible that the loss of the ability to graze the associated NFS lands could result in a livestock operation that is no longer viable and the State Trust lands may no longer be grazed. Under the latter scenario, existing structural range improvements on State Trust Land would no longer be maintained. The lack of improvement maintenance on the allotment and the potential cumulative impact of lack of improvements maintenance on the adjacent State Trust land would result in a loss of water available for wildlife as earthen stock ponds fill with sediment and as the pipeline/drinker system in the winter pastures is no longer operated and degrades. This scenario may alter the pattern of movement for wildlife in uplands and put more pressure on natural springs, wetlands and riparian areas from wild ungulate use. Additionally, as fences degrade due to lack of maintenance, they would likely become an entanglement/impalement hazard for wildlife.

Alternative 2: Modified Proposed Action

Under this alternative, adaptive management and annual implementation monitoring would provide the ability to modify livestock management as needed to maintain or improve vegetation conditions under varying climatic conditions. As a result, there would be no effects from this alternative that would be additive to the potential effects of climate change.

Wildlife grazing on the allotment would continue to create localized impacts and potentially areas of excessive utilization. Wildlife would continue to graze within the analysis area and provided the wildlife use is seasonal and transitory, would not change effects to vegetation production and quality. If heavy wildlife use occurs continuously throughout the year in combination with managed livestock grazing, vegetation production and quality will not be maintained as a decrease in vegetation diversity and density would likely occur.

Timber sales, fuels reduction projects, and prescribed burning projects within the analysis area (such as: Turkey Barney Fuels Management Project and the Four Forest Restoration Initiative) would result in localized, short term reductions in plant height, canopy cover, and vegetation production due to the physical defoliation and crushing of understory vegetation related to mechanical tree thinning activities and the consumption of above ground vegetation during prescribed burning activities. However, these effects would be temporary and recovery would typically occur in one growing season under favorable climatic conditions.

In the long term, timber sales, fuels reduction projects, and prescribed burning projects would result in increases in vegetation density, vegetation diversity, plant height and canopy cover, and vegetation production. Tree thinning and prescribed burning would increase vegetation density (number of plants per unit area) because of the overall increase in the amount of sunlight that

reaches the soil surface, the reduction of competition from over story species, the reduction of the pine needle litter layer, and the increase in nutrient cycling provided by burning. An increase in vegetation density would result in an increase plant canopy cover and vegetation production simply as a result of more plants occupying the site. Additionally, as more of the soil surface area is exposed to sunlight, vegetation diversity would improve as shade intolerant vegetation species would increase.

The long-term effects of the proposed mechanical thinning and prescribed fire on the allotment would result in a cumulative increase in grazing management flexibility when considered with the proposed fencing improvements. An increase in vegetation density and diversity would include an increase in forage production which would allow for more flexibility in grazing management. Increased forage production would improve livestock distribution and result in reduced grazing intensity and forage utilization levels. The reduced grazing intensity level would provide for an increase in the pasture grazing period which would provide the opportunity to allow for rest or seasonal deferment for other pastures.

Weed Treatments would result in localized, short term reductions in plant height, canopy cover, and vegetation production due to the physical defoliation and crushing of understory vegetation related to mechanical/vehicular weed treatment activities. However, these effects would be temporary and recovery would typically occur in one growing season under favorable climatic conditions. In the long term, weed treatment projects would remove, or control the spread of, noxious weed species which would result in maintaining vegetation density, vegetation diversity, plant height and canopy cover, and vegetation production within the analysis area.

Recreation (camping, hiking, biking, etc.), hunting , and firewood gathering all result in reductions in plant height, canopy cover, and vegetation production due to the physical defoliation and crushing of understory vegetation primarily related to the vehicular use associated with these activities. Except in areas that receive continuous recreational and vehicular use, the effects to plant height, canopy cover, and vegetation production would be temporary and recovery would typically occur in one growing season under favorable climatic conditions. Changes in road management through the Travel Management Plan would lessen the impact to the upland vegetation within the analysis area.

Off Highway Vehicle (OHV) use results in reductions in plant height, canopy cover, and vegetation production due to the physical defoliation and crushing of understory vegetation. Except in areas that receive continuous OHV use, the effects to plant height, canopy cover, and vegetation production would be temporary and recovery would typically occur in one growing season under favorable climatic conditions. Changes in road and OHV management through the Travel Management Plan will continue to lessen the impact to the upland vegetation within the analysis area through a reduction in the number and mileage of roads open for vehicular use and the elimination of off-road vehicle use.

Under this alternative, livestock grazing would continue on NFS land within the Windmill West Allotment and it is likely that livestock grazing would continue on the approximately 11,500 acres of State Trust lands within the Windmill West Allotment. How long these lands continue to be utilized for livestock grazing, and to what level livestock use occurs on these lands would be management actions determined by the Arizona State Land Department. Under this alternative, it is likely that existing structural range improvements on State Trust Land remain operational and would continue to be maintained.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects for this alternative are the same as the effects identified and discussed for the Modified Proposed Action.

Soils

This section describes the current condition of the soil in the allotment and the potential effects of the alternatives on soil condition. This analysis does not describe individual soil types, but rather focuses on the condition of the soil. This section does not break down the condition of the soil pasture by pasture; it focuses on specific areas with the most substantial problems. Appendix B contains supplemental information about current soil conditions in the allotment.

Soil is affected by livestock walking on the soil and consuming forage. When inadequately managed, the result can be compaction of soils resulting in a platy soil structure with reduced water infiltration and gas exchange, and increased resistance to root penetration. Consumption of vegetation without regarding to timing (i.e., when the grass is grazed in its growing cycle), duration, and intensity can result in increased exposure of soil to the erosive forces of wind and water leading to accelerated erosion and reduced input of organic matter to the soil. Managed grazing, however, can be beneficial to soils by:

- Breaking up dense, rank vegetation through hoof action, which can improve the health, palatability and forage production of grass species (Savory 1988).
- Stimulating plant production, which can produce more above-ground biomass that would be available for litter.
 - One study (Loeser 2004) on the Coconino NF in 2004 found that grazing can increase the annual net primary production of plants, over non-grazed areas.
- Some hoof action reduces compaction by breaking up the surface crust and preparing the soil for seeds and plants. The hoof action mixes organic materials into the soil and “plants” the seeds by burying them. (Savory and Parsons 1980, Savory 1988).

The description of existing conditions of soil resources in the analysis area was based on field visits conducted from 2010 to 2013 supplemented with information published in the Coconino National Forest (CNF) Terrestrial Ecosystem Survey (TES) (Miller, et. al. 1995). Soil condition ratings (definitions in the Glossary

) are based on interpretations of soil hydrologic function, soil stability, and soil nutrient cycling and are classified, using the R3 Soil Quality Technical Guidance (Forest Service Handbook, R3 Supplement 2509.18-99-1) and each ecological type (soil) is rated, as one of the following:

- Unsatisfactory
- Impaired
- Satisfactory
- Satisfactory but Inherently Unstable

The description of existing conditions of soil resources in the analysis area was based on field visits conducted from 2010 to 2013 supplemented with information published in the Coconino National Forest (CNF), Terrestrial Ecosystem Survey (TES) (Miller, et. al. 1995). Soil conditions

were assessed at 33 sites within 12 TES map units during September and April 2010, January 2012, and February and March 2013 using the soil condition assessment protocol developed by Region 3 of the U.S. Forest Service (FS) (FSH 2509.18-99-1) and Technical Guidance for Soil Quality Monitoring in the Southwest Region (Robbie, 2012). The TES was mapped across the landscape at a scale of 1:24,000. Therefore, small patches (<40 acres) are generally not broken out in the TES. The TES is considered reliable for allotment-level evaluations.

A complete breakdown of soils by TES unit, and an explanation on changes to soil condition classifications as a result of updated field observations can be found in the project record. For a detailed background on the history of the development of TES, refer to Miller, et. al. 1995.

Affected Environment

Across the allotment, soil conditions were evaluated based on interpretations of the three primary soil functions: soil hydrologic function, soil stability, and nutrient cycling.

- Hydrologic function is based on indications of reduced infiltration due to compaction and modification of the surface soil structure.
- Soil stability is generally assessed through visual inspection of the soil surface for evidence of erosion.
- Nutrient cycling is generally assessed through erosion modeling and visual observation of surface litter, composition and distribution of perennial vegetation, presence and distribution of coarse woody material, and root distribution within the surface soil horizons.

The existing soil conditions in the area being considered for grazing authorization are as follows:

Table 10: Soil Condition Classes on less than 40 % slopes in the Windmill West Allotment

Soil Condition Classification	Acres in Summer Pastures	Acres in Winter Pastures ¹	Acres in South Gyberg Pasture	Total Acres	Percentage of Allotment Being Analyzed
Satisfactory	41,874	5,656	634	48,164	43.8%
Impaired	1,286	44,202	1,252	47,734	43.4%
Unsatisfactory	87	6,666	0	6,753	6.1%
Satisfactory but Inherently Unstable	794	6,562	71	7,427	6.7%
Total	44,041	64,080	1,957	110,078	100%
1) Winter Pastures except South Gyberg which is only included in alternative 3					

The majority of the allotment is either in either satisfactory or impaired soil conditions. 6.1% of the allotment is in unsatisfactory soil condition and 6.7% is satisfactory but inherently unstable. The most current available data collected in 2012 and 2013 assesses several previously classified

unsatisfactory soil conditions, some of which were not formally validated on-site when they were first classified. The new data shows there are currently fewer areas of unsatisfactory and impaired soils compared to the projections made by TES modeling.

Soils within the summer range portion of the analysis area occur within the ponderosa pine vegetation community and are generally satisfactory owing to high amounts of effective vegetative ground cover (litter and herbaceous plants), however, reduced nutrient cycling may be occurring where ponderosa pine densities exceeding historic densities limit herbaceous cover. In summer pastures, soils classified as impaired or unsatisfactory are generally found within TES map units 50 and 55 corresponding to montane meadows, the soils of which have been observed to exhibit compaction and reduced nutrient cycling (Steinke 2012). Livestock and wildlife grazing has led to compaction and reduction of the soil's ability to hold moisture and reduced infiltration (Finch 2004).

Within the winter range portion of the analysis area, impaired soils are generally found within desert scrub and pinyon-juniper woodlands where indicators of hydrologic functioning and nutrient cycling suggest that, although soil productivity is being maintained, improvements to soil structure and plant species diversity could occur. Soils classified as unsatisfactory are generally located within the semi-desert grassland vegetation community. These unsatisfactory soils have vegetative ground cover less than tolerable ground cover indicating that soil productivity is not being maintained. These conditions are associated with TEU 280, 402, portions of 414 and 418 in Greasy East, Greasy West, Dutch Kid, and Sheepshead Holding Pastures, (see Rangeland Resources for more information on TEU 280 and 418).

TEU 414, rated as unsatisfactory by TES, covers approximately 3,020 acres of primarily semi-desert grasslands within Wheatfield, Greasy West, Duff Mesa, Greasy East, DK Unit, Malpais, Strip, Sheepshead Holding, and Dutch Kid Pastures, however; soils within 1,889 acres of Malpais, Strip, and Duff Mesa were re-classified to “impaired” based on on-site soil assessments performed at four different locations within these pastures with overall soil condition ratings of “impaired”. The TES “unsatisfactory” rating for the remaining 1,131 acres of this TEU was retained since there was insufficient field data to suggest otherwise.

TEU 402, rated as unsatisfactory by TES, covers approximately 500 acres of primarily semi-desert grasslands within Greasy East, Malpais, Strip, and Sheepshead Holding Pastures. On-site soil assessments of this map unit were performed at two different locations, one each in Strip and Malpais Pastures. Overall soil condition at both locations was rated as “impaired” and vegetative ground cover was estimated to exceed the TES estimated tolerable vegetative cover of 15%.

Vegetative ground cover in TEU 280, 402, portions of 414 and 418 are naturally low (i.e., TES potential vegetative ground cover in these map units is 20 percent) but other factors such as drought conditions and increased cover by woody species are likely limiting vegetative ground cover. Furthermore, factors such as the presence of a large amount of surface rock fragments may be preventing accelerated erosion at certain sites. Surface rock fragments can protect the soil from raindrop impact and prevent the development of surface crusts that impede water infiltration thereby reducing soil erosion (Weltz, et.al., 1998).

Woody species encroachment of western U.S. rangelands has been identified as one of the most extensive changes currently occurring in the pinyon-juniper (PJ) woodlands and semi-desert grassland vegetation community, where most impaired and unsatisfactory soil conditions on the

allotment are found (Davenport, et.al., 1998). Under some conditions, woody species encroachment has been accompanied by loss of herbaceous ground cover and subsequent accelerated erosion within the inter-canopy areas (Davenport, et.al., 1998). Studies conducted by Huber, et.al. (1999) suggest that understory productivity rapidly declines when woody species crown cover exceeds 20 percent to 30 percent. In some environments, the shift to woody species has been accompanied by increased erosion where woody species compete directly with grasses for limited soil moisture and nutrients (Wilcox and Davenport, 1995). This shift from grasslands to woodlands or shrublands, therefore, has the potential to impact soil productivity and, by extension, water quality.

Generally, soils are not classified as satisfactory but inherently unstable unless greater than 40 percent slope. Areas less than 40 percent slope are located on the foot slopes of hills and mountains and are generally capable of supporting livestock grazing, while still allowing for maintenance of soil productivity. Occasionally, soil loss modeling from TES predicts long term annual soil loss would exceed what is considered “natural soil loss” under the climax plant community on less than 40 percent slopes. However, on the ground observations of soil conditions on slopes less than 40 percent that were classified as satisfactory but inherently unstable were not prioritized for field validation because these areas were assigned no capability for grazing and thus did not factor into the estimated capacity for the Windmill West Allotment. Therefore, data collected in these areas was limited and not always sufficient to reclassify them.

In summary:

- The majority of the allotment (about 85 percent) contains satisfactory or impaired soil conditions. Impaired soils are able to support conservative levels of grazing while maintaining soil productivity.
- Pastures located in pinyon-juniper (PJ) woodlands, juniper/semi-desert grassland transitional areas, and semi-desert grasslands/shrublands are generally impaired and offer potential capability under a conservative allowable use and an adaptive management strategy while maintaining soil productivity.
- Pastures located in ponderosa pine vegetation types have satisfactory soil conditions and offer full capability for grazing. Grazing with a conservative allowable use and an adaptive management strategy would maintain this satisfactory soil condition and long-term soil productivity.
- Unsatisfactory soils account for approximately 6% of the allotment. However, these soils were not used to support the estimated capacity for the allotment and so their presence was not accounted for in determining permitted use for the allotment.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Soil condition and productivity would be the same in pastures proposed for closure under all alternatives.

Alternative 1: No Action

Under the no action alternative, there would be no livestock grazing within the allotment. This would eliminate any contributions from cattle grazing towards erosion, compaction, and

destabilization of soils. Soil conditions around water sources in the no action alternative would likely improve at a faster rate than under alternatives 2 and 3. In the rest of the allotment soil conditions would be similar to other alternatives. Under the no action alternative, soils identified as satisfactory but inherently unstable would likely remain unchanged as compared to the proposed action and its alternatives. These soils typically, though not always, occur on slopes exceeding 40 percent with limited livestock use and are characterized as having natural soil loss rates exceeding tolerable soil loss rates and are functioning properly and normally.

The No Action alternative would result in no treatments to remove encroachment of woody vegetation on up to 3,179 acres of winter range with soils in impaired and unsatisfactory conditions. Improvement of these soils would only be expected to occur by reducing competition from woody species for limited water and soil nutrients as is proposed through lop and scattering of juniper and pinyon trees under the modified proposed action. Thus, this alternative would result in the continued loss of soil function and productivity on these acres and a continued trend of woody vegetation encroachment over the length of the term grazing permit on the winter range of the Allotment. High utilization of montane grasslands by wildlife would continue to prevent improvements to soil conditions in these areas.

Summary

Alternative 1 would move soil conditions towards desired conditions slightly faster than alternatives 2 and 3 for most of the allotment. Where vegetation treatments are proposed in alternatives 2 and 3, alternative 1 would have soil conditions that would continue to decline in terms of productivity and function.

Alternative 2: Modified Proposed Action

Cattle grazing can have both negative and positive effects on soil properties, depending upon ecosystem properties and disturbance feedbacks which are primarily controlled by climatic conditions and grazing management variables. Grazing annually removes a portion of the standing biomass. Recovery of this biomass is dependent on precipitation and utilization levels. Precipitation influences short-term changes in vegetation more than any other single factor (Clark and Cable 1974). Grazing, either by livestock or native herbivores, has the potential to impact soils primarily through impacts to vegetative cover and through alteration of soil properties, such as bulk density.

Grazing, either by livestock or wildlife, has the potential to impact soils primarily through impacts to vegetative cover, since vegetative cover protects the soil from raindrop impact and sheetflow-induced shear stress, and through alteration of soil infiltration rates by compaction. In a rotational grazing management system such as that proposed for the Windmill West Allotment, pastures are generally grazed only once per year allowing for recovery of vegetation during the current or subsequent growing season and recovery of soil compaction through freeze-thaw and other soil disturbing processes. The majority of perennial grasses in the winter range are warm season grasses which may begin to green up in the spring but generally grow most rapidly and produce seedheads after the onset of the monsoon in about mid-July. Since livestock grazing in the winter range only occurs from about November 1st through May 31st, the majority of perennial grasses are not grazed during their growth period and recover fully upon favorable precipitation. Pastures in the summer range, would be managed for conservative to moderate grazing intensity (30-50 percent) in the late spring to early summer months when sufficient opportunity exists for plant regrowth. During the remainder of the summer grazing period, grazing intensity would be managed at conservative levels (30-40 percent) when the potential for

plant regrowth is limited. For the winter range, pastures would be managed for conservative grazing intensity (30-40 percent). These measures account for the physiological needs of forage plants and as such, would be protective of the vegetative cover so important to protecting maintaining soil. As a result, proposed grazing under alternative 2 should maintain or improve vegetative ground cover on impaired and unsatisfactory soils and maintain percent cover on satisfactory soils. Over the allotment, this should result in maintained or improved soil productivity.

As noted by Clark and Cable (1974), inter-annual fluctuations in precipitation would likely influence short-term changes in vegetation more than any other single factor. As identified in the Range Specialist report, historic precipitation data at various monitoring stations in the region highlight the degree of fluctuation in precipitation. Factors other than vegetative cover also protect the soil from raindrop impact, one of the dominant mechanisms of soil particle detachment on undisturbed rangelands (Wei, et. al. 2012). In the winter range, a high amount of surface rock fragment cover has been noted to protect the soil from accelerated erosion.

The annual reduction in plant canopy cover that occurs during the period between grazing and re-growth exposes more of the soil to raindrop-induced detachment of soil particles if intercanopy spaces are not otherwise covered by litter or rock fragments. Where bare mineral soil is exposed to direct raindrop impact, a surface crust may form that locally increases runoff attributable to reduced infiltration. This process may further enhance the detachment and transport of soil particles. Field evidence for this may include rilling, plant pedestals (i.e., areas where plant basal area is elevated above the surrounding soil though this pedestal may also occur from wind deposition), and flow-induced displacement of litter. These conditions would generally occur in localized areas or where unsatisfactory soil conditions are present in the winter pastures due to lack of vegetative cover. The effects of the hoof action of cattle have been reported to be both beneficial to soils by reducing soil compaction, breaking up surface crusts, and enhancing seedbed preparation of the soil (Savory, 1984) and detrimental to soils in terms of decreased infiltration and aeration of the soil through hoof compaction (Gifford and Hawkins, 1978). These contrasting effects may be representative of the complexity of rangeland ecosystems. By reducing soil aeration and infiltration, soil compaction can decrease soil productivity and increase runoff exposing the soil to increased shear stress and erosion.

TEU 280 is 14 acres in North Gyberg and could improve more quickly than other areas of unsatisfactory soil conditions due to the fact the pasture will be rested every other year and therefore will generate more vegetative ground cover.

Soil conditions in portions of TEU 418 with juniper canopy cover exceeding natural canopy cover would benefit from proposed vegetative treatments. The amount of bare soil would decrease and the vegetative ground cover would likely increase. Soil conditions within other portions of this unit that would not be improved by vegetative treatments would likely still have enough vegetative ground cover and/or surface rock to prevent accelerated erosion on these sites. No grazing capacity was assigned based on conditions in this TEU. Incidental grazing by cattle within the pasture would not impact the long term trend due to conservative utilization, timing of use and appropriate grazing management practices.

Soil conditions in TEUs 402, 414 and 420 would likely still have enough vegetative ground cover and/or surface rock to prevent accelerated erosion on these sites. Grazing capacity was assigned

to some of these TEUs but is not expected to impact the long term trend due to conservative utilization, timing of use and appropriate grazing management practices.

Given normal to above average precipitation levels, this alternative is expected to result in the maintenance of soils in satisfactory conditions and the decrease of soil area in impaired and unsatisfactory conditions over the 10 year term of the grazing permit. In periods of recurring drought or high severity drought, soil conditions would be maintained through adaptive management strategies including possible removal of cattle from some or all of the allotment for periods of time. Monitoring soil condition and using adaptive management strategies to adjust the timing and intensity of cattle grazing would reduce the likelihood of causing long term negative impacts associated with hoof impacts and removal of plant canopy.

In areas where vegetation treatments occur, there would be greater improvements in soil condition due to the reduction of canopy cover of juniper and the likely reestablishment of perennial grasses (Clary and Jameson 1981). Removal of juniper is expected to immediately increase vegetative ground covered as a result of scattered slash. An increase in grasses and forbs is expected to occur within 1 to 6 years of treatment (Clary and Jameson 1981, Jameson and Reid 1964, Bates et al. 2007).

The modified proposed action includes lop and scatter treatments on up to 3,179 acres to reduce woody species canopy cover in those TES map units with potential canopy cover less than 10 percent but current canopy cover estimated to exceed this value. These treatments are expected to improve soil conditions as juniper encroachment has been observed to be accompanied by loss of herbaceous ground cover and subsequent accelerated erosion within the inter-canopy areas due to competition for limited soil and water resources (Davenport, et.al., 1998). Since treatments will be done by hand thinning using chainsaws, there would be minimal ground disturbance associated with treatment implementation. Lopping and scattering of slash would result in an immediate increase in vegetative ground cover, thus having an immediate improvement of soil condition by decreasing erosion and improving opportunities for water infiltration. The downed woody debris would also function to distribute nutrients, provide shade, and minimize moisture loss (Bates et al. 2007, Stoddard et al. 2008, Ross et al. 2012). By reducing juniper canopy cover, vegetation treatments are expected to improve long-term soil productivity by facilitating the establishment of herbaceous cover where bare ground currently exists.

In the short-term, these treatments would reduce the competitive tree over-story and distribute branches and limbs on bare soil areas to help increase the nutrient cycling thus improving conditions for perennial grasses. The establishment of perennial grasses in former bare patches would increase soil cover by plant vegetative basal area and litter, decrease rainfall impact on bare soil, reduce erosion and improve nutrient cycling through more and faster vegetative decomposition (Clary and Jameson 1981, Stoddard et al. 2008, Gottfried 2008). These treatments would move us towards achieving our vegetation and soil desired conditions and objectives.

Over the long-term the lopped material would break down into organic matter, which would improve the soils nutrient status. The perennial grasses would become more of a dominant feature on the landscape, and more organic material would be available for absorption into the soil, increasing soil productivity. In a study conducted in Northern Arizona, yields of understory vegetation increased from 223 pounds per acre, including 50 pounds of perennial grasses, to 981 pounds per acre including 193 pounds of perennial grasses after juniper over-story was removed (Clary and Jameson 1981).

This long term improvement in site productivity would improve watershed and soil conditions on the Windmill West Allotment. Implementing restoration actions that maintain or improve conditions is key to providing resilient watersheds (USDA Forest Service 2010). The vegetative treatments are part of this overall adaptive management approach that can improve the resiliency of the landscape under the proposed action. These actions help ensure the forage productivity but more importantly the ecosystem resiliency and watershed stability.

Livestock do not directly graze biological soil crusts, but they may trample them when they graze through an area. Within the Windmill West Allotment, clearly visible biological soil crusts are typically found within the winter range portion of the allotment. Light to moderate stocking in early to mid-wet season is recommended for protecting soil crusts (Belnap et al. 2001). The forage utilization guidelines for this proposed action are consistent with the recommendation and would be expected to adequately protect soil crusts across the allotment. In localized areas, wind and water erosion in those areas protected by biological soil crusts would likely increase if these crusts were disturbed by livestock trampling.

Summary

Alternative 2 with the inclusion of resource protection measures and adaptive management strategies would maintain soil condition or move towards desired conditions over the next 10 years. Where vegetation treatments are proposed in alternatives 2 and 3, alternative 2 would improve soil conditions in terms of productivity and function at a faster rate than alternative 1.

Alternative 3: Modified Proposed Action with South Gyberg

Direct/indirect effects to soils from alternative 3 are identical to that for the modified proposed action except that grazing would occur on roughly 1,252 additional acres of impaired soils associated with TES map units 381 and 385. These map units had vegetative covers exceeding tolerable vegetative covers indicating maintenance of soil productivity but reduced nutrient cycling and hydrologic function. Grazing intensity and utilization would occur at conservative levels (30-40 percent) in the pasture. Grazing has not occurred for about 10 years on South Gyberg Pasture and climate conditions are likely affecting the diversity and density of herbaceous cover. However, conservative utilization will ensure 60-70 percent of vegetative plant matter is not grazed and continues to contribute to vegetative cover to help maintain and improve soil condition over the length of the term grazing permit.

Soil conditions and productivity in and around range improvements such as the pipeline and trough would decline in the short term but would partially regain vegetative ground cover under favorable climate conditions. In the short term, there may be some erosion caused by the increased area of bare ground. Over the long term, a smaller area in and around the trough may continue to have increase bare ground and become compacted because of livestock trampling.

Summary

Alternative 3 with the inclusion of resource protection measures and adaptive management strategies would maintain soil condition or move towards desired conditions over the next 10 years. Soils in TEU 381 and 385 would also maintain or improve their condition but at a slightly slower rate than they would under alternative 2. Soils around the trough in South Gyberg would be impacted by livestock trampling. Where vegetation treatments are proposed in alternatives 2 and 3, alternative 3 would improve soil conditions in terms of productivity and function at the same rate as alternative 2.

Cumulative Effects

Alternative 1: No Action

Recreational activities with potential impacts to soils occurring within the proposed allotment boundary include motorized and non-motorized travel, camping, hunting, and other related activities. Under the 2012 travel management decision for the Coconino National Forest, off-road vehicle access is restricted and Forest Service roads are designated as open to all motorized vehicles, open but restricted to highway legal vehicles, or are not designated, which means that they are closed to public use. In the analysis area, approximately 282 miles of roads are open to the public and roughly 152 miles of roads are not designated as open. The reduction in publicly accessible roads and prohibition of off-road vehicle access is expected to improve soil conditions throughout the allotment by reducing erosion of roadbeds, a process which is enhanced by traffic (Grace and Clinton, 2007).

Fuels reduction/forest restoration activities, such as the Four Forest Restoration Initiative and the Turkey Barney project, typically include commercial timber harvesting using mechanized equipment, pre-commercial thinning involving hand crews with chain saws, and prescribed fire in the form of broadcast burns or pile burns. All activities of this type that are reasonably foreseeable would occur in the summer pastures. Commercial thinning using mechanized equipment has short-term impacts to soils lasting roughly 3 to 5 years. Effects to soils from commercial thinning are frequently attributable to displacement of litter. Displacement of litter exposes bare mineral soil to the erosive effects of raindrop impact and may locally cause accelerated erosion. The compaction of soils from timber harvesting is generally associated with skid trails, landings, and temporary roads. Similar to the effects of litter displacement, soil compaction may lead to accelerated erosion to the extent that infiltration is reduced and runoff is enhanced. Thinning contracts include best management practices to minimize these negative effects to soils including installation of drainage features on skids trails and temporary roads to prevent concentrated flow that could lead to accelerated soil erosion. Fuels reduction/forest restoration activities can also result in improvements to soil conditions and productivity by reducing canopy cover, adding nutrients back to the soil, reducing the thickness of duff layers that impede the growth of herbaceous vegetation, and reducing the susceptibility of the forest to catastrophic fires that may result in high soil burn severity and loss of soil productivity. Improved herbaceous vegetation conditions would likely increase nutrient cycling. Most notably, improved forage conditions would likely result in improved soil conditions in TES map units such as 50 and 55 (currently rated as unsatisfactory and impaired, respectively) by facilitating the dispersal of grazing animals to achieve more even utilization of forage.

Prescribed fire, either as broadcast or pile burning, potentially impacts soils by exposing bare mineral soil. The conditions under which prescribed fires are conducted are such that negative impacts to soils are typically minimized (i.e., ground cover is not completely consumed), however; pile burning can have lasting negative effects to soils because of the concentration of woody fuel in slash piles and subsequent intense heating that can occur from this method of logging slash treatment. Korb, et.al. (2004) noted the absence of viable plant seeds and mycorrhizal fungi, which play an important role in nutrient availability for plants, nutrient cycling, and soil structure, in areas exposed to pile burning.

Climate change in the North American southwest is predicted to lead to decreased winter precipitation throughout the current century (Seager and Vecchi 2010). This decline in winter precipitation could lead to a decrease in herbaceous cover dependent on winter precipitation.

Climate change could also delay the onset of summer precipitation with no overall reeducation in amount of precipitation (Cook and Seager 2013). These changes in climate patterns could result in an extended fire season in the spring and early summer and therefore, an increased extent of soils impacted by fire and loss of vegetative cover, particularly for cool season grasses.

This alternative includes no authorization of grazing, which would result in no cumulative effect with the above activities except for improvement to soils from vegetation treatments that increase herbaceous cover. In alternative A these cumulative effects would be slightly less than the other alternatives because of the lack of improvement in soil condition on the 3,179 acres that would be treated under alternatives 2 and 3.

Alternative 2: Modified Proposed Action

Cumulative effects related to recreation, travel management and climate change would be similar to those described for the no action alternative. The combination of other federal and non-federal land management activities and recreational activities together with the modified proposed action would not be expected to result in a long-term loss of soil productivity for the following reasons. The Coconino National Forest's implementation of the Travel Management Rule is expected to reduce impacts to soils by prohibiting off-road motorized travel except in certain cases such as game retrieval and fuelwood harvesting, and by reducing the number of roads accessible to the public. Fuels reduction/forest health restoration activities are expected to reduce the susceptibility of forested areas to catastrophic wildfire, and improve nutrient cycling and dispersion of grazing by wild and domestic ungulates by fostering conditions for growth of herbaceous plants.

The cumulative effects to soils from the modified proposed action are similar for those associated with the no action alternative plus direct/indirect effects of the modified proposed action resulting from hand thinning of woody species on up to 3,179 acres. The continued authorization of livestock grazing with resource protection measures and adaptive management strategies under this alternative would maintain or improve soil productivity at a slightly slower rate than alternative 1 and therefore would have a slightly slower pace of moving towards desired conditions.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects to soils from alternative 3 would be identical to that for the modified proposed action except that grazing would occur on roughly 1,252 additional acres of impaired soils associated with TES map units 381 and 385. Like the modified proposed action, this alternative would combine cumulatively with actions such as reduced off-road motorized travel resulting from implementation of the travel management planning process to cumulatively improve soils on the allotment over the length of the term grazing permit. No reasonably foreseeable fuels reduction projects are currently planned in the South Gyberg Pasture that would result in a cumulative impact to soils.

Watersheds and Water Resources

This section briefly discusses the water quality of the area and how the alternatives may affect the water resource and watershed conditions. This section does not address water quality in earthen stock ponds that were established and are managed for wildlife and livestock management. Structural range improvements identified in Chapter 2 are not expected to affect water quality.

Affected Environment

The existing condition was determined based on field assessments and the existing forest inventory. The field assessments were completed by Forest Service personnel. See the soil and water specialist's report for a more in-depth explanation.

Watershed Condition

All pastures associated with the allotment are within the Upper Verde River sub-basin (4th code watershed) drained by the Verde River. Watersheds (5th code watersheds) which contain pastures that are proposed for continued livestock grazing within the Windmill West Allotment include Oak Creek, Sycamore Creek, Grindstone Wash-Verde River, and Cherry Creek-Verde River. Drainage within the analysis area is to the south with ephemeral and intermittent stream courses tributary to Oak Creek or the Verde River.

The condition of the watershed is based on an evaluation of the soil, aquatic, and riparian systems, as prescribed by Forest Service Manual 2500 and the Watershed Condition Framework (WCF) (USDA Forest Service 2011a). Using those procedures, the following conclusions were reached for the 6th code watersheds:

Table 11: Condition of 6th Code Watersheds within the Windmill West Allotment

6 th Code Watershed	Watershed Condition	Associated Pastures
Coffee Creek	Functioning at Risk	Black Tank, Wheatfield, Sugarloaf, 048, Greasy West, Red, DK Unit, Duff Flat, Malpais, Dutch Kid, Strip, Sheepshead Holding
Dry Creek	Impaired Function	West Barney, East Barney, Greasy West, 051, Greasy East, Malpais
Fry Canyon	Functioning Properly	Roger's Lake, Metz, Mill Park, Lockwood Springs, Fry Park East, Mexican Pocket, Harding Point
Little LO Spring Canyon	Functioning Properly	Roger's Lake, Mill Park, Lockwood Springs
Lower Oak Creek	Impaired Function	Duff Flat, Dutch Kid, Strip, North Gyberg, Sheepshead Holding
Middle Sycamore Creek	Functioning at Risk	Lockwood Springs, West Barney
Pumphouse Wash	Functioning at Risk	Mexican Pocket, Harding Point

6 th Code Watershed	Watershed Condition	Associated Pastures
Secret Canyon	Functioning Properly	Lockwood Springs, West Barney, Winter Cabin Holding
Sob Canyon-Verde River	Functioning at Risk	Wheatfield, Duff Mesa, Duff Flat
Spring Creek	Functioning at Risk	West Barney, Winter Cabin Holding, Black Tank, Greasy West, Greasy East, DK Unit, Malpais, Strip, Sheepshead Holding
Upper Oak Creek	Functioning at Risk	Mexican Pocket, Harding Point, East Barney
Volunteer Canyon	Functioning at Risk	Roger's Lake
West Fork Oak Creek	Functioning Properly	Mill Park, Lockwood Springs, Fry Park East, Fry Park West, Harding Point, West Barney, East Barney

Four of the 6th code watersheds are classified as functioning properly, seven as functioning at risk, and two as impaired. For an in-depth explanation of the WCF, see the soil and water specialist's report.

Many factors affect the health of the watershed, including soil condition, climate, grazing, and vegetative cover. The productive grasslands with open juniper woodlands have been altered over time by the encroachment of small junipers and woody shrubs into areas where they were not naturally dominant (Archer et al. 2005, Jameson and Reid 1964, Davis and Turner 1986, Borman 2005, Sankey and Germino 2008). Productive grasslands and open pinyon juniper woodlands with a healthy understory component have been altered over time by the encroachment of small junipers and woody shrubs which decreases herbaceous perennial grasses, exposes larger areas of bare soil, and accelerates rates of erosion and decreases overall watershed and soil function (Borman 2005, Stoddard 2008). This loss of perennial vegetative ground cover is primarily due to the increase in canopy cover which suppresses understory vegetation (Clary and Jameson 1981, Stoddard 2008).

Water Quality

There are no perennial streams within the allotment boundary. Dry Creek is the only stream course within the analysis area for which attainment has been assessed by ADEQ. Dry Creek was designated as “inconclusive” (category 3). Perennial streams or rivers in the analysis area that are upstream or tributary to ephemeral stream courses within the allotment include Spring Creek, Verde River located to the southwest of the analysis area, Sycamore Creek located to the west of the analysis area, and Oak Creek, including the West Fork of Oak Creek Canyon. Spring Creek was designated as “not attaining” because of elevated levels of E. coli. The West Fork of Oak Creek Canyon was designated as “attaining all uses”, Oak Creek from approximately its confluence with Sterling Canyon to its confluence with Spring Creek was designated as “not attaining” owing to elevated levels of E. coli, Sycamore Creek was designated as “attaining some uses” (category 2), the Verde River was designated as “attaining all uses” (category 1) from Sycamore Creek to its confluence with Oak Creek and “inconclusive” from the Oak Creek

confluence to Beaver Creek confluence (ADEQ 2012). The reaches of the Verde River were previously designated as “impaired” because of turbidity. Arizona repealed the turbidity water quality standard in 2003 and replaced it with a suspended sediment concentration (SSC) standard. No median value exceedances of the SSC standard have occurred within the previously impaired reaches of the Verde River (ADEQ 2012).

Environmental Consequences

This section provides a summary of effects. More detail can be found in the soil and water specialist’s report, in the project record.

Watershed Condition and Water Quality

Direct and Indirect Effects

Common to all Alternatives

None of the alternatives would be expected to measurably increase sediment yields over a six month period which is defined as “short term” in the Antidegradation clause. None of the alternatives would alter vegetation production and density in a manner that would increase vegetative ground as a result of changes in grazing management (See Rangeland Resources for more information). In addition, none of the perennial stream courses that the allotment drains into are out of compliance with the SSC standard. The Proposed Action has been evaluated for consistency with the Clean Water Act and associated State of Arizona Anti-degradation policy and determined to be fully consistent.

Alternative 1: No Action

The no action alternatives could lead to a slight improvement in water quality in Oak Creek canyon particularly in the upper reaches above Pine Flat where cattle have been identified as one possible source of E. coli contamination (Crabill 1999). Cattle are estimated to account for only 1 percent of E. coli found in Oak Creek though the contribution from any particular source is likely to be highly variable both spatially and temporally. Most of the fecal pollution in Oak Creek Canyon comes from natural animal populations with only sporadic impacts from human, dog, cattle, horse, and llama sources (OCWC 2012).

Improvements to the water quality from the no action alternative of the perennial section of Spring Creek downstream of the allotment boundary would likely be slight to none for the listed impairment (E. coli). This section of Spring Creek has been designated as “not attaining” the state water quality standard for E. coli. (ADEQ 2012). The source of this contamination has not been determined definitively (ADEQ 2010b) but sampling data collected by OCWC has suggested a possible human source of E. coli that may have come from leakage from a sewage pond adjacent to Spring Creek (OCWC, 2012).

With the removal of livestock, it is expected that watershed improvements would continue in most areas slightly faster than under the other alternatives, given normal or above average precipitation. The exception would be in the 3,179 acres proposed for vegetation treatments. Without the vegetation treatments, the canopy cover issue would continue to reduce understory vegetation through competition for moisture, nutrients, and other resources such as sunlight. This would limit the potential for watershed improvements on about 3,179 acres in the Spring Creek, Coffee Creek and Dry Creek 6th code watersheds.

Alternative 2: Modified Proposed Action

Livestock have no direct access to these perennial stream courses and therefore the proposed action will not have a direct effect on water quality in these streams/rivers. Livestock grazing under proposed levels is not expected to delivery measurable amounts of sediment downstream and not expected to negatively affect water quality

The contribution from livestock grazing to E. coli in non-attaining portions of Oak Creek would not likely change as a result of the modified proposed action. On average, 33 percent of Escheria (E) coli in Oak Creek was attributable to human-related sources with 4 percent of this amount attributed to cattle (Southam, et.al. 2000). Cattle are estimated to account for only 1 percent of E. coli found in Oak Creek though the contribution from any particular source is likely to be highly variable both spatially and temporally.

Grazing would not occur during the summer months in those pastures containing ephemeral reaches of Spring Creek upstream of the perennial section under the modified proposed action. Upstream contributions to stream flow in the perennial section of Spring Creek would likely occur mainly during summer storm events associated with the North American monsoon. During this period, cattle would be grazing summer pastures above the rim. Cow dung can harbor fecal coliforms for up to several years but bacterial dispersion from rain drop splash is limited to less than one meter from dung deposits indicating limited opportunity for water quality impacts unless the cow dung is deposited on the streambank or directly into the water (Buckhouse 2010). Since ephemeral sections of Spring Creek generally lack water and do not support riparian vegetation, cattle are unlikely to be attracted to the stream channel. Since the timing and location of cattle grazing under the modified proposed action would not occur in proximity to the perennial streambank, its effects on water quality in Spring Creek would not be measureable.

The proposed action also includes 3,179 acres of vegetative treatments to reduce the encroachment of small junipers and increase the vegetative ground cover of perennial grasses in areas with impaired and unsatisfactory soil conditions. This would immediately contribute towards an increase in ground cover and would support the increase in herbaceous and perennial grasses and forbs (Clary and Jameson 1981). Treated grasslands and savannahs would then maintain a higher grass cover and be more resistant to erosion. This would also contribute towards more effective litter for vegetative ground cover. This would then contribute towards improving the health and function of the watershed by improving key watershed indicators including soil condition and rangeland vegetation.

Given the propensity for drought in the region, it is possible that a multi-year or acutely intense drought would occur during the term of the grazing permit. Depending on the intensity, drought conditions would slow or stop the accumulation of vegetative ground cover in the allotment and reduce the rate of soil erosion in each watershed in the allotment. Especially intense droughts would result in decreased vegetative ground cover, which can result in a temporary increase in sedimentation with following precipitation events.

Alternative 3: Modified Proposed Action with South Gyberg

Direct/indirect effects to water quality from alternative 3 are expected to be similar to that for the modified proposed action. The inclusion of South Gyberg Pasture is not expected to increase direct/indirect water quality effects over that identified for the modified proposed action. The proposed improvement in the South Gyberg Pasture would not impact water quality because of their small scale and distance from perennial water.

Cumulative Effects

Cumulative effects to water quality from the no action alternative were considered over the next ten years (the term of the permit) within the 5th code Oak Creek watershed in which roughly 66 percent of the analysis area is located, the 5th code Sycamore Creek watershed in which roughly 18 percent of the allotment is located, the 5th Code Grindstone Wash-Verde River watershed in which roughly 7 percent of the allotment is located, and the Cherry Creek-Verde River watershed in which roughly 8 percent of the allotment is located.

Alternative 1: No Action

Major land use activities that may impact water quality, which occur to varying extents in all the 5th code watersheds overlapping the Windmill West Allotment, include fuels reduction/forest restoration activities (i.e. use of prescribed fire, mechanical thinning, and other methods of vegetation management to improve forest health and/or reduce fire risk), grazing, recreation, agriculture, as well as residential and commercial development. These land use activities have the potential to impact water quality by altering the rainfall/runoff response (i.e. more runoff is generated for a given amount of rainfall), which, in turn, may lead to accelerated erosion and increased sediment transport. Residential and commercial development may cause an increase in peak discharge, which can lead to stream incision and increased streambank erosion. Ground disturbance from mechanical thinning and prescribed fire may lead to increased runoff and localized accelerated erosion because of physical alterations to soil properties (i.e., increased bulk density and reduced infiltration from compaction associated with mechanized harvesting and increased exposure of bare mineral soil from prescribed fire and mechanized harvesting), however; these effects are unlikely to impact water quality at the watershed scale because of the use of best management practices such as filter strips, optimized timing of prescribed fire to minimize impacts to soil, and the use of drainage features on skid trails and temporary logging roads to prevent concentrated runoff.

The potential impacts of recreation on water quality are generally attributed to the use of forest roads and the need for ongoing maintenance of these roads to facilitate public use. Originally constructed to facilitate timber harvesting and fire management, the primary use of forest roads has shifted to recreation (Grace and Clinton 2007). Forest roads may impact water quality by increasing sediment delivery to streams particularly where unimproved road stream crossings occur. Impacts to water quality associated with roads are expected to decline over the next decade and beyond as many forest roads are now closed to public access under travel management regulations and many roads no longer needed for administrative purposes are being designated for decommissioning, which may include blocking the road entrance to line of site or through obliteration of the roadbed.

The portion of the Oak Creek watershed above the Mogollon Rim includes a human population of roughly 4,000 mainly within the unincorporated communities of Forest Highlands, Kachina Village, Mountaineer, and Munds Park. Below the rim, the city of Sedona and surrounding areas have the largest population with roughly 10,192 residents. As of 1996, Oak Creek canyon had a permanent resident population of 304 with roughly 245 acres under residential development. Many of the homes within Oak Creek canyon as well as homes within the various communities utilize septic systems for disposal of sewage and leakage from septic systems has been identified as a source of fecal coliform contamination in Oak Creek (OCWC 2012).

The Kelly Motorized Trails Project decision notice signed in 2012 designated a system of trails to accommodate OHV and motorcycle use on the Coconino National Forest. As part of this project, approximately 10 miles of new trails for OHV users, and 21 miles of trails for motorcycle users will be constructed and approximately 21 miles of user-created trails will be adopted for motorcycle use within the Oak Creek watershed. Approximately 5 miles of closed roads within the Oak Creek watershed are proposed for decommissioning as part of this project. The effect to water quality in Oak Creek Canyon from this project is anticipated to be minimal because of the use of best management practices during trails construction including locating trails a minimum of 66 feet from drainages, promoting positive drainage by locating trails on-the-contour, and minimizing the number of trails crossings of drainages.

Because of the various efforts of organizations like the Oak Creek Watershed Council, it is expected that water quality within Oak Creek will improve over the next ten years. The elimination of grazing on the Windmill West Allotment would not likely influence this predicted outcome as impacts to water quality from cattle represent a small portion (roughly 1 percent) of E. coli contamination of Oak Creek. Under the no action alternative, grazing within the Oak Creek watershed would still occur on the Mooney, Woody Mountain, Tinny Springs, and Casner Kelly Allotments (OCWC 2012).

Alternative 2: Modified Proposed Action

Cumulative effects to water quality from the modified proposed action include those cumulative effects associated with the no action alternative combined with those direct/indirect effects from the modified proposed action. As noted in the previous section, water quality monitoring data from those perennial streams just outside and downstream of the allotment boundary, particularly suspended sediment concentrations, suggest that hill slope and channel erosion within the allotment and other parts of the watersheds draining to these surface waters is not causing a deterioration of surface water quality. Information on the sources of E. coli in Oak Creek and Spring Creek suggest that sources other than livestock are likely the major contributors to exceedances of water quality standards for this pollutant.

Vegetation treatments in alternative 2 would improve the conditions in the Oak Creek watershed in combination with projects such as Turkey Barney Fuels Reduction project and the 4 Forest Restoration Initiative.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects to water quality from alternative 3 are expected to be similar to that for the modified proposed action. The inclusion of South Gyberg Pasture is not expected to increase cumulative water quality effects over that identified for the modified proposed action.

Wetlands, Springs and Riparian Resources

Affected Environment

Roger's Lake and Fry Lake are the only wetlands identified within the analysis area. These wetlands are seasonal wetlands that mainly support herbaceous plants with no woody riparian species present or considered to be part of their natural plant community. Roger's Lake occupies approximately 1,200 acres with roughly 80 acres on NFS lands. The remainder of the wetland is owned by the County and private landowners. This wetland has been classified as "functional at

risk.” Fry Lake is seasonally-flooded wetland created or modified by a human-made barrier or dam which obstructs the inflow or outflow of water.

Figure 8: Typical Riparian Area within the Allotment (Dry Creek)



There are 14 formally named springs appearing on USGS quadrangle maps and one informally named spring (Rattlesnake spring) within the analysis area. Several of these springs are not persistent and lacked surface flow and associated riparian and/or wetland habitat as noted during field visits conducted in 2012 and 2013 (See Table 3: Springs located within the Windmill West Analysis Area in Chapter 2). Several other springs are inaccessible to livestock due to steep topography (i.e., Maple, Buzzard, and Bunker Hill Springs) or are located in pastures that are not currently being grazed by livestock and are being proposed for removal from the

grazing allotment. As a result, Lockwood and Rattlesnake Springs are the only springs that could be affected by the alternatives considered in this analysis.

Table 12: Proposed Management for Springs within the Allotment for Alternatives 2 and 3

Spring Name	Pasture	Proposed Pasture-level Management ¹	Proposed Pasture-level Mitigation that benefits Springs
Bunker Hill Spring	Winter Cabin Holding	Allow grazing	Restricted grazing period of 10 days or less
Maple Spring	East Barney	Allow grazing	Generally inaccessible to livestock – no action needed
Buzzard Spring	East Barney	Allow grazing	Generally inaccessible to livestock – no action needed
Lockwood Spring	Lockwood Springs	Allow grazing	Fencing to limit livestock and wild ungulate access
Paterson Spring	North Roger’s Lake	Allow grazing	Not functional because of lack of water – no action needed
Rattlesnake Spring	South Gyberg	Closed in alternative 2 and allow grazing in alternative 3	Alternative 2 – no action needed Alternative 3 – pipeline, troughs and waterlot fencing would be constructed to limit livestock access to the spring

Spring Name	Pasture	Proposed Pasture-level Management ¹	Proposed Pasture-level Mitigation that benefits Springs
Barney Spring	East Barney	Allow grazing	Not functional because of lack of water – no action needed
1) This column describes the pasture-level management the description of alternatives in Chapter 2. At the sub-pasture level, some springs are not accesible to livestock because of the topography and terrain of the surrounding area.			

There are 11 identified riparian reaches within the allotment. Within a typical riparian reach, woody riparian plant species, such as cottonwood, Arizona walnut, and willow are present indicating the presence of free water within the common rooting depth of vegetation for at least a portion of the growing season, however; but the density and diversity of such vegetation is limited by the duration of surface flow (See Figure 8 for a sample location).

Casner Cabin Draw in the West Fry Park Pasture is not “at-risk” solely because of livestock grazing. The presence of Big Draw Tank in Casner Cabin Draw results in and concentrated wildlife use of the area which is also contributing to degraded channel conditions.

Table 13 displays the functioning condition of riparian stream reaches within the proposed allotment boundary. One of these reaches is Functional-At-Risk, one is unknown, one is not rated and 4 are in Proper Functioning Condition. Several stream reaches identified as riparian in the COF riparian geodatabase were not included because they did not meet the Forest Service definition of riparian area, monitoring is not yet established for them or because they are inaccessible to cattle. Casner Cabin Draw in the West Fry Park Pasture is not “at-risk” solely because of livestock grazing. The presence of Big Draw Tank in Casner Cabin Draw results in and concentrated wildlife use of the area which is also contributing to degraded channel conditions.

Figure 9: Photo of current conditions at Lockwood Spring



Table 13: Riparian Stream courses within Proposed Allotment Boundary

Name	Functional Class	Length (feet) ¹
Casner Cabin Draw	Functional-at-Risk	1,224
Casner Cabin Draw	Proper Functioning Condition	1,068
Dry Creek	Unknown	21,606
Fry Canyon	Proper Functioning Condition	4,694
Fry Canyon	Proper Functioning Condition	6,238
West Fork	Proper Functioning Condition	11,154
West Fork Tributary	Not Rated	6,023
TOTALS		52,016

Several stream reaches identified as riparian in the COF riparian geodatabase were not included in this analysis for one of two reasons. First, field visits to these ephemeral drainages in February 2013 confirmed that they did not meet the Forest Service definition of riparian area, including roughly 7.6 miles of Loy Canyon and 7.6 miles of Spring Creek. This definition, presented in section 2.3, identifies riparian ecosystems as transitional areas between the aquatic and adjacent terrestrial ecosystems identified by soil characteristics or distinctive vegetation communities that require free or unbound water. Second, the riparian reach below Rattlesnake spring is not listed because monitoring has not yet established the length of this reach although initial surveying in February 2013 indicates that roughly ½ mile of the stream channel below the spring emergence area may have subsurface soil moisture conditions that support a riparian area. A PFC assessment conducted in December 2012 rated the riparian area in “proper functioning condition”. Riparian areas associated with Fry Canyon, the West Fork of Oak Creek Canyon, and West Fork tributary

are generally not accessible to cattle due to steep topography and therefore were also excluded from analysis of the alternatives.

Inadequate information existed to determine the functional condition of Dry Creek. Though this drainage was previously rated as functioning at risk, the potential for this reach was not defined and this is a critical aspect of determining functional condition. Dry Creek is a low gradient intermittent stream channel with a predominantly cobble bed with lesser amounts of sand and gravel. It supports some woody species such as Fremont cottonwood, Arizona walnut, and Gooding's willow but is not capable of supporting an herbaceous understory or continuous overstory due to the lack of flow permanency.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

Since livestock grazing would be discontinued under the no action alternative, there would be no direct or indirect effects from cattle grazing to wetlands, springs, and/or riparian areas within the Windmill West Allotment. The conditions at springs within the allotment would be maintained because elk and other wildlife would continue to utilize the areas around springs, causing trampling and loss of vegetative cover. There would be no predicted improvement in the condition of Lockwood Springs under this alternative. Effects to Fry Lake and Roger's Lake wetland areas would potentially include excessive herbivory and trampling of wetland vegetation.

Alternative 2: Modified Proposed Action

Direct and indirect effects of the modified proposed action to wetlands, springs, and riparian areas within the Windmill West Allotment are only expected to occur where cattle have direct access to such features. Under the modified proposed action, there would be no access to riparian areas associated with Fry Canyon, the West Fork of Oak Creek Canyon, and West Fork tributary due to steep topography. Field visits in 2013 confirmed the absence of livestock and absence of evidence of their presence in these areas. A photo representative of the terrain surrounding Fry Canyon is shown in **Error! Reference source not found.**

Riparian areas associated with Dry Creek and Casner Cabin Draw are accessible to livestock, however; both these riparian areas lack perennial water and would therefore, not be expected to experience the same types of impacts that have been noted to occur in riparian areas with perennial water such as trampling of stream banks and excessive utilization of riparian species. The Forest Plan requirement to limit utilization of woody riparian species to 20 percent or less within riparian areas would further limit the effects of the modified proposed action on riparian areas though utilization of riparian areas by wild ungulates may make it difficult to achieve functional condition improvements in those riparian areas utilized by wild ungulates. In particular, riparian areas above the Mogollon Rim often experience high utilization by wild ungulates. The "functional-at risk" rating for the Casner Cabin Draw riparian area is at least partly attributable to high elk utilization.

Effects to Fry Lake and Roger’s Lake wetland areas would be minimized through Forest Plan standards that require the maintenance of at least 80 percent of the potential emergent vegetation cover from May 1 to June 15. Attainment of these standards from the perspective of livestock management would occur through construction of approximately 0.5 miles of fencing along the section line between sections 31 and 6 in the Roger’s Lake Pasture. This fence would exclude

Figure 10: Photo of Fry Canyon taken from the State Highway 89A Bridge that crosses Fry Canyon



livestock from section 31 while allowing livestock to graze the rest of Roger’s Lake Pasture. A gate would be constructed along the fence to allow livestock grazing to occur

a) after July 15 and

b) if wildlife utilization of riparian species in Roger’s Lake Pasture has not exceeded 20 percent utilization of woody vegetation, or 40 percent utilization of emergent vegetation.

If grazing were to occur during the period from May 1 to June 15 in the pasture containing Fry Lake and utilization by either domestic

livestock or wildlife would prevent maintenance of Forest Plan potential emergent vegetation cover standards, approximately 1.5 miles of livestock exclosure fence would be constructed. The livestock exclosure fence would include a fenced lane¹² to the existing earthen stock pond in Fry Lake to allow for livestock watering.

Surface water and higher herbaceous plant density plant than surrounding upland areas make persistent springs attractive to livestock and wildlife. When climate conditions limit surface water availability, persistent springs can experience excessive utilization and trampling of spring-supported vegetation. Under the modified proposed action, Lockwood Spring is the only spring with persistent surface water that is accessible to livestock. In order to reduce the negative impacts to this spring from ungulate use, an exclosure fence would be constructed to exclude domestic livestock and wildlife from the spring emergence point and discharge channel. A portion of the spring discharge would continue to be piped beyond the exclosure for use by livestock and wildlife. The exclosure would likely be nine feet tall and constructed of sucker rod supported by treated wood posts or steel pipe. Access to the spring by wildlife other than ungulates would not be prevented. This fencing would be expected to improve conditions at the spring including plant species richness, robustness, and diversity.

Alternative 3: Modified Proposed Action with South Gyberg

Direct/indirect effects to wetlands, springs, and riparian areas from alternative 3 would be identical to that for the modified proposed action except that livestock impacts to Rattlesnake

¹² Fry Lake does not support woody vegetation and therefore the Forest Plan guideline to limit utilization to 20% of woody vegetation in riparian area.

spring and its associated riparian area would occur. This riparian area supports abundant herbaceous riparian vegetation mostly in the form of deergrass as well as other phreatophytes such as cottonwood and willow. The year round presence of water and more abundant vegetation than surrounding uplands in this area would be an attractant to livestock causing trampling of vegetation and potential impacts to stream banks from hoof shear (i.e., sloughing of banks from hoof pressure).

Cumulative Effects

Alternative 1: No Action

Under the no action alternative, cumulative effects to wetlands, springs, and riparian areas would occur primarily because of wildlife and human use of these natural resources. Human use of these resources could include recreation in and around these natural resources although the absence of perennial water in riparian areas within the allotment would likely limit recreational use of these areas.

Alternative 2: Modified Proposed Action

It is assumed that there would be no cumulative effects from the modified proposed action for those wetlands, springs, and riparian areas inaccessible to livestock. Under the modified proposed action, cumulative effects to those wetlands, springs, and riparian areas accessible by livestock would occur primarily from the combined effects of livestock, wildlife, and human use of these natural resources. Wild ungulates have similar effects to these areas as livestock including trampling and utilization of vegetation. The robustness, diversity, and density of plant species associated with wetlands and riparian areas (including wetlands and riparian areas associated with springs) has been noted to be impacted by ungulates even in the absence of livestock grazing. Compaction of upland areas by ungulates and/or recreational use may cause incision of spring-fed stream channels that support riparian areas. Springs are often recreational destinations with associated trampling of riparian or wetland plants supported by the spring. Potential cumulative effects to Lockwood spring, Fry Lake, and Roger's Lake would be minimized through construction of fencing that would not only limit utilization and trampling of vegetation by ungulate but would deter impacts from recreational use of these features.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects to wetlands, springs, and riparian areas from alternative 3 would be identical to that for the modified proposed action except that livestock impacts to Rattlesnake spring and its associated riparian area would occur due to the installation of pipelines, fencing and troughs. These impacts could combine with effects to the spring that could result from climate change, which is expected to result in an intensification of drought including longer periods of below average precipitation and higher temperatures in the Southwest, including the central Arizona region (Williams et al. 2010). More intense episodes of drought would limit vegetative growth (Notaro 2012) and can concentrate wildlife and grazing impacts around reliable water sources such as Rattlesnake spring. These combined impacts could result in a decrease or loss in function of the spring and the riparian habitat it supports over the next 10 years.

Fire and Fuels

Affected Environment

Historically, the winter range portion of the project area was semi-desert grasslands and desert communities with pinyon-juniper located on sites with shallow rocky soils. The introduction of fire suppression and livestock grazing after European settlement likely altered the fire frequency in this area and resulted in the encroachment of pinyon-juniper into grassland and may have contributed to an increase in tree density in areas that were historically grassland dominated (Romme et. al. 2009).

Historical fire frequency intervals vary among vegetation types. For continuous grasslands, it is likely that fire frequency interval prior to the introduction of livestock grazing and fire suppression was generally less than 10 years (Gottfried et. al. 1996). Fire frequency interval for pinyon-juniper woodlands is dependent upon site specific conditions and it is likely that pre-settlement pinyon-juniper fires were a mixture of surface and crown fires with varying frequency and intensity (Gottfried et. al. 1996). Crown spacing is the primary characteristic that influences the potential for high intensity crown replacing fires in the pinyon-juniper woodland. As crown spacing decreases, increased shading results in a decrease in herbaceous ground cover.

Analysis of the existing vegetation conditions in the Windmill West Allotment has identified several areas that have high canopy cover and low herbaceous ground cover which is inconsistent with the desired conditions. These areas are scattered throughout six pastures in the winter range of the allotment. It is unlikely that a large scale crown replacing fire would occur in the allotment due to the discontinuity of areas of high canopy cover. The absence of herbaceous groundcover in areas of high canopy cover also limit the ability of ground fire to spread through areas of high canopy cover potentially resulting in transition to crown fire. Discontinuity of herbaceous ground cover throughout the allotment also limits the potential for the occurrence of large scale low intensity fires. However, the current conditions would support crown fires in large patches of pinyon-juniper vegetation that would result in a high severity impact to the trees and understory vegetation in these areas.

Environmental Consequences

Alternative 1: No Action

Under the no action alternative, fire potential within the winter range pastures would likely increase gradually over time. In the absence of livestock grazing, litter loading may gradually increase resulting in a more continuous fuel bed. Precipitation would be the primary factor in determining the growth of understory. The potential for large scale low intensity surface fires would increase as a result in areas where canopy cover is within the natural range of variability. The potential for crown replacing wildfire in areas of dense pinyon-juniper would gradually increase over time as encroachment of pinyon-juniper into the grassland continues.

Alternative 2: Modified Proposed Action

The vegetation treatments proposed for the Windmill West Allotment have been proposed to improve the unsatisfactory and impaired soils and increase herbaceous ground cover within portions of the winter grazing range. Although mitigation of fire hazard within the allotment is not a goal of the vegetation treatments, the potential for wildfire will be affected. The proposed vegetation treatment consisting of reducing canopy cover in areas of the allotment by thinning pinyon and juniper and scattering of resultant slash will have the effect of decreasing the potential

for crown fire in the 3,179 acres being treated. Short term effects of thinning pinyon and juniper will be a reduction in the potential for crown replacing wildfire by increasing crown spacing between trees. The scattering of slash will not increase fire potential in the short term because the slash will be scattered in areas of bare soil and rock that are lacking herbaceous groundcover. Wildfire will not likely carry through the scattered slash in the absence of extreme drought and wind conditions. The long term effect of thinning and scattering of slash will be an increase in the potential for low intensity ground fire in the treated areas. The re-establishment of grass and shrubs in the treated areas may allow surface fires to carry through the treated areas. The increased potential for surface fires in the treated areas may be mitigated, however, by the continuation of grazing.

Alternative 3: Modified Proposed Action with South Gyberg

Alternative 3 has the same effects as alternative 2 concerning fire and fuels because there is no difference in the location, scale or type of treatments between alternatives. The addition of livestock grazing in South Gyberg is expected to have little impact on the potential for low-intensity fire in this pasture because the utilization requirements and rest requirements for this pasture would maintain adequate ground cover to continue to support low-intensity ground fires.

Special Status Plant Species

This section focuses on potential effects to special status plants, either threatened, endangered, candidate or sensitive species and habitat. More details can be found in the botany specialist's report.

Affected Environment

Threatened and Endangered Species -Arizona Cliffrose and Arizona Bugbane

The Arizona cliffrose (*Purshia subintegra* - endangered) is the only threatened or endangered plant species. Arizona cliffrose is a long-lived shrub, endemic to white Tertiary (Miocene and Pliocene) limestone lakebed deposits that are high in lithium, nitrates, and magnesium (Anderson 1986; Arizona Game and Fish Department 2001). Arizona cliffrose occurs in four disjunctive populations spread across an area of approximately 200 miles in central Arizona. Population areas include Burro Creek in Mohave and Yavapai counties, Cottonwood in Yavapai County, Horseshoe Lake in Maricopa and Yavapai counties and near Bylas in Graham County (USFWS, 1995). Each of the four population areas is considered a separate recovery unit.

Threats to the species include livestock and burro grazing, mineral exploration and development, construction and maintenance of roads and utility rights-of-way, recreation, off-road vehicle use, urbanization, pesticides, poor reproduction (e.g., recruitment) and hybridization. The relative importance of these threats varies from population to population.

In the Cottonwood area population, which occurs on the southern portion of the Windmill West Allotment, Arizona cliffrose has hybridized with the more common Stansbury cliffrose (*Purshia stansburiana*) at some point in its evolutionary past, forming what has been referred to as “hybrid swarms”. These resulting hybrids are protected by the recovery plan as well.

The Cottonwood population occurs on the Coconino National Forest, adjacent state and county land with some habitat and plants on private lands. Most of the population is on the Coconino National Forest. The majority of known plants occur in the South Gyberg Pasture, particularly concentrated in the Verde Valley Botanical Area, and in Dead Horse Ranch State Park, which have been popular areas for hiking and mountain biking. The 1997 Biological Opinion estimated that 10-15 percent of the cliffrose were located outside of the South Gyberg Pasture (USFWS 1997). Goodwin's 2010-2012 study found 6,499 individual plants on National Forest System lands. 75 percent of the population detected by Goodwin is in the South Gyberg Pasture. Less than 2 percent of those detected by Goodwin are in the North Gyberg Pasture. The remaining plants are located outside of the allotment. It is unknown whether the individuals found since the early 2000's constitute an increase in the population or if the plants were present at the time but simply not yet inventoried.

The Recovery Plan (USFWS 1995) states that stocking rates and grazing systems should be applied to prevent moderate to heavy grazing within Arizona cliffrose habitat. Past seasons of pasture use in North Gyberg have exceeded the timeframe in the Recovery Plan. In addition, the pasture has not been rested every other year. In particular, this was an issue before the Windmill Allotment was split, when staff turnover caused the recovery guidelines to be forgotten because they were not explicit in the annual operating instructions at the time. When the allotment was split and the mistake was realized, the timing restrictions in the recovery guidelines were followed.

Table 14: AUMs authorized in the North Gyberg Pasture 1999-2013

Year	Dates of Pasture Use	Type of Livestock	Total Animal Unit Months (AUMs)
2012/2013	Rested	NA	0
2011/2012	11/1/11 to 3/10/12	35 Bulls	150
2010/2011	10/1/10 to 2/1/11	37 Bulls	151
2009/2010	10/1/09 to 1/31/10	46 Bulls	186
2008/2009	12/23/08 to 1/25/09;	45 Bulls	50
2007/2008	12/24/07 to 3/1/08	57 Bulls	127
2006/2007	2/29/07 to 3/29/07	340 Yearlings + 21 Bulls	256
2005/2006	3/15/06 to 4/14/06	574 Adult Cattle	409
2004/2005	2/8/05 to 3/8/05	502 Adult Cattle	335
2003/2004	12/9/03 to 1/31/04	43 Bulls	76
2002/2003	3/16/03 to 3/31/03	457 Adult Cattle	240
2001/2002	Rested	NA	0
2000/2001	3/1/01 to 3/31/01	673 Adult Cattle	686
1999/2000	10/21/99 to 1/5/00	70 Yearlings + 15 Adult Cattle	162

In the 2013/2014 grazing period, the range specialist established plots for cliffrose monitoring that were observed prior to livestock entering the North Gyberg Pasture in November and again on December 16, 2013. Once livestock are removed around January 31st, another observation will be taken and this will allow the Coconino to have a baseline year for future monitoring before finalizing the analysis of allotment management for Windmill West.

Sensitive Species

Habitat in Windmill West Allotment is capable of supporting nine Forest Service Region 3 sensitive plant species. Potential habitat exists for all nine species within the allotment, and there is known populations of all species except for Heathleaf wild buckwheat (see Botany Specialist's Report for details on plant collections and known occurrences).

The seven sensitive species that occur in the winter range of the Windmill West Allotment are:

- **Tonto Basin Agave** - Tonto Basin agave is often found in association with archaeological sites and is usually found on the tops of benches, edges of slopes, and on gentle slopes overlooking major drainages and perennial streams. It represents feral domesticated crops that have persisted without human care for hundreds of years. It has been found in the Greasy West and Duff Mesa Pastures.

- **Phillip’s Agave** – Phillip’s agave is often found in association with archaeological sites and is usually found on the tops of benches, edges of slopes, and on gentle slopes overlooking major drainages and perennial streams. It represents feral domesticated crops that have persisted without human care for hundreds of years. It has been found in the Duff Mesa Pasture.
- **Heathleaf Wild Buckwheat** - Heathleaf wild buckwheat is restricted to a limestone substrate described as white or chalky gray and powdery formed from old lakebed deposits on the Coconino and Prescott National Forests. It is part of the unique plant community associated with Arizona cliffrose. There are no recorded locations for this species within the allotment area but habitat exists.
- **Ripley Wild Buckwheat** - Ripley wild buckwheat is found in the creosote community of the Sonoran desert shrub and pinyon-juniper woodland of Great Basin conifer woodland. It grows on low arid hillsides associated with a unique white outcrop, high in lithium and magnesium and is part of the unique plant community that grows in the habitat of Arizona cliffrose. It has been found in the South Gyberg and Duff Flat Pastures.
- **Hualapai Milkwort** - Hualapai milkwort is perennial but the plants tend to be small and inconspicuous except when in bloom which is generally from April to July. In some areas of its range this plant occurs on the same formation as Mearn’s sage and Heath-leaf wild buckwheat. It has been found in the South Gyberg and Duff Flat Pastures.
- **Mearn’s Sage** - Verde Valley sage is a slow growing native shrub, endemic to Central Arizona. It grows on low arid hillsides associated with a unique white outcrop, high in lithium and magnesium and is part of the unique plant community that grows in the habitat of Arizona cliffrose. It has been found in the South Gyberg and Duff Flat Pastures.
- **Lyngholm’s Brakefern** - Lyngholm’s brakefern is a rare fern known only from a few locations in the Sedona Area where it grows only on canyon slopes in rocky or cliffy areas that livestock would have limited ability to access. There has been one known location in the Black Tank Pasture.

The two sensitive species that occur in the summer range of the Windmill West Allotment are:

- **Arizona bugbane**¹³ –Arizona bugbane is endemic to northern and central Arizona. It requires deep shade from forest or riparian overstory. Arizona bugbane occurs in mesic habitats, typically along the bottoms and lower slopes of steep, narrow canyons, where the dense overstory often includes a combination of coniferous and deciduous tree species. Important overstory species include Douglas fir (*Psuedotsuga menziesii*), white fir (*Abies concolor*), big-tooth maple (*Acer saccharum ssp. grandidentatum*), Arizona alder (*Alnus oblongifolia*) and red osier dogwood (*Cornus stolonifera*). Known occurrences are found in the West Barney, East Barney, Harding Point, Mexican Pocket and Lockwood Springs Pastures (See Botany Specialist Report for details). The population in Lockwood Springs Pasture is fenced and the other known populations are inaccessible to cattle due to topography. There is also a population in Upper West Fork that is unfenced but is not in an area that is frequently used by cows.

¹³ The Arizona Bugbane Conservation Assessment and Strategy for Coconino and Kaibab National Forests (1995) is expired. The US Fish and Wildlife Service has directed that the species be analyzed in the same manner as a candidate for listing until the document is revised and accepted.

- **Flagstaff pennyroyal** - Flagstaff pennyroyal is a small perennial, mat-like herb that grows on dolomitic limestone outcrops or soils in ponderosa pine forests. East Barney, West Barney and Harding Point Pastures contain documented occurrences of Flagstaff pennyroyal. The locations are on slopes, near canyon edges or in remote areas that are inaccessible to livestock.

Environmental Consequences

Arizona Cliffrose

Direct and Indirect Effects

Common to All Alternatives

Proposed vegetation treatments in alternatives 2 and 3 are outside the range of Arizona cliffrose and therefore there would be no difference between alternatives pertaining to canopy cover or tree encroachment and related effects to soil productivity.

Alternative 1: No Action

There would be no direct effects to Arizona cliffrose on National Forest System (NFS) lands because grazing would not be authorized. Therefore there would be no trampling or browsing of cliffrose plants by livestock on NFS lands. Browsing and trampling by other wildlife would still occur under this alternative

If the no action alternative were selected, there would be no need to maintain the structural improvements such as the fence that currently separates the North and South Gyberg Pastures. Over time, the fence would lapse into disrepair and would allow more access points to other users such as recreationists that frequent the area. This could contribute to increased social trails in the habitat of Arizona cliffrose and in the Verde Valley Botanical Area. Numerous social trails already exist in this area due to the increases in recreational use and expanding human populations. Increased use on social trails as well as system trails has resulted in such impacts as soil erosion and widening of trail width.

Alternative 2: Modified Proposed Action

The modified proposed action would allow grazing in the North Gyberg Pasture but would reduce the amount of time cattle are in the pasture. The length of time in the pasture would comply with the Recovery Plan. The alternative would also comply with the guidance for mineral supplement placement in Arizona cliffrose habitat and incorporate the recommendations of the Recovery Plan such as resting the pasture every other year.

The proposed action would only permit conservative utilization within the North Gyberg Pasture, which complies with the recovery plan goal of preventing heavy to moderate utilization. The most recent data (2007) does not suggest that grazing use by cattle is exceeding the utilization threshold from the Arizona cliffrose Recovery Plan in the North Gyberg Pasture. Overall utilization on the pasture from 2007 to present has been lower than the 2004-2007 levels and therefore, we assume that cliffrose utilization has been similar or lower (See Table 14). Since the modified proposed action would maintain a similar level of utilization and grazing intensity and incorporates more stringent timing and rest restrictions, predicted utilization would also be below Recovery Plan thresholds. Monitoring is necessary to determine whether cattle use on Arizona cliffrose is occurring at an acceptable level outlined in the Recovery Plan. A long-term monitoring plan will be developed in consultation with Fish and Wildlife Service to replace the

interim monitoring that occurred in 2013/2014 and to assess the effects of grazing and assure compliance with the Recovery Plan.

The modified proposed action would permanently remove South Gyberg Pasture from the allotment. The pasture contains most of the documented locations of Arizona cliffrose and has not been grazed in more than 10 years. The result would be permanent removal of the impacts from cattle grazing to Arizona cliffrose in the South Gyberg Pasture, except for occasional incursions when cattle are in other pastures and gates are left open or breaks occur in the fence. Occasional incursions in the South Gyberg Pasture from unauthorized livestock from the allotment or from surrounding private ranches results in limited impacts because of the lack of a water source and are not expected to result in impacts to Arizona cliffrose that violate the Recovery Plan. These incursions are not expected to result in impacts to Arizona cliffrose beyond the guidelines of the Recovery Plan.

Juniper removal treatments will not affect Arizona cliffrose because none will occur in the habitat of Arizona cliffrose.

Alternative 3: Modified Proposed Action with South Gyberg

Alternative 3 adds the use of the South Gyberg Pasture to the allotment. This would expose approximately 75% of the population of Arizona cliffrose on the Coconino National Forest to the impacts of cattle, such as trampling, browsing and habitat disturbance. Within the modified proposed action, less than 2 percent of the documented occurrences of Arizona cliffrose would be affected. Even though grazing capacity is not assigned to the Verde Valley Botanical Area per Forest Plan direction, this alternative does not propose to fence the area off from the rest of the South Gyberg Pasture and so grazing impacts would occur in this area. Overall, intensity of grazing would be reduced within the pasture compared to the intensity of grazing allowed in the winter range under the current permit.

To facilitate cattle use in the South Gyberg Pasture, installation of a pipeline, water trough and water lot would be needed to provide water (See Figure 7). The trough would be in the center of section 25. The trough location is within the boundary of the Verde Valley Botanical Area and less than 1/10th mile from the nearest Arizona cliffrose documented locations. This would result in elevated risks of browsing on individual plants, trampling, and soil compaction. Cattle would likely congregate around the trough and would not disperse to other areas without the use of nutritional supplements. Supplements within this pasture would also be impossible to locate in a manner consistent with the recovery plan because of the density and distribution of cliffrose plants within the pasture. This would result in high levels of impacts to cliffrose within the proposed pipeline corridor and the area surrounding the proposed trough because of livestock congregating in the area. Providing new water developments or nutritional supplements within a ½ mile of Arizona cliffrose does not comply with the recommendations of the recovery plan (see Appendix A).

The management actions necessary for placement of the trough and waterline such as digging is expected to avoid direct impacts to cliffrose plants but would result in disturbance to the fragile soil which is a vital and necessary component of Arizona cliffrose habitat. It might also lead to the increased risk of introduction of noxious or invasive weeds into the habitat of Arizona cliffrose through the use of machinery necessary to install and maintain the infrastructure and through increased disturbance.

Cumulative Effects

The spatial boundary of the cumulative effects analysis for Arizona cliffrose is the extent of the Cottonwood population. The length of time of the analysis is from 1987 when the Coconino National Forest adopted its current plan until present, and Forest Plan revision which is underway. Recreational use and its accompanying impacts are expected to continue and increase in the foreseeable future. The effects of climate change such as increased aridity are predicted to affect Arizona cliffrose (Maschinski et al. 2006).

Common to All Alternatives

The Forest Plan designated the Verde Valley Botanical Area (1,140 acres) for the protection of the unique plant community, which includes Arizona cliffrose. The Forest Service has considered Arizona cliffrose and its habitat, including the botanical area, in its actions since 1987 and has implemented many favorable actions that benefit cliffrose, such as such as motorized vehicle closures, fence and gate installation, and eliminating such activities as trash dumping and “party spots.” These would continue to improve the recovery of the population under all alternatives through the following ten years. This would cumulatively combine with the removal of livestock grazing pressure to cliffrose in the South Gyberg Pasture under the no action and modified proposed action.

In 2013, Yavapai County constructed a trail on the land proposed for exchange with the Forest Service. The parcel in question was obtained by the county in a complex agreement that was part of the mitigation for the expansion of Mingus Avenue Bypass in 1996. It contains habitat and Arizona cliffrose plants. The effects of this newly constructed trail on Arizona cliffrose are uncertain at this time but observers have noted that the trail constructed through suitable habitat and very near established plants. While this action is not a federal action, it illustrates the recent increase in risk of recreational impacts to the Cottonwood population and also increases the risks of noxious or invasive weed infestations along the trail.

Approximately 20 to 25 percent of the Arizona cliffrose population in the Cottonwood area occurs on lands under other ownership. This includes state, county, city and private lands. The Cottonwood population is in a developing urban/suburban area. The most serious impacts are from land development, road construction, and motorized and non-motorized recreation. The City of Cottonwood has a growing population that has experienced a 23.3% increase from 2000 to 2011. Population growth results in urban expansion and road construction. These activities can directly destroy Arizona cliffrose or indirectly affect them by increasing soil erosion in the Verde formation and altering potential habitat so that it is no longer support Arizona cliffrose. Existing roads, utility corridors and trails that are present in the area would still be present and their maintenance activities would still have some effect on the Cottonwood population of Arizona cliffrose because they can provide vectors for invasive plant introduction and are sources of sedimentation. The Forest Service worked with Arizona Public Service on the Phase II Maintenance in Utility Corridors on Arizona National Forests to assure that maintenance and improvements to utility lines within Arizona cliffrose habitat are mitigated, and existing plants are avoided (Phillips 2008).

As a mitigation for the 1996 expansion of U.S. highway 89A and Mingus Ave. near Cottonwood, Arizona Department of Transportation and the Arboretum at Flagstaff cultivated and found suitable locations for Arizona cliffrose plants, some of which were located on NFS lands in the South Gyberg Pasture. This mitigation for road construction is an example of how maintaining

potential habitat in the Verde formation on NFS lands is important for maintaining the population and protecting it from activities on non-federal lands.

As a result of the Travel Management Rule in October 2011, cross-country vehicle travel is no longer allowed on most of the forest including the areas on the forest containing Arizona cliffrose. This reduces the expansion of bare soil from motorized vehicles and nearly eliminates direct impacts of legal off-road motorized vehicles travel on the Arizona cliffrose population. Limited administrative and access for permitted uses such as livestock grazing are the extent of permitted off-road travel.

The Forest Service has also been working on proper alignment and routing of non-motorized trails, particularly mountain biking, within the habitat of Arizona cliffrose through the Sedona Trail Planning Process and efforts to align the Lime Kiln trail in a sustainable location. The proposed trails would consolidate non-motorized trail routes to a given area and reduce off-trail recreational use that could impact Arizona cliffrose plants and reproduction.

The effects of recent climate change on Arizona cliffrose are unknown. Alterations of climatic patterns may facilitate the establishment and/or spread of invasive species, increasing resource competition with Arizona cliffrose plants. This effect would be limited within the 10 year term grazing permit (Runyon et al. 2012).

For the modified proposed action with South Gyberg Pasture alternative, livestock grazing would occur in the Verde Valley Botanical Area using the guidelines in the recovery plan designed to protect cliffrose. The reintroduction of livestock grazing pressure would cumulatively combine with other elements affecting the growth and reproduction of the Arizona cliffrose population, such as off-trail recreation, drought, and competition from invasive weeds. Monitoring and adaptive management would be used to adjust grazing intensity and timing to prevent more than 20 percent utilization of Arizona cliffrose plants, which would moderate the cumulative impact of grazing to the species especially during periods of drought.

Alternative 1: No Action

Currently, some of the adjacent Arizona state trust lands are used for grazing as part of this allotment. It is unclear what uses would occur on the land if no grazing is permitted on federal land. The state could continue grazing on the land, change its use or possibly offer it for sale, allowing more urbanization in the area. If the land management on the state sections changed, impacts to Arizona cliffrose growing on state lands might change as well.

Grazing would still be allowed on nearby state and private lands that are not directly associated with the Windmill West allotment that contain Arizona cliffrose so impacts from cattle grazing in those areas would still occur. Grazing on State and private lands would likely occur at conservative to moderate levels and may limit the annual growth and reproduction of the actively grazed plants in these areas. It is possible that lowering the supply of available rangeland over such a small area may create economic pressure to intensify grazing on nearby lands under other ownership. This would reduce the effects to Arizona cliffrose on lands under Forest Service control but would not reduce grazing use on Arizona cliffrose on adjacent state and private lands.

Lehmann lovegrass has recently been detected in the habitat of Arizona cliffrose. The forest Service currently does not have environmental clearance completed to manage this species because it was not analyzed in the Weeds FEIS. It has been reported In North and South Gyberg

pastures. Threats to Arizona cliffrose and its habitat include the ability of lovegrass to increase and become invasive in response to disturbances such as fire and grazing. This would lead to reduction or elimination of native plants and would increase the risk of wildfire entering the habitat of Arizona cliffrose. This could result in deaths of individual plants and alteration of Arizona cliffrose habitat. Currently, there are no reliable controls for Lehmann lovegrass that would remove it. Grazing, fire and environmental factors such as drought would result in the increase of Lehmann lovegrass in the infested areas and expansion of the current areas of infestation. The risks of treating Lehmann lovegrass with herbicide would include the risks of killing native species including desirable native grasses and individuals of Arizona cliffrose.

This alternative would decrease grazing pressure on approximately 2 percent of the Cottonwood population, which will remove one of the current environmental factors that will continue to impact the Arizona cliffrose over the next ten years including competition from Lehmann lovegrass, increasing wildfire risk, and limited habitat for recovery.

Alternative 2: Modified Proposed Action

Livestock grazing on State and private lands with cliffrose habitat would continue into the foreseeable future. Grazing would likely occur at conservative and moderate utilization levels in a manner similar to that proposed in the modified proposed action.

Cattle would be present in the North Gyberg Pasture in the areas containing Lehmann lovegrass at least in some years in the winter months when Lehmann lovegrass is dormant. Cattle would still utilize the dry biomass resulting in reduction of the canopy which would possibly result in the increase of seedlings of Lehmann lovegrass under favorable spring or summer growing conditions. Actions that remove the canopy, such as grazing and fire allow seedling emergence in these areas (Robinett 1992). Even without grazing in the South Gyberg Pasture, Lehmann lovegrass is likely to persist in the area and would possibly expand, depending on environmental conditions (Anable and McClaran 1992).

This alternative would maintain grazing pressure on approximately 2 percent of the Cottonwood population, which will cumulatively contribute to other factors impacting the Arizona cliffrose over the next ten years including competition from Lehmann lovegrass, increasing wildfire risk, and limited habitat for recovery.

Alternative 3: Modified Proposed Action with South Gyberg

Effects from cattle and their ability to spread Lehmann lovegrass would be expanded to South Gyberg Pasture. Because of the limited ability to manage Lehmann lovegrass, the concentration of Arizona cliffrose plants in South Gyberg and the potential to increase the risk of lovegrass expansion within Arizona cliffrose habitat, this alternative would have the cumulative effect of accelerating invasive plant introduction within the known extent of the Cottonwood population (see Invasive Plant Species section for more information).

This alternative would maintain increase pressure on approximately 75-80 percent of the Cottonwood population, which will cumulatively contribute to other factors impacting the Arizona cliffrose over the next ten years including increasing competition from Lehmann lovegrass, increasing wildfire risk, and limited habitat for recovery.

Findings - Arizona Cliffrose

The “finding of effect” statements below are based on the “Framework for Streamlining Informal Consultation for Livestock Grazing Activities” (USDA Forest Service 2005).

Alternative 1: No Action

Under alternative 1, there would be no impact to Arizona cliffrose.

Alternative 2: Modified Proposed Action

Under alternative 2, activities associated with livestock grazing would potentially impact to 2% of the known population of Arizona cliffrose on the Coconino NF

Alternative 3: Modified Proposed Action with South Gyberg

Under alternative 3, the finding for activities associated with livestock grazing would potentially impact to 75-80% of the known population of Arizona cliffrose on the Coconino NF.

Sensitive Species in the Winter Range

Direct and Indirect Effects

Species discussed in this section include Tonto Basin agave, Phillip’s agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn’s sage. Because of similarity in findings, habitat and responses to grazing impacts, these species are discussed as a group. For information specific to each species, reference the botany specialist’s report. Lyngholm’s brakefern is discussed separately under effects common to all alternatives

Common to All Alternatives

Due to the limited accessibility and remote location of the only known plant in the allotment (Black Tank Pasture), there would be no direct or indirect effects to Lyngholm’s brakefern from grazing or management activities associated with the implementation of grazing activities. There will be no effects to it in any of the alternatives.

Alternative 1: No Action

In this analysis, the no action alternative would mean no grazing on lands managed by the Forest Service. No permit would be issued and no livestock grazing would occur. There would be no effects from cattle grazing or management activities associated with the implementation of grazing on sensitive plant species in the winter range as a result.

Alternative 2: Modified Proposed Action

The effects of grazing on the remaining sensitive plant species within the winter range include trampling of plants, soil disturbance and loss of flowering stalks (for agave) by cattle rubbing on them. Currently, monitoring on the allotment has resulted in no observations of these effects are occurring. Other possible effects include destruction of plants during such activities as structural improvements (fence building, etc.) but these effects can be mitigated by pre-activity surveys (See Resource Protection Measures in Chapter 2), avoiding plants during construction, following the specific actions identified in the recovery plan (see Appendix A) and by implementing the best management practices for noxious or invasive weeds at the sites. Avoidance and effectiveness of mitigation measures will be ensured by implementation of the following resource protection measure: “Surveys should be conducted for Region 3 sensitive plants during the appropriate time of year before any restoration or construction activities are conducted.”

There is no effect to sensitive species in the winter range from juniper removal because there are no occurrences of the species in the area of treatment except for the two agave species. For Tonto Basin and Phillip's agave, pre-treatment surveys and direction to avoid damaging or destroying agaves per State law would sufficiently protect individual plants.

For Heath-leaf wild buckwheat, there are no documented occurrences of this species within the allotment boundary and so the only effects that would need to be mitigated are those that result from soil disturbance. Therefore, implementation of conservative utilization grazing levels and soil best management practices would sufficiently protect this species and associated habitat.

Alternative 3: Modified Proposed Action with South Gyberg

The effects of alternatives 2 and 3 are similar for these species except that alternative 3 would affect two more known locations of Ripley's wild buck wheat and of Hualapai milkwort because of grazing in the South Gyberg Pasture. Therefore, it is estimated that twice as much of their habitat would be affected by grazing than in alternative 2.

Even though Mearn's sage occurs in the South Gyberg Pasture, monitoring data collected by Moser and others in 2011 in the Apache Maid Allotment determined that cattle did not graze on the plants there, despite the aromatic foliage, when grazed at a conservative utilization level. Therefore, it is expected that Mearn's Sage would be generally unaffected and the effects to the species would be the same for alternatives 2 and 3.

Cumulative Effects

The area of consideration is the range of these species within the allotment or if the range is unknown the allotment boundary.

For Tonto Basin agave and Phillip's agave, the timeframe of this discussion is from 2001 when these species were first described to present and reasonable foreseeable activities. For all other species, the timeframe is the past 10 years and reasonable foreseeable activities.

Common to All Alternatives

There are no direct and indirect effects for Lyngholm's brakefern and therefore no cumulative effects.

Alternative 1: No Action

There are no direct and indirect effects for Tonto Basin agave, Phillip's agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn's sage associated with alternative 1 and therefore no cumulative effects.

Alternative 2: Modified Proposed Action

Cumulative effects to Region 3 Sensitive plants in general include past and ongoing management actions by the U.S. Forest Service and adjacent state and private lands. Most of these actions have very little impact because their effects are mitigated according to the Coconino Forest Plan give the activity is under Forest Service jurisdiction.

The portion of the allotment containing Tonto Basin agave, Phillip's agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn's sage is adjacent to a growing urban area with high levels of recreation activities. Most of the recreation activities in areas with sensitive plant populations are non-motorized activities such as hiking, mountain bike riding and

horseback riding. The past impacts of these activities are unknown but would be similar to those of grazing, including trampling, loss of young plants, destruction of flowering stalks (agaves), and impacts to the fragile soil that provides habitat for the species.

The implementation of the Travel Management Rule in 2011 decreased the threats of damage by motorized vehicles to habitat and plants by eliminating cross country travel and by limiting road access in the area.

Tonto Basin, Phillip's and other agaves are collected as food and fiber plants on rare occasions by Native Americans, but these collections are very rare and likely have no impact at the scale of the overall population.

Collection of agaves is regulated by Arizona law. Tonto Basin agave and Phillip's agave are "highly safeguarded protected" plant under state law. This category of the most restrictive category of the state native plant law and is applied "those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in this state are in jeopardy or which are in danger of extinction throughout all or a significant portion of their ranges, and those native plants which are likely within the foreseeable future to become jeopardized or in danger of extinction throughout all or a significant portion of their ranges. This category also includes those plants resident to this state and listed as endangered, threatened, or category 1 in the federal endangered species act of 1973 (P.L. 93-205; 87 Stat. 884; 16 United States Code sections 1531 et seq.), as amended, and any regulations adopted under that act."

Global climate change is expected to be a source of widespread disturbances. Higher temperatures will occur and precipitation cycles will be modified from current patterns over large areas. The warmer climate conditions may affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances for some species (Bradley et al 2010, Hellmann et al 2008, Middleton 2006). Larger and more frequent fires are expected (Marlon et al. 2009). Climate may favor the spread of invasive exotic grasses into arid lands where the native vegetation is too sparse to carry a fire. When these areas burn, they typically convert to non-native monocultures and the native vegetation is lost (USDA Forest Service 2010).

Alternative 3: Modified Proposed Action with South Gyberg

The direct and indirect effects of alternative 3 are the same as alternative 2 except for effects to Ripley's wild buck wheat and Hualapai milkwort. Therefore, the cumulative effects for other sensitive plants species in the winter range are the same for alternatives 2 and 3. For Ripley's wild buck wheat and Hualapai milkwort, the cumulative effects for soil disturbance and structural improvements of alternative 3 are more than alternative 2.

Sensitive Species in the Winter Range –Findings

Common to all Alternatives

Implementation of any of the alternatives for Windmill West Allotment will have no effect on Lyngholm's brakefern.

Alternative 1: No Action

Alternative 1 will have no impact on Tonto Basin agave, Phillip's agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn's sage.

Alternative 2: Modified Proposed Action

Implementation of alternative 2 for the Windmill West Allotment may impact individuals of Tonto Basin agave, Phillip’s agave, Heath-leaf wild buckwheat, Ripley wild buckwheat, Hualapai milkwort and Mearn’s sage but is not likely to result in a trend toward federal listing or loss of viability.

Alternative 3: Modified Proposed Action with South Gyberg

Findings for alternative 3 are the same as those for alternative 2.

Sensitive Species in the Summer Range

Arizona Bugbane - Direct and Indirect Effects

Alternative 1: No Action

In this analysis, the no action alternative would mean no grazing on lands managed by the Forest Service. No permit would be issued and no livestock grazing would occur. There would be no effects from cattle grazing or management activities associated with the implementation of grazing on Arizona Bugbane as a result.

Alternative 2: Modified Proposed Action

Most locations of Arizona bugbane are in drainages that are inaccessible to cattle but some populations such as those in the Upper West Fork Area are not protected by topographic features or by fencing. Cattle may periodically enter these areas and eat or trample plants. Additionally, there may be some impacts from cattle “loafing” or resting in the cooler, shady areas of the drainage bottoms. One such area is near Fernow Draw in the Lockwood Pasture. To mitigate cattle grazing impacts to Arizona bugbane in that area, the drainage has been fenced and is maintained by the permittee (see Resource Protection Measures in chapter 2).

Modifications of fences and other actions are proposed for the Rogers Lake area but there are no occurrences of Arizona bugbane in that area and it does not contain any suitable habitat so there is no potential impact to Arizona bugbane at Roger’s Lake.

Alternatives 2 and 3 include wetland and spring improvement projects but none of the areas being considered for improvements or modification are known to contain Arizona bugbane. Therefore there would be no effects to these populations from these improvement projects

Occurrences of Arizona bugbane are in drainages near Lockwood Spring but not immediately adjacent to it or the associated spring box and therefore there would be no effect to this population from proposed spring restoration activities. Restoration activities, including fencing, for Lockwood Springs are proposed to aid in the restoration of riparian vegetation, and to protect the spring and associated riparian areas from domestic livestock and wildlife browsing. The bugbane population in Lockwood Pasture would not be impacted by the construction of fencing or replumbing of the spring box.

There are no effects to this species from the proposed vegetation treatments for removal of juniper trees in certain areas of the allotment because the areas proposed for treatment are not suitable habitat for Arizona bugbane.

Alternative 3: Modified Proposed Action with South Gyberg

Effects for alternative 3 are the same as those for alternative 2 because this species does not occur in the South Gyberg Pasture.

Arizona Bugbane - Cumulative Effects

The boundary of this analysis includes the canyons and drainages within the allotment that contain Arizona bugbane. This includes the West Fork of Oak Creek and its associated side canyons in or adjacent to the project area. The timeline is from 1993 to present and reasonable foreseeable activities.

Alternative 1: No Action

There are no direct and indirect effects for Arizona Bugbane associated with alternative 1 and therefore no cumulative effects.

Alternative 2: Modified Proposed Action

The Conservation Strategy for Arizona bugbane (1995) included strategies to protect bugbane populations from the effects of livestock grazing including fencing and monitoring. This has led to a reduction in these conflicts.

Climate change may increase the frequency of drought in the Southwest (Crimmins et al. 2007). Signs of domestic and wild grazers have been observed in the bugbane populations in Upper West Fork. Cow dung was observed on the canyon floor near known populations during drought years (1996 and 2002) when animals were seeking food, water and shelter in canyons. No herbivory that can be directly attributed to cattle has been observed recently, however, recurring drought conditions may result in a cumulative impact to un-fenced bugbane populations on the allotment. Drought will likely increase the effects of wildlife browsing in the areas associated with bugbane populations. Potential livestock grazing in and adjacent to bugbane populations may combine with wildlife grazing and the physiological impacts of drought to result in a cumulative effect to un-fenced bugbane populations in the allotment over the next ten years.

Alternative 3: Modified Proposed Action with South Gyberg

Effects for alternative 3 are the same as those for alternative 2 because this species does not occur in the South Gyberg Pasture.

Flagstaff Pennyroyal - Direct and Indirect Effects

Alternative 1: No Action

In this analysis, the no action alternative would mean no grazing on lands managed by the Forest Service. No permit would be issued and no livestock grazing would occur. There would be no effects from cattle grazing or management activities associated with the implementation of grazing on Flagstaff pennyroyal as a result.

Alternative 2: Modified Proposed Action

The 1984 Management Plan for Flagstaff Pennyroyal concluded that risks from grazing would be limited to the effects of overgrazing, which is unlikely to occur in the populations within the Windmill West Allotment because they are located in areas inaccessible to livestock. Incidental grazing by livestock could possibly occur because the populations are not fenced but this effect would be very infrequent. This effect may result in impacts to individual plants but is not likely to result in damage to the population in the allotment.

There would be no juniper removal in the summer range and thus this activity would have no potential impacts to Flagstaff Pennyroyal.

Alternative 3: Modified Proposed Action with South Gyberg

Effects for alternative 3 are the same as those for alternative 2 because this species does not occur in the South Gyberg Pasture.

Flagstaff Pennyroyal - Cumulative Effects

Common to all alternatives

There are no direct and indirect effects for Flagstaff pennyroyal associated with the alternatives and therefore no cumulative effects.

Sensitive Species in the Summer Range – Findings

Common to All Alternatives

Under all alternatives, there would be No Effect on Flagstaff pennyroyal.

Alternative 1: No Action

In this analysis, the no action alternative would mean no grazing on lands managed by the Forest Service. No permit would be issued and no livestock grazing would occur. There would be no effects from cattle grazing or management activities associated with the implementation of grazing on Arizona bugbane as a result.

Alternative 2: Modified Proposed Action

Implementation of alternative 2 for the Windmill West Allotment may impact individuals of Arizona bugbane through occasional browsing and tramping of the population in Upper West Fork but is not likely to result in a trend toward federal listing or loss of viability.

Alternative 3: Modified Proposed Action with South Gyberg

Effects for alternative 3 are the same as those for alternative 2 because this species does not occur in the South Gyberg Pasture.

Invasive Plant Species¹⁴

Affected Environment

The following noxious or invasive weeds are documented in the Windmill West Allotment and were addressed in the 2005 Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (Weeds FEIS).

¹⁴ The purpose and need of this analysis is to examine whether or not to authorize grazing on the Windmill West Allotment and does not include authorization any noxious or invasive weed treatments as part of the management actions to be considered in this decision. The treatment strategies and objectives for noxious or invasive weeds are addressed in the Final Environmental Impact Statement for the Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests. Weed treatments are not specifically proposed for any alternatives in this analysis but may occur in conjunction with activities in the action alternatives such as where structural improvements are proposed.

- **Russian knapweed** - Duff Flat Pasture
- **Diffuse knapweed** - Loy Canyon Pasture
- **Tamarisk** -South Sycamore and North Gyberg Pastures
- **Scotch thistle** - Black Tank Pasture
- **Dalmatian toadflax** - Mexican Pocket, Roger's Lake, Fry Park West, Lockwood Springs, East Barney, Mill Park, West Barney, and Fry Park East Pastures
- **Bull thistle** - Fry Park East, Mexican Pocket, Lockwood Springs, West Barney, Winter Cabin Holding, East Barney and Black Tank Pastures
- **Cheatgrass** - Lockwood Springs, East Barney, Mill Park, West Barney, Fry Park East and Mexican Pocket Pastures
- **Red brome** - widely observed in the winter range pastures of the allotment
- **Wild oat** – Strip Pasture
- **Tree of heaven** - Duff Flat Pasture
- **Yellow starthistle** – Greasy West Pasture
- **Malta starthistle** – Duff Flat Pasture

Lehmann lovegrass was not analyzed in the Weeds FEIS. It is being addressed in this analysis because it has recently been detected in the habitat of Arizona cliffrose leading to concern for individuals and habitat of Arizona cliffrose (see Arizona cliffrose cumulative effects).

The acreage covered by Lehmann lovegrass on the Coconino National Forest is unknown at this time. The species is generally not targeted during surveys for other species. However, it is believed that Lehmann lovegrass is widespread throughout the forest due to past land management practices, such as seeding for non-natives erosion control and forage improvement (USDA Forest Service 2012b). It has been used as a forage species (Ruyle and Young 2002) and as part of fire rehabilitation in the past. Within the allotment, it has been reported from the area near Blanco Mesa Tank, in Verde Valley Botanical Area and within several of the winter pastures.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

Since its introduction Lehmann lovegrass has become invasive, replacing perennial native grasses and providing fuel to carry fire into ecosystems not adapted to fire and experiences rapid regrowth after fires. This allows it to out-compete native perennial grasses and may introduce fire into areas such as the Verde Valley Botanical Area and Arizona cliffrose habitat.

Lehmann lovegrass germinates and can grow under a variety of conditions (Robinett 1992). Lehmann lovegrass has the ability to invade existing perennial grass communities and replace most species (Cable 1971 and Robinett 1992). The seeds of Lehmann lovegrass are generally too small to be targeted by native seed predators and can germinate with little or no soil cover. Seedling emergence is limited in dense, mature stands of Lehmann lovegrass where litter and standing biomass reduce the amount of sunlight reaching the ground. Disturbance, such as fire and grazing can open the canopy and allow for seed emergence (Robinett 1992). Parks et al. found that properly managed grazing does not drive the spread of Lehmann lovegrass where utilization leaves enough cover to inhibit seed emergence (Parks et al. 2005)

Drought can also affect the density of Lehmann lovegrass. In one study conducted in southeastern Arizona, Lehmann lovegrass and black grama, a native perennial grass, co-occurred in approximately equal portions on a range monitoring transect. A drought killed large patches of both species. After the drought, Lehmann lovegrass established and grew in these patches, but no similar regeneration in the native grasses was noted. In less than one year, the patches were completely covered by Lehmann lovegrass (Robinett 1992). Similar results were noted in fire in the same general area, where Lehmann lovegrass replaced black grama in one year after a severe fire (Robinett 1992).

Treatment to remove this species is outside of the scope of this document but may be considered in other program areas such as the noxious weed program, if an efficient treatment can be developed.

Alternative 1: No Action

Alternative 1 is the no action alternative. No grazing would occur and there would be no effects to noxious or invasive weeds from grazing or management activities. There would be no disturbance from the maintenance or construction of range improvements and no need to mitigate any expansion or introduction of noxious or invasive weeds that would result from such activities. The permittee would also not participate in monitoring for new invasions and therefore the frequency of early detection may also decrease.

Alternative 2: Modified Proposed Action

The effects of noxious or invasive weeds listed in the affected environment include the degradation of the ecosystem in general and the reduction of forage availability. Weeds, in general, decrease grazing opportunities by occupying habitat that would otherwise be occupied by native plant species. Therefore, it is important to employ good grazing practices and limit the risk of the spread of existing noxious or invasive weed infestations and the introduction of new ones using the resource protection measures in Chapter 2. Alternative 2 provides for adaptive management which can be used to address the risk factors of disturbance and overgrazing by monitoring and taking precautions where there is an identified risk of introducing or spreading invasive weeds. Periodic inspections dictated in the Annual Operating Instructions will detect disturbances and areas of overgrazing that can facilitate the spread on invasive species by creating openings for seed establishment. Though wildlife grazing may be contributing to the creation of these areas, adjusting timing and intensity of livestock grazing and chemically treating invasions early will reduce the risk of establishing and spreading weed species.

Structural improvements and vegetation treatments can be sources of disturbance. Locations for these activities would be surveyed for noxious or invasive weeds before construction begins to avoid creating disturbances and bare soil near invasive species populations that would facilitate their spread. Noxious or invasive weeds should be treated in conjunction with these activities to prevent spread. Products used in the construction of structural improvements would be inspected and weed free before being brought on site. Seeding mixes used in conjunction with vegetation treatments would be certified weed-free. All of these activities would follow the Best Management Practices in Appendix B of the Weeds FEIS.

In alternative 2, cattle would be present in the areas containing Lehmann lovegrass at least in some years in the winter months when Lehmann lovegrass is dormant. Cattle would still utilize the dry biomass resulting in reduction of the canopy which would possibly result in the increase of seedlings of Lehmann lovegrass under favorable spring or summer growing conditions.

Actions that remove the canopy, such as grazing and fire can allow seedling emergence in these areas (Robinett 1992). Adaptive management such as changes in grazing timing and intensity may be considered if a need to control the species is identified, especially if it is in proximity to Arizona cliffrose populations (See Arizona Cliffrose cumulative effects for more information)

Alternative 3: Modified Proposed Action with South Gyberg

Effects for alternative 3 are the same as those for alternative 2 except that the presence of cattle and the construction of new improvements in the South Gyberg Pasture may facilitate the expansion of Lehmann lovegrass in that pasture through the creation of openings in recently ungrazed grasslands.

Cumulative Effects

The timeframe for this discussion is from 2005, when the treatment of noxious or invasive weeds was authorized to present. The boundary of the discussion is the all lands within the allotment boundary and an additional buffer of one mile. This boundary was used because noxious or invasive weeds on properties nearby an analysis area can rapidly spread into the area of interest and become problematic.

Common to All Alternatives

In 2005, the Forest completed the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona (Weeds FEIS). This document represented a major change in the management of noxious or invasive weed control on the forests by allowing the use of herbicides on forest lands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino National Forest Plan by Amendment 20 of the Plan.

Numerous management actions that could have affected the occurrence, distribution and areal extent of noxious or invasive weeds have occurred in the past. However, sources of introduction for noxious or invasive weeds are often unknown or difficult to verify.

Activities on non-Forest Service lands within the allotment boundary and within one mile of the boundary may contribute to noxious or invasive weed issues within the allotment. There are no additional species of noxious or invasive weeds known to exist on lands under other jurisdictions within or near the boundary of the allotment. Major highways such as US Highway 89 are near the boundary of the allotment. Highways tend to be vectors of noxious or invasive weeds but weeds are often controlled by the management agency responsible for them. The Verde River is near the edge of the allotment and it contains a suite of noxious or invasive weeds. Several of these such as salt cedar are currently being controlled by a group of cooperators focusing on the Verde River corridor. The status of infestations and treatment on lands under other ownership including private, county and state lands is largely unknown. Infestations likely exist on at least some of these lands but the extent and density is unknown as is any treatment strategy that may exist for any specific property.

Disturbance is a major factor in noxious weed invasions. Areas that prohibit motor vehicle access, such as wilderness and implementation of the Travel Management Rule on the Coconino National Forest in 2012, reduce the dispersal of invasive weeds by limiting the extent and frequency of motor vehicle traffic. Where public traffic is limited, administrative activities continue to pose a risk of noxious or invasive weed dispersal.

Global climate change is expected to be a source of widespread disturbances. Higher temperatures will occur and precipitation cycles will be modified from current patterns over large areas. The warmer climate conditions may affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances for some species (Bradley et al. 2010, Hellmann et al 2008, Middleton 2006). Larger and more frequent fires are expected (Marlon et al. 2009). Climate may favor the spread of invasive exotic grasses into arid lands where the native vegetation is too sparse to carry a fire. When these areas burn, they typically convert to non-native monocultures and the native vegetation is lost (USDA Forest Service 2010).

The effects of global climate change on invasive species are expected to add to the effects of disturbance from motor vehicle use across the Forest under this alternative and are and are expected to result in an increasing amount of invasive species populations. Also, the concentration of disturbance from motorized use and disturbance effects from climate change would cumulatively increase the ability of invasive species to persist and spread. These effects, however, may slightly be muted or partially contained through the many approved invasive weed treatment activities.

Lehmann lovegrass is present on state and private lands within and adjacent to the Windmill West allotment and can be spread through human activities similar to other invasive species. There is no program to address the spread of this species in the area at this time.

Alternative 1: No Action

Alternative 1 would do the most to reduce the spread of invasive species on the allotment because the use of motorized vehicles for purposes of grazing management would mostly stop and there would be no regular livestock grazing; reducing two potential sources of invasive species establishment and spread. Invasive weed dispersal would continue to occur based on existing or slightly increasing rates due to climate change and other activities within and directly adjacent to the allotment.

Alternative 2: Modified Proposed Action

Alternative 2 would have larger cumulative effects compared to alternative 1 because of the increased risk of dispersing invasive weeds caused by livestock grazing and allotment-related motorized vehicle use and maintenance, juniper treatments, and construction of range improvements. These activities would combine with an increased risk of invasive species establishment and spread as a result of climate change to result in a cumulative increase in the establishment and spread of invasive species on this allotment. This cumulative increase from grazing would be limited. Parks et al. demonstrated that properly managed grazing results in fewer opportunities for invasive species establishment and spread and usually results in invasive species populations similar to ungrazed areas (2005).

Alternative 3: Modified Proposed Action with South Gyberg

Alternative 3 would have the largest extent of cumulative effects related to invasive weeds because of the increased administrative traffic and construction of new water sources in the South Gyberg Pasture.

Wildlife

This section presents the analysis of effects for the terrestrial species that have potential habitat within the Windmill West Allotment and those that have habitat adjacent to the allotment and

have the potential be affected by the activities within. There are two threatened wildlife species and three species that have been proposed for listing discussed under “Threatened and Endangered Species.” The Sensitive Species section discloses the effects to an additional 15 species that are identified by the Regional Forester.

The section also addresses compliance with the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act and the requirements of the Forest Plan concerning Management Indicator Species (MIS).

Threatened and Endangered Species

Guidelines from the 2005 Forest Service Southwest Region’s “Framework for streamlining informal consultation for livestock grazing activities” were used during the effects analyses and findings of the two species designated as “threatened” in the analysis area (Mexican spotted owl and southwestern willow flycatcher). Similar guidelines have not been developed for those species that are currently “proposed” for listing under the Endangered Species Act (ESA).

Mexican Spotted Owl

Affected Environment

All or portions of 22 Mexican spotted owl protected activity centers (PAC) occur in the Windmill West Allotment. The area designated as PAC habitat on the allotment is approximately 6,185 acres (or approximately 4.4 percent of the total area) and includes areas in both forested and canyon habitats.

Potential Mexican spotted owl nesting, roosting, and foraging habitat in the Windmill West Allotment includes all or portions of the 648 acres of riparian forest, 1,561 acres of mixed conifer forest, and 48,753 acres of ponderosa pine forest on the allotment. The quality of these habitats for use by owls varies. Many of the areas described as riparian lack the diversity of species and vegetative structure preferred by owls. Moderate to high intensity wildfires have led to decreases in mature trees, canopy closure, and a diversity of tree species. Recreation activities may lead to increases in disturbance to nesting, roosting and foraging activities and decreases in herbaceous cover and diversity for prey species.

Livestock grazing has the potential to affect the maintenance of adequate prey species (a primary constituent element for Mexican spotted owl) because of the activities effects to adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration (USFWS 2004). Other primary constituent elements would not be affected by the activities considered under the alternatives.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in these species habitat. No effects from human disturbance and associated noise from livestock management activities would occur. Additionally, water quality and availability for foraging in creek, streams, and wetlands would be maintained. Decreases in availability of water at earthen stock ponds would occur over time as no maintenance of these water sources would occur under this alternative reducing prey habitat for the species.

Alternative 2: Modified Proposed Action

Under alternative 2, livestock grazing would occur in Mexican spotted owl PACs during the breeding season (March 1st – August 31st). Since the presence of humans and noise associated with livestock management activities could potentially result in temporary or permanent nest abandonment, the use of mechanized equipment such as chainsaws and ATV/UTVs; spring branding and fall gathering; new construction of fences, corrals, or buildings; or cleaning or maintenance, or construction of earthen stock tanks and drinkers with pipelines and water storage would not be permitted inside of PACs during the breeding season (March 1st – August 31st). Grazing-related activities in PACs during this sensitive period would be limited to routine herding and fence maintenance. This includes a total of approximately 1 mile of fence in Sterling PAC in Harding Point Pasture, Bunker PAC in Winter Cabin Holding Pasture, and Red Hill PAC in Lockwood Springs Pasture. This information along with the locations where mechanized equipment cannot be used during the breeding season would be provided to the permittee.

Potential effects from concentrations of livestock in suitable spotted owl foraging habitat including wet meadows and other forest openings could result in trampling of vegetation and compaction of soil, reducing foraging habitat quality by reducing hiding cover and food resources for prey. Water quality of streams, springs, wetlands, and earthen stock ponds could potentially be impacted by grazing and result in effects to hiding cover and food resources for prey species (See Soils and Wetlands, Springs and Riparian Resources sections for more details). As described in the Rangeland Resources section, potential effects to herbaceous cover under alternative 2 would be managed through the length of the grazing period (how long plants are exposed to livestock grazing), frequency of grazing (how often plants are exposed to livestock grazing), grazing intensity (how much of a plants growth to date is removed during the grazing period; determined at the end of the grazing period), and forage utilization guidelines (how much of a plants annual growth is removed; determined at the end of the growing season). By limiting the length of grazing of a pasture to 5 to 60 days in a given year and the use of a rotational grazing management system to allow for use of pastures on the summer range at different times between years effects to herbaceous height and cover can be minimized. These practices allow for herbaceous plant growth and recovery to occur under favorable climatic conditions as livestock are moved between pastures. Additionally, grazing intensity on the summer range would be managed at conservative to moderate levels (30-50 percent) and forage utilization would be managed at conservative levels (30-40 percent). Management at these levels would provide sufficient herbaceous forage and hiding cover for owl prey and to maintain soil conditions and, therefore, water quality.

Potential effects from livestock grazing to suitable foraging habitat in wetland areas at Fry and Roger's Lakes and Lockwood Springs would be minimized through monitoring and potential fence construction. Congregation of livestock in these areas and near other water sources would also be mitigated through the placement of salt or mineral supplements in less sensitive areas such as uplands.

The Mexican Spotted Owl Recovery Plan encourages managing habitat for a diversity of prey species to help buffer against population fluctuations of individual prey species and provide a more constant food supply for the spotted owls (USFWS 2012a). The amounts of remaining vegetative biomass resulting from different levels of grazing have shown varying levels of impacts on small mammal populations important to Mexican spotted owls. Shifts among small mammal prey species on the Windmill West Allotment would be expected to occur between areas

with higher intensity grazing (10 – 50 percent) such as close to water, salt, or mineral blocks and those with lower intensity to no grazing (0 – 10 percent) would be expected to occur in areas farther from water or inaccessible to livestock (i.e. steep slopes and canyons). Managing grazing intensity and utilization of herbaceous vegetation at conservative levels (30 – 40 percent) would help meet this objective.

Proposed vegetation treatments would occur in areas outside breeding habitat for spotted owls but could result in temporary disturbance of wintering or dispersing owls on the winter range. Since treatments would be completed by hand, these effects would occur across small areas and be of short duration. Decreased juniper cover, increased herbaceous cover, and stabilization of soils in these areas would result in improved conditions for prey species and foraging owls over the long-term. Based on this information, potential direct and indirect impacts from livestock grazing on Mexican spotted owl and suitable foraging habitats on would be expected to be discountable.

Maintenance of existing structural improvements and construction of new improvements including fences and exclosures could also have effects on vegetative cover and soil conditions in suitable spotted owl foraging habitat. Reductions in herbaceous cover and potentially soil condition in the immediate vicinity of improvements would be expected to result in a potential decrease in hiding cover and food resources for prey. Effects would be limited to localized areas and be short in duration with recovery expected in one to two years under favorable climatic conditions. Construction of the fence at Fry and Roger’s Lakes and the exclosure at Lockwood Springs would minimize potential effects of livestock grazing on potential foraging habitats at these locations. Additionally availability of water for prey at earthen stock ponds and drinkers/pipeline systems would be maintained. Based on this information, potential direct and indirect impacts from new or existing structural improvements on suitable goshawk foraging habitat would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

Effects to Mexican spotted owl for alternative 3 are the same as those for alternative 2 because South Gyberg lacks suitable habitat.

Environmental Consequences - Cumulative Effects

Cumulative effects to Mexican spotted owl and its habitats would result from disturbance of nesting spotted owls and changes in vegetative cover and soil conditions that affect spotted owl foraging habitat through changes in food resources and hiding cover for prey as well as water quality and availability at or near earthen stock ponds, springs, and wetlands. Past, present, and reasonably foreseeable future projects that could be sources of noise disturbance of nesting spotted owls include recreationists such as hikers, bikers, horseback riders, hunters, and OHV users and fuelwood harvests.

Activities that could cumulatively affect spotted owl foraging habitats include wild ungulate grazing, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, management activities on Coconino County lands at Roger’s Lake, fuels reduction projects, wildfire, fuelwood harvest, spread of invasive plant species, motor vehicle closures, and climate change.

Wild ungulate grazing in PACs, potential nesting, roosting and foraging habitats, and critical habitat on the Windmill West Allotment would be expected to have similar effects to owls and

their habitat as described for livestock. The main difference is livestock grazing is intensively managed, while wild ungulates are not. This may result in decreases in vegetative cover and water quality in wetlands such as Roger's and Fry Lakes at Lockwood Springs and earthen stock ponds, and in montane subalpine grasslands. This could lead to decreases in quality and quantity of hiding cover and food resources for owl prey species.

Effects from wildfires and suppression tactics are evident in owl habitat on the allotment and can be expected in the future as a result of the human alteration of the natural fire regime. Effects depend on the time of year, scale of the fire, intensity, severity and associated management or suppression activities and can range from none to improvement or reduction of owl and prey habitat. Best management practices are incorporated into suppression activities as much as possible to conserve owl habitat and its components. Short-term effects of fire to herbaceous cover typically last one to 3 years but recovery depends on factors such as climate and burn severity. Water quality of streams, wetlands, and earthen stock ponds also can be affected especially in areas where fire severity is moderate to high. As fuels reductions projects, including the Four Forest Restoration Initiative and Turkey Butte – Barney Fuels Reduction project, are implemented effects of wildfires would decrease. While short-term effects to herbaceous cover would occur from the effects of activities such as logging equipment and broadcast burns, the long term effects of increased herbaceous cover across the landscape would benefit owl prey.

Recreational activities such as motorized and non-motorized travel, camping, hunting, and fuelwood harvest have the potential to affect vegetative cover and soil condition. System and user created roads remove vegetation and litter and compact soils, and therefore increased erosion (see Soil and Water Report for more detail). An increase in erosion could lead in a decrease in water quality in wetlands, springs, earthen stock ponds, and streams. New travel management rules were established by the Forest in 2011. As they are implemented, these effects to owl prey would be reduced.

Invasive plant species are well-adapted to out-compete native plants leading to decreases in the density and diversity of plant species in the infested area. When this decreased is combined with the toxicity of many invasive plants to wildlife, food resources for prey and as a result, prey availability decrease. As infested areas are treated and native plants are restored, the effect to owls and their prey would be reduced.

Coconino County is working with the AZGFD on a management plan for 2,250 acres that includes most of Roger's Lake and some of the surrounding upland habitat. The plan will include protecting the wetland landscape and supporting outdoor education, research, watchable wildlife programs, interpretation of historic and prehistoric sites, and low-impact recreation. Management in this manner would conserve and potentially enhance vegetative cover and wetland condition. This would have beneficial effects for Mexican spotted owl prey.

Components of owl habitats such as vegetation density, diversity, and cover and available water fluctuate naturally in response to inter-annual and longer periods of climate variability. Periods of favorable climatic conditions can result in increased quality and quantity of wildlife habitats including herbaceous cover, plant growth, fruit and seed production, and water in streams, springs, and stock tanks, while in periods of unfavorable climatic conditions the reverse can occur. Climate change is predicted to result in periods of extreme climatic conditions in both temperature and precipitation. As described in the Rangeland Resources and Soils sections, climate change in the Southwest is predicted to lead to decreased winter precipitation and delays

in the onset of the monsoon. These changes could result in drier conditions and an extension of the fire season resulting in increased areas of owl habitat being impacted by wildfire on the allotment as well as reductions in the quantity and quality of water available for owls and their prey.

In general, most of the past, present, and reasonably foreseeable future activities would be expected to result in localized decreases in the quality and quantity of spotted owl foraging habitat on the allotment. Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under the Travel Management Rule (TMR), restoration activities are implemented under the Four Forest Restoration Initiative (4FRI) and Turkey – Barney Fuels Reduction Project, and treatment, control of invasive plant species occurs and the area protected by Coconino County at Roger’s Lake.

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the effects described for past, present and reasonably foreseeable activities and therefore no cumulative effects would occur.

Alternative 2: Modified Proposed Action

Cumulative effects for alternative 2 would not result in long-term losses in soil productivity or decreases in diversity, density, production, and quality of herbaceous vegetation or condition of wetlands such as Roger’s and Fry Lakes and Lockwood Springs. Habitat conditions for owl prey species would be expected to remain stable. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in any additional effects to spotted owls and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Effects to Mexican spotted owl for alternative 3 are the same as those for alternative 2 because South Gyberg lacks suitable habitat.

Critical Habitat

There are approximately 36,616 acres of designated critical habitat (or approximately 26 percent of the total area) on the allotment, all of which are above the Mogollon Rim in the summer range.

Direct and Indirect Effects

Under alternative 1, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments. As a result, there would be no direct or indirect effects of this alternative to Primary Constituent Elements (PCEs) of critical habitat for Mexican spotted owl.

Under alternative 2 and 3, livestock grazing could potentially reduce levels of residual plant cover below what is necessary to maintain fruits, seeds, and allow plant regeneration on critical habitat designated for Mexican spotted owl as discussed in detail in direct & indirect effects on owls and their habitats. By limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels and forage utilization at conservative levels, potential reductions in residual plant cover and related

effects to owl prey would be minimized and be limited to localized areas across the 36,615 acres of critical habitat. When viewed across the entire Upper Gila Mountain Ecological Management Unit, these alternatives would have discountable effects to critical habitat for the species.

Cumulative Effects

Cumulative effects to Mexican spotted owl critical habitats would result changes in vegetative cover that affect maintenance of owl prey habitat. As described in detail in cumulative effects on owls and their habitats, activities that could cumulatively affect residual plant cover include wild ungulate grazing, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, management activities on Coconino County lands at Roger's Lake, fuels reduction projects, wildfire, fuelwood harvest, spread of invasive plant species, motor vehicle closures, and climate change. Most of these activities would be expected to result in localized decreases in the quality and quantity of vegetative cover across spotted owl critical habitat on the allotment. Conversely, improvement in residual cover would be expected in those areas where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, treatment and control of invasive plant species occurs and the area protected by Coconino County at Roger's Lake.

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above. Alternatives 2 and 3 would be expected to have additional effects on vegetative cover, but would not cumulatively result in long-term decreases in levels of residual plant cover below what is necessary to maintain fruits, seeds, and allow plant regeneration for the maintenance of Mexican spotted owl prey. Therefore, the potential effects of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in any additional effects on Mexican spotted owl critical habitat.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on Mexican spotted owl and designated critical habitat.

Under alternative 2, grazing and associated activities could have negative impacts on Mexican spotted owls through noise disturbance and reductions in quality of prey habitats, but they would be minimized through grazing management strategies and timing restrictions of human activities. As a result, impacts to Mexican spotted owls and critical habitats under alternative 2 would be expected to be minimal.

There would be no difference between the impacts of alternative 2 and 3. As a result, impacts to Mexican spotted owl and designated critical habitat under alternative 3 would be expected to be minimal.

Southwestern Willow Flycatcher

Affected Environment

There is no suitable nesting or foraging habitat for this species on the Windmill West Allotment. Suitable foraging habitat exists along the Verde River adjacent to the southwest boundary of the allotment but these same areas are unsuitable breeding habitat because of a lack of the dense riparian vegetation and foliage preferred by nesting flycatchers.

Historically occupied nest locations are known from Tavasci Marsh and Tuzigoot on Tuzigoot National Monument, 0.2, and 1.2 miles, respectively, from the southwestern boundary of the allotment. The last year flycatchers nested at Tuzigoot was in 1995 and Tavasci Marsh in 1996.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments in southwestern willow flycatcher habitat. No effects to flycatchers would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in streams adjacent to the allotment would be maintained.

Alternative 2: Modified Proposed Action

Under alternative 2, there would be no direct effects to southwestern willow flycatcher as livestock do not have access to riparian vegetation along the Verde River. Willow flycatchers could be indirectly affected by grazing through changes in vegetative cover and soil conditions. Decreased water quality of suitable habitat adjacent to the allotment could result if sediment concentrations increase. Effects to macroinvertebrates and aerial insect prey could occur, reducing prey availability for flycatchers. Grazing can also affect water quality by increasing contaminants such as *E. coli* in adjacent streams. This alternative would manage potential effects to vegetative cover and soil condition through adaptive management strategies outlined in Table 5. Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock in sensitive areas such as ephemeral channels that drain into the Verde River would be unlikely to occur due to the lack of riparian vegetation cover and structure throughout these areas on the winter range. Design features for this alternative would require the placement of salt or mineral supplements in less sensitive areas such as uplands so livestock do not gather in areas of riparian vegetation on the allotment.

Additional indirect effects of livestock grazing on willow flycatchers on the allotment would potentially occur through brood-parasitism by brown-headed cowbirds. The proximity of foraging habitat (areas where livestock are grazing) on the allotment to historically occupied and potential flycatcher habitats along the Verde River during the flycatcher breeding season (May 1st – July 31st) could increase the risk of nest failure as a result of brown-headed cowbirds if sites became occupied (USFWS 2002). Abundance of cowbirds has been shown to decline with increasing distance from anthropogenic food sources such as livestock over distances as short as 2 – 4 kilometers. Under alternative 2, livestock would be departing the winter range no later than May and would move above the Mogollon Rim to the summer range. This would minimize the amount of cowbird foraging habitat available on the allotment during the flycatcher breeding season and potential effects of brood-parasitism.

Maintenance of existing structural improvements such as boundary fences could have short-term effects on willow flycatchers through noise disturbance. Potential effects of noise disturbance on foraging and nesting flycatchers would be minimal as construction and maintenance activities would occur for short durations of time (hours to several days) at localized areas across the winter range in any given year. Any potential effects would be limited to maintenance of the southern boundary fence as it is the fence closest in proximity to the Verde River.

Proposed vegetation treatments would have no measureable effect on water quality and therefore, no effect on prey availability for willow flycatcher. Based on the information above, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on southwestern willow flycatcher would be discountable.

Alternative 3: Modified Proposed Action with South Gyberg

No difference would be expected in the effects of the two alternatives despite the proximity of South Gyberg Pasture to the Verde River. Under alternative 3, livestock grazing in this pasture would be limited to October through January every other year to comply with the Arizona Cliffrose Recovery Plan (USFWS 1995). This would minimize additional effects to water quality as it would provide time for herbaceous plant growth and recovery under favorable climatic conditions.

Environmental Consequences - Cumulative Effects

Cumulative effects to southwestern willow flycatcher and its habitats would result from disturbance of nesting and foraging birds, increases in cowbird populations, and changes in vegetative cover, soil conditions and contaminants that affect water quality and the availability of prey in the Verde River. Past, present, and reasonably foreseeable future projects that could be sources of noise disturbance include recreationists such as hikers, bikers, boaters, dispersed campers, horseback riders, hunters, and OHV users.

Activities that could cumulatively affect this species through increases in cowbird populations include grazing on federal and non-federal lands immediately adjacent to the allotment, agriculture, and residential development.

Activities that could cumulatively affect flycatchers and their habitats through changes in vegetative, soil conditions, contaminants include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plant species, development, and climate change.

The main cumulative effect on southwestern willow flycatchers are those occurring from recreational use of riparian areas along the Verde River. Recreating in and adjacent to riparian areas can alter flycatcher nesting and foraging flycatchers. Additionally, recreation can affect flycatcher habitat over time by removing vegetation and compacting soil, thereby affecting water quality directly through contaminants and indirectly by increasing sediment loads.

Development on private lands can also contribute to cumulative effects on flycatchers. Along the Verde River development has increased demand for water. As more water is taken from groundwater sources to meet this demand, flows in the Verde River would begin to decrease

during drier portions of the year and in periods of drought. When combined with the potential effects of decreases in winter precipitation and increased time between spring snowmelt and the onset of the North American monsoon as a result of climate change, development could result in decreased flows of the Verde River and result in potential decreases in density of riparian vegetation and reduced habitat quality for macroinvertebrates as water temperatures increase and dissolved oxygen decreases.

Most of these activities would be expected to result in localized increases in disturbance of flycatchers and decreases in the quality of prey habitat adjacent to the allotment. Conversely, long-term improvements in water quality would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI, Turkey – Barney, or other project, and treatment and control of invasive plant species.

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, there would be no additive effects to those described above.

Alternative 2: Modified Proposed Action

While additive effects would be expected for alternative 2 from the additional activities described above, they would be minimal and would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation; or increases in suspended sediments or contaminants in perennial streams adjacent to the allotment. Therefore, the potential effects of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to southwestern willow flycatcher and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects for alternative 3 would be similar to those for alternative 2 because the grazing period for the South Gyberg Pasture would be limited to the winter season and would have minimal overlap with the southwestern willow flycatcher.

Critical Habitat

There are approximately 27 acres of designated critical habitat for southwestern willow flycatcher located in Duff Flat Pasture on the winter range (USFWS 2013). Livestock do not have access to this area because of fences or steep topography so no effects to PCEs of critical habitat related to riparian vegetation would occur from proposed activities. As a result, no further discussion of PCEs related to riparian vegetation will occur. The critical habitat effects analysis will focus on insect prey populations.

Direct and Indirect Effects

Under alternative 1, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments. As a result, there would be no direct or indirect effects of this alternative to PCEs of critical habitat for southwestern willow flycatcher.

Under alternative 2 and 3, livestock grazing could potentially affect the availability of insect prey through changes in water quality from increased suspended sediments and contaminants as discussed in detail in direct and indirect effects on flycatchers and their habitats. By limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels and forage utilization at conservative levels, potential reductions in prey availability would be minimized. Additionally, improvements and vegetation treatments proposed under these alternatives would have no effect on the availability of prey due to the distance of these activities from critical habitat. When viewed across the entire Verde Management Unit, these alternatives would have discountable effects to critical habitat for the species.

Cumulative Effects

Cumulative effects to critical habitat for southwestern willow flycatcher would result from those activities that affect insect prey availability. As described in detail in cumulative effects on willow flycatchers and their habitats, activities that could cumulatively affect prey availability include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plant species, development, and climate change.

Most of these activities could result in localized decreases in prey availability in designated critical habitat on the allotment. Conversely, improvement in prey availability could occur where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, treatment and control of invasive plant species occurs.

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above. Alternatives 2 and 3 would be expected to have additive effects on prey availability, but would not cumulatively result in long-term decreases prey. Therefore, the potential effects of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in any additional effects on southwestern willow flycatcher critical habitat.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on southwestern willow flycatcher and designated critical habitat.

Under alternative 2, grazing and associated activities could have negative impacts on southwestern willow flycatcher through brood parasitism, noise disturbance and reductions in quality of prey habitats. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied nesting sites. As a result, impacts to southwestern willow flycatcher and critical habitats under alternative 2 would be expected to be minimal.

There would be no difference between the impacts of alternative 2 and 3. As a result, impacts to southwestern willow flycatcher and designated critical habitat under alternative 3 would be expected to be minimal.

Western Yellow-billed Cuckoo

Affected Environment

There is no suitable nesting or foraging habitat for this species on the Windmill West Allotment. Suitable cuckoo habitat can be found adjacent to the analysis area on the Verde River and Oak Creek. The closest documented nests to the allotment are on Oak and Wet Beaver Creeks north of Cornville.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments in yellow-billed cuckoo habitat. No effects to cuckoos would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in streams adjacent to the allotment would be maintained.

Alternative 2: Modified Proposed Action

Under alternative 2, there would be no direct effects to yellow-billed cuckoo as livestock do not have access to riparian vegetation along the Verde River or Oak Creek. Cuckoos could be indirectly affected by grazing through changes in vegetative cover and soil conditions that result in a decrease in the water quality of in suitable habitat adjacent to the allotment if sediment concentrations increase. Effects to macroinvertebrates and thereby, terrestrial insect prey could occur, reducing prey availability for cuckoos. Grazing can also affect water quality by increasing contaminants such as E. coli in adjacent streams. This alternative would manage potential effects to vegetative cover and soil condition by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock in sensitive areas such as ephemeral channels that drain into the Verde River and Oak Creek would be unlikely to occur due to the lack of riparian vegetation cover and structure throughout these areas on the winter range. If a nesting pair was found, congregations could be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands.

Maintenance of existing structural improvements such as boundary fences could have short-term effects on yellow-billed cuckoos through noise disturbance. Potential effects of noise disturbance on foraging and nesting cuckoos would be minimal as construction and maintenance activities would occur for short durations of time (hours to several days) at localized areas across the winter range in any given year. Any potential effects would be limited to maintenance of the southern boundary as it is the fence closest in proximity to the Verde River.

Proposed improvements at Roger's and Fry Lakes and Lockwood Springs would have no effects on this species as these sites are located above the Mogollon Rim, which is outside of the known range of the species. Additionally proposed vegetation treatments would have no measureable effect on water quality and therefore, no effect on prey availability for cuckoo.

Based on the information above, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on yellow-billed cuckoo would be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

No difference would be expected in the effects of the two alternatives despite the proximity of South Gyberg Pasture to the Verde River. Under alternative 3, livestock grazing in this pasture would be limited to October through January every other year to comply with the Arizona Cliffrose Recovery Plan (USFWS 1995). This would minimize additional effects to water quality as it would provide time for herbaceous plant growth and recovery under favorable climatic conditions.

Ground disturbance resulting from the installation of the pipeline and water trough and grazing at Rattlesnake Spring would not result in any direct impacts to the western yellow-billed cuckoo. Potential indirect effects of these activities such as erosion would be minimized by BMPs and the distance of these features from suitable habitat on the Verde River.

Environmental Consequences - Cumulative Effects

Cumulative effects to yellow-billed cuckoo and its habitats would result from disturbance of nesting and foraging birds and changes in vegetative cover, soil conditions, and contaminants on the winter range that affect water quality and the availability of prey in the Verde River. Past, present, and reasonably foreseeable future projects that could be sources of noise disturbance include recreationists such as hikers, bikers, boaters, dispersed campers, horseback riders, hunters, and OHV users.

Activities that could cumulatively affect cuckoos and their habitats through changes in vegetative, soil conditions, contaminants include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plant species, development, and climate change.

Most of these activities would be expected to result in localized increases in disturbance of cuckoos and decreases in the quality of prey habitat adjacent to the allotment. Conversely, long-term improvements in water quality would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI, Turkey – Barney, or other project, and treatment and control of invasive plant species.

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, there would be no additive effects to those described above.

Alternative 2: Modified Proposed Action

While additive effects would be expected for alternatives 2, they would be minimal and would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation; or increases in suspended sediments or contaminants in perennial streams adjacent to the allotment. Therefore, the potential effects of

livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to yellow-billed cuckoo and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects for alternative 3 would be similar to those for alternative 2 because the grazing period for the South Gyberg Pasture would be limited to the winter season and would have minimal overlap with the western yellow billed cuckoo.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on western yellow-billed cuckoo.

Under alternative 2, grazing and associated activities could have negative impacts on western yellow-billed cuckoo through noise disturbance and reductions in quality of prey habitats. Any potential effects would be minimized through grazing management strategies and the distance of the allotment to occupied nesting sites. . As a result, impacts to yellow-billed cuckoo under alternative 2 would be expected to be minimal.

There would be no difference between the impacts of alternative 2 and 3. As a result, impacts to yellow-billed cuckoo at under alternative 3 would be expected to be minimal.

Northern Mexican Gartersnake

Affected Environment

There is no suitable habitat for northern Mexican gartersnake on the Windmill West Allotment due to a lack of perennial streams. Suitable habitat exists adjacent to the analysis area in the Verde River and Oak and Spring Creeks. Individuals have been sighted along the upper Verde River and several of its tributaries, including Oak Creek at Page Springs and Bubbling Ponds fish hatcheries. Spring Creek is perennial from its confluence with Oak Creek almost to State Highway 89A. This is approximately 0.7 mile southwest of the allotment boundary. On the allotment, Spring Creek becomes ephemeral with only small pools of water in driest portions of the year and scattered patches of riparian vegetation.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in suitable northern Mexican gartersnake habitat. No effects to gartersnakes would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in streams adjacent to the allotment would be maintained. Improvement in contaminant levels such as E. coli in Oak Creek and Spring Creek would likely be slight to none and possibly too small to be detected through typical water quality monitoring methods. As a result, if such a change were to occur, it would not have a noticeable effect on water quality or the availability of food for this species or its prey.

Alternative 2: Modified Proposed Action

Under alternative 2, there would be no direct effects to northern Mexican gartersnakes as livestock do not have access to the Verde River or other perennial streams and their associated riparian vegetation. Gartersnakes could be indirectly affected by grazing through changes in vegetative cover and soil conditions. Such changes could result in a decrease in the water quality of in suitable habitat adjacent to the allotment as sediment concentrations increase. Effects to macroinvertebrates and ultimately fish and amphibians could occur, reducing prey availability for northern Mexican gartersnakes. Grazing can also affect water quality by increasing contaminants such as *E. coli* in adjacent streams. Both alternatives would manage potential effects to vegetative cover and soil condition by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock in sensitive areas, such as ephemeral channels that drain into the Verde River and Oak and Spring Creeks, would be unlikely to occur due to the lack of riparian vegetation cover and structure throughout these areas on the winter range. If one was found, congregations could be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands.

Timing of grazing also greatly minimizes the potential contribution of livestock to *E. coli* levels in Oak and Spring Creeks downstream of the allotment. Since the winter pastures are grazed between November and May and contaminants from livestock manure is most easily moved through the ephemeral sections of Spring Creek on the allotment during the monsoon, it is highly unlikely that livestock grazing is a meaningful or measurable contributor of *E. coli* contamination to adjacent creeks (see Soil and Watershed sections for more detail).

Maintenance of existing structural improvements such as boundary fences could have short-term effects on northern Mexican gartersnakes. These could occur from noise disturbance as well as reductions in vegetative cover in the immediate area of the improvements. Potential effects of noise disturbance on foraging and basking snakes would be minimal as construction and maintenance activities would occur for short durations of time (hours to several days) at localized areas across the winter range in any given year. Additionally only gartersnakes in the Verde River along the southern boundary of the allotment could be affected by these activities as this is the only area in close proximity to perennial water. In areas where vegetative cover was affected as result maintenance of improvements, only upland vegetation would be affected and recovery would be expected in one to two years under favorable climatic conditions.

Proposed improvements at Roger's and Fry Lakes and Lockwood Springs would have no effects on this species as these sites are located above the Mogollon Rim, which is outside of the known range of the species. Additionally proposed vegetation treatments would have no measureable effect on water quality and therefore, prey availability for Mexican gartersnakes.

Routine cleaning of earthen stock ponds on the winter range would be unlikely to affect this species through spread of non-native species and disease. The closest earthen stock ponds on the allotment to occupied habitat are approximately 2.2 miles from both D.K Well in Duff Flat Pasture to the Verde River and Triangle Tank in Strip Pasture to Oak Creek. While gartersnakes are unlikely to use earthen stock ponds on the winter range due to their lack of connectivity with perennials streams, an approved protocol would still be followed during maintenance activities at stock tank. This protocol helps reduce the risk of introducing and spreading non-native species

and disease between aquatic systems and adversely affecting northern Mexican gartersnakes and their prey and would be attached to the annual operating instructions for the allotment. Design features would require notification of the District at least a notice 60 days prior to conducting work in earthen stock ponds to allow for surveys to be completed if needed, and/or mitigation to be implemented to reduce potential effects to aquatic species.

Based on the information above, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on northern Mexican gartersnakes and its habitats would be expected to be discountable.

Alternative 3: Modified Proposed Action with South Gyberg

No difference would be expected in the effects of the alternatives 2 and 3 despite the proximity of South Gyberg Pasture to the Verde River. Under alternative 3, livestock grazing in this pasture would be limited to October through January every other year to comply with the Arizona Cliffrose Recovery Plan (USFWS 1995). This would minimize additional effects to water quality as it would provide time for herbaceous plant growth and recovery under favorable climatic conditions.

Environmental Consequences - Cumulative Effects

Cumulative effects to northern Mexican gartersnake and its habitats would result from disturbance of basking and foraging snakes and changes in vegetative cover, soil conditions, and contaminants that affect water quality and the availability of hiding cover and food resources for its prey on the winter range. Additionally, activities that introduce or assist in the spread of diseases and non-native aquatic species such as bullfrogs, crayfish, and warm-water fish would contribute to cumulative effects.

Past, present, and reasonably foreseeable future projects that could be sources of noise disturbance include recreationists such as hikers, bikers, boaters, dispersed campers, horseback riders, hunters, and OHV users.

Activities that could cumulatively affect gartersnakes and their habitats through changes in vegetative, soil conditions, and contaminants and movement of non-native species and disease include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change.

Most of these activities would be expected to result in localized decreases in the quality of prey habitat adjacent to the allotment. Conversely, improvement in snake habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI, Turkey – Barney, and other projects, and treatment and control of invasive plant species.

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above.

Alternative 2: Modified Proposed Action

While additive effects would be expected for alternative 2, they would be minimal and would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation; or increases in suspended sediments or contaminants in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to northern Mexican gartersnake and their habitats

Alternative 3: Modified Proposed Action with South Gyberg

Under alternative 3, cumulative effects would be the same as alternative 2 because the direct and indirect effects are the same.

Critical Habitat

The allotment contains portions of the proposed Verde River Sub-basin Critical Habitat Unit: 450 acres of the Verde River Subunit and 237 acres of the Spring Creek Subunit. The majority of the 450 acres of proposed critical habitat in the Verde River Subunit is in the Duff Flat and Duff Mesa pastures with only a small piece (less than 20 acres) in South Gyberg Pasture. All of these pastures are located in the winter range and would only be grazed between November and May. The majority of the 237 acres of proposed critical habitat in the Spring Creek Subunit occurs on Strip, Malpais, DK, Greasy West, and Black Tank Pastures in the winter ranger with only a small portion (less than 25 acres) in the summer range in Winter Cabin Holding Pasture.

As described in the Soils and Watershed sections, the reach of Spring Creek on the Windmill West Allotment does not support free flowing water during even a portion of the growing season, making it unsuitable habitat for this species. Although it is currently included in proposed critical habitat for this species, the 237 acres on the allotment in the Spring Creek Subunit lacks the PCEs for aquatic/riparian habitats, adequate terrestrial space, and prey. For this reason, potential effects of the proposed project to critical habitat along Spring Creek will not be discussed further.

For the remaining 450 acres of proposed critical habitat in the Verde River Subunit, potential effects to the PCEs that describe aquatic/riparian habitats, and terrestrial space, and nonnative species will not be discussed further since livestock lack access to critical habitat along the Verde River due to fences and/or steep topography and no activities in the proposed project would aid in transport of non-native species to the river. Therefore, the effects analysis for PCEs of proposed northern Mexican gartersnake critical habitat will focus on viable populations of native amphibian and fish prey species.

Direct and Indirect Effects

Under this alternative, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments. As a result, there would be no direct or indirect effects of this alternative to PCEs of critical habitat for northern Mexican gartersnake.

Under alternatives 2 and 3, livestock grazing could potentially affect viable populations of native amphibian and fish prey species in the Verde River through changes in water quality from increased suspended sediments and contaminants as discussed in detail in direct and indirect

effects on gartersnakes and their habitats. By limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels and forage utilization at conservative levels, potential reductions in native prey populations would be minimized. Additionally, improvements and vegetation treatments proposed under these alternatives would have no effect on the availability of prey due to the distance of these activities from critical habitat. When viewed across the entire Verde River Sub-basin Critical Habitat Unit, these alternatives would have discountable effects to critical habitat for the species.

Cumulative Effects

Cumulative effects to proposed critical habitat for northern Mexican gartersnake would result from those activities that affect populations of native amphibian and fish species in the Verde River. As described in detail in cumulative effects for northern Mexican gartersnake and their habitats, activities that could cumulatively affect native prey species include wild ungulate grazing, grazing on State lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change.

Most of these activities could result in localized decreases in prey populations in proposed critical habitat on the allotment. Conversely, improvement in prey availability could occur where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, treatment and control of invasive plant species occurs.

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above. While additive effects would be expected for alternatives 2 and 3, they would be minimal and would not cumulatively result in long-term decreases in native prey populations in the Verde River. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to proposed critical habitat for northern Mexican gartersnake.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on northern Mexican gartersnakes and proposed critical habitat.

Under alternative 2, grazing and associated activities could have negative impacts on northern Mexican gartersnakes through noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, impacts to northern Mexican gartersnakes and proposed critical habitat under alternative 2 would be expected to be minimal.

There would be no difference between the impacts of alternative 2 and 3. As a result, impacts to northern Mexican gartersnakes and proposed critical habitat under alternative 3 would be expected to be minimal.

Narrow-headed Gartersnake

Affected Environment

No records of narrow-headed gartersnakes exist for the Windmill West Allotment but individuals have been sighted in adjacent areas along the upper Verde River and several of its tributaries, including Oak Creek. A portion of West Fork of Oak Creek on the allotment has suitable habitat for gartersnakes in the form of perennial water, native fish populations, and well-developed riparian vegetation, but this area is inaccessible to livestock because of steep topography.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in suitable narrow-headed gartersnake habitat. No effects to gartersnakes would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in streams adjacent to the allotment would be maintained. Improvement in contaminant levels such as *E. coli* in Oak and Spring Creeks would likely be slight to none and possibly too small to be detected through typical water quality monitoring methods. While there is the potential for beneficial effects from the slight decrease in contaminants in creeks adjacent to the allotment, any effects to suitable gartersnake habitat would be discountable.

Alternative 2: Modified Proposed Action

Under alternative 2, there would be no direct effects to narrow-headed gartersnakes as livestock do not have access to the Verde River or other perennial streams and their associated riparian vegetation. Gartersnakes could be indirectly affected by grazing through changes in vegetative cover and soil conditions. Such changes could result in a decrease in the water quality of in suitable habitat adjacent to the allotment as sediment concentrations increase. Effects to macroinvertebrates and ultimately fish and amphibians could occur, reducing prey availability for narrow-headed gartersnakes. Grazing can also affect water quality by increasing contaminants such as *E. coli* in adjacent streams. Both alternatives would manage potential effects to vegetative cover and soil condition by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock in sensitive areas such as ephemeral channels that drain into the Verde River and Oak and Spring Creeks would be unlikely to occur due to the lack of riparian vegetation cover and structure throughout these areas on the winter range. If one was found, congregations could be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands.

Timing of grazing also greatly minimizes the potential contribution of livestock to *E. coli* levels in Oak and Spring Creeks downstream of the allotment. Since the winter pastures are grazed between November and May and contaminants from livestock manure is most easily moved through the ephemeral sections of Spring Creek on the allotment during the monsoon, it is highly unlikely that livestock grazing is a meaningful or measurable contributor of *E. coli* contamination to adjacent creeks (see Soil and Watershed Report for more detail).

Maintenance of existing structural improvements such as boundary fences could have short-term effects on narrow-headed gartersnakes. These could occur from noise disturbance as well as reductions in vegetative cover in the immediate area of the improvements. Potential effects of noise disturbance on foraging and basking snakes would be minimal as construction and maintenance activities would occur for short durations of time (hours to several days) at localized areas across the winter range in any given year. Additionally only gartersnakes in the Verde River along the southern boundary of the allotment could be affected by these activities as this is the only area in close proximity to perennial water. In areas where vegetative cover was affected as result maintenance of improvements, only upland vegetation would be affected and recovery would be expected in one to two years under favorable climatic conditions.

Proposed improvements at Roger's and Fry Lakes and Lockwood Springs would have no effects on this species as these sites are located above the Mogollon Rim, which is outside of the known range of the species. Additionally proposed vegetation treatments would have no measureable effect on water quality and therefore, prey availability for gartersnakes.

Routine cleaning of earthen stock ponds on the winter range would be unlikely to affect this species through spread of non-native species and disease. The closest earthen stock ponds on the allotment to occupied habitat are approximately 2.2 miles from both D.K Well in Duff Flat Pasture to the Verde River and Triangle Tank in Strip Pasture to Oak Creek. While gartersnakes are unlikely to use earthen stock ponds on the winter range due to their lack of connectivity with perennials streams, an approved protocol would still be followed during maintenance activities at stock tank. This protocol helps reduce the risk of introducing and spreading non-native species and disease between aquatic systems and adversely affecting narrow-headed gartersnakes and their prey and would be attached to the annual operating instructions for the allotment. Design features would require notification of the District at least a notice 60 days prior to conducting work in earthen stock ponds to allow for surveys to be completed if needed, and/or mitigation to be implemented to reduce potential effects to aquatic species.

Based on the information above, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on narrow-headed gartersnakes and its habitats would be expected to be discountable.

Alternative 3: Modified Proposed Action with South Gyberg

No difference would be expected in the effects of the two alternatives despite the proximity of South Gyberg Pasture to the Verde River. Under alternative 3, livestock grazing in this pasture would be limited to October through January every other year to comply with the Arizona Cliffrose Recovery Plan (USFWS 1995). This would minimize additional effects to water quality as it would provide time for herbaceous plant growth and recovery under favorable climatic conditions.

Environmental Consequences - Cumulative Effects

Cumulative effects to narrow-headed gartersnake and its habitats would result from disturbance of basking and foraging snakes and changes in vegetative cover, soil conditions, and contaminants that affect water quality and the availability of hiding cover and food resources for its prey on the winter range. Additionally activities that introduce or assist in the spread of diseases and non-native aquatic species such bullfrogs, crayfish, and warm-water fish would contribute to cumulative effects.

Past, present, and reasonably foreseeable future projects that could be sources of noise disturbance include recreationists such as hikers, bikers, boaters, dispersed campers, horseback riders, hunters, and OHV users.

Activities that could cumulatively affect gartersnakes and their habitats through changes in vegetative, soil conditions, and contaminants and movement of non-native species and disease include wild ungulate grazing, grazing on State lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change.

Most of these activities would be expected to result in localized decreases in the quality of prey habitat adjacent to the allotment. Conversely, improvement in snake habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI, Turkey – Barney, and other projects, and treatment and control of invasive plant species.

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above.

Alternative 2: Modified Proposed Action

While additive effects would be expected for alternative 2 and 3, they would be minimal and would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation; or increases in suspended sediments or contaminants in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to narrow-headed gartersnake and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Under alternative 3, cumulative effects would be the same as alternative 2 because the direct and indirect effects are the same.

Critical Habitat

The allotment contains portions of the Verde River Sub-basin Critical Habitat Unit: 450 acres of the Verde River Subunit and 631 acres of the West Fork of Oak Creek Subunit. The majority of the 450 acres of proposed critical habitat in the Verde River Subunit occurs in Duff Flat and Duff Mesa Pastures with only a small piece (less than 20 acres) in South Gyberg Pasture. All of these pastures are in the winter country. All 631 acres of proposed critical habitat in the West Fork of Oak Creek Subunit occurs in Lockwood Pasture on the summer country.

As described in the Soils and Watershed Specialist report, the perennial portion of West Fork of Oak Creek on the Windmill West Allotment that supports riparian vegetation is inaccessible to livestock. The upper reach, which is located on top of the Mogollon Rim, is accessible to livestock but lacks sufficient flowing water to support riparian vegetation, making it unsuitable

habitat for this species. Although it is currently included in proposed critical habitat, the 631 acres on Lockwood Pasture in the West Fork of Oak Creek Subunit lacks the PCEs for aquatic/riparian habitats, adequate terrestrial space, and prey. For this reason, potential effects to critical habitat on West Fork of Oak Creek will not be discussed further.

For the acres of proposed critical habitat in the Verde River Subunit, potential effects to the PCEs that describe aquatic/riparian habitats, and terrestrial space, and nonnative species will not be discussed further since livestock lack access to critical habitat along the Verde River due to fences and/or steep topography and no activities in the proposed project would aid in transport of non-native species to the river. Therefore, the effects analysis for PCEs of proposed narrow-headed gartersnake critical habitat will focus on viable populations of native amphibian and fish prey species.

Direct and Indirect Effects

Under alternative 1, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments. As a result, there would be no direct or indirect effects of this alternative to PCEs of critical habitat for narrow-headed gartersnake.

Under alternative 2 and 3, livestock grazing could potentially affect viable populations of native amphibian and fish prey species in the Verde River through changes in water quality from increased suspended sediments and contaminants as discussed in detail in direct and indirect effects on gartersnakes and their habitats. By limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels and forage utilization at conservative levels, potential reductions in native prey populations would be minimized. Additionally, improvements and vegetation treatments proposed under these alternatives would have no effect on the availability of prey due to the distance of these activities from critical habitat. When viewed across the entire Verde River Sub-basin Critical Habitat Unit, these alternatives would have discountable effects to critical habitat for the species.

Cumulative Effects

Cumulative effects to proposed critical habitat for narrow-headed gartersnake would result from those activities that affect populations of native amphibian and fish species in the Verde River. As described in detail in cumulative effects for narrow-headed gartersnake and their habitats, activities that could cumulatively affect native prey species include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change.

Most of these activities could result in localized decreases in prey populations in proposed critical habitat on the allotment. Conversely, improvement in prey availability could occur where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, treatment and control of invasive plant species occurs.

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above. While additive effects would be expected for alternatives 2 and 3, they would be minimal and would not cumulatively result in long-term decreases in native prey populations in the Verde River. Therefore, the potential impacts of

livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to proposed critical habitat for narrow-headed gartersnake.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on narrow-headed gartersnakes and proposed critical habitat.

Under alternative 2, grazing and associated activities could have negative impacts on narrow-headed gartersnakes through noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, impacts to narrow-headed gartersnakes and proposed critical habitat under alternative 2 would be expected to be minimal.

There would be no difference between the impacts of alternative 2 and 3. As a result, impacts to narrow-headed gartersnakes and proposed critical habitat under alternative 3 would be expected to be minimal.

Sensitive Species

Sensitive species are defined as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density, or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5(19))". The U.S. Forest Service Region 3 sensitive species list (9/18/2013) was reviewed and a list of species was created for this project based on known occurrences or, in the absence of survey data, the presence of suitable habitat. This assessment considers, as appropriate for the species and area, factors that may affect the current trend for the species' population. Additionally, this assessment will display findings under the various management alternatives considered for the project (FSM 2621.2).

Western yellow-billed cuckoo, northern Mexican and narrow-headed gartersnakes are Forest Service sensitive species that have been proposed for listing by the U.S. Fish and Wildlife Service. They are discussed in detail under Threatened and Endangered species.

Navajo Mogollon Vole

Affected Environment

There are no documented occurrences of Navajo Mogollon voles on the Windmill West Allotment, but suitable habitat does exist in all or portions of the 1,337 acres of subalpine grasslands, 89 acres of wetlands, and wet areas that support high grass cover in and adjacent to ponderosa pine and mixed conifer forests in the pastures on the summer range.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new or maintenance of existing structural improvements in vole habitat. As a result, no direct or indirect effects of livestock grazing would occur to voles and their habitats.

Alternative 2: Modified Proposed Action

Under alternative 2, potential effects from concentrations of livestock in areas such as wet meadows and other wet areas with high grass cover in forested habitats could result in trampling of individuals and vegetation, compaction of soil, and collapsing of burrows. Grazing by livestock could also result in a potential increase in competition for herbaceous forage, loss of cover, and risk of predation for voles. Potential effects to herbaceous cover under alternative 2 would be managed through adaptive management strategies identified in Table 5 whose consequences are described in the Rangeland Resources effects analysis. By limiting the length of grazing of a pasture to 5 to 60 days in a given year and the use of a rotational grazing management system to allow for use of pastures on the summer range at different times between years effects to herbaceous height and cover can be minimized. These practices allow for herbaceous plant growth and recovery to occur under favorable climatic conditions as livestock are moved between pastures. Since livestock grazing is dependent upon herbaceous growth and limited to conservative utilization of that growth, livestock grazing impacts would be limited during drought conditions. Additionally, grazing intensity on the summer range would be managed at conservative to moderate levels (30-50 percent) depending on the time of year grazing would occur and forage utilization would be managed at conservative levels (30-40 percent). Management at these levels would provide sufficient herbaceous forage and cover for voles.

Potential effects to suitable vole habitat in wetland areas at Fry Lake and Roger's Lakes from livestock grazing under alternative 2, such as herbivory, trampling, and congregation of livestock, would also be minimized through an adaptive management approach (See Wetlands, Springs and Riparian Resources section for more details). This approach includes monitoring and potential fence construction to move toward Forest Plan guidelines for the maintenance of at least 80 percent of the potential emergent vegetation cover from May 1st to June 15th. The congregation of livestock in suitable vole habitat would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on the discussion above, potential direct and indirect impacts from livestock grazing on voles and suitable vole habitat would be expected to be minimal.

Maintenance of existing structural improvements and construction of new improvements including fences and enclosures would have short duration effects on Mogollon voles and their habitats. Disturbance created by the presence of humans and the noise of construction activities could lead to short duration avoidance by breeding and foraging voles of areas where construction and/or maintenance activities occur. Vegetative cover could be reduced in the immediate vicinity of improvements but potential effects would be expected to occur in localized areas across the summer range in any given year. These effects would be short in duration and these areas would recover in one to two years under favorable climate conditions. Construction of the fence at Roger's Lake and the enclosure at Lockwood Springs would minimize potential effects of livestock grazing on potential vole habitats at these locations, and possibly improve habitat.

Based on this information, potential direct and indirect impacts from new or existing structural improvements on voles and suitable vole habitat would be expected to be discountable.

Proposed juniper thinning would have no effect on Mogollon vole as this activity is limited to areas below the Mogollon Rim, which is outside of the species' range.

Alternative 3: Modified Proposed Action with South Gyberg

Effects to Navajo Mogollon vole for alternative 3 are the same as those for alternative 2 because South Gyberg lacks suitable habitat.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to Navajo Mogollon vole from this alternative and therefore no cumulative effects.

Alternative 2: Modified Proposed Action

Cumulative effects to Navajo Mogollon voles and their habitats would result from changes in vegetative cover and soil conditions in wet meadows and other wet areas that support high grass cover in and adjacent to ponderosa pine and mixed conifer forests on the summer range of the allotment. Past, present, and reasonably foreseeable future projects¹⁵ would be expected to result in localized decreases in the quality and quantity of vole habitat on the allotment. Conversely, improvement in vole habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, and treatment and control of invasive plant species occurs on the allotment.

Cumulative effects from alternative 2 would not result in long-term losses in soil productivity or decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger's and Fry Lakes and Lockwood Springs. Noise disturbance to voles may increase during periods of forest restoration but fence construction and maintenance in and around wetlands would not necessarily overlap temporally or would be coordinated to reduce their impacts through the wildlife program. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to Mogollon voles and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects to Navajo Mogollon vole for alternative 3 are the same as those for alternative 2 because South Gyberg lacks suitable habitat for this species.

¹⁵ Activities that could cumulatively affect voles and their habitats include wild ungulate grazing, motorized and non-motorized dispersed recreation, forest restoration projects, management activities on Coconino County lands at Roger's Lake, fuels reduction projects, wildfire, fuelwood harvest, spread of invasive plant species, travel management rule (TMR) implementation, and climate change.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on Navajo Mogollon voles.

Under alternative 2, livestock grazing and associated activities could have both positive and negative effects on Navajo Mogollon voles. Potential negative effects on forage and cover for voles would be minimized through timing of grazing and other management strategies. Protection of wetland habitats could have long-term beneficial effects for this species by improving cover and forage. Alternative 2 may impact individual Navajo Mogollon voles but are not likely to result in a trend toward Federal listing or loss of viability of the species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual Navajo Mogollon voles but is not likely to result in a trend toward Federal listing or loss of viability of this species.

Sensitive Bats

Affected Environment

There are four Forest Service sensitive bat species that have suitable habitat within the Windmill West Allotment: Western Red Bat, Spotted Bat, Allen's Lappet-browed Bat, and Pale Townsend's Big-eared Bat.

There are no documented occurrences of western red bat on the Windmill West Allotment. Potential roosting habitat occurs in deciduous trees along drainages, streams, and creeks across the allotment including Dry and Spring Creeks, Casner Cabin Draw, and Lockwood and Rattlesnake Springs and in pine-oak woodlands, mixed conifer forest, and aspen stands on the summer range. Suitable habitat for foraging and drinking can be found across the allotment at earthen stock ponds, springs, wetlands, creeks, and other watercourses.

There are no documented occurrences of spotted bat on the Windmill West Allotment. Suitable roosting habitat exists along the face of the Mogollon Rim and the steep walled canyons between the summer and winter range. Foraging habitat exists on both the summer and winter range in forest and woodland openings, meadows, grasslands, and water sources including creeks, springs, and earthen stock ponds.

Allen's lappet-browed bats have been documented on the Windmill West Allotment at Snafu Tank, maternity roosts have been found under the bark of ponderosa pine snags in the forest above the Mogollon Rim and bachelor roosts in rock crevices in pinyon-juniper woodlands below the Rim. Suitable roosting habitat can be found in snags across the summer range and in the crevices along the Rim between the summer and winter range. Foraging habitat exists on both the summer and winter range in wet meadows and along water sources including creeks, springs, and earthen stock ponds.

There are two documented occurrences of pale Townsend's big-eared bats roosting on the Windmill West Allotment. During surveys by Arizona Game and Fish Department, at least one bat was observed at Nolan's Sinkhole in the Greasy West Pasture and another at Jaw Bone Cave in the Roger's Lake Pasture. Suitable roosting habitats exist in caves, sinkholes, mines, and other man-made structures across the allotment and suitable foraging habitat exists at creeks, wetlands,

springs, and earthen stock ponds on the summer and winter range as well as mature forests above the Mogollon Rim.

Environmental Consequences - Direct and Indirect Effects

Common to All Alternatives

There is no difference in effects to abandoned mines and other man-made structures, which are potential roosting habitat for pale Townsend's big-eared bats between alternatives (See Heritage Resources for more information).

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in sensitive bat habitat. No effects to roosting bats would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in wetlands, creeks, and springs would be maintained. Decreases in availability of water at earthen stock ponds and drinker/pipeline systems for foraging and drinking would occur over time as no maintenance of these water sources would occur under this alternative reducing prey habitat and drinking water for the species. Additionally, the risk of drowning in drinkers would increase for bats since maintenance of wildlife escape ramps would not occur.

Alternative 2: Modified Proposed Action

Under alternative 2, water quality of streams, springs, wetlands, and earthen stock ponds could potentially be impacted by grazing and result in effects to macroinvertebrates and ultimately aerial insect prey. Potential effects from concentrations of livestock in areas such as wet meadows, grasslands and other open habitats could result in trampling of vegetation and compaction of soil, reducing foraging habitat quality by reducing cover and food resources for prey species. Potential effects to herbaceous cover under alternative 2 would be managed through adaptive management strategies identified in Table 5 whose consequences are described in the Rangeland Resources effects analysis. Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Additionally, potential effects from livestock grazing to suitable bat foraging habitat in wetland areas at Fry and Roger's Lakes would be minimized through monitoring and potential fence construction to maintain at least 80 percent of the potential emergent vegetation cover from May 1st to June 15th. Congregation of livestock in these areas and near other water sources would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on this information, potential direct and indirect impacts from livestock grazing on western red bats, spotted bats, Allen's lappet-browed bats, pale Townsend's big-eared bats and their habitats would be expected to be minimal.

Spotted bats, Allen's lappet-browed bats and pale Townsend's big-eared bats roost in abandoned mines, cracks and crevices on cliff faces that would be inaccessible to livestock grazing and less susceptible to noise disturbance from grazing – associated activities than foliage roosting bats species. For those bats that roost on the cliffs along the Mooney Trail, potential effects from noise from herding could occur, but would be minimal as the trail is only used two days out of the year (once in spring and once in fall).

Maintenance of existing structural improvements and construction of new improvements including fences and exclosures could have short duration effects on bats and their habitats.

Disturbance created by the presence of humans and the noise of construction activities could potentially cause bats to prematurely exit day roosts. Potential impacts of noise disturbance would be minimal as construction and maintenance activities would occur at localized areas across the allotment and would be short in duration (several hours to several days). Construction of the fence at Roger's and Fry Lakes, and the enclosure at Lockwood Springs would minimize potential effects of livestock grazing on water quality and increase insect prey availability at these sites. Additionally availability of water at earthen stock ponds and drinker/pipeline systems would be maintained and risk of drowning would be reduced as maintenance of these water sources and wildlife escape ramps in drinkers would be maintained. Based on this information, potential direct and indirect impacts from new or existing structural improvements on bats and suitable bat habitat would be expected to be minimal for western red bats and Allen's lappet-browed bats due to short term noise disturbance. For spotted bat and pale Townsend's big-eared bats, the management of water sources and structural improvements would be beneficial to these species.

Vegetation treatments would improve conditions on up to 3,179 acres of grassland with impaired and unsatisfactory soils conditions that have resulted due to encroachment of juniper and other woody species. As described in the Range section, reducing the overstory canopy of juniper trees would increase upland vegetation density and diversity within the treatment areas. These changes could improve potential foraging habitat for bats in these areas by creating more open habitats and increasing insect diversity and availability.

Alternative 3: Modified Proposed Action with South Gyberg

The effects of alternative 3 on spotted bats and their habitats would be expected to be slightly greater than the effects of alternative 2. Under alternative 3, livestock would have access to Rattlesnake Spring, which could result in impacts to the quality of water and the availability of prey if livestock were allowed to congregate in the area. These potential impacts would be limited as grazing would only occur in South Gyberg Pasture every other year between October 1st and January 31st. Construction of a drinker/pipeline system in the uplands and placement of salt or mineral blocks outside of the riparian area would further reduce potential impacts to the spring by moving cattle out of the area. This new water source would also increase the availability of water for drinking and potentially increase habitat for prey of these bats.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to Forest Service sensitive bats from human noise disturbance or habitat alternation under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the risk of bats drowning in drinkers and therefore there are no cumulative effects based on water availability.

Alternative 2: Modified Proposed Action

Cumulative effects to sensitive bats and their habitats would result from disturbance of roosting bats and changes in vegetative cover and soil conditions that affect water availability for drinking and foraging and water quality for prey at or near earthen stock ponds, springs, wetlands, creeks, and other watercourses. Sources of noise disturbance at roost locations along the Mogollon Rim in cliffs, crevices, and abandoned mines include rock climbers, cavers, and hikers. Likewise, man-made structures are a point of interest for visitors and may have regular or occasional human

disturbance. Past, present, and reasonably foreseeable future projects¹⁶ would be expected to result in localized decreases in the quality and quantity of foraging habitat on the allotment.

Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney and treatment of invasive plant species occurs. Alternatives 2 would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger’s and Fry Lakes and Lockwood Springs; or increases in suspended sediments in perennial streams adjacent to the allotment.

Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to sensitive bats and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

The cumulative effects for alternative 3 would be similar to alternative 2 except that an additional spring would be used as a livestock water source and therefore effects to the quality of water and the availability of prey would be slightly greater under alternative 3.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on Forest Service sensitive bats.

Under alternative 2, livestock grazing and associated activities could have both positive and negative effects on Forest Service sensitive bats. Potential negative effects on prey availability and from noise disturbance would be minimized timing of grazing and other management strategies. Protection of wetland habitats could have long-term beneficial effects for these species by improving habitat for prey. As a result, alternative 2 may impact individual Forest Service sensitive bats but are not likely to result in a trend toward Federal listing or loss of viability of these species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual Forest Service sensitive bats but is not likely to result in a trend toward Federal listing or loss of viability of these species.

¹⁶ Activities that could cumulatively affect sensitive bats and their habitats include wild ungulate grazing, motorized and non-motorized dispersed recreation (especially in and around caves), forest restoration projects, management activities on Coconino County lands at Roger’s Lake, fuels reduction projects, wildfire, fuelwood harvest, spread of invasive plant species, travel management rule (TMR) implementation, and climate change.

Western Yellow-billed Cuckoo

A description of occupied and potential habitat for yellow-billed cuckoo as well as direct, indirect, and cumulative effects for all alternatives can be found under Threatened and Endangered Species.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on western yellow-billed cuckoo.

Under alternative 2, grazing and associated activities could have negative impacts on western yellow-billed cuckoo through noise disturbance and reductions in quality of prey habitats. Any potential effects would be minimized through grazing management strategies and the distance of the allotment to occupied nesting sites. There would be no difference between the impacts of alternatives 2 & 3. As a result, alternative 2 may impact individual yellow-billed cuckoos but is not likely to result in a trend toward Federal listing or loss of viability of the species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual yellow-billed cuckoos but is not likely to result in a trend toward Federal listing or loss of viability of the species.

Bald Eagle

Affected Environment

No nesting bald eagles are known to occur on the Windmill West Allotment due to a lack of suitable nesting habitat. There are two known nest location along the Verde River in areas adjacent to the allotment.

No winter roost locations have been documented on the Windmill West Allotment, although individual birds have been observed on the allotment during the winter. Suitable roosting habitat occurs in stands for mixed conifer, ponderosa pine, and pine/oak forests. A modeling effort completed in 2012 by Forest biologists identified potential eagle roosting habitat on the northeast slope of Dutton Hill in Metz & Roger's Lake Pastures.

Suitable foraging habitat for eagles exists on and immediately adjacent to the allotment during the breeding season at earthen stock ponds, wetlands such as Roger's Lake, and streams and creeks including the Verde River, Spring Creek, Oak Creek, and West Fork of Oak Creek. In winter, when water sources are frozen, suitable foraging habitat can be found along major roads such as Arizona State Route 89A, where road kill can be found.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in bald eagle nesting, wintering or foraging habitat. No effects to roosting or foraging eagles would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in wetlands, creeks, and springs would be maintained. Decreases in availability of water at earthen stock ponds and

drinker/pipeline systems would occur over time as no maintenance of these water sources would occur under this alternative reducing habitat for prey species.

Alternative 2: Modified Proposed Action

Under alternative 2, livestock on the Windmill West Allotment lack access to occupied or suitable bald eagle habitat on the Verde River and its tributaries but would have access to suitable wintering roosting and foraging habitat. Therefore, the presence of humans and noise associated with livestock management activities under both alternatives could potentially impact roosting eagles during the winter, but would not impact eagles during the breeding season. The Arizona Conservation Assessment and Strategy guidelines restrict human activity within 500 feet of a roost between October 15th and April 15th (Driscoll et al. 2006). Potential noise from livestock grazing and associated activities such as gathering and moving of cattle would occur only in localized areas for a short duration of time (daylight hours over one to several days) and would not occur in extreme weather such as heavy snow or rain. Since roosts are typically occupied between dusk and dawn and in inclement weather, potential direct impacts of noise disturbance to roosting eagles under alternatives 2 and 3 would be expected to be minimal.

Under alternatives 2 and 3, water quality of streams, springs, wetlands, and earthen stock ponds could potentially be impacted by grazing and result in effects to macroinvertebrates and ultimately fish and avian prey species such as waterfowl. Effects to water quality and macroinvertebrates and thus prey species would be similar to those described for sensitive bats. Potential effects from livestock grazing to suitable bald eagle foraging habitat in wetland areas at Fry and Roger's Lakes would be minimized through monitoring and potential fence construction to maintain emergent vegetation cover from May 1st to June 15th. Congregation of livestock in these areas and near other water sources would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on this information, potential direct and indirect impacts from livestock grazing on bald eagles and their habitats would be expected to be minimal.

Maintenance of existing structural improvements and construction of new improvements including fences and exclosures as well as juniper treatments could have short duration effects on bald eagles and their habitats. Disturbance created by the presence of humans and the noise of project activities could potentially cause eagles to prematurely exit winter roosts. These potential impacts from noise would be expected to be minimal as construction and maintenance activities would occur at localized areas across the allotment and would be short in duration (several hours to several days) during daylight hours and would not occur during inclement weather such as heavy rain or snow when eagles would likely still be roosting. Construction of the fence at Roger's and Fry Lakes and the exclosure at Lockwood Springs would minimize effects of livestock grazing on water quality and potentially increase prey availability at these sites. Additionally availability of water at earthen stock ponds and drinker/pipeline systems would be retained to support eagle prey as maintenance of these water sources would occur. Based on this information, potential direct and indirect impacts from new or existing structural improvements and vegetation treatments on bald eagle and suitable eagle foraging habitat would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

The effects of alternative 3 on bald eagles and their habitats would be expected to be slightly greater than the effects of alternative 2. Under alternative 3, livestock would have access to Rattlesnake Spring, which could result in impacts to water quality and as a result eagle prey if livestock were allowed to congregate in the area. These potential impacts would be limited as grazing would only occur in South Gyberg Pasture every other year between October 1st and January 31st. Construction of a drinker/pipeline system in the uplands and placement of salt or mineral blocks outside of the riparian area would further reduce potential impacts to the spring by moving cattle out of the area.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to bald eagles from human noise disturbance or habitat alternation under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the availability of prey and therefore there are no cumulative effects based on water availability.

Alternative 2: Modified Proposed Action

Cumulative effects to bald eagle and its habitats would result from disturbance of roosting eagles and changes in vegetative cover and soil conditions that affect water availability for foraging and water quality for prey at or near earthen stock ponds, springs, wetlands, creeks, and other watercourses. Most past, present, and reasonably foreseeable future activities would be expected to result in localized decreases in the quality and quantity of eagle foraging habitat on the allotment. Conversely, improvement in eagle foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney. Cumulative effects of alternatives 2 would not result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger’s and Fry Lakes and Lockwood Springs; or increases in suspended sediments in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to bald eagles and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

The cumulative effects for alternative 3 would be similar to alternative 2 except that an additional spring would be used as a livestock water source and therefore effects to the quality of water and the availability of prey would be slightly greater under alternative 3.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on nesting or wintering bald eagles.

Under alternative 2, livestock grazing and associated activities could have both positive and negative effects on bald eagles. Potential negative effects from noise disturbance and on prey availability would be minimized timing of construction activities and grazing management strategies. Protection of wetland habitats could have long-term beneficial effects for this species

by improving habitat for prey. As a result, alternative 2 may impact individual bald eagles but are not likely to result in a trend toward Federal listing or loss of viability of the species.

While potential negative impacts on roosting and foraging bald eagles through noise disturbance and decreased prey availability from construction of the drinker and pipeline under alternative 3 would be slightly greater than for alternative 2, these effects would be short-term and localized. As a result, alternative 3 may impact individual bald eagles but are not likely to result in a trend toward Federal listing or loss of viability of the species.

Northern Goshawk

Affected Environment

There are all or portions of five northern goshawk post-fledging family areas (PFAs) or approximately 2,396 acres, on the summer range of the Windmill West Allotment. Suitable foraging habitat for goshawks can be found across the summer range in openings under the canopy of ponderosa pine forests and areas adjacent pine habitats including grasslands, meadows, wetlands, springs, and earthen stock ponds. This includes areas both inside and outside of the PFAs.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

No livestock grazing or associated activities would occur on the Windmill West Allotment if this alternative was implemented, so no direct or indirect effects would be expected to occur to northern goshawks. Water quality and availability in springs and wetlands for prey species would be maintained. Decreases in availability of water at earthen stock ponds and drinker/pipeline systems for prey would occur over time as no maintenance of these water sources would occur under this alternative.

Alternative 2: Modified Proposed Action

Under alternative 2, livestock grazing would occur in northern goshawk PFAs during the breeding season (March 1st – August 31st). Since the presence of humans and noise associated with livestock management activities could potentially result in temporary or permanent nest abandonment, the use of mechanized equipment such as chainsaws and ATV/UTVs; spring branding and fall gathering; new construction of fences, corrals, or buildings; or cleaning or construction of earthen stock ponds would not be permitted inside of PFAs during the breeding season (March 1st – August 31st). Grazing-related activities in PFAs during this sensitive period would be limited to routine herding and fence maintenance. This information along with the locations where mechanized equipment cannot be used during the breeding season would be provided to the permittee.

Potential effects from concentrations of livestock in areas suitable goshawk foraging habitat including wet meadows, grasslands and other open habitats could result in trampling of vegetation and compaction of soil, reducing foraging habitat quality by reducing cover and food resources for prey. The effects and mitigations would be similar to those described for bald eagle. Additionally, proposed juniper thinning would have no effect on northern goshawks as this activity is limited to areas below the Mogollon Rim, which is outside of the species' range. Based

on this information, potential direct and indirect impacts from livestock grazing on northern goshawks and suitable foraging habitats would be expected to be minimal.

Maintenance of existing structural improvements and construction of new improvements including fences and enclosures could also have effects on vegetative cover and soil conditions similar to those described for bald eagle. Based on this information, potential direct and indirect impacts from new or existing structural improvements on suitable goshawk foraging habitat would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

No difference in effects would be expected between alternatives 2 and 3 as South Gyberg Pasture is located below the Mogollon Rim and therefore lacks suitable nesting, roosting, or foraging habitat for northern goshawk.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to northern goshawk from human noise disturbance or habitat alteration under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the availability of prey and therefore there are no cumulative effects based on water availability.

Alternative 2: Modified Proposed Action

Cumulative effects to northern goshawk and its habitats would result from disturbance of nesting goshawks and changes in vegetative cover and soil conditions that affect water availability for foraging and water quality for prey at or near earthen stock ponds, springs, wetlands, creeks, and other watercourses. Most past, present, and reasonably foreseeable future activities would be expected to result in localized decreases in the quality and quantity of eagle foraging habitat on the allotment. Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney. Cumulative effects of alternatives 2 would not result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger's and Fry Lakes and Lockwood Springs; or increases in suspended sediments in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to northern goshawks and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

No difference in effects would be expected between alternatives 2 and 3 as South Gyberg Pasture is located below the Mogollon Rim and therefore lacks suitable nesting, roosting, or foraging habitat for northern goshawk.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on northern goshawks.

Under Alternatives 2, livestock grazing and associated activities could have both positive and negative effects on northern goshawks. Potential negative effects from noise disturbance and on prey availability would be minimized timing of construction activities and grazing management strategies. Protection of wetland habitats could have long-term beneficial effects for this species by improving habitat for prey. As a result, alternative 2 may impact individual northern goshawks but are not likely to result in a trend toward Federal listing or loss of viability of the species.

There would be no difference between the impacts of alternatives 2 and 3. As a result, alternative 3 may impact individual northern goshawks but are not likely to result in a trend toward Federal listing or loss of viability of the species.

American Peregrine

Affected Environment

There are no documented nesting occurrences of peregrine falcons on the Windmill West Allotment, but there are several known eyries immediately adjacent to the allotment in Loy and Boynton canyons. Suitable nesting habitat for peregrine falcons occurs throughout the Red Rock – Secret Mountain Wilderness. Suitable foraging habitat exists in wetlands, meadows, and earthen stock ponds across the entire allotment.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in these species habitat. No effects from human disturbance and associated noise from livestock management activities would occur. Additionally, water quality and availability for foraging in creek, streams, and wetlands would be maintained. Decreases in availability of water at earthen stock ponds would occur over time as no maintenance of these water sources would occur under this alternative reducing prey habitat for the species.

Alternative 2: Modified Proposed Action

Peregrine falcons nest and roost on cliff faces that would be inaccessible to livestock grazing and would be less susceptible to noise disturbance from associated activities avian species that nest on the ground or in shrub and trees. For any peregrines that might nest on the cliffs along the Mooney Trail, potential effects from noise from herding could occur, but would be minimal as the trail is only used one day during the breeding season in spring and once in fall.

Effects of maintenance of existing structural improvements, construction of fencing for wetlands and springs and concentrations of livestock in areas such as wet meadows, wetlands and earthen stock ponds would be similar to those described for bald eagles and northern goshawk. Juniper thinning would be done by hand, so no impacts would be expected to soils that could affect water quality of stock tanks in treatment areas that could provide suitable habitat for prey for this species. Based on this information, potential direct and indirect impacts from livestock grazing on peregrine falcons and suitable foraging habitats would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

The effects of alternative 3 on peregrines and their habitats would be expected to be slightly greater than the effects of alternative 2. Under alternative 3, livestock would have access to

Rattlesnake Spring, which could result in impacts to water quality and as a result peregrine prey if livestock were allowed to congregate in the area. These potential impacts would be limited as grazing would only occur in South Gyberg Pasture every other year between October 1st and January 31st. Construction of a drinker/pipeline system in the uplands and placement of salt or mineral blocks outside of the riparian area would further reduce potential impacts to the spring by moving cattle out of the area.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to bald eagles from human noise disturbance or habitat alternation under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the availability of prey and therefore there are no cumulative effects based on water availability.

Alternative 2: Modified Proposed Action

Cumulative effects to American peregrine and its habitats would result from disturbance of nesting peregrine and changes in vegetative cover and soil conditions that affect water availability for foraging and water quality for prey at or near earthen stock ponds, springs, wetlands, creeks, and other watercourses. Most past, present, and reasonably foreseeable future activities would be expected to result in localized decreases in the quality and quantity of eagle foraging habitat on the allotment. Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney. Cumulative effects of alternatives 2 would not result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger’s and Fry Lakes and Lockwood Springs; or increases in suspended sediments in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to American peregrine and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

The cumulative effects for alternative 3 would be similar to alternative 2 except that an additional spring would be used as a livestock water source and therefore effects to the quality of water and the availability of prey would be slightly greater under alternative 3.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on American peregrine falcons.

Under alternative 2, livestock grazing and associated activities could have both positive and negative effects on American peregrine falcons. Potential negative effects from noise disturbance and on prey availability would be minimized timing of construction activities and grazing management strategies. Protection of wetland habitats could have long-term beneficial effects for this species by improving habitat for prey. As a result, alternative 2 may impact individual American peregrine falcons but are not likely to result in a trend toward Federal listing or loss of viability of the species.

While potential negative impacts on American peregrine falcons through decreased prey availability from construction of the drinker and pipeline under alternative 3 would be slightly greater than for alternative 2, these effects would be short-term and localized. As a result, alternative 3 may impact individual American peregrine falcons but are not likely to result in a trend toward Federal listing or loss of viability of the species.

Burrowing Owl

Affected Environment

There are no documented occurrences of burrowing owl on the Windmill West Allotment, but suitable foraging and burrow habitat does exist in semi-desert grasslands and sparsely vegetated desert communities on the winter range and in montane grasslands on the summer range. These owls take over burrows of prairie dogs ground squirrels, and other rodents and dens of coyote, fox and badger. There are no documented prairie dog colonies on the allotment, but dens created by foxes and coyotes and abandoned pocket gopher tunnels provide suitable burrows for the species during the breeding season, migration and winter.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in these species habitat. As a result, no direct or indirect effects of livestock grazing would occur to burrowing owls and their habitats. No vegetation treatments would occur on pinyon-juniper grasslands with excessive overstory with impaired and unsatisfactory soils under this alternative. As a result no improvement would be expected in the extent of potential habitat for species that create burrows and dens that can be later occupied by owls. Therefore, there would be no potential increase in suitable grassland habitat for burrowing owls.

Alternative 2: Modified Proposed Action

Under alternative 2, potential effects of grazing in grasslands on the summer and winter range could result in trampling of individuals and vegetation, compaction of soil, and collapsing of burrows. Grazing by livestock could also result in a potential increase in competition for herbaceous forage, loss of cover, and risk of predation for prey of burrowing owl. Maintaining sufficient herbaceous cover is key to maintaining soil conditions and burrow availability. Conservative to moderate grazing intensity would reduce the canopy height of herbaceous vegetation, increasing visibility for burrowing owl and reducing risk of predation. Based on this information, potential direct and indirect impacts from livestock grazing on burrowing owls and suitable burrow and foraging habitat would be expected to be minimal.

Maintenance of existing structural improvements and construction of new improvements including fences and exclosures would have short duration effects on this species and their habitats. Disturbance created by the presence of humans and the noise of construction activities could lead to temporary avoidance of owl burrows and foraging areas where construction and/or maintenance activities occur. Reductions in vegetative cover in the immediate area of improvements could affect hiding cover and food resources for prey but would be anticipated with recovery would be expected to occur in one to two years with favorable climate conditions. These potential effects would occur at localized areas across suitable owl habitat in any given year and would be of short duration. Based on this information, potential direct and indirect

impacts from new or existing structural improvements on owls and suitable owl habitat would be expected to be minimal.

Vegetation treatments would improve conditions on up to 3,179 acres of grassland with impaired and unsatisfactory soils due to encroachment of juniper and other woody species. Removal of woody species and lopping and scattering of slash would result in an immediate increase in vegetative ground cover, thus an increase in upland vegetation density and diversity. The decrease in canopy cover of juniper and other woody species and increase in herbaceous vegetative cover would result in an increase in potential burrowing owl habitat on the allotment. These changes could improve potential foraging habitat for burrowing owl through an increase in hiding cover and food resources for its prey.

Alternative 3: Modified Proposed Action with South Gyberg

The effects of alternative 3 on burrowing owls and their habitats would be expected to be slightly greater than the effects of alternative 2. Under alternative 3, a drinker/pipeline system would need to be installed to provide water for livestock and to minimize impacts to Rattlesnake Spring and its associated riparian vegetation. This drinker/pipeline system would affect approximately 9 acres of desert scrub and desert grassland habitat. Temporary noise disturbance and reduction in vegetative cover would occur in the immediate area but avoidance of burrows would only last as long as the construction activities and herbaceous cover would be expected to recover in one to two years with favorable climate conditions.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to burrowing owl from human noise disturbance or habitat alteration under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the availability of potential burrows or prey and therefore there are no cumulative effects based on water availability.

Alternative 2: Modified Proposed Action

Cumulative effects to burrowing owls and their habitats would result from noise disturbing activities that affect owls and their prey as well as changes in vegetative cover and soil conditions in montane grasslands on the summer range and semi-desert grasslands and sparse desert scrub on the winter range. Most past, present, and reasonably foreseeable future activities would be expected to result in localized decreases in the quality and quantity of burrowing owl foraging habitat on the allotment. Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney. Cumulative effects of alternatives 2 would not result in long-term losses in soil productivity; decreases in diversity, density, production, or quality of herbaceous vegetation or. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to burrowing owl and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

The cumulative effects for alternative 3 would be similar to alternative 2 except that an additional spring would be used as a livestock water source and therefore effects to the quality of water, potential for trampling of burrows by livestock and the availability of prey would be slightly greater under alternative 3.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would have no impact on burrowing owls.

Under alternative 2, livestock grazing and associated activities could have both positive and negative effects on burrowing owls. Potential negative effects on forage and cover for owls and their prey would be minimized through timing of grazing and other management strategies. Juniper thinning could have long-term beneficial effects for this species by improving habitat for owls and prey. As a result, alternative 2 may impact individual burrowing owls but are not likely to result in a trend toward Federal listing or loss of viability of the species.

While potential negative impacts on burrowing owls through noise disturbance and decreased prey availability from construction of the drinker and pipeline under alternative 3 would be slightly greater than for alternative 2, these effects would be short-term and localized. As a result, alternative 3 may impact individual burrowing owls but is not likely to result in a trend toward Federal listing or loss of viability of the species.

Leopard Frogs

Affected Environment

There are two Forest Service sensitive amphibian species that have suitable habitat within the Windmill West Allotment: lowland and northern leopard frogs.

There are currently no known occurrences of northern leopard frogs on the Windmill West Allotment. Suitable habitat exists at Rogers Lake and earthen stock ponds in neighboring pastures on the summer range. Efforts to establish populations of northern leopard frogs on State and Coconino County lands adjacent to the allotment are under discussion with AGFD and USFWS.

Historically, lowland leopard frogs were found in the Verde River, Sycamore Canyon, and their tributaries, but have not been detected for decades likely due to the presence of predatory non-native aquatic species such as bullfrogs, fish, and crayfish. Suitable habitat for this species exists in earthen stock ponds in the pastures on the winter range as well as portions of Spring & Oak creeks immediately adjacent to the allotment. There are currently no efforts underway by AGFD or other organization to increase the number of occupied sites through translocations and/or captive breeding as there are for other leopard frog species in Arizona.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in lowland leopard frog habitat. No effects from human disturbance and associated noise from livestock management activities would occur. Additionally, vegetative cover and water quality in riparian habitats would be maintained or potentially improved. Decreases in

availability of frog habitat and quality of water and therefore decreases in prey availability at earthen stock ponds would occur over time as no maintenance of these water sources would occur under this alternative.

Alternative 2: Modified Proposed Action

Under alternative 2, water quality of wetlands, streams, springs, and earthen stock ponds could potentially be impacted by grazing through changes in vegetative cover and soil conditions. Changes in water quality could result in effects to northern and lowland leopard frogs and prey species including macroinvertebrates and aerial insect prey. Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregation of livestock near suitable frog habitats including springs, wetlands, creeks, and earthen stock ponds would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on this information, potential direct and indirect impacts from livestock grazing on leopard frogs and their habitats would be expected to be minimal.

Maintenance of existing structural improvements such as fences and earthen stock ponds would have short duration effects on leopard frogs and their habitats. Short-term effects would occur from noise disturbance as well as reductions in vegetative cover in the immediate area of the improvements. Potential impacts of noise disturbance on foraging and basking frogs would be minimal as construction and maintenance activities would occur at localized areas and would be short in duration (several hours to several days). Additionally vegetation would recover in one to two years with favorable climate conditions. Routine cleaning of earthen stock ponds would help maintain suitable aquatic habitat for leopard frogs. Design features would require notification of the District at least a notice 60 days prior to conducting work in earthen stock ponds to allow for surveys to be completed if needed, and/or mitigation to be implemented to reduce potential effects to these species. Proposed improvements at Roger's and Fry Lakes, and Lockwood Springs would improve habitat for northern leopard frogs across the allotment have and have no effects on lowland leopard frogs as these sites are outside of the range of the species. Based on this information, potential direct and indirect impacts from new or existing structural improvements on northern and lowland leopard frogs and suitable frog habitat would be expected to be minimal.

Proposed juniper thinning would have no effect on either leopard frog species. This activity would occur in areas below the Mogollon Rim, which is outside of the range of the northern leopard frog. Thinning would be done by hand, so no impacts would be expected to soils that could affect water quality of stock tanks near treatments that could provide suitable habitat for lowland leopard frogs.

In order to minimize the risk of introducing and spreading disease among aquatic systems, approved protocols would be followed during maintenance activities at earthen stock ponds on the allotment. This protocol limits the introduction and spread of non-native species and disease between aquatic systems and adversely affecting leopard frogs and their prey. It would be attached to the annual operating instructions for the allotment.

Alternative 3: Modified Proposed Action with South Gyberg

No difference in effects would be expected between alternatives 2 and 3 as the only water source in South Gyberg Pasture, Rattlesnake Springs, does not contain sufficient water to support lowland leopard frogs and is outside of the range of northern leopard frog.

Environmental Consequences - Cumulative Effects

Alternative 1: No Action

There are no direct or indirect effects to northern and lowland leopard frog from human noise disturbance or habitat alternation under these alternatives, and therefore no cumulative effects to these measures. Past, present and reasonably foreseeable activities would not influence water availability or the availability of prey and therefore there are no cumulative effects based on water or prey availability.

Alternative 2: Modified Proposed Action

Cumulative effects to northern and lowland leopard frogs and their habitats would result from disturbance of basking and foraging frogs and changes in vegetative cover and soil conditions that affect water availability and quality for frogs and their prey at earthen stock ponds, springs, and creeks. Additionally activities that introduce or assist in the spread of non-native aquatic species such bullfrogs, crayfish, and warm-water fish diseases such as chytrid would contribute to cumulative effects. Most past, present, and reasonably foreseeable future activities could result in noise disturbance for frogs, changes in vegetative and soil conditions and movement of non-native species and diseases under the right conditions. Conversely, improvement in foraging habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI and Turkey – Barney. Northern leopard frogs could be cumulatively affected by management activities on Coconino County lands at Roger’s Lake and potential introductions of northern leopard frogs on non-federal lands adjacent to the allotment. Cumulative effects of alternatives 2 would not result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger’s and Fry Lakes and Lockwood Springs; or increases in suspended sediments in perennial streams adjacent to the allotment. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative impacts to leopard frogs and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Effects to northern and lowland leopard frogs for alternative 3 are the same as those for alternative 2 because South Gyberg lacks suitable habitat for either species.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on northern and lowland leopard frogs.

Under alternative 2, grazing and associated activities could have both positive and negative impacts on northern and lowland leopard frogs through noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. Protection of wetland habitats could have long-term beneficial effects for these species by improving habitat for frogs and prey. As a result, alternative 2 may impact individual northern and lowland leopard frogs but is not likely to result in a trend toward Federal listing or loss of viability of these species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual northern and lowland leopard frogs but is not likely to result in a trend toward Federal listing or loss of viability of these species.

Northern Mexican Gartersnake

A description of occupied and potential habitat for northern Mexican gartersnake as well as direct, indirect, and cumulative effects for all alternatives can be found under Threatened and Endangered Species.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on northern Mexican gartersnakes.

Under alternative 2, grazing and associated activities could have negative impacts on northern Mexican gartersnakes through noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, alternative 2 may impact individual northern Mexican gartersnakes but is not likely to result in a trend toward Federal listing or loss of viability of these species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual northern Mexican gartersnakes but is not likely to result in a trend toward Federal listing or loss of viability of these species.

Narrow-headed Gartersnake

A description of occupied and potential habitat for narrow-headed gartersnake as well as direct, indirect, and cumulative effects for all alternatives can be found under Threatened and Endangered Species.

Findings

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on narrow-headed gartersnakes.

Under alternative 2, grazing and associated activities could have negative impacts on narrow-headed gartersnakes through noise disturbance, reductions in quality of prey habitats, and spread of non-native species and disease. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, alternative 2 may impact individual narrow-headed gartersnakes but is not likely to result in a trend toward Federal listing or loss of viability of these species.

There would be no difference between the impacts of alternative 2 and 3. As a result, alternative 3 may impact individual narrow-headed gartersnakes but is not likely to result in a trend toward Federal listing or loss of viability of these species.

Bald and Golden Eagle Protection Act Compliance

Affected Environment

A description of occupied and potential habitat for bald eagles can be found under Sensitive Species.

Golden eagles have been observed on the allotment in both the canyons associated with the Red Rock Secret-Mountain Wilderness and the grasslands and desert communities below the Mogollon Rim.

A historic golden eagle nest is known from a ponderosa pine at the northwest edge of Bear Sign Canyon in West Barney Pasture. Eagles also have the potential to nest along the canyon walls between the winter and summer range and in trees above the Mogollon Rim. Suitable foraging habitat exists in open vegetation types such as grasslands, pinyon-juniper woodlands, and desert communities, largely in pastures on the winter range.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Effects for golden and bald eagles under alternative 1 are described in the Bald Eagle section of Sensitive Species.

Alternative 2: Modified Proposed Action

Effects for bald eagles under alternative 2 are described in the Bald Eagle section of Sensitive Species.

Effects for golden eagles under alternative 2 are similar to bald eagles. In addition, golden eagles nest and roost on cliff faces and in large trees that would be inaccessible to livestock grazing and would be less susceptible to noise disturbance from associated activities avian species that nest on the ground or in lower shrub and trees. For any eagles that might nest on the cliffs along the Mooney Trail, potential effects from noise from herding could occur, but would be minimal as the trail is only used one day during the breeding season in spring and once in fall. Proposed vegetation treatments would potentially result in short-term negative effects from noise disturbance during implementation but would result in long-term beneficial effects by improving habitat conditions for prey species and foraging eagles. Based on this information, potential direct and indirect impacts from new and existing structural improvements and vegetation treatments on golden eagles and suitable foraging habitat would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

Effects for golden and bald eagles under alternative 3 are described in the Bald Eagle section of Sensitive Species.

Environmental Consequences - Cumulative Effects

Cumulative effects for bald eagles are described in the Bald Eagle section of Sensitive Species.

Cumulative effects for golden eagles are similar to those described in the Bald Eagle section of Sensitive Species.

Findings

No livestock grazing or related activities would occur under alternative 1, so the proposed project would not result in take of bald or golden eagles as defined under the Bald and Golden Eagle Protection Act.

Under alternative 2, livestock grazing and associated activities could have negative effects on nesting, roosting, and foraging bald and golden eagles. Potential negative effects would be minimized by timing of herding and construction activities. As a result, alternatives 2 would not result in take of bald or golden eagles as defined under the Bald and Golden Eagle Protection Act.

While potential negative impacts on roosting and foraging bald and golden eagles through noise disturbance from construction of the drinker and pipeline under alternative 3 would be slightly greater than for alternative 2, these effects would be short-term and localized. As a result, alternative 3 would not result in take of bald or golden eagles as defined under the Bald and Golden Eagle Protection Act.

Management Indicator Species

A Forest-wide assessment entitled "Management Indicator Species Status Report for the Coconino National Forest, Version 2" (Forest MIS report) summarizes current knowledge of population and habitat trends for species identified as management indicator species (MIS) for the Coconino National Forest (USDA Forest Service 2013a).

Affected Environment

Table 15 describes MIS and the habitat components for which they are indicators. MIS for this project are evaluated based on management area (MA) types located within the project area. Only those MIS that represent habitats and/or features which livestock grazing and associated activities may affect will be analyzed. Thirteen MIS were eliminated from further consideration because they represent habitat that is not impacted by the presence or absence of livestock grazing in the allotment. For a more detailed explanation of which MIS were eliminated and the rationale, see the Wildlife Specialist Report.

Table 15: Coconino NF Management Indicator Species relevant to the Windmill West Allotment and the Habitat Features Each Species Represents

Species	Indicator Habitat	MAs	Acres in Project Area	Forest-wide Acres ¹	Habitat Component Trend	Forest Population Trend
Pronghorn Antelope	Early and late seral grasslands	9, 10, 11, 27	Alternative 2 – 31,005 Alternative 3 – 31,264	113,112 ²	Stable to declining	Stable
Lucy's Warbler	Late seral, low elevation riparian (<7000')	12	579 ³	6,119 ³	Stable to improving	Stable

Yellow-breasted Chat	Late seral, low elevation riparian (<7000)	12	579 ³	6,119 ³	Stable to improving	Inconclusive
Cinnamon Teal	Wetlands/aquatic	12	94	9,879	Stable to improving	Inconclusive
<p>1) Acres from Potential Natural Vegetation Types unless otherwise noted</p> <p>2) Number represents forest-wide acres of the two grassland types on the allotment: semi-desert and montane subalpine.</p> <p>3) Number represents acres of the two suitable riparian habitats on the allotment: mixed broadleaf deciduous and cottonwood willow riparian forests</p>						

As a group, aquatic macroinvertebrates (macroinvertebrates) are identified in the Forest Plan as a MIS for low and high elevation late-seral riparian areas. Macroinvertebrates are organisms that lack a backbone, are visible by the naked eye, and which require a watered environment to persist and/or complete their life cycle (Voshell 2002). The current Forest population trend for macroinvertebrates is described as stable, while the Forest habitat trends for low and high elevation are stable to improving and stable, respectively (USDA Forest Service 2013a).

There are no perennial reaches of rivers or creeks within the Windmill West Allotment boundary and indirect effects to macroinvertebrates is expected to be minimal as stated throughout the Wildlife and Fish and Aquatics Species sections. As a result, the proposed project will not impact the Forest-wide population trends for macroinvertebrates or habitat trends for low or high elevation riparian. No further discussion of MIS will occur in this report.

Environmental Consequences - Direct and Indirect Effects

There would be no effects on habitat quantity for MIS from any of the 3 alternatives as none of the proposed activities would result in the conversion of one habitat type to another. As a result, there will be no further discussion of potential effects on habitat quantity. Table 16 contains the effects to habitat quality and the related percent change of Forest-wide acres for each MIS by alternative.

Table 16: Effects to Habitat Quality for Each Management Indicator Species by Alternative

MIS Species	Forest-wide Habitat	Effects to Habitat Quality (acres / percent change)		
		Alternative 1	Alternative 2	Alternative 3
Pronghorn Antelope	113,112	0	+3,179/+0.02	+3,179/+0.02
Lucy’s Warbler	6,119	0	-40/ -<0.01	-40/ -<0.01
Yellow-breasted Chat	6,119	0	-15/ -<0.01	-15/ -<0.01
Cinnamon Teal	9,879	0	+94/ +<0.01	+94/ +<0.01

Alternative 1: No Action

No livestock grazing or associated activities would occur on the Windmill West Allotment if this alternative was implemented, so no direct or indirect effects would be expected to occur to management indicator species. Existing range improvements such as fences, earthen stock ponds, and pipeline/drinker would not be maintained nor would proposed improvements be constructed under this alternative.

Pronghorn Antelope

This would result in an increased risk of entanglement or impalement for pronghorn over time as the conditions of fences degrade. Additionally, decreases in availability of water at earthen stock ponds and drinker/pipeline systems would occur over time due to a lack of maintenance. No vegetation treatments would occur under this alternative, so no change in the quality or quantity of pronghorn habitat would occur.

Lucy's Warbler, Yellow-breasted Chat and Cinnamon Teal

No effects to nest or foraging birds, including Lucy's warbler, yellow-breasted chat and cinnamon teal, would occur from human disturbance and associated noise from livestock management activities. Additionally, water quality and prey habitats in creeks and springs would be maintained.

Livestock grazing would not occur at in the pastures that contain Roger's and Fry Lakes between May 1st and June 15th to meet LMP standards of maintaining at least 80 percent of emergent vegetation in wetlands during the cinnamon teal breeding season. As a result, no change in habitat quality or quantity would be expected to occur under this alternative.

Alternative 2: Modified Proposed Action

Pronghorn Antelope

Under alternatives 2 and 3, potential effects from livestock grazing in semi-desert and montane subalpine grasslands include trampling of vegetation and compaction of soils. Herbaceous vegetative cover, and therefore pronghorn food resources, could be impacted by livestock grazing, but only during those times when the availability of forbs and shrubs are reduced and pronghorn are relying more heavily on grasses. Potential effects to herbaceous cover under alternative 2 would be managed through adaptive management strategies identified in Table 5 whose consequences are described in the Rangeland Resources effects analysis. Maintaining herbaceous cover is key to maintaining soil conditions. Based on this information, potential direct and indirect impacts from livestock grazing on pronghorn and grassland habitats would be expected to be minimal.

Maintenance of existing structural improvements such as fences and drinker/pipelines on the winter range would have short duration effects on this species and its foraging habitats. Disturbance created by the presence of humans and the noise of construction activities could lead to temporary avoidance of areas where construction and/or maintenance activities occur in suitable pronghorn habitats. Reductions in vegetative cover in the immediate area of improvements would be anticipated with recovery expected to occur in one to two years with favorable climate conditions. These potential effects would occur at localized areas across grasslands on the summer and winter range in any given year and would be of short duration. Fences would be maintained reducing the risk of pronghorn becoming entangled or impaled on

fences. Additionally, fences would be reconstructed over time to meet wildlife specifications, reducing the number of barriers that exist on pronghorn movements on the landscape. Availability of water at earthen stock ponds and drinkers/pipeline systems would be maintained under these alternatives. Construction of new fences at Roger's and Fry Lakes would be expected to have similar effects to those described for maintenance of improvements. The proposed enclosure to be constructed at Lockwood Springs would have no effect on this species as it would be built outside of suitable pronghorn habitat. Based on this information, potential direct and indirect impacts from new or existing structural improvements on pronghorn and grassland habitats would be expected to be minimal.

Proposed vegetation treatments would improve conditions on up to 3,179 acres of grassland habitats on the winter range. As described in the Soil and Watershed Report, removal of woody species and lopping and scattering of slash would result in an immediate increase in vegetative ground cover, thus an immediate improvement of soil condition by decreasing erosion and improving opportunities for water infiltration impaired. These treatments would result in an increase in forage for pronghorn and would also create movement corridors for the species across the pastures on the winter range. The height of the scattered slash would not impede antelope movement. Implementation of treatments could potentially result in temporary disturbance of pronghorn foraging and movement patterns, but these effects would occur in localized areas for a short duration of time. Over the long-term, these treatments could lead to benefits to pronghorn through an increase in the quality of grassland habitat on the winter range of the allotment (0.02 percent of Forest-wide acres of grasslands).

Lucy's Warbler

Under alternatives 2 and 3, livestock on the Windmill West Allotment lack access to suitable Lucy's warbler nesting habitat on perennial streams including the Verde River and its tributaries but do have access to potential habitat along Spring and Dry Creeks north of Arizona State Route 89A. The presence of humans and noise associated with livestock management activities would be unlikely to impact Lucy's warbler because of their preference for nesting in dense foliage of patches of riparian habitat.

Under alternatives 2 and 3, water quality of streams and springs could potentially be impacted by grazing and result in effects to macroinvertebrates and ultimately aerial insect prey. Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock near intermittent streams would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on this information, potential direct and indirect impacts from livestock grazing and associated activities on Lucy's warblers and riparian habitats on the winter range would be minimal.

Maintenance of existing structural improvements, construction of new improvements and proposed vegetation treatments would have very little effect on Lucy's warbler and its habitats. No new improvements are proposed and very few existing improvements (i.e. fences) are located in areas that support potential nesting and foraging habitat for this species. Vegetation treatments would not occur in or adjacent to potential warbler habitat. Any potential impacts from these activities would be minimal as construction and maintenance activities would occur at localized areas over a short time (several hours to several days). Based on this information, potential direct and indirect impacts from new or existing structural improvements and proposed vegetation treatments on Lucy's warbler and low elevation riparian habitats would be minimal.

As described for southwestern willow flycatcher, indirect effects of livestock grazing on this warbler would potentially occur through brood-parasitism by brown-headed cowbirds. The proximity of foraging habitat to potential Lucy's warbler habitats along the Spring and Dry Creeks would increase the risk of nest failure as a result of brown-headed cowbirds. Under alternatives 2 and 3, livestock would be departing the winter range, including Greasy East and Strip, no later than May. Moving to the summer range above the Mogollon Rim during this time would reduce the amount of cowbird foraging habitat available on the allotment during the Lucy's warbler breeding season (April - July). While the potential for brood-parasitism of warbler nests by cowbirds would not affect habitat quantity, it could result in a small decrease in habitat quality (less than 0.01 percent of Forest-wide acres of low elevation riparian).

Yellow-breasted Chat

Effects would be expected to be the same as described for Lucy's warbler. While the potential for brood-parasitism of chat nests by cowbirds would not affect habitat quantity, it could result in a small decrease in habitat quality (less than 0.01 percent of Forest-wide acres of low elevation riparian).

Cinnamon Teal

Under alternatives 2 and 3, concentrations of livestock near Roger's and Fry Lakes could result in trampling of vegetation and nests and compaction of soil. Grazing by livestock could also result in a potential loss of cover and increased risk of predation of eggs and ducklings. As described for many Forest Service sensitive species potential effects to herbaceous cover under alternative 2 would be managed through adaptive management strategies identified in Table 5 whose consequences are described in the Rangeland Resources effects analysis. Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Additionally, potential effects from livestock grazing on wetland habitats at Fry and Roger's Lakes would be minimized through monitoring and potential fence construction to maintain at least 80 percent of the potential emergent vegetation cover during the breeding season for cinnamon teal, May 1st to June 15th. Congregation of livestock in these areas would be discouraged through the placement of salt or mineral supplements in less sensitive areas such as uplands. Based on this information, potential direct and indirect impacts from livestock grazing on cinnamon teal and wetland habitats would be expected to be minimal.

Proposed juniper thinning would have no effect on cinnamon teal as this activity is limited to areas below the Mogollon Rim, where there are no wetland habitats.

Maintenance of existing structural improvements and construction of proposed new improvements could have both short-term negative and long-term beneficial effects on the quality of wetland habitats on the allotment. Disturbance created by the presence of humans and the noise of construction activities could lead to short duration avoidance by teal of areas where construction and/or maintenance activities occur. Vegetative cover could be reduced in the immediate vicinity of improvements but potential effects would be expected to occur in localized areas and be short in duration. Recovery of herbaceous cover would occur in one to two years under favorable climate conditions. The construction of 0.5 mile of fence to create the North Roger's Lake Pasture would allow for better management of livestock in both Roger's Lake and North Roger's Lake Pastures. Livestock would only graze North Roger's Lake if conservative levels of utilization (30 – 40 percent) have not been exceeded by wild ungulates. Over the long-term, these new improvements could lead to benefits to cinnamon teal through an increase in

the quality of wetland habitat on the allotment (less than 0.01 percent of Forest-wide acres of wetland/cienega).

Alternative 3: Modified Proposed Action with South Gyberg

Pronghorn Antelope

The effects of alternative 3 on pronghorn and their habitats would be expected to be slightly greater than the effects of alternative 2. Under alternative 3, a drinker/pipeline system would need to be installed to provide water for livestock and to minimize impacts to Rattlesnake Spring and its associated riparian vegetation. This drinker/pipeline system would have short duration effects on potential foraging habitat. Vegetative cover would be reduced in the immediate area but would be expected to recover in one to two years with favorable climate conditions.

Lucy's Warbler, Yellow-breasted Chat and Cinnamon Teal

There would be no difference in the effects of alternatives 2 and 3 for Lucy's warbler, yellow-breasted chat, and cinnamon teal because South Gyberg Pasture lacks suitable habitat for these species.

Environmental Consequences - Cumulative Effects

The timeframe selected for this cumulative effects analysis is 10 years in the past and the 10 year term of the grazing permit that would be issued under alternatives 2 and 3.

The geographical extent of the cumulative effects analysis for each species is semi-desert and montane subalpine grassland habitats (antelope), low elevation riparian habitats (Lucy's warbler and yellow-breasted chat) and wetlands and cienegas (cinnamon teal) on the Coconino NF.

Pronghorn Antelope, Lucy's Warbler and Yellow-breasted Chat

Since no livestock grazing or related activities would occur under alternative 1, there would be no cumulative effects from this alternative. As described in the Rangeland Resources, Soil and Watershed sections, cumulative effects would be expected to be greater for alternatives 2 and 3 than alternative 1 but would not result in long-term losses in soil productivity or decreases in diversity, density, production, and quality of herbaceous vegetation. Most of past, present and reasonably foreseeable activities would be expected to result in localized decreases in the quality and quantity of grassland habitat across the Forest.

Climate change would be a long-term cumulative effect that is expected to impact riparian habitat quality for many species and may result in a substantial decline in riparian habitat quality as drought severity and frequency increases (Perry et al. 2012). These changes would not be fully manifested over the next 10 years; however, drought conditions may limit the improvement of riparian condition in proposed fenced areas or could affect natural processes to such an extent as to result in impacts beyond the magnitude and scale of the proposed action.

Conversely, improvement in riparian habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI, Turkey – Barney, and smaller restoration projects, and treatment and control of invasive plant species on the Forest. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects

would not result in changes in Forest-wide trends for low elevation riparian habitats or Lucy's warbler and yellow-breasted chat populations.

Cinnamon Teal

Since no livestock grazing or related activities would occur under alternative 1, there would be no cumulative effects from this alternative. As described in the Rangeland Resources, Soil and Watershed sections, cumulative effects would be expected to be greater for alternatives 2 and 3 than alternative 1 but would not result in long-term losses in soil productivity or decreases in diversity, density, production, and quality of herbaceous vegetation or the condition of wetlands such as Roger's and Fry Lakes. Most of past, present and reasonably foreseeable activities would be expected to result in localized decreases in the quality and quantity of wetland habitat across the Forest. Conversely, improvement in wetland habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI, Turkey – Barney, and other small wetland restoration projects, and treatment and control of invasive plant species on the Forest. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects would not result in changes in the quantity or quality of wetland habitats Forest-wide.

Findings

Pronghorn Antelope

- Alternative 1 would result in no change in habitat quantity or quality for pronghorn antelope. This would not alter Forest-wide habitat and population trends.
- Alternatives 2 and 3 would result in a small increase (approximately 0.02 percent Forest-wide) in habitat quality but no change in habitat quantity for pronghorn antelope. This increase would be too small to alter Forest-wide habitat and population trends

Lucy's Warbler

- Alternative 1 would result in no change in habitat quantity or quality for Lucy's warbler. This would not alter Forest-wide habitat and population trends.
- Alternatives 2 and 3 would result in no change in habitat quantity but a slight decrease (less than 0.01 percent Forest-wide) in habitat quality for Lucy's warbler. This decrease would be too small to alter Forest-wide habitat and population trends.

Yellow-breasted Chat

- Alternative 1 would result in no change in habitat quantity or quality for yellow-breasted chat. This would not alter Forest-wide habitat and population trends.
- Alternatives 2 and 3 would result in no change in habitat quantity but a slight decrease (less than 0.01 percent Forest-wide) in habitat quality for yellow-breasted chat. This decrease would be too small to alter Forest-wide habitat and population trends.

Cinnamon Teal

- Alternative 1 would result in no change in habitat quantity or quality for cinnamon teal. This would not alter Forest-wide habitat and population trends.

- Alternatives 2 and 3 would result in no change in habitat quantity but a slight increase (less than 0.01 percent Forest-wide) in habitat quality for cinnamon teal. This increase would be too small to alter Forest-wide habitat and population trends.

Migratory Birds

Affected Environment

The project area contains mixed conifer, ponderosa pine, pinyon-juniper, chaparral, desert scrub, grasslands, wetlands, and low-elevation riparian habitat types. In addition to species already discussed in this document, 27 species listed as Arizona Partners in Flight Priority Bird Species or USFWS Birds of Conservation Concern have the potential to occur in the project area. These species are listed in Table 17 along with the organization the species is listed by, their habitat preferences and the number of acres of potential habitat found on the allotment. See the Wildlife Specialist's Report for more information on these species.

Table 17: Migratory Birds Species with Their Habitat Preferences and Acres of Potential Habitat that May Occur on the Windmill West Allotment

Species	USFWS Bird of Conservation Concern	Arizona Partners in Flight Priority Species	Habitat Preference ¹	Acres of Habitat in Project Area
Olive-sided Flycatcher		X	Mixed conifer, ponderosa pine	50,314
Virginia's Warbler	X		Mixed conifer, ponderosa pine, high-elevation riparian	50,314
Cordilleran Flycatcher		X	Ponderosa pine, mixed conifer	50,314
Olive Warbler	X		Ponderosa pine	48,753
Greater Pewee	X		Ponderosa pine	48,753
Grace's Warbler	X		Ponderosa pine	48,753
Lewis' Woodpecker	X		Ponderosa pine	48,753
Flammulated Owl	X		Ponderosa pine	48,753
Purple Martin		X	Ponderosa pine	48,753
Swainson's Hawk	X	X	High elevation grasslands	1,337
Grasshopper Sparrow (<i>ammolegus</i>)	X	X	High elevation grasslands and wetlands	1,431
Pinyon Jay	X	X	Pinyon-juniper	25,030
Gray Vireo	X	X	Pinyon-juniper	25,030

Species	USFWS Bird of Conservation Concern	Arizona Partners in Flight Priority Species	Habitat Preference ¹	Acres of Habitat in Project Area
Gray Flycatcher		X	Pinyon-juniper	25,030
Black-throated Gray Warbler	X	X	Pinyon-juniper	25,030
Band-tailed Pigeon		X	Drainages in pinyon-juniper, ponderosa pine	73,783
Loggerhead Shrike	X		Pinyon-juniper, chaparral, desert scrub, grasslands	89,513
Black-chinned Sparrow	X	X	Chaparral	20,432
Canyon Towhee	X		Chaparral, desert scrub, semi-desert grassland, low-elevation riparian	63,725
Costa's Hummingbird	X	X	Desert scrub	11,839
Sage Sparrow		X	Desert scrub	11,839
Bendire's Thrasher	X		Desert scrub	11,839
Lawrence's Goldfinch	X		Riparian, desert scrub, grasslands	43,293
Elf Owl (<i>whitneyi</i>)	X		Desert scrub, riparian	12,418
Yellow Warbler	X		Riparian	648
Gila Woodpecker	X		Riparian	648
Phainopepla	X		Riparian	648
Notes				
¹ For PIF priority species, habitat preference from Latta, Bearmore and Corman 1999; otherwise, from Corman and Wise-Gervais, 2005).				

Important Bird Areas (IBA) are identified by The Audubon Society and are sites within a network that maintain the long-term viability of wild bird populations while engaging the public to conserve those areas of critical habitat. The Tuzigoot State IBA is immediately adjacent to Duff Flat and South Gyberg Pastures and the Lower Oak Creek IBA is located approximately 1 mile south of the Strip and Malpais Pastures. Livestock do not have access to either of these IBAs, so livestock grazing and associated activities would have no effect on either IBA or the birds that are found there. There are no important overwintering areas on the allotment.

Environmental Consequences - Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, no livestock grazing or associated activities would occur, so no direct or indirect effects to migratory birds would occur. Habitat conditions for all 27 bird species would generally remain stable, notwithstanding natural processes. The availability of water for birds and their prey would decrease over time under this alternative because maintenance of earthen stock ponds and drinker/pipelines systems would not occur.

Alternative 2: Modified Proposed Action

Under alternative 2, noise disturbance from livestock grazing and associated activities such as maintenance and construction of range improvements could potentially affected all 27 species of migratory birds. The presence of humans and noise associated with livestock management activities could potentially impact nesting migratory birds. Noise disturbance of high intensity or long duration would potentially cause temporary or permanent nest abandonment and ultimately nest failure. Noise effects would typically be of short-duration and only occur in small areas at any one time, so any effects would be expected to be minimal.

Livestock grazing and associated activities would occur on 48,753 acres of ponderosa pine habitat. Livestock grazing would have no effects on habitat conditions for the species that forage and nest in the trees and snags in this habitat type. These species are flammulated owl, Lewis's woodpecker, purple martin, band-tailed pigeon, Grace's warbler, greater pewee, olive warbler, cordilleran flycatcher, olive-sided flycatcher, and Virginia's warbler.

Livestock grazing would also occur in 1,561 acres of mixed conifer habitat. As with ponderosa pine habitats, livestock grazing and associated activities would have no effect on habitat conditions for the species that forage and nest in the trees and snags in this habitat type such as olive-sided flycatcher and cordilleran flycatcher. Potential effects to Virginia's warbler, a ground nesting species as a result of grazing could include trampling of eggs, young, or vegetation and reduced herbaceous cover. Such impacts would be expected to be minimal since this species typically nests underneath shrubs or small trees and often on slopes, which would limit the access livestock have to these structures. Potential effects to vegetation cover under alternative 2 would be managed by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). This would allow for plant growth and recovery under favorable climatic conditions when pastures are rested or are not in use.

Livestock grazing and associated activities would occur on 1,337 acres of high-elevation grassland habitat. Since Swainson's hawks and grasshopper sparrows would be on the allotment during spring and fall migration, livestock grazing would have minimal effects to habitat conditions for these species since these are typically the wettest times of year on the both the summer and winter range. Potential effects to herbaceous cover would be managed by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). This would allow for herbaceous plant growth and recovery to occur under favorable climatic conditions.

Under alternative 2, grazing would occur on as many as 25,030 acres of juniper woodland habitat. For those species that nest and forage in the trees and shrubs of these woodlands, no effects from livestock grazing would be expected to occur. These species are pinyon jay, gray vireo, black-throated gray warbler, band-tailed pigeon, and loggerhead shrike.

Grazing would occur on 20,432 acres of chaparral habitat on the allotment. Livestock would have limited to no effect on species associated with chaparral because livestock rarely browse the chaparral shrub species and in areas where dense shrubs occur, livestock movement would be minimal. Potential effects to vegetation would be managed by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). Additionally grazing would not occur during the driest times of the year as this habitat type is only found on the winter range and grazing would in these pastures occurs between October and May. Species found in chaparral habitats are loggerhead shrike black-chinned sparrow, and canyon towhee.

There are approximately 11,839 acres of desert scrub on the allotment. Grazing in these habitats would likely have no effect on those species that nest in trees and shrubs in this habitat such as Costa's hummingbird and Bendire's thrasher since nests would be protected from trampling. Additionally, this habitat is found on the winter range and would be grazed between October and May, which barely overlaps with the beginning of the breeding seasons of these birds. Effects to species that winter in desert scrub habitats like the sage sparrow would also be limited under most climatic conditions. Only when drought has significantly reduced the amount of herbaceous cover would livestock browse desert shrubs and trees. At such times, a drought management strategy that includes numerous adaptive management actions would be implemented to mitigate the effects of grazing. Also, as discussed for other habitats, limiting the use of pastures, use of a rest, rotational grazing system and monitoring of grazing intensity and utilization of herbaceous cover and conservative to moderate and conservative levels, respectively would minimize potential effects to desert scrub habitats.

According to the Forest's Potential Natural Vegetation Type (PNVT) GIS layer, there are 648 acres of riparian habitat on the allotment. As described in the Watershed and Wetlands, Springs and Riparian Resources sections, many of these acres do not support riparian vegetation due to a lack of perennial water and there would not support migratory birds. Additionally, riparian habitats in Fry Canyon, West Fork of Oak Creek, and a tributary to West Fork are inaccessible to livestock. In addition to the approximately 40 acres of low-elevation riparian that are accessible to livestock and supports patches of riparian vegetation (see Lucy's warbler under MIS for more details), there is approximately 25 acres of high-elevation riparian habitat in Casner Cabin Draw that meets these criteria and is considered wetland/cienega in PNVT but is described as riparian habitat in the Soil & Watershed Report. This means there is a total of 65 acres of habitat that support riparian vegetation on the Windmill West Allotment.

Woody riparian vegetative cover and water quality in these habitats could potentially be impacted by grazing. In addition to limiting the use of pastures in a year, use of a rest rotational grazing system, and monitoring of grazing intensity and utilization of herbaceous vegetation, utilization of woody riparian vegetation for both domestic and wild ungulates would be monitored and would not exceed 20 percent, and congregations of livestock in riparian areas and drainages that could impact soil condition and water quality would be discouraged through placement of salt or mineral supplements in less sensitive areas. This would minimize potential effects of grazing on

species that nest and forage in riparian including yellow warbler, elf owl, and Lawrence's goldfinch.

Under alternatives 2 and 3, unintentional take could occur. Trampling of or reductions in herbaceous vegetative cover and woody riparian species in the spring and summer could result in take of individual migratory birds and potentially impact nesting success. Unintentional take could occur through removal of vegetation for construction of the enclosure at Lockwood Springs or along existing fences.

Management tools including rest-rotational grazing, placement of salt and mineral supplements outside of sensitive areas such as riparian habitats, meadows, and wetlands, and managing utilization of herbaceous vegetation and woody riparian species at conservative levels (30 - 40 percent) and not to exceed 20 percent, respectively, have been incorporated into both alternatives and would reduce the potential for unintentional take to occur.

Alternative 3: Modified Proposed Action with South Gyberg

The difference in effects between alternatives 2 and 3 on migratory birds is limited to those birds found in desert scrub habitats. Under alternative 3, an additional 1,698 acres of desert scrub habitat in the South Gyberg Pasture would be grazed. As described above, these effects would be minimal so only a slight decrease in habitat quality at most would be expected.

Environmental Consequences - Cumulative Effects

The geographical extent of the cumulative effects analysis for migratory birds is confined to the Windmill West Allotment. The timeframe selected is 10 years in the past and the 10 year term of the grazing permit that would be issued under alternatives 2 and 3.

Common to all Alternatives

Cumulative effects to migratory birds and their habitats would include those activities that result in disturbance to these species and changes in vegetative cover and soil conditions on the allotment. Cumulative effects to migratory birds and their habitats include those activities that result in disturbance to these species and changes in vegetative cover and soil conditions on the allotment. Sources of human disturbance include recreationists such as hikers, bikers, horseback riders, hunters, campers, rock climbers, and OHV users; fuelwood cutters; and wildlife fire and suppression activities. Activities that could cumulatively affect migratory birds and their habitats include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, management activities on Coconino County lands at Roger's Lake, fuels reduction projects, wildfire, fuelwood harvest, spread of invasive plant species, motor vehicle closures, and climate change. Most of these activities would be expected to result in localized decreases in the quality and quantity of migratory bird habitat on the allotment. Conversely, improvement in bird habitats would be expected in those areas where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, and other restoration projects, and control and treatment of invasive plant species occurs.

Since no livestock grazing or related activities would occur under alternative 1, there would be no cumulative effects from this alternative. Under alternatives 2 and 3, the amount of impacts on migratory birds that would occur from livestock grazing and associated activities when added to

past, present and reasonably foreseeable future actions is not likely to occur to an extent that there would be a measureable negative effect on migratory bird populations.

Findings

Alternative 1 would not result in unintentional take of individuals and would not lead to a decline in migratory bird populations.

Alternatives 2 and 3 would potentially result in unintentional take of individuals but would not lead to a decline in migratory bird populations.

Fish and Macroinvertebrates

There are no perennial streams within the boundaries of the Windmill West Allotment. The allotment includes portions of Oak Creek, Sycamore Creek, Grindstone Wash-Verde River, and Cherry Creek-Verde River 5th code watersheds. These watersheds contain approximately 44.8 perennial stream miles out of a total of approximately 271.8 perennial stream miles on the Forest. This represents 16.4 percent of the Forest total.

Threatened and Endangered Species

Guidelines from the 2005 Forest Service Southwest Region's "Framework for streamlining informal consultation for livestock grazing activities" were used during the effects analyses of the five endangered species of fish. Similar guidelines have not been developed for candidate species.

Affected Environment

There are a total of six federally listed or candidate fish species with the potential to occur immediately adjacent to the Windmill West Allotment. Three are listed as endangered and have designated critical habitat on the Windmill West Allotment: razorback sucker (*Xyrauchen texanus*), loach minnow (*Tiaroga cobitis*), and spinedace (*Meda fulgida*). Two are listed as endangered but lack critical habitat on the allotment: Colorado pikeminnow (*Ptychocheilus lucius*) and Gila topminnow (*Poeciliopsis occidentalis*). Additionally, there is one candidate species: roundtail chub (*Gila robusta*).

Due to the lack of perennial water, no suitable habitat for Colorado pikeminnow, razorback sucker, loach minnow, spinedace, and Gila topminnow occurs on the Windmill West Allotment. However, potential habitat does exist in the Verde River, Oak Creek and their perennial tributaries immediately adjacent to the analysis area. Roundtail chub occurs in these same areas as well as Sycamore Creek. There are approximately 4 miles of razorback sucker critical habitat, 2 miles of loach minnow critical habitat, and 2 miles of spinedace critical habitat on the southern boundary of the allotment along the Verde River in portions of Duff Mesa and Duff Flat Pastures. However, topography and the location of the allotment boundary fence outside of the riparian area make all of the acres of critical habitat along the Verde River inaccessible to livestock. Therefore cattle grazing would not directly affect critical habitat.

For more information on threatened and endangered fish species, see the Fisheries Specialist Report.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

Under alternative 1, there would be no livestock grazing or construction of new structural improvements in suitable threatened and endangered species habitat. Improvement in contaminant levels such as *E. coli* in Oak Creek and Spring Creek would likely be slight to none and possibly too small to be detected through typical water quality monitoring methods. As a result, if such a change were to occur, it would not have a noticeable effect on water quality or the availability of food for these species or their prey.

Alternative 2: Modified Proposed Action

Under alternative 2, there would be no direct effects to threatened and endangered fish species as livestock do not have access to the Verde River or other perennial streams and their associated riparian vegetation.

In general, these species could be indirectly affected by grazing through changes in vegetative cover and soil conditions. Such changes could result in a decrease in the water quality in suitable habitat adjacent to the allotment as sediment concentrations increase. Effects to macroinvertebrates and ultimately fish and amphibians could occur, reducing prey availability for threatened and endangered fish species. Grazing can also affect water quality by increasing contaminants such as *E. coli* in adjacent streams. Both alternatives would minimize potential effects to vegetative cover and soil condition by limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels (30-50 percent) and forage utilization at conservative levels (30-40 percent). Maintaining herbaceous cover is key to maintaining soil conditions and therefore, water quality. Congregations of livestock in sensitive areas such as ephemeral channels that drain into the Verde River and Oak and Spring Creeks would be unlikely to occur due to the lack of riparian vegetation cover and structure throughout these areas on the winter range.

Timing of grazing also greatly minimizes the potential contribution of livestock to *E. coli* levels in Oak and Spring Creeks downstream of the allotment. Since the winter pastures are grazed between November and May and contaminants from livestock manure is most easily moved through the ephemeral sections of Spring Creek on the allotment during the monsoon, it is highly unlikely that livestock grazing is a meaningful or measurable contributor of *E. coli* contamination to adjacent creeks (see Soil and Watershed Report for more detail).

Proposed improvements at Roger's and Fry Lakes and Lockwood Springs would have no effects on these species as these sites are located above the Mogollon Rim, which is outside of the known range of these species. Additionally maintenance of existing improvements and proposed vegetation treatments would have no measureable effect on water quality and therefore, prey availability for these species.

Routine cleaning of earthen stock ponds on the winter range would be unlikely to affect these species through spread of non-native species and disease. The closest earthen stock ponds on the allotment to occupied habitat are approximately 2.2 miles from both D.K Well in Duff Flat Pasture to the Verde River and Triangle Tank in Strip Pasture to Oak Creek. An approved protocol would be followed during maintenance activities at stock tank. This protocol helps reduce the risk

of introducing and spreading non-native species and disease between aquatic systems and adversely affecting threatened and endangered fish species and their prey.

Based on the information above, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on threatened and endangered fish species and their habitats would be expected to be discountable.

Alternative 3: Modified Proposed Action with South Gyberg

No difference would be expected in the effects of the two alternatives despite the proximity of South Gyberg Pasture to the Verde River. Under alternative 3, livestock grazing in this pasture would be limited to October through January every other year to comply with the Arizona Cliffrose Recovery Plan (USFWS 1995). This would minimize additional effects to water quality as it would provide time for herbaceous plant growth and recovery under favorable climatic conditions and would limit impacts during periods of drought.

Cumulative Effects

The cumulative effects boundary for this project is Oak Creek, Sycamore Creek, Grindstone Wash-Verde River, and Cherry Creek-Verde River 5th code watersheds.

Alternative 1: No Action

Since no direct or indirect effects from livestock grazing or related activities would occur under alternative 1, there would be no cumulative effects.

Alternative 2: Modified Proposed Action

Cumulative effects to aquatic threatened and endangered species and their habitats would result from changes in vegetative cover, soil conditions, and contaminants that affect water quality and the availability of its prey on the winter range. Additionally activities that introduce or assist in the spread of diseases and non-native aquatic species such as bullfrogs, crayfish, and warm-water fish would contribute to cumulative effects. These activities include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change (see the Wildlife Specialist Report for more detail).

Most of these activities would be expected to result in localized decreases in the quality of prey habitat adjacent to the allotment. Conversely, improvement in aquatic threatened and endangered species habitat would be expected in those areas where off-road travel is limited and road densities are reduced under TMR and restoration activities are implemented under 4FRI, Turkey – Barney, and other projects, and treatment and control of invasive plant species.

While additive effects would be expected for alternatives 2, they would be minimal and would not cumulatively result in long-term losses in soil productivity; decreases in diversity, density, production, and quality of herbaceous vegetation; or increases in suspended sediments or contaminants in perennial streams adjacent to the allotment. Climate change would be a long-term cumulative effect that is expected to impact aquatic ecosystems as drought severity and frequency increases and higher temperatures affect the physiology of some aquatic species (Perry et al., 2012). These changes would not be fully manifested over the next 10 years; however,

drought conditions may affect natural processes to such an extent as to result in impacts beyond the magnitude and scale of the proposed action.

In extreme drought conditions, livestock may be removed from all or portions of the allotment until conditions improve. Thus even in unfavorable climate conditions the potential effects of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to threatened and endangered fish species and their habitats.

Alternative 3: Modified Proposed Action with South Gyberg

Alternative 2 and 3 have the same direct and indirect effects and therefore the same cumulative effects.

Critical Habitat

Direct and Indirect Effects

Since the portion of the Verde River adjacent to the allotment is inaccessible to livestock grazing due to fences and/or topography, grazing and related activities would only affect PCEs of critical habitat for razorback sucker, loach minnow, and spokedace related to prey availability and pollutants. No further discussion will occur about other PCEs for these fish species.

Under alternative 1, there would be no livestock grazing, construction of new or maintenance of existing structural improvements, or vegetation treatments. As a result, there would be no direct or indirect effects of this alternative to PCEs of designated critical habitat for razorback sucker, loach minnow, and spokedace.

Under alternatives 2 and 3, livestock grazing could potentially affect PCEs of razorback sucker, loach minnow and spokedace critical habitat in the Verde River through changes in water quality from increased suspended sediments and contaminants as discussed in detail in direct and indirect effects for threatened and endangered fish species. By limiting the length of grazing of a pasture in a given year, using a rotational grazing management system, managing grazing intensity at conservative to moderate levels and forage utilization at conservative levels, potential reductions in native prey populations would be minimized. Additionally maintenance of existing improvements and proposed vegetation treatments would have no measureable effect on water quality and therefore, prey availability for these species. These two alternatives would have discountable effects to water quality and prey populations in the sections of the Verde River adjacent to the allotment.

Cumulative Effects

Cumulative effects to designated critical habitat for razorback sucker, loach minnow, and spokedace would result from those activities that affect water quality and prey populations in the Verde River. As described in detail in cumulative effects for threatened and endangered fish species and their habitats, these activities include wild ungulate grazing, grazing on State Lands within the allotment boundary, recreation including dispersed camping and illegal road and trail creation, OHV use, forest restoration projects, fuels reduction projects, illegal stocking of fish, wildfire, fuelwood harvest, motor vehicle closures, spread of invasive plants and animals, development, and climate change.

Most of these activities could result in localized decreases in water quality and prey populations in designated critical habitat on the allotment. Conversely, improvement in these PCEs could

occur where off-road travel is limited and road densities are reduced under TMR, restoration activities are implemented under 4FRI and Turkey – Barney, treatment and control of invasive plant species occurs.

Since no livestock grazing or related activities would occur under alternative 1, there would be no addition to the cumulative effects described above. While additive effects would be expected for alternatives 2 and 3, they would be minimal and would not cumulatively result in long-term decreases in water quality or prey populations in the Verde River. Therefore, the potential impacts of livestock grazing and associated activities combined with past, present and reasonably foreseeable future projects on the allotment would not result in negative effects to designated critical habitat for razorback sucker, loach minnow, and spikedace.

Findings

This section summarizes the findings for threatened and endangered fish species. There are no differences in findings between species because of the significant overlap in potential and critical habitat (see Fisheries Specialist Report for more details).

Alternative 1: No Action

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on threatened and endangered fish species and their habitats.

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on designated critical habitat for razorback sucker, loach minnow or spikedace.

Alternative 2: Modified Proposed Action

Under alternative 2, grazing and associated activities could have negative impacts on threatened and endangered fish species through reductions in quality of prey habitats. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, impacts to threatened and endangered fish species under alternative 2 would be minimal.

Under alternatives 2 and 3, grazing and associated activities could have negative impacts on designated critical habitat for razorback sucker, loach minnow, and spikedace through reductions in quality of prey habitats. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, impacts to designated critical habitat for razorback sucker, loach minnow, and spikedace under alternative 2 would be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

There would be no difference between the impacts of alternatives 2 and 3. As a result, impacts to threatened and endangered fish species under alternative 3 would be minimal.

There would be no difference between the impacts of alternatives 2 and 3. As a result, impacts to designated critical habitat for razorback sucker, loach minnow, and spikedace under alternative 3 would be minimal.

Sensitive Species

Affected Environment

The U.S. Forest Service Region 3 sensitive species list (9/18/2013) was reviewed and a list of species was created for this project based on known occurrences or, in the absence of survey data, the presence of suitable habitat on or immediately adjacent to the Windmill West Allotment. Three fish species (desert and Sonoran suckers and roundtail chub) and three macroinvertebrates species (California floater, A. mayfly, and Balmorhea saddle-case caddisfly) were identified. Since roundtail chub was described in the Federally Listed Species section, it will not be repeated in this section.

Due to the lack of perennial water, no suitable habitat for desert and Sonoran suckers occurs on the Windmill West Allotment but they are known to occur or potential habitat exists in the Verde River, Oak, West Fork of Oak, and Sycamore Creeks immediately adjacent to the analysis area.

Similarly, no suitable habitat for California floater, A. mayfly and Balmorhea saddle-case caddisfly occurs on the Windmill West Allotment. However, these species are known to occur in water courses adjacent to the analysis area, such as Verde River and Oak, West Fork of Oak, Spring, and Sycamore Creeks.

For more information on Forest Service sensitive fish and macroinvertebrate species, see the Fisheries Specialist Report.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

Under this alternative, there would be no livestock grazing or construction of new structural improvements in suitable habitat for sensitive species. Improvement in contaminant levels such as E. coli in Oak Creek and Spring Creek would likely be slight to none and possibly too small to be detected through typical water quality monitoring methods. As a result, if such a change were to occur, it would not have a noticeable effect on water quality or the availability of food for these species or their prey.

Alternative 2: Modified Proposed Action

Effects of alternative 2 on Forest Service sensitive fish species would be the same as those described for threatened and endangered fish.

Additionally, the effects of alternative 2 on the quality of water and therefore, habitat for Forest Service sensitive macroinvertebrates (i.e. California floater, A. mayfly, and Balmorhea Saddle-case Caddisfly) would be the same as described for threatened and endangered fish species.

Therefore, potential direct and indirect effects from livestock grazing, new or existing structural improvements, and vegetation treatments on these Forest Service sensitive species and their habitats would be expected to be minimal.

Alternative 3: Modified Proposed Action with South Gyberg

Effects to Forest Service sensitive species for alternative 3 would be the same as those listed for alternative 2.

Cumulative Effects

The cumulative effects boundary for this project is Oak Creek, Sycamore Creek, Grindstone Wash-Verde River, and Cherry Creek-Verde River 5th code watersheds.

Alternative 1: No Action

Since no direct or indirect effects from livestock grazing or related activities would occur under alternative 1, there would be no cumulative effects.

Alternative 2: Modified Proposed Action

Cumulative effects to Forest Service sensitive species for alternative 2 would be the same as those listed for threatened and endangered fish species.

Alternative 3: Modified Proposed Action with South Gyberg

Cumulative effects to Forest Service sensitive species for alternative 3 would be the same as those listed for alternative 2.

Findings

There are no differences in National Forest Management Act findings between species because of the significant overlap in potential habitat (see Fisheries Specialist Report for more details).

Since no livestock grazing or related activities would occur under alternative 1, no impacts from the proposed project would be expected on Forest Service sensitive fish and macroinvertebrate species.

Under alternative 2, grazing and associated activities could have negative impacts on threatened and endangered fish species through reductions in quality of prey habitats. Any potential effects would be minimized through timing of grazing and other management strategies and the distance of the allotment to occupied habitats. As a result, alternative 2 may impact individual Forest Service sensitive fish and macroinvertebrate species but is not likely to result in a trend toward Federal listing or loss of viability of these species.

There would be no difference between the impacts of alternatives 2 and 3. As a result, alternative 3 may impact individual Forest Service sensitive fish and macroinvertebrate species but is not likely to result in a trend toward Federal listing or loss of viability of these species.

Scenery

Affected Environment

There are four possible areas where the alternatives would influence the scenic resources within the Windmill West Allotment. The first is Roger's Lake, where fencing is proposed in alternatives 2 and 3. The lake is partially owned by Coconino County for its open space value. The second is Fry Lake, which has been identified as a wildlife viewing location by the Arizona Game and Fish department. The proposed fencing in alternatives 2 and 3 would be installed if monitoring indicates the need to protect the native plant community adjacent to the tank. The third location is Lockwood Springs where fencing has been proposed for spring restoration in alternatives 2 and 3. The fourth location is the South Gyberg Pasture where a pipeline and other range improvements are being proposed in alternative 3.

Roger's Lake, Fry Lake and Lockwood Spring are in the Ponderosa Pine Landscape Character Zone, which is characterized by ponderosa pine forests, some mixed conifer forest and aspen can be found on northern exposures, drainages, and on mountainous areas. Small natural and artificial lakes and wetlands are scattered throughout this character zone. In the immediate project area, Roger's Lake is the largest example of an ephemeral natural lake.

The South Gyberg Pasture is located in Verde Valley Landscape Character Zone, which is composed of pinyon-juniper and juniper woodlands in the eastern portion and desert grass and shrub communities including mesquite, creosote bush, and Manzanita. This landscape character zone contains creeks, draws, washes, or canyons along with two lakes and 239 earthen stock ponds.

Landscape character with a high degree of intactness is in a high scenic condition. Evidence of discordant elements or deviation from the existing landscape character results in a less intact appearance, and lower scenic condition. The project area has some deviation from the intact landscape character. This can be due to unnatural ecological conditions, or presence of human constructed features that are not typically viewed as positive scenic features. Less attractive human constructed features may include barbwire fencing, signs, utility corridor features, and structures that have a high degree of contrast compared to the surrounding landscape. All of these features may be found in the project area. Constructed earthen stock ponds often contrast with the surrounding landscape and do not necessarily contribute to the scenic beauty, but may also be valued because water is rare in the project area. Earthen stock ponds may also have other associated aesthetic qualities such as opportunities for wildlife viewing as animals and birds come to the earthen stock ponds for water.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

There are no effects to scenic resources from alternative 1 because there would be no range improvements constructed for the purpose of supporting livestock grazing. Lack of maintenance on existing structures would not impact the scenic integrity within the allotment.

Alternative 2: Modified Proposed Action

The proposed fence at Roger's Lake would have minimal and short term effects on scenery. Roger's Lake is an important feature in the project area. It currently has fencing, structures and roads that detract from the intactness of the landscape character. The existing scenic integrity is moderate, and the desired scenic integrity objective is moderate. There would be little or no change as a result of the additional fencing. Short term effects would include a minimal increase in contrast due to new, shiny fence posts and fencing. This will become less noticeable as weather dulls the fencing materials. The presence of the additional fencing will be a longer term effect, but will not be particularly noticeable due to the abundance of fencing in the area.

At Fry Lake, the addition of the enclosure would have both short term and long term effects to scenery. Short term effects would include a minimal increase in contrast due to new, shiny fence posts and fencing. This will become less noticeable as weather dulls the fencing materials. The addition of 1.5 miles of new fencing for the enclosure would be noticeable. It would be in keeping with the existing scenic integrity of moderate. There are other fences in the area, and

while this would add new constructed features, it would be similar to others already existing. There would be little progress toward the desired scenic integrity objective of high with the addition of new fencing. If monitoring of the vegetation in the area shows a decline in native plant community diversity and abundance, the landscape character of the area would be further disrupted. Fencing would allow for vegetation recovery. This would result in improvement in the landscape character. The final result is to maintain the existing scenic integrity.

Proposed activities include fencing of Lockwood Springs to restore riparian vegetation and protect the spring from browsing. Water is a rare commodity in the project area, and protection of springs and riparian vegetation is important to improving the desired landscape character of the area. Fencing would introduce unnatural linear features into the landscape that would not be natural appearing. The proposed fencing material is wire. Wire fencing materials would be more noticeable than weathered steel sucker rod or sucker rod with wood posts. Wire and metal posts can be shiny when installed and their color can contrast with the natural surroundings. Wire fencing would have short term effects in the spring location. These effects would decrease somewhat as weathering dulls the surfaces. It would be preferable to use weathered steel or steel with wood posts.

Weathered steel sucker rod fencing or a combination of wooden posts and sucker rods would have effects similar to wood fencing. The advantage is that it usually does not require maintenance and its appearance is retained. As the steel weathers, it would blend in better with natural features. There would be a slight decrease in scenic quality with the installation of the fence, but this would be balanced or overshadowed by the potential in the conditions at the spring and associated plant species. These would move toward the desired landscape character.

Alternative 3: Modified Proposed Action with South Gyberg

The proposed pipeline in the South Gyberg Pasture would result in short term disturbance to the landscape character, but it is expected that the pipeline would recover and be natural appearing within 3 to 5 years. The addition of the trough and waterlot fencing would have minimal long term effects as constructed features would be added to the landscape. The scenic integrity objectives for this area would be maintained.

Cumulative Effects

Common to all alternatives

Since there are no long-term effects to scenic integrity from the alternatives, there are no cumulative effects to scenic resources.

Recreation

Affected Environment

Recreation use within the Windmill West Allotment includes driving for pleasure, wildlife viewing, big game and antler hunting, hiking, horseback riding, mountain biking, picnicking, firewood gathering, heritage site visitation, dispersed camping, cabin rental use, outfitter guide operations, and motorized recreation – including 4-wheeling, motorcycle and OHV travel.

The following developed recreation sites and trails are located within or adjacent to the Windmill West Allotment analysis area: Palatki and Honanki Heritage Sites, Fernow Cabin, Loy Canyon Trail, Casner Mountain Trail, Mooney Trail, Taylor Cabin Trail, and Secret Mountain Trail.

The Mooney Trail #12 is located near the center of the allotment and is the only recreation resource that is also used by the permittee for range management purposes. The trail is managed for hiking and equestrian use. The trail is 4.2 miles in length and has an elevation gain/loss of 1,000 ft. The trail begins next to Black Tank at the junction of FSR's 525C and 9551. The trail turns due north along FR 9551A. The road ends at Sebra Tank and the foot path begins. From Sebra Tank the trail follows Mooney Canyon for about a mile at which time it starts a steep ascent to the top to the rim. The trail tops out at the junction of Taylor Cabin and Casner Mountain trails. The Mooney Trail was originally built to drive cattle to and from summer pastures on the rim which is why the trail is wide in many portions of its route, often resembling a road. The trail is open year-round and receives light to medium use depending on the time of year.

The Recreation Opportunity Spectrum (ROS) classes in the Windmill West Allotment analysis area include: Primitive (P) within Sycamore Canyon Wilderness and Red Rock / Secret Mountain Wilderness (adjacent to analysis area); some Semi-Primitive Non-Motorized (SPNM) in the central portion of the analysis area, Semi-Primitive Motorized (SPM) in much of the southern portion of the analysis area, Roaded Natural (RN) in much of the northern portion of the analysis area and along major roadways (i.e. Highway 89A, FSR152C), and some Rural (R) near west Sedona.

Environmental Consequences

Direct and Indirect Effects

Alternative 1: No Action

The no action alternative would have minimal direct effect on recreation resources and activities within the analysis area. Trails would not be impacted by livestock, including Mooney Trail which is currently used for trailing (transport) of cattle from winter to summer range. Most recreationalists participating in various recreational activities such as camping, hiking, biking, horseback riding, driving, other recreational activities and hunting would not likely notice a difference if cattle were no longer in the Windmill West Allotment.

There would be an indirect effect in that livestock fences would no longer be maintained and likely fall in disrepair. This includes fencing around recreation sites like Palatki, Honanki, and Fernow Cabin.

The no action alternative would have no effect on the current ROS classification within the project area.

Alternative 2: Modified Proposed Action

The modified proposed action would continue using Mooney Trail to trail (transport) livestock from their winter to summer ranges. This has a direct impact on recreationalists using the trail during the 2 days when trailing is underway because the trail would be closed to the public for safety of the permittee and the public. If livestock are transported during rainy or moist conditions, there could be damage to the trail surface. The permittee would assist with maintenance when trail condition assessments demonstrated that cattle were contributing towards declining condition.

The modified proposed action alternative would have no effect on the current ROS classification within the project area.

Alternative 3: Modified Proposed Action with South Gyberg

The direct, indirect and cumulative effects for alternative 3 – Modified Proposed Action with South Gyberg Pasture would be the same to the recreation resource as alternative 2- Modified Proposed Action. The inclusion of the South Gyberg Pasture is inconsequential to recreational activities within that portion of the analysis area.

Cumulative Effects

Alternative 1: No Action

Since there would be no direct and indirect effects from alternative 1, there would be no cumulative effects to recreation.

Alternative 2: Modified Proposed Action

Effects of livestock grazing to the recreation uses and settings within the Windmill West Allotment would not be noticeable to visitors or limit recreation opportunities and therefore there would be no cumulative effects

Alternative 3: Modified Proposed Action with South Gyberg

Effects of livestock grazing to the recreation uses and settings within the Windmill West Allotment would not be noticeable to visitors or limit recreation opportunities and therefore there would be no cumulative effects

Wilderness

Affected Environment

Congressionally designated wilderness areas within the project boundary include portions of Sycamore Canyon Wilderness and Red Rock/Secret Mountain Wilderness. Approximately 12,000 acres of wilderness falls within the allotment but most is on the steep slopes or in areas that are difficult for cattle to access. There are no range improvements in wilderness associated with the allotment. There are no wilderness study areas, National Recreation Areas, or inventoried roadless areas in the analysis area.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

There would be no range improvements in the wilderness under any alternative and therefore there would be no direct, indirect or cumulative effects to wilderness character. Livestock grazing is an activity that is permitted in wilderness, if it was allowed at the time of designation, which is the case for Windmill West. Under all alternatives, the area of wilderness that would be grazed would be reduced.

Wild and Scenic Rivers

Affected Environment

The Windmill West Allotment overlaps the Upper Verde Watershed, which drains into the Verde River. Verde Wild and Scenic River is outside of this watershed. The northern extent of the Wild and Scenic River starts approximately 20.2 miles southeast of the Windmill West Allotment boundary.

The Sycamore Creek (4.1 miles) and Upper Verde (9.5 miles) eligible Wild and Scenic Rivers are adjacent to the western edge of the current allotment boundary. The adjacent pastures are Duff Mesa, South Sycamore, #60 and Duff Flat.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

There are no measureable direct or indirect effects to the designated wild and scenic rivers from any of the alternatives because of the lack of measurable changes to any water quality indicator resulting from the alternatives and because of the distance between the allotment and the designated segments of the Verde River.

Effects to the Sycamore Creek eligible Wild and Scenic River are the same for all alternatives because the adjacent pastures (South Sycamore and #60) would not be grazed under any of the alternatives. The next pasture to the north along Sycamore Creek (North Sycamore) would also not be grazed under any alternative. Therefore, there would be no measureable direct or indirect effects to the Sycamore Creek eligible Wild and Scenic River, its water quality or its outstandingly remarkable values.

Alternative 1: No Action

Under the no action alternatives there would be no direct or indirect effects to the Upper Verde eligible Wild and Scenic River because there would be no grazing permitted in the Duff Flat or Duff Mesa Pastures.

Alternative 2: Modified Proposed Action

Livestock within the Windmill West Allotment have no direct access to perennial stream courses because of fencing and topography. Therefore the modified proposed action would not have a direct effect on water quality in these streams/rivers.

The Verde River is attaining water quality standards and there is no evidence that recent or proposed livestock grazing would have negative effects to water quality in the Verde River. Therefore, there are no indirect effects to Upper Verde eligible Wild and Scenic River or its outstandingly remarkable values.

Alternative 3: Modified Proposed Action with South Gyberg

There are no direct or indirect effects from the grazing of the South Gyberg Pasture that would affect the Upper Verde eligible Wild and Scenic River because the pasture drains into the Verde River downstream of the eligible segment.

Cumulative Effects

There are no effects to designated or eligible wild and scenic rivers from these alternatives and therefore no cumulative effects.

Heritage Resources

Affected Environment

Per the Coconino National Forest heritage geodatabase, a total of 278 cultural resource sites are documented in the Windmill West Allotment (more details available in the Heritage Resources Specialist Report) These can be simplified into 218 prehistoric, 55 historic sites, 4 sites with both historic and prehistoric components, and 1 site that is currently unknown.

Known cultural resource concerns from grazing in the Windmill West Allotment are limited. Among the various site types found in the allotment, rock shelters sites, mostly located in the winter range, intuitively seem to be the most at risk from damage from cattle aggregation, given that these are generally shaded locations. From the CNF geodatabase, several rock shelter sites were selected for inspection in the spring of 2012. Several other sites that were in the vicinity of these selected sites were also inspected for possible impacts from cattle. No evidence of impacts to these sites from cattle were observed.

Environmental Consequences

Common to All Alternatives

There would be no adverse effect to heritage resources under all alternatives. Removing grazing from the allotment per the No Action alternatives would result in no effect to heritage resources. Reauthorization of grazing under alternatives 2 and 3 would result in no effect, or at a minimum,

no adverse effect to cultural resource sites. Grazing activities should be benign to cultural resource sites and not adversely affect their national register status. Using adaptive management strategies, anywhere that trespass and visible damage has occurred in rock shelters, historic buildings, and prehistoric sites with standing architecture, fencing or some other form of enclosure would be constructed.

Economics

Affected Environment

Livestock grazing contributes to the livelihood of the Windmill West Allotment permittee as well as to the economy of local communities and counties. The Windmill West Allotment is located in Coconino and Yavapai Counties and is currently permitted 565 head of adult cattle with a yearlong season of use. The presence of cattle grazing does not limit recreational activities or other permitted activities on National Forest System lands contained within the allotment. The nearest communities to the allotment are Cottonwood, Flagstaff, and Sedona. These communities have large and fairly diverse economies with livestock grazing associated revenues making up a very small portion of the economy. Although livestock grazing revenues represent only a small percentage of the funds Coconino and Yavapai Counties receive from National Forest fees, they are an important contributor. Additionally, individual allotments provide incremental contributions to local economies; a change to one allotment may result in no impacts to the local economy, but changes in several allotments would most likely result in a cumulative impact to the area economy.

The economies of Coconino and Yavapai Counties gain revenue from several sources: county sales taxes, state-shared sales taxes, highway user revenues (gasoline taxes), property taxes and National Forest fees. The greatest revenues come from the county and state-shared sales taxes. National Forest fees, which include payments from timber harvesting, mining, recreational uses, and cattle grazing, are an important part of county revenues, but provide only a fraction of available funds (EPS-HDT 2013a). Coconino County also receives National Forest fees from uses on the Apache-Sitgreaves, Kaibab, and Prescott National Forests; while Yavapai County also receives National Forest Fees from uses on the Prescott, and Tonto National Forests. National Forest fees are used primarily for highway maintenance and public schools in both Coconino and Yavapai Counties. The Windmill West permittee directly contributes revenues to Coconino and Yavapai Counties through property taxes.

Environmental Consequences

Direct and Indirect Effects

Estimates of direct and indirect jobs and payments to Coconino and Yavapai Counties from Federal receipts provide a relative comparison of economic effects that could occur due to changes in livestock grazing. Table 18 estimates the effects expected on these indicators in Coconino and Yavapai Counties from implementing the No Action alternative, the Modified Proposed Action and the Proposed Action alternative on the Peaks Allotment.

Table 18: Estimated Economic effects for Coconino and Yavapai Counties

Economic Effects	No Action Alternative	Modified Proposed Action Alternative	Modified Proposed Action with South Gyberg Pasture Alternative
Direct and Indirect Jobs*	0	6.44	6.44
Federal Payments to Counties**	0	\$2,288.25	\$2,288.25
*Approximately 1.14 jobs per 100 cattle			
**The amount shown under the Modified Proposed Action alternative and the Modified Proposed Action with South Gyberg Pasture alternative is based on 25 percent of the Windmill West Allotment grazing fees paid to Coconino and Yavapai Counties at the 2013 grazing fee rate of \$1.35/HM and at the maximum permitted Head Months of 6,780. Not shown in this amount are the taxes that counties collect on range structural improvements. These taxes are based on a percentage of the assessed values of those improvements and the materials purchased for the construction of these improvements.			

Quantifiable factors such as economic costs and outputs, along with projected head months (HM) or animal unit months (AUM) have been used to help describe the economic effects of grazing on the Windmill West Allotment. These projections from the Quick-Silver model are best used as an indicator of change rather than a precise measurement. Additionally, identifying some of these effects is difficult, if not impossible, as economic effects tend to deal with personal issues.

The investment analysis anticipates the rate of return for the projected expenditures by the permittee and Forest Service on the Windmill West Allotment over a 10 year period.

Table 19 displays shows that the Modified Proposed Action has the highest benefit cost ratio, followed by the Modified Proposed Action with South Gyberg and the No Action provides a zero value benefit cost ratio.

Table 19: Investment Analysis

Investment Analysis	No Action Alternative	Modified Proposed Action Alternative	Modified Proposed Action with South Gyberg Pasture Alternative
Forest Service			
Present Value of Benefits ¹	\$0.00	\$74,239	\$74,239
Present Value of Costs ²	\$0.00	-\$99,513	-\$106,939
Present Net Value ³	\$0.00	-\$25,274	-\$32,700
Benefit/Cost Ratio ⁴	NA	0.75	0.69
Permittee			
Present Value of Benefits ¹	\$0.00	\$625,258	\$625,258
Present Value of Costs ²	\$0.00	(\$231,898)	(\$243,079)
Present Net Value ³	\$0.00	\$393,360	\$382,179
Benefit/Cost Ratio ⁴	NA	2.70	2.57
All Partners			
Present Value of Benefits ¹	\$0.00	\$699,497	\$699,497
Present Value of Costs ²	\$0.00	(\$331,412)	(\$350,018)
Present Net Value ³	\$0.00	\$368,085	\$349,479
Benefit/Cost Ratio ⁴	NA	2.11	2.00
<p>Note: Dollar figures in () indicate a negative amount, or loss of money. These figures have been rounded to the nearest dollar.</p> <p>¹ <i>Present value of benefits</i> represents the income generated from grazing on the Windmill West Allotment by the permittee, along with the present value of the grazing fees collected by the Forest Service.</p> <p>² <i>Present value of costs</i> represents the cost of range improvement maintenance, range improvement construction, and range inspections (Permittee), along with the costs of permit administration, range inspections, range monitoring, materials for new range improvements, and limited construction of range improvements (Forest Service).</p> <p>³ <i>Present net value</i> represents present value of benefits minus present value of costs.</p> <p>⁴ <i>Benefit/cost ratio</i> represents the present value of benefits divided by the present value of costs</p>			

Gross revenue estimates are created by estimating the amount of calves produced each year for each alternative. Table 20 represents a comparison of the No Action alternative, the Modified

Proposed Action alternative and the Modified Proposed Action with South Gyberg Pasture alternative for Estimated Gross Annual Revenue.

Table 20: Estimated Gross Annual Revenue

Value	No Action Alternative	Modified Proposed Action Alternative	Modified Proposed Action with South Gyberg Pasture Alternative
Estimated Gross Annual Revenue	\$0.00	\$352,888	\$352,888

These factors will vary annually but serve as a point of comparison. No complete projections were made of the permittee’s actual costs, the ability to cover costs, or any supplemental income that may be available.

Alternative 1: No Action

Under the No Action alternative, the allotment would not be grazed and the permit for grazing cattle on this allotment would be cancelled. The permittee would lose future potential revenue derived from the sale of cattle that would have been produced on the Windmill West Allotment.

The No Action alternative would result in the loss of annual Federal payments to Coconino and Yavapai Counties for livestock grazing on the Windmill West Allotment. This loss, by itself, is not substantial; however, the counties would also lose revenues from taxes on structural improvements and the state would lose tax revenues based on the permittee’s use of Federal lands. Under this alternative, all jobs directly associated with livestock grazing on the Windmill West Allotment would be eliminated. Some of the jobs indirectly associated with livestock grazing on the Windmill West Allotment may also be eliminated; however, most indirect jobs would likely be maintained because the need for ranching supplies and services would continue to be filled by other area ranches and individuals/businesses from the surrounding communities. Since livestock grazing does not limit recreational uses or other permitted activities on National Forest System lands, it is not anticipated that the local economies would be enhanced due to increased recreational use or an increase in other permitted activities once livestock are removed.

Alternative 2: Modified Proposed Action

The Modified Proposed Action alternative would help maintain current jobs within the surrounding communities and revenues to Coconino County, Yavapai County, and the State of Arizona. If changes are made in the use of the Windmill West Allotment in the future, contributions to state, county and local economies from fees, taxes and jobs associated with cattle grazing on this allotment would change accordingly.

Alternative 3: Modified Proposed Action with South Gyberg

Alternative 3 would have similar effects as alternative 2 at the State, county and regional scale. Alternative 3 would result in the additional cost of approximately \$7,500 as a result of pipeline and trough construction. This cost would be to the permittee, but the permittee would also likely benefit from the additional forage and management flexibility made available from the use of an additional pasture.

Cumulative Effects

Common to All Alternatives

Changing the economic contribution of the Windmill West Allotment and associated Forest Service federal land payments from the regional economy would be insignificant in terms of cumulative effects. Because the agricultural sector makes up less than 1 percent of the economy in Coconino and Yavapai Counties (EPS-HDT 2013b)

Environmental Justice

Executive Order 12898 directs federal agencies to consider Environmental Justice under NEPA. Environmental Justice requires evaluating whether a proposed action would have a disproportionately high and adverse human health or environmental effect on minority and/or low-income populations or Indian tribes, and consideration of that effect when making a decision.

Affected Environment

In Coconino County, minority groups present in a percentage greater than the Arizona state percentage are American Indian and Alaska Native persons and persons claiming two or more races. In Yavapai County, the only group present in a percentage above the Arizona state percentage consists of white persons, not Hispanic. In Coconino County, the poverty level is higher than the state percentage, indicating a low-income population (US Census Bureau 2013). In Yavapai County, the poverty level is below the state average (US Census Bureau 2013b).

Environmental Consequences

There would be no effect related to Environmental Justice under all alternatives. Although minority and low-income populations are present, none of the alternatives would result in adverse, disproportionate effects to those groups. There is no data to suggest current ranch operations, and employment at the ranch is uniquely depended upon by any minority or low-income populations. Therefore, there would be no adverse, disproportionate effects to minority and/or low-income populations under any of the alternatives.

Relationship of Short-Term Uses and Long-Term Productivity (all resources)

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Continuing livestock grazing, using the principles of conservative utilization and adaptive management to respond to changing conditions would allow for the long-term productivity of the land.

Vegetation treatments are included as part of the proposed action. These vegetation treatments, described in Chapter 2 are intended to enhance the long-term productivity of the range. In the long-term, these vegetation treatments are expected to result in more grass and forage and more stable soils in 3,179 acres of impaired and unsatisfactory soils on the allotment and contribute towards a healthier watershed.

If livestock grazing is removed from the allotment, it would result in the long-term productivity of the upland and riparian vegetation on the allotment similar to the proposed action with two exceptions. First, effects to Lockwood Springs from elk grazing would continue. If grazing was removed from the allotment, the permittee would not construct and maintain this fence. Secondly, under the no action alternative, vegetation treatments would not be performed on 3,179 acres in the allotment. The long-term productivity of these acres would still be compromised by the juniper encroachment.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

There are no irreversible commitments of resource associated with this process, as livestock grazing under the proposed action nor would the no action alternative result in loss of resources that cannot be regained. The irretrievable commitment of resources in this case is the temporary removal of vegetation and localized compaction that inevitably occurs with the continuation of grazing activities. Continuation of grazing is expected to continue to result in compacted soils and thus limited soil productivity where livestock and wildlife congregate around water sources.

Relevant Disclosures

The Coconino Forest Plan is undergoing revision. When the revised plan is complete, it might contain rangeland management requirements that differ from the current plan. If the proposed action is approved, adaptive management or future planning through the NEPA process would allow the Forest Service to make adjustments to ensure compliance with the new plan. The

website for the Coconino National Forest Plan Revision is:

<http://www.fs.fed.us/r3/coconino/plan-revision.shtml>

Protection and management of heritage resource on National Forest System land is mandated by the National Historic Preservation Act, 1966 as amended (NHPA), 36 CFR 800, and Forest Service Manual 2360, American Indian Religious Freedom Act, Archaeological Resource Protection Act and the National Environmental Policy Act (NEPA).

In addition Southwest Region has developed alternative procedures, per 36 CFR 800.14, in the form of the Region 3 First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities. An appendix to this Agreement, *APPENDIX H STANDARD CONSULTATION PROTOCOL FOR RANGELAND MANAGEMENT* establishes standard procedures for NHPA compliance for Rangeland Management related undertakings.

Any future improvements and ground-disturbing management practices will be contingent upon completion of the identification and protection of historic properties and compliance with applicable provisions of NHPA. This will include acceptance of the inventory report by the Forest Archaeologist or other FS archaeologist with delegated responsibilities and appropriate SHPO and tribal consultation.

Chapter 4 - Consultation and Coordination

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment. Other groups and individuals who were sent the proposed action but who did not provide comments are feedback can be found in the project record.

Interdisciplinary Team Members:

Specialists Contributing to the EA

Gary Hase, Jr. – Rangeland Resources
Mandy Roesch – Rangeland Resources
Sara Dechter- Interdisciplinary Team Lead, Wild and Scenic Rivers, Environmental Justice
Tom Runyon – Soil and Water, Wetlands, Springs and Riparian Resources
Debbie Crisp – Botany and Weeds
Julia Camp – Wildlife and Fish
Charlotte Minor - Scenery
Brian Poturalski – Recreation and Wilderness
Jeremy Haines – Heritage Resources
Brian Blanchard – Fire and Fuels

Other Contributors

Mike Childs – Fish Biologist
Janie Agyagos – Wildlife Biologist, Red Rock Ranger District
Amina Sena - Hydrologist, Red Rock Ranger District
Leah Schofield – Environmental Coordinator
Erin Phelps – NEPA Writer-Editor
Laura Moser – Weeds Program Manager

Federal and State Officials and Agencies

US Fish and Wildlife Service
Arizona Department of Game and Fish
Arizona State Lands Office
Arizona Department of Environmental Quality

Tribes

Hopi Tribe
Navajo Nation
Hualapai Tribe
White Mountain Apache Tribe
Fort McDowell Yavapai Nation
Yavapai-Apache Nation
Tonto Apache Tribe
Yavapai Prescott Tribe
San Carlos apache Tribe

Others

Dustin and Becki Ross, Windmill Mountain Ranch
Center for Biological Diversity
Friends of Anderson Mesa

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Glossary

A

Actual Use: The actual number of livestock and period of use for each pasture reported by the permittee at the end of the current grazing season.

Adaptive Management: The alternatives are designed to provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicated that desired conditions are not being achieved, management will be modified in cooperation with the permittee. Changes may include administrative decisions such as the specific number of livestock authorized annually, specific dates of grazing, class of animal or modifications in pasture rotations. Such changes would not exceed the limits for timing, intensity, duration and frequency defined for the alternatives.

Allotment Management Plan (AMP): A document that specifies the actions to be taken on individual allotments to manage and protect the rangeland resources and reach the stated set of objectives. A long-term operating plan which is the implementing document for the decision made through the National Environmental Policy Act process and promotes progress toward desired future conditions.

Annual Operating Instructions (AOI): A set of instructions cooperatively developed by the Forest Service and range permittee on an annual basis that explains the specific pastures to be used and adjustments to the allotment management plan for the current year only

Animal Unit (AU): A standardized measure of animals for agricultural purposes. The standard measure for an AU is a 1000 pound beef cow that requires 26 pounds of forage/day. Based on this standard, AUs can be calculated for other animals. For example, a 700 pound steer would be 0.80 AUs.

Animal Unit Month (AUM): The amount of oven-dry forage (forage demand) required by one animal unit for a standardized period of 30 animal-unit-days. The term AUM is commonly used in three ways: (a) stocking rate, as in “X acres per AUM”; (b) forage allocations, as in “X AUMs in Allotment A”; (c) utilization, as in “X AUMs utilized in Unit B”.

Antidegradation Clause: Rules or guidelines that are required of each state by federal regulations implementing the Clean Water Act (CWA), stating that existing water quality be maintained even if the current water quality in an area is higher than the minimum permitted as defined by federal ambient water quality standards.

Authorized Use: The number of livestock and season of use authorized for the permittee by the responsible official for the current grazing season.

B

Best Management Practices (BMPs): A combination of practices that are the most effective and practical means of achieving resource protection objectives (primarily water quality protection) during resource management activities.

Biomass: The total mass of living organisms within a particular environment.

Browse: (1) The part of shrubs, half shrubs, woody vines, and trees available for animal consumption; or (2) to search for or consume browse.

Browse Plant or Browse Species: a shrub, half shrub, woody vine, or tree capable of producing shoot, twig, and leaf growth suitable for animal consumption.

C

Canopy Cover Data: Cover data obtained from an individual species.

Capability: Grazing capability of a land area is dependent upon the interrelationship of the soils, plants, and animals. Grazing capacity is a function of capability, proper use by livestock, and the level of management that may be applied. Capability is used to further quantify areas defined as “Full Capacity” in the Coconino National Forest Plan, as amended. Only those acres defined as “Full Capacity” in the Forest Plan were assigned a capability class. Capability classifications are made based on the following three capability classes:

- *Full Capability* - Full Capability areas are those which can be used by grazing animals under proper management without long-term damage to the soil resource or plant communities. Typically, this land is stable. Vegetative ground cover is maintaining site productivity and producing a minimum of 100 pounds of dried forage per acre per year. Soil loss as judged by available techniques is within tolerance.
- *Potential Capability* - : Areas which could be used by grazing animals under proper management but where soil stability is impaired, or range improvements are not adequate under existing conditions to obtain necessary grazing animal distribution. The area is not capable of being fully or adequately utilized by grazing animals. Generally, this land has impaired soil stability, lack of water, steep terrain, lack of access and/or there is insufficient vegetative ground cover to protect the soil, but if treated, developed, or properly managed, could become Full Capability. When determining grazing capacity in the Potential Capability class, conservative allowable use assignments must be made. Rationale for assigned allowable use will be documented.
- *No Capability* - No capability areas are those which cannot be used by animals without long-term damage to the soil resource or plant community, or are barren or unproductive naturally. These areas are not capable of being grazed by domestic livestock under reasonable management goals. Grazing capacity will not be assigned to these areas, even though light livestock use may occur.

Capacity: The average number of livestock and/or wildlife which may be sustained on a management unit compatible with management objectives for the unit. In addition to site characteristics, it is function of management goals and management intensity. Capacity is based on lands identified as “Full Capacity” in the Coconino National Forest Plan, as amended as was further quantified and reduced based on capability class categorization.

Condition: As evaluated and ranked by the Forest Service, is a subjective expression of the status or health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. Soundness and stability are evaluated relative to a standard that encompasses the composition, density, and vigor of the vegetation and the physical characteristics of the soil.

Corral: A range improvement that generally is made of logs, boards or pipe, and is used to hold, load, or unload livestock.

Critical Habitat: That portion of a wild animal’s habitat that is critical for the continued survival of the species (“Critical” is a formal designation under the Endangered Species Act).

Cumulative Effects: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR § 1508.7).

D

Decision Notice: A decision document prepared for an environmental assessment that documents the decision by the Responsible Official and explains the rationale for the decision.

Deferment: The delay of grazing to achieve a specific management objective. A strategy aimed at providing time for plant reproduction, establishment of new plants, restoration of plant vigor, a return to environmental conditions appropriate for grazing, or the accumulation of forage for later use.

Deferred Rotation Management: A grazing system that provides for a systematic rotation of the deferment among pastures to provide for plant reproduction, establishment of new plants, or restoration of plant vigor.

Developed Recreation: Recreation areas that require facilities that result in concentrated use of an area. Examples are campgrounds and ski areas. Facilities might include roads, parking lots, picnic tables, toilets, water systems, ski lifts, and buildings.

Direct Effects: The effects caused by the action and occur at the same time and place (40 CFR§ 1508.8).

Dispersed Recreation: Recreation use that occurs outside of developed sites and requires few, if any, improvements other than roads and trails. Representative activities are hiking, backpacking, driving for pleasure, viewing scenery, snowmobiling, cross-country skiing, hunting, off-road vehicle use, and berry picking.

E

Vegetative ground Cover: In general, vegetative ground cover is defined as an area having basal vegetation and litter that is 0.5 inches or deeper on the soil surface.

Environmental Assessment (EA): A concise document that briefly provides sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact.

Environmental Justice: refers to an equitable spatial distribution of burdens and benefits to groups such as [racial minorities](#), and/or residents of [economically disadvantaged](#) areas.

Ephemeral Channels: Watercourses that only flow for hours or days after a rainfall

F

Finding of No Significant Impact (FONSI): A document briefly presenting the reasons why an action will not have a significant effect on the human environment and for which an environmental impact statement will not be prepared (40 CFR 1508.13).

Forage: All non woody plants (grass, grass-like plants, and forbs) and portions of woody plants (browse) available to domestic livestock and wildlife for food. Only a portion of a plant is available for forage if the plant is to remain healthy.

Forage Production: The weight of forage produced within a designated period of time on a given area. Production may be expressed as green, air dry, or oven dry weight. The term may also be modified as to the time of production such as annual, current year, or seasonal forage production.

G

Grasslands: Lands where the vegetation is dominated by grasses, grass-like plants, and/or forbs. Non-forest land is classified as grassland when herbaceous vegetation provides at least 80 percent of the canopy cover excluding trees.

Grazing Intensity: The percentage of forage produced in the current season, to the date of the measurement, that has been consumed or trampled by animals. It is a comparison of the amount of herbage left compared with the amount of herbage that has been produced to the date of the measurement. Grazing intensity is measured at the end of a grazing period. Grazing intensity differs from utilization because it does not account for subsequent growth of either the ungrazed or grazed plants. May also be referred to as “seasonal utilization” or “relative utilization”.

Grazing Intensity Level: Descriptors for grazing intensity levels as determined at the end of the grazing period (FSH, R3-2209.13-2007-1).

Grazing intensity level	Percent of vegetation consumed at end of the grazing period
Light to non-use	0-30 percent
Conservative	31-40 percent
Moderate	41-50 percent
Heavy	51-60 percent
Severe	61+ percent

Grazing Period: The length of time allowed in grazing pasture or unit, usually displayed in number of days. Also referred to as season of use.

H

Head Month (HM): One month’s use and occupancy of range by one weaned or adult animal cow, bull, steer, heifer, horse, burro, mule or five sheep or goats.

Hydrologic Unit Code (HUC): A system of codes used to identify all of the drainage basins in the United States in an arrangement from largest to smallest. A drainage basin is an area or region of land that catches precipitation that falls within that area, and funnels it to a particular creek, stream, river or other watercourse until it drains into an ocean. See the following website for a more extensive explanation: <http://water.usgs.gov/GIS/huc.html>

I

Impaired Soil Condition: Indicators signify a reduction in soil quality. The ability of the soil to function properly has been reduced and/or there exists an increased vulnerability to degradation. An Impaired category indicates a need to investigate the ecosystem to determine the cause and degree of decline. Changes in land management practices or other preventive measures may be appropriate.

Important Bird Area (IBA): an internationally recognized place on the landscape that provides exceptionally valuable or essential habitat for one or more species of birds, including breeding, wintering or migratory habitat.

Indirect Effects: Effects caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR § 1508.8).

Inherently Unstable Soil - These soils have 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. These soils have no capability for grazing.

Interdisciplinary Team (IDT): A group of individuals with skills from different disciplines.

Intermittent Stream: Streams which normally cease flowing for weeks or months every year.

Invasive Species: A species not native to the ecosystem being considered and whose introduction causes or is likely to cause environmental, economic or human harm.

Issue: A subject, question, or unresolved conflict of widespread public discussion or interest regarding management of National Forest System lands.

K

Key Area: A portion of rangeland selected because of its location, grazing or browsing value, or use. It serves as a monitoring and evaluation point for range condition, trend, or degree of grazing use. Properly selected key areas reflect the overall acceptability of current grazing management over the rangeland. A key area guides the general management of the entire area of which it is a part.

L

Lop and scatter: a hand method of removing the upward-extending branches from tops of felled trees to keep slash low to the ground, to increase rate of decomposition, lower fire hazard, or as a pretreatment prior to burning

M

Macroinvertebrate: Animals without backbones that are larger than ½ millimeter, are generally visible to the naked eye, and require a watered environment to persist and/or complete their life cycle. Includes animals such as crayfish, clams, and snails.

Management Area (MA): As defined in the Coconino National Forest Plan, an area that has common direction throughout and that differs from neighboring areas. The entire forest is divided into management areas where common standards and guidelines apply.

Management Indicator Species (MIS): Any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (FSM 2605).

Maximum Numbers: The maximum number of livestock that could reasonably be permitted while making the best use of available capacity.

Mitigation Measures: Actions that are taken to lessen the severity of effects of other actions.

Montane: Pertaining to mountains. A montane meadow is a mountain meadow or a high elevation meadow.

N

Nonpoint source (NPS) pollution: unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

NRIS - Natural Resource Information System: A U.S. Forest Service system that provides information and support for a variety of database, data collection and analysis products. See www.fs.fed.us/emc/nris/products/index.shtml.

P

Pace Frequency Method: A method in which the observer navigates to a designated point, places a quadrat down and identifies all vegetation within the quadrat. The quadrat is then picked up and moved a “pace”, placed on the ground and again all vegetation in the quadrat is identified.

Perennial Stream: A stream or river that has continuous flow in parts of its bed year round.

Permittee: An individual who has been granted a Federal permit to graze livestock for a specific period of time on a range allotment.

Prescribed Fire: Fires set under conditions specified in an approved plan to consume fuels, control unwanted vegetation, stimulate growth of desired vegetation, and change successional stages to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives.

Proper Functioning Condition (PFC): A methodology for assessing the physical functioning of riparian and wetland areas. The term PFC is used to describe both the assessment process, and a defined, on-the-ground condition of a riparian-wetland area. In either case, PFC defines a minimum or starting point. The PFC assessment provides a consistent approach for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. The PFC assessment synthesizes information that is foundational to determining the overall health of a riparian-wetland area. The on-the-ground condition termed PFC refers to *how well* the physical processes are functioning. PFC is a state of resiliency that will allow a riparian wetland system to hold together during a 25- to 30-year flow event, sustaining that system’s ability to produce values related to both physical and biological attributes.

An area is in PFC when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high flows
- Filter sediment and capture bed load
- Aid floodplain development
- Improve floodwater retention and groundwater recharge
- Stabilize streambanks

Protected Activity Center (PAC): A breeding area for a pair of Mexican spotted owls. They are a minimum of 600 acres as mandated by the U.S. Fish and Wildlife Service.

Potential Natural Vegetation Type: The plant community that would become established if all successional sequences were completed without human interference un[present environmental and floristic conditions, including those created by humans.

Prehistoric: Refers to the span of time before recorded history.

R

Range Allotment: A designated area of land available for livestock grazing. Usually a grazing permit is issued designating a specified number and kind of livestock to be grazed according to direction found in an allotment management plan. It is the basic land unit used in the management of livestock on National Forest System lands, and associated lands administered by the Forest Service.

Rangeland (Range): All land producing, or capable of producing, native forage for grazing and browsing animals, and lands that have been revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. It includes all grasslands, forblands, shrublands, and those forested lands which can – continually or periodically, naturally or through management – support an understory of herbaceous or shrubby vegetation that provides forage for grazing or browsing animals.

Responsible Official: Forest Service officer with the authority to make a decision on a NEPA project. Usually a District Ranger or Forest Supervisor.

Rest: To leave an area of grazing land ungrazed for a specific time, such as a year, a growing season, or a specified period required within a particular management practice.

Rest- Rotation Management: A grazing management system in which an individual pasture(s), or grazing unit(s), is given complete rest from livestock grazing for an entire year. The rested pasture will be rested annually to provide all pastures on an allotment with a rest period. Varies from deferred- rotation management in length of time the area is not grazed by livestock: 12 months rather than a portion of the growing season.

Rest-Rotation Management: A grazing management system in which an individual pasture(s), or grazing unit(s), is given complete rest from livestock grazing for an entire year. The rested pasture is rotated annually to provide all pastures on an allotment with a rest period.

Re-vegetation: Re-establishing and developing plant cover. This may take place naturally through the reproductive processes of existing vegetation or artificially by planting.

Riparian Area: Riparian ecosystems are distinguished by the presence of free water within the common rooting depth of native perennial plants during at least a portion of the growing season. Riparian ecosystems are normally associated with seeps, springs, streams, marshes, ponds, or lakes. The potential vegetation of these areas commonly includes a mixture of water and land ecosystems.

Recreation Opportunity Spectrum (ROS): A land classification system that categorizes National Forest land into six classes, each class being defined by its setting and by the probable recreation experiences and activities it affords. The six classes in the spectrum are: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban/

S

Satisfactory Soil Condition: Soil function is being sustained and soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high. These soils have full capability and full grazing capacity.

Scenic Integrity: A measure of the degree to which a landscape is visually perceived to be “complete” and is determined by three factors: dominance, degree of deviation and intactness of desired landscape character. An exception to this is direct human alterations that have become accepted over time as having positive landscape character attributes.

Sediment: Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth’s surface either above or below sea level.

Sensitive Species: Plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution (FSM 2670.5(19)).

Seral stage – An intermediate stage in an ecosystem that is advancing towards its climax community. Usually more than one seral stage evolves until climax conditions are reached.

Stock Tank: A man-made earthen tank for providing water for livestock and wildlife.

Stocking Capacity: The number of Head Months (HM) planned for an allotment.

Structural Improvement (Range and Wildlife): Any type of range or wildlife improvement that is human-made such as fences, water developments, corrals, and waterfowl islands.

Suitability: “The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.” (36 CFR 219.3)

T

Term Grazing Permit (TGP): Authorization for livestock grazing on National Forest System Lands for a specified number of livestock, grazing season, location, and duration of time.

Terrestrial Ecosystem Unit Survey (TEU) : The TEU survey is the result of the systematic analysis, mapping, classification and interpretation of terrestrial ecosystems also known as

ecological types delineated and numbered in ecological units. It is the only seamless mapping of vegetation and soils available across the Forest. TEU boundaries and classifications were determined using a sample of field visited, validated and correlated sites that were interpolated using a Regional and National protocol. The data for the Coconino National Forest was compiled in 1991.

Threatened and Endangered Species: Species identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act, as amended.

- *Threatened Species* - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- *Endangered Species* - Any species that is in danger of extinction throughout all or a significant portion of its range.
- *Proposed Species* - Any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under Section 4 of the Endangered Species Act (50 CFR 402.02).

Trend: The direction of change in resource value ratings or attributes as observed over time. Apparent trend is an interpretation of trend based on observations and professional judgment at a single point in time. Measured trend is quantitative changes in vegetative or soil conditions over time, which can be measured in terms of plant communities or resource value ratings.

Turbidity (or haze): The cloudiness or haziness of a fluid caused by suspended solids that are generally invisible to the naked eye.

U

Understory: The trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Unsatisfactory Soil Condition: Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts. Unsatisfactory soils are candidates for improved management practices or restoration designed to recover soil functions. These soils have potential capability but currently do not provide much forage.

Utilization: The proportion or degree of current year's forage production by weight that is consumed or destroyed by animals (including insects). The term may refer either to a single plant species, a group of species, of the vegetation community as a whole. It is a comparison of the amount of herbage left compared with the amount of herbage produced during the year. Utilization is measured at the end of the growing season when the total annual production can be accounted for and the effects of grazing in the whole management unit can be assessed.

Utilization Guidelines: Guidelines developed for utilization that are intended to indicate a level of use or desired stocking rate to be achieved over a period of years.

W

Waterlot: A range improvement usually constructed of fencing materials that enclose a watering structure that is used to provide water for livestock or to close the water off to livestock.

Watershed: An entire area that contributes water to a drainage or stream.

Watershed Condition Framework: A method for classifying watershed condition based on the following 12 indicators: water quality, water quantity, aquatic habitat, aquatic biota, riparian wetland vegetation, roads and trails, soils, fire regime, forest cover, rangeland vegetation, terrestrial invasive species and forest health,

Wetlands: Areas with shallow standing water or seasonal to yearlong saturated soils including bogs, marshes, and wet meadows. The United States Army Corps of Engineers has jurisdiction over wetlands. According to the 1987 USACE Wetlands Delineation Manual, wetlands must have the following three attributes to be considered wetlands: (1) hydric soils, (2) hydrophytic vegetation, and (3) evidence of frequent inundation.

Wildfire: Any wildland fire that requires a suppression action. This includes all fires not meeting the requirements of a prescribed fire.

Appendix A – Threatened and Endangered Species Recovery Plan Guidance

See Forest Plan compliance supplement for Mexican Spotted Owl Recovery Plan Information.

Table 21: Specific recovery actions for Arizona Cliffrose applicable to the Alternatives 2 and 3

Recovery Action	Specific Action
3b.1. Develop or revise and implement AMPs	Key forage species should include preferred palatable species.
3b.1.	Livestock utilization of AZ cliffrose should be permitted only if the combined utilization of cattle and wildlife does not exceed 20 percent of the growth on any individual. Utilization should be measured each year livestock are within pastures containing AZ cliffrose.
3b.1.	Livestock should be permitted in pastures with AZ cliffrose only during the months October through January when AZ cliffrose is not actively growing
3b.1.	Livestock should not be permitted to use pastures containing cliffrose more frequently than every two years.
3b.1.	No loading areas, salt blocks , mineral, nutrient or watering facilities should be placed or exist within ½ mile of an AZ cliffrose population
3b.2. Continually review utilization, condition and trend	Adjust stocking rates and grazing systems as necessary. Exclusion or rest may be necessary if the current condition is poor or objective is not being met. Review of data should occur at least once per year.
3b.3. Grazing decisions should comply with section 7 of the Act (ESA)	The effects of term grazing permits and management documents including AMPs should be assessed and formal consultation carried out as appropriate.

Appendix B – Supplement Information for Soil Conditions

Soil condition parameters in Table 22 show the variability of conditions that influence a TEUs potential to provide vegetative ground cover.

Table 22: Range of Soil Conditions not included in Desired Conditions by TEU groupings

TEU Groupings	Potential Soil Conditions
55	Bare soil 10-40 percent Rock 4 percent Basal Vegetation 25-50 percent Effective Litter (>.5") 5-30 percent
350	Bare Soil 11-20 percent Rock 58-72 percent Basal Vegetation 6-11 percent Effective Litter (>0.5") 2-8 percent
381, 385	Bare soil 39-80 percent Rock 0-10 percent Basal vegetation 6-15 percent Effective litter (>0.5") 5-50 percent
402, 403, 404	Bare soil 20-65 percent Rock 5-55 percent Basal vegetation 7-20 percent Effective litter (>0.5") 5-15 percent
414, 417	Bare soil 23-70 percent Rock 5-33 percent Basal vegetation 8-15 percent Effective litter (>0.5") 1-8 percent
418	Bare soil 30-40 percent Rock 30-40 percent Basal vegetation 5-10 percent Effective litter (<0.5") 1-10 percent

TEU Groupings	Potential Soil Conditions
420,430,	Bare Soil 5-25 percent Rock 45-56 percent Basal Vegetation 8-12 percent c. cover Effective Litter (>0.5") 2-7 percent
447	Bare soil 35-60 percent Rock 15-40 percent Basal vegetation 6-10 percent Effective litter (>0.5") 5-10 percent
457, 458	Bare soil 3-50 percent Rock 25-73 percent Basal vegetation 5-12 percent Effective Litter (>0.5") 10-20 percent
462, 463, 495	Bare Soil 12-21 percent Rock 28-55 percent Basal Vegetation 6-12 percent Effective Litter (>0.5") 5-15 percent
536, 546, 549	Bare soil 1-10 percent Rock 0.33-11 percent Basal vegetation 2-10 percent Effective litter (>0.5") 20-55 percent
550, 582, 584, 585	Bare soil 3-25 percent Rock 0-19 percent Basal vegetation 3-10 percent Effective litter (>0.5") 18-30 percent
572	Bare soil 15-25 percent Rock 6 percent Basal vegetation 4-10 percent Effective litter (>0.5") 20-50 percent
586	Bare soil 5-10 percent Rock 19 percent Basal vegetation 10-18 percent Effective litter (>0.5") 15-50 percent

TEU Groupings	Potential Soil Conditions
567, 578, 579	Bare soil 2-20 percent Rock 2-15 percent Basal vegetation 2-18 percent Effective litter (>0.5") 20-63 percent

Table 23 shows how many acres are in satisfactory, impaired, satisfactory but inherently unstable and unsatisfactory soil condition occur in each TEU. The Location column distinguishes acres in the winter and summer range and those that are only applicable to alternative 3 in the South Gyberg Pasture.

Table 23: Soil Condition Class by TEU in the Summer Range, Winter Range and South Gyberg Pasture

Terrestrial Ecosystem Unit	Soil Condition Class	Location	Acres
33	Impaired	Winter	83
34	Impaired	Winter	0
45	Satisfactory	Winter	343
50	Unsatisfactory	Summer	87
55	Impaired	Summer	1,286
280	Unsatisfactory	Winter	14
350	Satisfactory	Winter	4,383
350	Satisfactory but Inherently Unstable	Winter	788
350	Satisfactory	South Gyberg Pasture	634
350	Satisfactory but Inherently Unstable	South Gyberg Pasture	71
381	Impaired	Winter	4,451
381	Impaired	South Gyberg Pasture	258
383	Impaired	Winter	136
385	Impaired	Winter	3,974
385	Impaired	South Gyberg Pasture	994
402	Unsatisfactory	Winter	497
403	Impaired	Winter	5,870
404	Impaired	Winter	1,005
414	Impaired	Winter	1,889
414	Unsatisfactory	Winter	1,131
416	Impaired	Winter	3,468
417	Impaired	Winter	2,715
418	Unsatisfactory	Winter	5,024
420	Impaired	Winter	3,654
430	Satisfactory but Inherently Unstable	Winter	1,413

Terrestrial Ecosystem Unit	Soil Condition Class	Location	Acres
447	Impaired	Winter	1,837
448	Impaired	Winter	1,847
448	Satisfactory but Inherently Unstable	Winter	77
457	Impaired	Winter	5,211
458	Impaired	Winter	6,146
462	Impaired	Winter	1,153
463	Impaired	Winter	1,673
471	Satisfactory but Inherently Unstable	Summer	794
471	Satisfactory but Inherently Unstable	Winter	4,284
492	Impaired	Winter	84
493	Satisfactory	Winter	184
495	Satisfactory	Winter	468
536	Satisfactory	Summer	790
546	Satisfactory	Summer	11
546	Satisfactory	Summer	9,088
549	Satisfactory	Summer	12
549	Satisfactory	Summer	3,846
549	Satisfactory	Winter	16
550	Satisfactory	Summer	194
555	Satisfactory	Summer	2
555	Satisfactory	Summer	3,658
555	Satisfactory	Winter	262
565	Satisfactory	Summer	131
567	Satisfactory	Summer	93
572	Satisfactory	Summer	482
572	Satisfactory	Winter	0
575	Satisfactory	Summer	106
578	Satisfactory	Summer	150
579	Satisfactory	Summer	18
579	Satisfactory	Summer	678

Terrestrial Ecosystem Unit	Soil Condition Class	Location	Acres
582	Satisfactory	Summer	1
582	Satisfactory	Summer	7,205
584	Satisfactory	Summer	80
584	Satisfactory	Summer	5,063
585	Satisfactory	Summer	50
585	Satisfactory	Summer	5,094
586	Satisfactory	Summer	110
586	Satisfactory	Summer	3,452
595	Satisfactory	Summer	45
611	Satisfactory	Summer	0
650	Satisfactory	Summer	182
651	Satisfactory	Summer	1,067
654	Satisfactory	Summer	266

Table 24 displays the acres of each TEU grouping within the allotment, what portion is found on slopes greater than 40% (which are often inherently unstable) and whether Pace Frequency monitoring or tenth-acre inventories have been recorded within the TEU within the Windmill West allotment. This table does not show the results of soil assessments and other monitoring conducted on the allotment (See the Soil and Water Specialist Report for more details).

Table 24: Acres of TEU groupings within the Windmill West Allotment in Grazed Pastures

TES Unit/Groupings	Summer Pastures		Winter Pastures		Total Acres	Percent of Allotment Acres	Percent of Grazed Acres	Monitoring Plots	Inventory Plots	Acres with Existing Condition Data	Acres < 40% slope with Existing Condition Data	Acres without Existing Condition Data	Acres < 40% slope without Existing Condition Data
	Acres with < 40% slope	Acres with > 40% slope	Acres with < 40% slope	Acres with > 40% slope									
33	0	0	50	33	83	0%	0%	0	0	0	0	83	50
45	0	0	329	14	343	0%	0%	0	0	0	0	343	329
50	87	0	0	0	87	0%	0%	0	0	0	0	87	87
55	1,286	0	0	0	1,286	1%	1%	1	0	1,286	1,286	0	0
280	0	0	14	0	14	0%	0%	0	0	0	0	14	14
350	0	0	4,383	788	5,171	5%	4%	0	3	5,171	4,383	0	0
381, 385	0	0	8,417	8	8,425	8%	9%	3	0	8,425	8,417	0	0
383	0	0	136	0	136	0%	0%	0	0	0	0	136	136
402, 403, 404	0	0	7,328	44	7,372	7%	7%	1	0	7,372	7,328	0	0
414, 417	0	0	5,728	7	5,735	5%	6%	2	0	5,735	5,728	0	0

TES Unit/Groupings	Summer Pastures		Winter Pastures		Total Acres	Percent of Allotment Acres	Percent of Grazed Acres	Monitoring Plots	Inventory Plots	Acres with Existing Condition Data	Acres < 40% slope with Existing Condition Data	Acres without Existing Condition Data	Acres < 40% slope without Existing Condition Data
	Acres with < 40% slope	Acres with > 40% slope	Acres with < 40% slope	Acres with > 40% slope									
416	0	0	3,278	190	3,468	3%	3%	0	0	0	0	3,468	3,278
418	0	0	4,937	87	5,024	5%	5%	1	0	5,024	4,937	0	0
420, 430	0	0	3,978	1,089	5,067	5%	4%	0	3	5,067	3,978	0	0
447	0	0	1,833	4	1,837	2%	2%	1	0	1,837	1,833	0	0
448	0	0	1,847	77	1,924	2%	2%	0	0	0	0	1,924	1,847
457, 458	0	0	10,960	397	11,357	11%	11%	1	0	11,357	10,960	0	0
462, 463, 495	0	0	3,187	107	3,294	3%	3%	0	3	3,294	3,187	0	0
471	231	563	1,171	3,113	5,078	5%	1%	0	0	0	0	5,078	1,402
492	0	0	84	0	84	0%	0%	0	0	0	0	84	84
493	0	0	184	0	184	0%	0%	0	0	0	0	184	184
536, 546, 549	13,296	451	3	13	13,763	13%	14%	4	0	13,763	13,299	0	0
555	1,810	1,850	52	210	3,922	4%	2%	0	0	0	0	3,922	1,862
550, 582, 584, 585	17,365	322	0	0	17,687	16%	18%	2	0	17,687	17,365	0	0
565	131	0	0	0	131	0%	0%	0	0	0	0	131	131
567, 578, 579	934	5	0	0	939	1%	1%	2	0	939	934	0	0

TES Unit/Groupings	Summer Pastures		Winter Pastures		Total Acres	Percent of Allotment Acres	Percent of Grazed Acres	Monitoring Plots	Inventory Plots	Acres with Existing Condition Data	Acres < 40% slope with Existing Condition Data	Acres without Existing Condition Data	Acres < 40% slope without Existing Condition Data
	Acres with < 40% slope	Acres with > 40% slope	Acres with < 40% slope	Acres with > 40% slope									
572	457	25	0	0	482	0%	0%	1	0	482	457	0	0
575	45	61	0	0	106	0%	0%	0	0	0	0	106	45
586	3,556	6	0	0	3,562	3%	3%	1	0	3,562	3,556	0	0
595	45	0	0	0	45	0%	0%	0	0	0	0	45	45
650, 651, 654	1,354	161	0	0	1,515	1%	1%	0	0	0	0	1,515	1,354
TOTAL	40,597	3,444	57,899	6,181	108,121	100%	99%	20	9	91,001	87,648	17,120	10,848
	<i>Total Summer Pastures Acres</i> 44,041		<i>Total Winter Pastures Acres</i> 64,080			<i>Percent of Total Acres</i>			84.2%	89.0%	15.8%	11.0%	

Appendix C – Activities Considered in Cumulative Effects Analysis

Not all activities in Table 25 were relevant to each resource’s cumulative effects analysis. Projects and their expected outcomes may have been discussed generally or grouped in the effects analysis.

Table 25: Summary of Past, Present and Reasonably Foreseeable Activities for the Windmill West Allotment EA

Project	Description and Relevant Effects	Effects Timeframe
Four-Forest Restoration Initiative EIS: Kaibab and Coconino	Restoring Ponderosa Pine Ecosystems and reducing overstory canopy cover may increase understory vegetation available for ungulates. The large block implementation (30,000 acres) approach would prioritize the north end of the Windmill west allotment for treatment.	Reasonably foreseeable
Cattle Grazing on the Kaibab National Forest	No projects are currently planned in the vicinity of Windmill West. Cattle grazing in allotments are similar in nature, magnitude and scale of effects. There is no grazing permitted in the Sycamore Canyon Wilderness.	Present
Cattle Grazing on the Prescott National Forest	None of the allotments adjacent to Windmill West are currently being reauthorized. Cattle grazing in allotments are similar in nature, magnitude and scale of effects. There is no grazing permitted in the Sycamore Canyon Wilderness.	Present
Cattle Grazing on the State Trust Lands within the allotment boundary	Under the No Action alternative, livestock grazing may continue or may cease on the subject State Trust lands because of the removal of cattle grazing on adjacent NFS lands. If grazing continues on the State Trust lands, it is unknown as to what level of livestock use would occur as those are management actions that would be determined by the Arizona State Land Department.	Present

Project	Description and Relevant Effects	Effects Timeframe
	<p>However, it is likely that additional fencing and water developments would be constructed on State Trust Land to facilitate livestock grazing.</p> <p>It is also likely that the loss of the ability to graze the associated NFS lands would result in a livestock operation that is no longer viable and the State Trust lands would no longer be grazed. Under this scenario, existing structural range improvements on State Trust Land would no longer be maintained. The lack of improvement maintenance would result in a loss of water available for wildlife as stock tanks fill with sediment and as the pipeline/drinker system in the winter pastures is no longer operated and degrades. Additionally, as fences degrade due to lack of maintenance, they would likely become an entanglement/impalement hazard for wildlife.</p> <p>Under the modified proposed action and the modified proposed action with South Gybrg, livestock grazing would continue on NFS land within the Windmill West allotment and it is likely that livestock grazing would continue on the approximately 11,500 acres of State Trust lands within the Windmill West allotment. How long these lands continue to be utilized for livestock grazing, and to what level livestock use occurs on these lands would be management actions determined by the Arizona State Land Department. Under this alternative, it is likely that existing structural range improvements on State Trust Land would be maintained.</p>	
<p>Turkey Butte/Barney Pasture Forest Health Restoration Project</p>	<p>This project is designed to reduce improve forest and watershed health in the Turkey Butte and Barney Pasture area. Project activities would include thinning of small and medium diameter trees and prescribed burning.</p>	<p>Reasonably foreseeable</p>
<p>Management of Dead Horse State Park</p>	<p>Dead Horse State Park is a entry point to the windmill West allotment for dispersed recreation including mountain biking and hiking along the Lime Kilm Trail. The Lime Kiln Trail also traverse Arizona cliffrose habitat and the Verde Valley Botanical Area.</p>	<p>Present</p>

Project	Description and Relevant Effects	Effects Timeframe
Sedona Trails Planning	Planning for non-motorized trails in the vicinity of the Windmill West Allotment. There have been several site-specific projects in the area and recently there has been an area-wide effort at trail planning.	Past, Present and Reasonably Foreseeable
Windmill Ranch Horseback Riding outfitter-guide	The Windmill Ranch operates a horseback riding outfitter-guide in the Windmill West allotment and surrounding area west of Sedona.	Present
Jeep Outfitter Guides on the Casner Road	The Casner Road on the Windmill West allotment is only available for motorized recreation by special use permit through outfitter guides.	Present
Mountain Biking Dispersed Recreation	Mountain biking is increasing in popularity throughout the Windmill West allotment. Especially in the winter range west of Sedona. There is an effort by local bike shops, organization and the International Mountain Biking Association to market this activity in the Verde Valley. This increases the potential for recreation-livestock grazing conflicts in the future.	Reasonably Foreseeable
Management of adjacent private lands	<p>The southern end of the Windmill West allotment is in a developing urban/suburban area. The most serious impacts are from land development, road construction, and motorized and non-motorized recreation. These activities can directly destroy Arizona cliffrose or indirectly affect them by increasing soil erosion in the Verde formation and altering potential habitat so that it is no longer support Arizona cliffrose. Existing roads, utility corridors and trails that are present in the area would still be present and their maintenance activities would still have some effect on the Cottonwood population of Arizona cliffrose because they can provide vectors for invasive plant introduction and are sources of soil disturbance. The Forest Service worked with Arizona Public Service on the Phase II Maintenance in Utility Corridors on Arizona National Forests to assure that maintenance and improvements to utility lines within Arizona cliffrose habitat are mitigated, and existing plants are avoided (Phillips, 2008).</p> <p>Most of the recreation activities in areas are non-motorized activities such as hiking, mountain bike riding and horseback riding. The past impacts of these activities are unknown but would be similar to</p>	Past, Present and Reasonably Foreseeable

Project	Description and Relevant Effects	Effects Timeframe
	<p>those of grazing, including trampling, loss of young plants, destruction of flowering stalks (agaves), and impacts to the fragile soil that provides habitat for the species.</p> <p>In 2013, Yavapai County constructed a trail on the land proposed for exchange with the Forest Service. The parcel in question was obtained by the county in a complex agreement that was part of the mitigation for the expansion of Mingus Avenue Bypass (1996). It contains habitat and Arizona cliffrose plants. The effects of this newly constructed trail on Arizona cliffrose are uncertain at this time but observers have noted that the trail constructed through suitable habitat and very near established plants. While this action is not a federal action, it represents an encumbrance on the property to be exchanged as well as increasing the risk of recreational impacts to the Cottonwood population and increases the risks of noxious or invasive weed infestations along the trail.</p>	
<p>Grazing by wild ungulates</p>	<p>Grazing by elk, deer, and antelope occurs throughout the project area. Arizona Game and Fish (AZGFD) estimated that the elk herd size within the allotment is an average of 500 elk in the summer range and 200 elk in the winter range (source: personal communication with L. Luedeker 2013). A number of efforts have been made on the forest to support antelope movement to support antelope movement in the winter range on and in the area surrounding the allotment. Hunting is the main control on the population of wild ungulates in the allotment and occurs at levels that meet AZGFD objectives for population management.</p>	<p>Present</p>
<p>Stock tank invasive aquatic species management</p>	<p>Establish clearance for treatments of non-invasive aquatic species in stock tanks to prevent non-native invasive fish and other aquatic species from being reintroduced to downstream habitat with Threatened, Endangered and Sensitive fish.</p>	<p>Reasonably foreseeable</p>
<p>Invasive Weeds Management on the Coconino, Kaibab and Prescott National Forests</p>	<p>This decision was signed in 2005 and allows the use of herbicides on forest lands, therefore providing a management tool not previously available to forest managers. The document and its provisions were incorporated into the Coconino National Forest Plan by Amendment 20 of the Plan and is presently being implemented across all 3 forests.</p>	<p>Present</p>

Project	Description and Relevant Effects	Effects Timeframe
Verde Valley Botanical Area	The Forest Service has considered Arizona cliffrose and its habitat, including the botanical area, in its actions since 1987 and has implemented many favorable actions that benefit cliffrose such as motorized vehicle closures, and eliminating such activities as trash dumping and “party spots”.	Present
APS VR1 Windmill Ranch 69 kV Line	Proposal to construct a 2 mile section of new 69kV aerial power line and platform substation near the Windmill Ranch west of Sedona.	Reasonably foreseeable
Maintenance of 69 KV Powerlines	There are several 69 KV or larger powerlines maintained by Arizona Public Service in the allotment. The right of way for these lines will continue to be maintained per national standards for vegetation clearance and approved by appropriate NEPA analysis.	Present
Coconino NF Travel Management	As a result of the Travel Management decision in October 2011, public cross-country vehicle travel is no longer allowed on most of the forest. This reduces the expansion of bare soil from motorized vehicles and nearly eliminates direct impacts of legal off-road motorized vehicles travel. Limited administrative and access for permitted uses such as livestock grazing are the extent of permitted off-road travel.	Present
Maintenance of Forest Roads in and around the Windmill West allotment	Routine maintenance of roads for administrative and public use would continue throughout the cumulative effects area according to Forest Service policy.	Present
Greasy Spoon Road Maintenance - Phase 2	Perform repair work on Greasy Spoon Road	Reasonably foreseeable
Spring Creek (Oak Creek Aquatic Species Protection)	Bureau of Reclamation (BOC) project to construct a fish barrier on Oak Creek to protect the native fishery. BOC will prepare the NEPA document for Forest Service review.	Reasonably foreseeable

Project	Description and Relevant Effects	Effects Timeframe
Spring Creek Aquatic Protection Program	Construct a fish barrier on lower Spring Creek to prevent the upstream migration of non-natives and reintroduce native fish.	Reasonably foreseeable
Coconino County –Planning for Roger’s Lake	Coconino County acquired the majority of Roger’s Lake from the State Lands Department in 2010 as open space.	Present
Oak Creek Watershed Council activities	The Oak Creek Watershed Improvement Plan is currently being developed implemented by the Council. The council has started a clean up campaign and an Oak Creek Ambassadors program. They are installing pet waste stations and sampling E. coli levels at recreation sites in the summer. The Council has proposed to develop small-scale green infrastructure and other sediment retention to slow, spread and sink stormwater close to where it lands and help prevent <i>E. coli</i> pollution and the sediment that may host it from flowing quickly into Oak Creek on the Little Elf property. (source: http://www.oakcreekwatershed.org/2011-12-24-01-09-05/ocwc-work-plan-2013-2014)	Present and Reasonably foreseeable
Private lands in Oak Creek Canyon	Outdated septic tanks contribute to E. coli exceedences in Oak Creek	Present
Climate change	Global climate change is expected to be a source of widespread disturbances. Higher temperatures will occur and precipitation cycles will be modified from current patterns over large areas. The warmer climate conditions may affect ecosystems by altering biotic and abiotic factors and increase the extent and severity of disturbances for some species (Bradley et al 2010, Hellmann et al 2008, Middleton 2006). Larger and more frequent fires are expected (Marlon et al. 2009). Climate may favor the spread of invasive exotic grasses into arid lands where the native vegetation is too sparse to carry a fire. When these areas burn, they typically convert to non-native monocultures and the native vegetation is lost (USDA Forest Service 2010).	

16 April 2014 ERRATA to the Windmill West Environmental Assessment

Page #	Paragraph #	Correction Summary
Clarifications (minor errors, corrections, replacements)		
58 All All All	3	“USLE”= Universal Soil Loss Equation “mitigation measures” and “design features” = resource protection measures “Forest”, “CNF”, and “COF” = “Coconino National Forest” “term grazing permit” = “TGP” = ten-year TGP
2, 33	4, 1	Replace “156,000” = 154,000; “142,000” = 140,500; “14,000” = 13,500; “142,000” = 140,500; “34,600” = 32,400. Replace “Therefore, while the allotment is approximately 156,000 acres in size, the Forest Service manages about 142,000 acres with the remaining 14,000 acres managed by either the Arizona State Land Department or private land owners. Of the 142,000 acres managed by the Forest Service, approximately 34,600 acres have not been actively grazed in the past ten years.” = The allotment is approximately 154,000 acres in size, but the Forest Service only has management jurisdiction over about 140,500 acres with the remaining 13,500 acres managed by either the Arizona State Land Department or private land owners. Approximately 32,400 acres of the 140,500 acres managed by the Forest Service have not been actively grazed in the past ten years and would be closed under alternative 2. Under alternative 2, the new allotment boundary and associated activities would be confined to approximately 108,100 acres
9, 86, 30, 33, 34, 44, 47, 66, 67	2, 2, 3, 1 & 2, 2, 11, 2, 3, 3	“Removed” and “Removal” = Closed, closure to grazing
31	1	“Grazing Intensity: Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the <u>grazing</u> period.” Growing = grazing
33, 102	4, 8	“Surveys should be conducted for Region 3 sensitive plants” = surveys will be conducted
34, 90	3, 1	“A gate will be constructed” both references to Roger’s lake = North Roger’s Lake pasture
36 36 89	1 1 3	“Error! Reference Source Not Found.”= Table 3, page 36 “Error! Reference Source Not Found.”= Figure 6, page 37 “Error! Reference Source Not Found.”= Figure 10, page 90
36, 45	Table, 2	“no water” = no accessible water
38, 64	2, 3	Seeding is part of the modified proposed action, but may not actually occur if not necessary because natural seeding is working or if funding does not allow.
42	1 (after table)	“to retain water in earthen stock ponds for wildlife.” Delete “earthen stock ponds” = replace with troughs
43	2	Replace entire bullet point paragraph with: North Gyberg Pasture will be grazed in accordance with guidance in the current Arizona Cliffrose Recovery Plan (USDI FWS 1995). This includes resting the pasture every other year, limiting grazing to October through January, and monitoring cliffrose utilization when livestock use the pasture. If the Recovery Plan is updated during the term of the permit, management of the North Gyberg Pasture will reflect any changes in guidance. If additional populations of Arizona cliffrose are detected outside of North and South Gyberg pastures during the term of the permit, measures will be implemented in compliance with the Arizona Cliffrose Recovery Plan to avoid and minimize impacts from cattle if necessary.
43	9	Replace link < http://www.epa.gov/owow/nps/agmm/index.html > with < http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm >
47	5	“Windmill West currently has no riparian pastures”, but alternative 2 would result in the creation of North Rogers Lake pasture which would be considered a riparian pasture.
71	1	“reliable” = best available
76, 98, 103, 105, 107, 148, 157	3, 3, 1, 8, 1, 2, 2	“removal” = cutting. The juniper vegetation treatments do not include removal, material will be lopped and scattered.

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95, 98	1, 1	<p>“In the 2013/2014 grazing period” = 3/1/2013 to 2/28/2014 “prior to livestock entering” = before = 10/31/2013 “and again on” = during = 12/17/2013 (delete December 16, 2013). “another observation” = after = 2/4/2014</p>
177	1	“Approximately 12,000 acres of wilderness” = 12,800 acres.
Additions		
30	9	“A management guideline of conservative use” (30-40 percent)
30	9	“Within riparian areas, allowable use will not exceed 20 percent on the woody vegetation” when measured at the scale of the pasture.
34, 35, 47, 65, 90	3, 1, 5, 1 and 2, 2 and 3	“This pasture would only be used by livestock a) after July 15” to protect waterfowl nesting habitat “and b) if wildlife” and livestock “utilization...”
35	1	“used to determine if” livestock “use”
36	1	“Bunker Hill” spring
44	5	“A trail assessment will be conducted by a Forest trail” and range specialist.
44	6	“would be surveyed and cleared” by the District or Forest Archaeologist.
44	10	“The preferred fencing material for spring improvements is welded steel pipe” (non-galvanized)
47	5	“This pasture would only be used by livestock a) after July 15” per the Coconino Forest Plan in order to avoid impacts to wetland birds.
61	6	<p>Entirely new section of text, see appendix for tables. Livestock water consumption varies by environmental temperature, class of livestock, weight, and whether cows are lactating or not (Rasby and Walz; 2011). Using the approximate daily water intake amounts presented in Rasby and Walz, the estimated annual water consumption by the maximum permitted livestock number on the Windmill West allotment is approximately 3.6 million gallons or approximately 10.9 acre-feet (see attached Tables 1 and 2). <u>Available Water on the Windmill West Allotment:</u> There are 6 weather stations that approximate precipitation amounts for the Windmill West allotment; 3 stations represent the winter use pastures and 3 stations represent the summer use pastures. For this analysis, each weather station was assumed to represent 1/3 of the acreage within the summer or winter use pastures. Within the winter use pastures, each weather station represents approximately 21,360 acres; within the summer use pastures, each weather station represents approximately 14,680 acres. Average annual precipitation amounts for each station were used to determine the estimated average total annual precipitation amounts for each area using the following calculation: Avg. Ann. precip (inches) ÷ 12 inches/foot x area size (acres) = Estimated Average Total Annual Precipitation Amount (Acre-Feet). Per Baker, 19XX, 3% of total annual precipitation runs off as streamflow (surface water). Based on this analysis, there is an estimated average total annual surface water amount of 1.28 billion gallons (3,936 acre-feet) produced on the Windmill West allotment (see attachment Table 3). The maximum permitted livestock estimated annual water consumption of approximately 10.9 acre-feet represents approximately three tenths of one percent (0.28%) of the estimated average total annual surface water amount on the Windmill West allotment.</p> <p>A fraction of annual surface water is impounded in earthen stock ponds on the Windmill West allotment for livestock and wildlife consumption. There are 296 earthen stock ponds on the Windmill West allotment (FRD Records) and the average capacity of earthen stock ponds on the Coconino National Forest is 2.34 acre-feet (R. Steinke, 3/2014). This equates to a water storage capacity of approximately 693 acre-feet of water. The water storage capacity on the Windmill West allotment represents approximately 17.6% of the total estimated surface runoff for the allotment. Additionally, the estimated annual water consumption by the maximum permitted livestock number on the Windmill West allotment represents approximately 1.6% of the water storage capacity on the allotment.</p>
94	4	Hybrid and “pure” forms of Arizona cliffrose are difficult to distinguish from each other. We regret that there is confusion on the identification of Arizona cliffrose

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		and its hybrids. The Arizona Cliffrose Recovery Plan (1995) stated that hybrids between the endangered form of Arizona cliffrose and the hybrid form may be difficult to recognize. See response to comments documentation for additional explanations and rationale.
97	6	“A long-term monitoring plan will be developed” = plan was developed, finalized, and submitted to FWS on April 3, 2014.
98	2	The Verde Valley Botanical Area would be closed to grazing under Alternative 2.
104	2	“decreased the threats of damage by motorized vehicles to habitat and plants by eliminating” the majority of
189	7	References: Baker, M.B. Jr. 1987. The diversity in streamflow response from upland basins in Arizona. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. December (149) p. 211-215.
Deletions		
30	2	“AOIs would be developed in the spring... and fall...” Delete both words “early”.
30	9	“ Utilization: ” replace last sentence “Both the” with- Both the herbaceous and woody vegetation utilization guidelines take into account the cumulative effects of wildlife and livestock use. Delete “allowable use and the” and “browsing”
32	2	Delete entire bulleted paragraph because content is clearly presented earlier in text. <ul style="list-style-type: none"> • “Grazing Periods: The AOI would state the planned graze period for each pasture for each grazing year. However, the actual grazing period within each pasture would depend on current growing conditions and the need to provide for plant recovery following grazing. The length of the grazing period within each pasture would also be dictated by the allotment-wide allowable use guidelines.”
32	3	Replace the sentences starting with “Following” and “Using” with- Following the Region 3 supplement to the Grazing Permit Administration Handbook 2209.13-2006-1, the Standardized Precipitation Index (SPI) combined with site-specific information, will be used to assess drought conditions and determine necessary adaptive management alternatives. Delete- “FSH”, “moisture”, and “A determination for drought will be made using the SPI and monitoring plot data will be used as a baseline, providing for the proper evaluation of.”
32	7	“Pasture use periods may need to be shortened.” Delete sentence- Pastures will not be grazed twice during the same grazing season and this may ultimately result in an early exit from the allotment.
34	4	“Management practices ...” Delete- haying [and] placement of
43	7	“Work on projects, such as trick tanks, fences, and roads, will occur.” Delete words- pipelines, powerline.
56	Table 8	Delete “3) These desired conditions are based on the TEU-estimated tolerable ground cover which includes graminoid basal area plus litter greater than 1” in thickness but does not include rock fragments.”
88	1, Table 13	“Riparian Stream courses within Allotment Boundary”. Delete word- Proposed.

Appendix

Cows	Use (gal./day)	Use Period on Windmill West	Use Period (Days)
Lactating Cows (Winter)	14.5	3/1 to 5/15	76
Lactating Cows (Summer)	18.2	5/16 to 10/31	169
Wintering Cows	8.3	11/1 to 2/28	120
Bulls	Use (gal./day)	Use Period on Windmill West	Use Period (Days)
Bulls; 1,600 lbs. + (Winter)	10.8	11/1 to 5/15	196
Bulls; 1,600 lbs. + (Summer)	20.6	5/16 to 10/31	169
Calves	Use (gal./day)	Use Period on Windmill West	Use Period (Days)

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Calves (Winter/Summer)	3.4	3/1 to 8/31	184
Calves (Summer)	6.7	9/1 to 10/31	61

Table 2: Estimated Annual Water Consumption by Maximum Permitted Livestock Numbers					
Use Period	Number	Days	AUDs	Gallons/AUD	Estimated Consumption (Gallons)
BULLS					
Winter	30	196	5,880	10.8	63,504
Summer	30	169	5,070	20.6	104,442
Annual Total					167,946
COWS					
Winter - Lactating	535	76	40,660	14.5	589,570
Winter - Dry	535	120	64,200	8.3	532,860
Summer - Lactating	535	169	90,415	18.2	1,645,553
Annual Total					2,767,983
CALVES					
Winter/Summer	428	184	78,752	4.75	374,072
Summer	428	61	26,108	9.5	248,026
Annual Total					622,098

Total Estimated Annual Cattle Consumption (gallons)	3,558,027
Total Estimated Annual Cattle Consumption (acre-feet)	10.9

Factors and Assumptions used for calculating the Estimated Annual Water Consumption
1) Daily use rates presented in Rasby and Walz are a factor of ambient temperature. For calculating the estimated water consumption, the highest daily intake level for each class of livestock was used for the winter and summer periods. This approach likely results in over estimating cattle water consumption.
2) Maximum permitted livestock numbers are 565 head. For a cow/calf operation assume: 30 bulls; 535 cows; annual calf crop of 80% (428 calves).
3) Assuming an 80% calf crop means that 20% of the cow herd (107 cows) would be without calves and not lactating. Non-lactating cows have a much lower daily intake level of water than lactating cows. This factor was not accounted for in the estimated water use calculation; all cows were assigned the higher daily use rate of lactating cows from parturition to weaning (assumed 3/1 to 10/31). This approach likely results in over estimating cattle water consumption.
4) Rasby and Walz do not provide daily use rates for calves less than 400 pounds. However, they do state that Universtiy of Georgia publication estimated 5 to 10 gallons per day for calves in high temperature environments (90 degrees). Neither the winter or summer use pastures on the Windmill West allotment would be considered high temperature environments. Rasby and Walz further state that for a nursing calf , a portion of the daily water needs will come from the dams milk. Considering these factors, an average daily use rate of 4.75 gallons per day was used for calves from 0 to 6 months of age. This use rate is one half of the maximum use rate listed in Rasby and Walz for a 400 pound calf (9.5 gallons/day).
5) For the purposes of calculating the estimated annual water consumption for calves: calves are on the allotment from 0 to 8 months of age (3/1 to 10/31); from 0 to 6 months of age (3/1 to 8/31), calves weigh less than 400 pounds; from 6 to 8 months of age (9/1 to 10/31), calves weigh more than 400 pounds but less than 600 pounds.

Table 3: Estimated Average Annual Precipitation and Surface Water Amounts for the Windmill West Allotment

	Acres	Avg. Annual PPT (inches)	Avg. Annual PPT (feet)	Estimated Average Total Annual Precipitation Amount (Acre-Feet)	Estimated Average Total Annual Precipitation Amount (Gallons)	Estimated Average Total Annual Surface Water Amount (Gallons)	Estimated Average Total Annual Surface Water Amount (Acre-Feet)
Winter Pastures	21,360	10	0.83	17,800	5,800,147,800	174,004,434	534
	21,360	12	1.00	21,360	6,960,177,360	208,805,321	641

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	21,360	17	1.42	30,260	9,860,251,260	295,807,538	908
Total	64,080			69,420	22,620,576,420	678,617,293	2,083
Summer Pastures	14,680	14	1.17	17,127	5,580,741,460	167,422,244	514
	14,680	16.5	1.38	20,185	6,577,302,435	197,319,073	606
	14,680	20	1.67	24,467	7,972,487,800	239,174,634	734
Total	44,040			61,778	20,130,531,695	603,915,951	1,853
Allotment Total	108,120			131,198	42,751,108,115	1,282,533,243	3,936