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Final Environmental Assessment

Hackberry and Pivot Rock Range Allotment

Mogollon Rim and Red Rock Ranger Districts
Coconino National Forest
Yavapai and Coconino Counties, Arizona

Photo of Pivot Rock

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Figure 1

Vicinity Map for Hackberry and Pivot Rock Range Allotments

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Chapter 1 – Purpose and Need

Introduction

This Environmental Assessment (EA) describes a Forest Service proposal to authorize grazing on the Hackberry and Pivot Rock Range Allotments located on the Red Rock Ranger District and Mogollon Rim Ranger District of the Coconino National Forest.

Federal actions such as the authorization of grazing must be analyzed to determine potential environmental consequences pursuant to the National Environmental Policy Act of 1969 (NEPA) and the Rescission Act (P.L 104-19, 1995). The Council on Environmental Quality regulations define an environmental assessment as a "concise public document" that "shall include brief discussions" of the need for the proposal, alternatives to the proposal, discussion of environmental effects based on the substantive issues, and a listing of agencies and persons consulted (40 CFR 1508.9).

In order to meet the intent of the regulations with respect to "concise" and "brief", the text of this environmental assessment will contain references to the contents of the analysis record whenever possible. Throughout this EA, references to supporting documentation are shown in parentheses. For example, a reference "[PR# 21]" would indicate that a specific passage in the EA is linked to information contained in Document No. 21 in the project record. Supporting documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Blue Ridge Ranger Station on the Mogollon Rim Ranger District in Happy Jack, Arizona. Also, acres used in effects analysis may differ from one resource to another and may not always agree down to the exact acre. This may be due to the type of data base that is being queried to generate acres or rounding parameters that are embedded in the data bases.

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:

Chapter 1. Purpose and Need for Action: 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.
Chapter 2. Alternatives: 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 issues raised during scoping. This discussion includes possible mitigation measures and a comparison of the alternatives.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental consequences or effects of implementing the proposed action and other alternatives.
Chapter 4. Monitoring and Adaptive Management: This chapter describes the type of monitoring and any adaptive management actions that would occur under the action alternative during the life of the decision.
Chapter 5. Consultation and Coordination: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Project Background

Location and Setting

The Hackberry and Pivot Rock Allotments are two separate allotments geographically separated from each other but are administered under one permit. The area within the boundaries of the two allotments are referred to as the project area in the Environmental Assessment.

The Hackberry Allotment is located entirely on the Red Rock Ranger District approximately 10 miles southeast of Camp Verde and is roughly bounded by Highway 260 on the north and the Verde River on the south. Elevations run from approximately 3,000 feet to 5,900 feet and vegetation adheres to typical elevation regimes (Figure 2). The general legal description is as follows: T12N R5E Sections 1, 12-13, 24; T12N R6E Sections 1-23, 26-30, 32-33, T12N R6 ½ E Sections 1, 12, 13; T12N R7E Sections 6-7, 18; T12 ½ N R5E Section 36; T12 ½ N R6E Sections 31-36; T13N R5E Sections 25, 36; T13N R6E Sections 19-20, 29-36.

The Hackberry Allotment consists of approximately 24,300 acres, divided into twenty one (21) pastures. Table 1 lists the pastures and water lots.

The Pivot Rock Allotment is located entirely on the Mogollon Rim Ranger District and is roughly bisected by Forest Highway 3 (Lake Mary Road) in the northeast, State Route 87 through the midsection and State Route 260 through the western portions of the allotment (Figure 4). Elevations run from approximately 6,200 feet to 8,000 feet and vegetation adheres to typical elevation regimes. The general legal description is as follows: T14N, R10E, Sections 1, 11-13, 24; T14N, R11E, Sections 6-8, 17-21, 27-34; T13N, R 9E, Sections 9-27, 36; T13N, R10E, Sections 1 10-36; T13N, R11E, Sections 5-9, 14-23, 26-35; T12N, R10E, Sections 1-5, 11-13; T12N, R11E, Sections 2-11, 16-18.

The Pivot Rock Allotment consists of approximately 54,218 acres, divided into forty (40) pastures and water lots. Table 2 lists the pastures and water lots.

Table 1. Hackberry Range Allotment Pastures

Pasture	Acres	Pasture	Acres	Pasture	Acres
Basin	2175	Holding	9	Pambo	974
Buckhead	1351	Jims 1	1370	Partnership Water lot	14
Bull Run	2967	Jims 2	744	Phroney	230
Cottonwood Well	66	Jims Holding	3	Pipeline	1722
Doren	1194	Lower Towel	3707	Saddle Waterlot	4
Hackberry	3050	Mesquite Springs	1800	Teepee	523
Hackberry Basin	182	Middle Towel	1329	Towel Peaks Waterlot	1
Hackberry Springs	55	No Name	3	Towel Waterlot	2
				Upper Towel	801
Allotment Total					**24,276**

Table 2. Pivot Rock Range Allotment Pastures

Pasture	Acres	Pasture	Acres	Pasture	Acres	Pasture	Acres
009	74	Calloway	4515	Kehl	7575	Potato South	1678
011	58	Calloway Gathering	20	Lee Johnson Waterlot	1	Sandrock	1043
012	9	Clear Creek	1489	Long Valley	323	Sandrock Draw Waterlot	4
013	30	Corral	631	Long Valley Waterlot	5	Shipping	637
142A	1	Dry Lake	1930	Miller	4653	Toms Creek	10,307
Baker	1785	Fuller Waterlot	1	Neck 1	820	Twentyseven Mile	2725
Bald	3859	Good Enough Waterlot	1	Neck 2	1410	Vickers Waterlot	1
Bed Bug East	980	Horse	472	Neck 3	240	Waterlot	6
Bed Bug West	2256	Huffer	2450	Potato North	1556	Wingfield Horse	594
Allotment Total							**54,134**

Grazing History

Livestock grazing has occurred in the area since the late 1870's. Permitting began around 1908 with the establishment of the National Forests. No specific documentation is available regarding the type and number of livestock grazed in the early years on an individual allotment, but information does exist for the Coconino National Forest. Tables 3 and 4 below represent livestock numbers on the Coconino National Forest from 1910 to 2000.

Table 3. Permitted Numbers and Head Months on the Coconino National Forest, 1910-2000

Year	Permitted Number	Permitted Head Months	Actual Head Months
1910	33,200	247,000	239,000
1920	49,106	427,000	400,000
1930	19,088	149,000	142,000
1940	19,500	144,992	139,835
Late 1940's-50	19,000	137,589	132,639
1960	18,000	138,906	131,018
1970	19,000	138,688	123,611
1980	17,350	134,589	112,713
1990	17,540	136,160	96,118
2000	16,271	126,684	88,801

Table 4. Sheep and Goats on the Coconino National Forest, 1910-2000

Year	Permitted Number	Permitted Head Months	Actual Head Months
1910	89,550	360,000	300,000
1920	95,090	420,000	350,000
1930	63,080	240,000	200,000
1940	50,000	188,237	153,966
Late 1940's-50	24,000	112,827	94,594
1960	17,000	73,554	66,512
1970	15,000	57,742	53,993
1980	10,000	41,565	13,666
1990	2,670	14,747	12,002
2000	2,670	14,747	10,227

The grazing history of the Hackberry and Pivot Rock Allotments most likely reflects the Coconino National Forest trends, starting with high numbers and generally dropping to the current levels. The current permitted livestock numbers for the Hackberry and Pivot Rock Allotments is 760 head of adult cattle and 10 horses and the permitted season of use is yearlong. The current grazing utilization standard is 50 percent, which is considered 'moderate' seasonal utilization. This permitted use equates to 9,240 Animal Unit Months (AUMs). Actual use on the Hackberry and Pivot Rock Allotments over the past eleven years is shown in Table 5. Actual use averaged 95% of permitted numbers from 1996 to 2001 with slight reductions in stocking level primarily in response to operational requirements and dry years. In response to drought conditions, actual use was reduced from 2002 to 2004 and livestock numbers were gradually increased in 2005 and 2006.

Table 5. Hackberry and Pivot Rock Allotments Actual Use and Permitted Use; 1996 to 2006.

Hackberry and Pivot Rock Allotments Actual Use and Permitted Use											
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Actual Use	8,844	8,856	9,000	9,038	8,964	7,944	5,220	3,707	2,400	4,380	5,160
Permitted Use	9,240	9,240	9,240	9,240	9,240	9,240	9,240	9,240	9,240	9,240	9,240

Per FSH 2209.13 92.31, current management will not be analyzed in detail as a separate alternative because the current management does not meet the Purpose and Need for Action and Forest Plan Standards and Guidelines.

Purpose and Need for Action

The Hackberry and Pivot Rock Allotments are scheduled for an environmental analysis of grazing use on the Coconino National Forest, as required by the Burns Amendment (1995). This analysis is required in order to ensure livestock grazing is consistent with goals, objectives, and the standards and guidelines of the Coconino National Forest Plan[1] (1987, as amended). [PR#14]

The purpose of this project is to authorize cattle grazing in a manner that maintains and/or moves the area toward Forest Plan objectives and desired conditions. There is a need for change from the current management as the allotment is not meeting or moving toward desired conditions in an acceptable timeframe. Specific desired conditions that are not being met include: soil condition, vegetation condition, and riparian and wildlife habitat conditions at certain earthen tanks, springs, and creeks.

There is a need to improve vegetation condition on the allotments. On the Hackberry Allotment, vegetation conditions, as measured by range condition and trend, have declined on 45% of the permanent monitoring locations and a downward trend was observed on 91% of the permanent monitoring locations. On the Pivot Rock Allotment, vegetation conditions have improved or remained static on 100% of the permanent monitoring locations but a downward trend was observed on 29% of the permanent monitoring locations. The decline in vegetation condition, as measured by range condition and trend, are attributable to a reduction in ground cover (vegetation and litter), a reduction in perennial grasses (primarily cool-season grass species), and an increase in unpalatable shrub species. In some areas, the reduction in ground cover and perennial grasses is due to encroachment of ponderosa pine and pinyon-juniper into grasslands and meadows. Impacts from the 1998 to the present drought period, coupled with livestock grazing, are believed to be the significant factors in the decline in vegetation conditions, [PR#38, Range Specialist Report].

[1] Where consistent with the goals, objectives, standards and guidelines of Forest Plans, it is Forest Service policy to make forage from lands suitable for grazing available to qualified livestock operators Authority to manage National Forest System (NFS) rangeland resources is derived from laws enacted by Congress that authorize the Secretary of Agriculture to administer NFS lands and issue necessary regulations. Summaries of these laws and regulations are found in the Forest Service Manual (FSM) Chapter 2201. Forest Service objectives and policies for rangeland management are found in FSM 2202 and 2203.

There is a need to improve soil conditions towards satisfactory conditions on the Hackberry Allotment. Soil conditions on this allotment have declined and currently about 46% of the allotment is in impaired or unsatisfactory condition. No acres are in satisfactory condition currently. There is a need to improve soil conditions towards satisfactory conditions on the Pivot Rock Allotment. There is approximately 4% of the allotment acreage in impaired or unsatisfactory condition, [PR# 39, Soil Water Specialist Report - Existing Condition].

Soil and vegetative conditions are interrelated. Soil conditions are dependent on vegetation type and density, and litter production, which in turn, factor into nutrient cycling and erosion rates. Improving soil and vegetation conditions therefore would also improve nutrient cycling and reduce erosion rates, [PR# 39, Soil and Water Specialist Report].

On the Hackberry Allotment, there is a need to improve about 15 miles of riparian streams and reaches to proper functioning conditions, and to improve riparian conditions at springs in the allotment. Currently, 46% are functional at-risk and 38% nonfunctional. Grazing pressure and trampling have reduced the amounts of woody vegetation and other riparian plant species along several stream reaches and springs. Currently, 55% are either functional at-risk and 5% nonfunctional. [PR# 39, Soil and Water Specialist Report].

On the Pivot Rock Allotment, there is a need to improve about 17 miles of riparian streams and reaches to proper functioning conditions. Riparian conditions of woody vegetation throughout the allotment are poor. In several places on the Pivot Rock Allotment, degradation of stream reaches is attributable to wild ungulate grazing. [PR# 34, Wildlife Specialist Report; PR# 39, Soil and Water Specialist Report].

There is a need to improve the habitat conditions for wildlife and other threatened and endangered species at several stock tanks and at other spring or riparian areas. Livestock grazing at stock tanks, springs, and creeks can cause trampling and removal of aquatic and riparian vegetation, disturbance to the active stream and channel banks, increased sedimentation, decreased water quality and quantity, and disturbance to riparian dependent wildlife and their habitat requirements. [PR#34, Wildlife Specialist Report]

Desired Conditions

Based on Forest Plan guidance and site-specific knowledge of the allotments, the following constitute the desired condition for the allotments. For all resource areas below please refer to [PR#11].

Soil and Vegetation Conditions

Vegetation density, height, canopy cover and production are improving and moving towards Potential Plant Community. Vegetation diversity is improving and moving towards Potential Plan Community. Due to the implementation of mitigation measures and/or adaptive management actions, vegetation condition and trend is improving.

Soil stability is satisfactory with soil loss below tolerance, and there are no visible signs of accelerated erosion. Surface hydrologic soil condition and nutrient cycling is in satisfactory

condition. Soil conditions are improving and moving towards more satisfactory conditions on the Hackberry Allotment. The number of acres in the impaired or unsatisfactory category is decreasing and there are now significant amount of acres in the satisfactory category. Soil conditions in the Pivot Rock Allotment have improved and more acres are now in the satisfactory condition category. Because of improved soil and vegetation conditions, soil nutrient cycling is in satisfactory condition and soil stability is satisfactory with soil loss below tolerance and there are no visible signs of excessive erosion. Surface hydrologic soil condition is in satisfactory condition. [PR#39, Soil and Water Specialist Report]

Riparian Streams and Reaches

Desired conditions based on monitoring, indicates that Hackberry Allotment riparian streams and reaches are improving and are in proper functioning condition or making significant improvements towards desired conditions. Springs are showing marked improvement, with healthy and vigorous riparian vegetation. Woody vegetation and other riparian plant species along stream reaches and springs are increasing.

Desired conditions based on monitoring, indicates that Pivot Rock Allotment riparian streams and reaches are improving and are in proper functioning condition or making significant improvements towards desired conditions. Springs are showing marked improvement, with healthy and vigorous riparian vegetation. Woody vegetation and other riparian plant species along stream reaches and springs are increasing. [PR#34, Wildlife Specialist Report; PR#39, Soil and Water Specialist Report]

Wildlife Habitat Conditions

Desired conditions based on monitoring, indicates that habitat conditions for wildlife and other threatened and endangered species at several stock tanks, spring and riparian areas are improving.

Grass cover, soil litter, and residual forage around tanks and immediate uplands, are being maintained around occupied and recently occupied sites for Chiricahua leopard frog and other important wildlife that occupy or use habitat at earthen tanks, springs and other riparian areas. Emergent, submergent, and floating aquatic vegetation as well as bank side vegetation is present to provide substrate for egg masses to adhere to and hiding cover for all frog life stages. Prevention protocols are in place to avoid the spread of chytrid to aquatic systems. [PR#34, Wildlife Specialist Report]

Objective and Measures

The following Table 6 discloses objectives and measures that would meet the desired conditions for soil, vegetation and wildlife conditions on the two allotments.

Table 6. Objectives and Measures

Objectives	Measures
Range, Upland Vegetation and Soil on Both Allotments	
Improve vegetative diversity towards 2/3 of Potential Plant Community by TES map unit.	Change in the density of species and type present at any one time. This will be variable depending on moisture conditions within next 10 years.
Improve vegetative density, cover, and production to a minimum of 2/3 of Potential Natural Vegetation (PNV) as defined by TES map unit, as evidenced by an effective ground cover (where achievable).	Change in effective ground cover and litter (where achievable) between 13 – 67% PNV dependent upon specific TES Map Units as shown in Chapter 2, Design Features, Table 9, within the next 10 years.
Increase both the probability and rate of improvement of soil and watershed conditions during periods of drought and recovery periods after drought.	Effective ground cover and litter
Wildlife Habitat Conditions for Both Allotments	
Improve effective ground cover in areas around sites that have occupied or potential habitat for wildlife at tanks, springs and riparian areas.	Forage utilization of a maximum of 30-40% in areas around occupied sites, and managing grazing intensity at a moderate 40-50% utilization to a conservative 30-40% utilization level. Utilization will not exceed 20% on the woody vegetation in riparian areas.
Protect riparian areas and stock tanks from the spread of chytrid.	Strict adherence to disease prevention protocol.
Improve riparian conditions	Proper functioning condition

Proposed Action

The Red Rock and Mogollon Rim Ranger Districts are proposing to authorize livestock grazing on the Hackberry and Pivot Rock Range Allotments.

Hackberry Allotment: The maximum permitted livestock use level for the Hackberry Allotment will be 3,800 AUMs. This figure represents the maximum number of AUMs that will be permitted when all pastures on the allotment are available for livestock use, desired conditions for vegetation and soil conditions have been reached, and favorable climate conditions exist. Current vegetation and soil conditions on the allotment will not support this level of livestock use.

Current conditions in the Teepee pasture will not support livestock grazing and this pasture will be deferred from livestock use for a minimum of 10 years due to unsatisfactory soil conditions. Until soil conditions improve in the Teepee pasture, permitted livestock on the Hackberry Allotment will be limited to 3,650 AUMs. This figure represents the maximum number of AUMs that will be permitted when desired conditions for vegetation and soils have been reached on the remainder of the allotment, and favorable climate conditions exist. Current vegetation and soil conditions on the remainder of the allotment will not support this level of livestock use.

Based on current conditions, the permit will be issued for a maximum 2,250 AUMs. This figure represents the maximum number of AUMs that can be supported under current conditions during times of favorable climate. Increases in this permitted use level, up to a maximum of 3,800 AUMs, will not occur until monitoring documents improvement in vegetation and soil condition.

The typical season of use will be 5 months; from December 1 to April 30. The initial permitted livestock use level of 2,250 AUMs, equates to 450 Animal Units for the 5 month season of use. The maximum permitted livestock use level of 3,800 AUMs equates to 760 Animal Units for the 5 month season of use.

Pivot Rock Allotment: The maximum permitted livestock use level for the Pivot Rock Allotment will be 5,250 AUMs. This figure represents the maximum number of AUMs that will be permitted when all pastures on the allotment are available for livestock use and favorable climate conditions exist. Current conditions within the Kehl pasture will not support this level of livestock use.

Current conditions in the Kehl pasture will not support livestock grazing and this pasture will be deferred until desired conditions in the headwater meadow/riparian areas are achieved. Until vegetation and soil conditions improve in the Kehl pasture, Kehl pasture will be deferred from livestock use and the maximum permitted livestock use level on the remainder of the Pivot Rock allotment will be 4,650 AUMs. This figure represents the maximum number of AUMs that can be supported during times of favorable climate. Increases in this permitted use level, up to a maximum of 5,250 AUMs, will not occur until monitoring documents improvement in vegetation and soil condition within Kehl pasture.

The typical season of use will be 7 months; from May 1 to November 30. The initial permitted livestock use level of 4,650 AUMs equates to 750 Animal Units for the 7 month season of use.

For both allotments, annual authorized livestock numbers will be based on existing conditions, available water and forage, and predicted forage production for the year. Adjustments to the annual authorized livestock numbers (increase or decrease) may occur during the grazing year, based on conditions and/or range inspections.

The components of the Proposed Action: *authorization, structural improvements, deferred pastures, resource protection and mitigation measures, monitoring, and adaptive management*, are described in detail in Chapter 2 of the EA.

Management Direction

This action responds to the goals and objectives outlined in the 1987 Coconino National Forest Plan and all subsequent amendments. The Forest Plan provides direction for all resource management programs, practices, uses, and protection measures on the Coconino National Forest.

This project is consistent with direction listed in the forest-wide standards and guidelines [PR# 11 – Existing and Desired Conditions by Resource Area; PR# 14 – Coconino NF Land Management Plan Direction for Range; PR# 56 – Forest Plan Consistency Check] and for the following management areas (MAs), as listed in Table 7. Table 7 also lists the Forest Plan emphasis of each of these management areas. Consistency with the Forest Plan applies only to

the specific activities described in the No Graze/No Action Alternative; Proposed Action Alternative and the No Trailing Alternative.

Table 7. Coconino Forest Plan Emphasis on Management Areas in the Hackberry and Pivot Rock Allotments

Hackberry Allotment			
MA	**DESCRIPTION**	**MANAGEMENT EMPHASIS**	**ACRES**
2	Verde Wild and Scenic River	Maintain the Wild & Scenic River outstandingly remarkable values (ORVs) for scenic, fish, wildlife, and historic and cultural values, while also protecting the river's free-flowing character. The Comprehensive River Management Plan (CRMP) describes in further detail the Wild and Scenic Rivers legislation and the details of the ORVs for this River. The Act also requires that the Wild & Scenic River must first be administered in such a manner as to protect and enhance the river's values, and second to allow other uses that do not interfere with public use and enjoyment of those river values. Protection and enhancement of the specific outstandingly remarkable values and water quality within the VWSR provides the foundation upon which all management actions and authorizations of uses are based. (FP, amendment 19, page 113-114)	1,175
8	Pinyon-juniper Woodland, Greater than 40% Slopes	Emphasize wildlife habitat, watershed condition, and dispersed recreation. Management intensity is low. (FP, amendment 15, replacement p. 139)	26
10	Grassland and Sparse Pinyon-juniper above the Mogollon Rim	Emphasize range management, watershed condition, and wildlife habitat. Other resources are managed to improve outputs and quality. Emphasis is on prescribed burning to achieve management objectives. (FP, amendment 11, replacement p. 162)	398
11	Verde Valley	Emphasize watershed condition, range management, wildlife habitat for upland game birds, and dispersed recreation.	22,701
12	Riparian and Open Water	Emphasize wildlife habitat, visual quality, fish habitat, and watershed condition on the wetlands, riparian forest, and riparian scrub. Emphasize dispersed recreation, including wildlife and fish recreation, on the open water portion. (FP, amendment 11, replacement p. 172)	Small Areas – Not Mapped
TOTAL			**24,300**

Pivot Rock Allotment			
MA	**DESCRIPTION**	**MANAGEMENT EMPHASIS**	**ACRES**
1	Fossil Springs Wilderness	Emphasize wilderness recreation and watershed condition while maintaining wilderness resource values. Manage grazing under Congressional guidelines for grazing in wilderness. Livestock grazing presently occurs in portions of all the wildernesses except Strawberry Crater. (FP, amendment 3, page 105)	227
3	Ponderosa Pine and Mixed Conifer, Less than 40% slopes	Emphasize a combination of multiple-uses including a sustained-yield of timber and firewood production, wildlife habitat, livestock grazing, high quality water, and dispersed recreation. (FP, amendment 11, replacement p. 117)	47,210
4	Ponderosa Pine and Mixed Conifer, Greater than 40%	Emphasize wildlife habitat, watershed condition, and dispersed recreation. Management intensity is low. (FP, amendment 15, replacement p. 139)	1,181

	slopes		
6	Unproductive Timber Lands	Emphasize a combination of wildlife habitat, watershed condition, and livestock grazing. Other resources are managed in harmony with the emphasized resources. (FP, amendment 12, replacement p. 145).	1,457
7	Pinyon-juniper Woodland, Less than 40% Slopes	Emphasize firewood production, watershed condition, wildlife habitat, and livestock grazing. Other resources are managed in harmony with the emphasized resources. (FP, amendment 12, replacement p. 148)	280
9	Mountain Grassland	Emphasize livestock grazing, visual quality, and wildlife habitat. Other resources are managed in harmony with emphasized resources. The smaller mountain meadows in remote areas are managed mostly for wildlife habitat, especially for elk summer range. (FP, amendment 15, replacement p. 158)	59
12	Riparian Areas	Emphasize wildlife habitat, visual quality, fish habitat, and watershed condition on the wetlands, riparian forest, and riparian scrub. Emphasize dispersed recreation, including wildlife and fish recreation, on the open water portion. (FP, amendment 11, replacement p. 172)	632
17	Special Areas (Mogollon Rim Botanical Area)	Emphasize and protect watershed condition and maintain natural ecological conditions on the Research Natural Areas (RNA's) so that they are available for research and education that does not disturb the areas' natural condition. Use restrictions are imposed as necessary to keep areas in their natural or unmodified condition. There is no harvest of timber products, including firewood. RNA's are closed to off-road driving. (FP, amendment 12, replacement p. 194)	375
19	Mogollon Rim	Emphasize dispersed and developed recreation, visual quality, and wildlife travel corridors across the Rim, generally the heads of major canyons running to the northeast. Dwarf mistletoe is aggressively treated through ISM. (FP, p. 200)	2,299
Other		Experimental forest, administrative sites, private land and no MA	533
TOTAL			**54,253**

Public Involvement

This project was first listed in the Coconino National Forest Schedule of Proposed Actions (SOPA) in October 2006. Tribes have been consulted through the Coconino National Forests Annual Project Consultation List specifically about this project since July 2007 [PR#29]. The permittee has been involved early on in the development of this project. On May 24, 2007, a description of the Proposed Action and a series of maps were mailed to individuals and organizations who have expressed interest in similar past projects or who were otherwise determined to be affected (adjacent landowners, interest groups, and agencies). Fourteen (14) comment letters and forms were received during this public scoping period. Of the fourteen comment letters received, 3 did not include any comments and requested to remain on the mailing list only. Of the remaining 11 comment letters, 2 were supportive; 2 supported but had questions of clarification; 2 responded only with additional questions and 5 partially supported and had further recommendations. Some of the recommendations were related to increased effectiveness monitoring, riparian, and livestock numbers. Two comment letters had responded only with additional questions.

The Forest Service addressed all comments, concerns and questions relative to the proposed action. A summary of comments and Forest Service responses can be found in the Project Record [PR#41]. All original comments are also included in the project record.

The Environmental Assessment was completed [PR#67] and mailed on April 11, 2008 for the 30-day Official Notice and Comment period [PR#69 and 70]. A legal notice for an opportunity to comment on the Environmental Assessment was published in the Arizona Daily Sun, the paper of record, on April 11, 2008 [PR#71 and 72]. Five (5) comment letters were received during the comment period from, Clifford Finch, Hackberry and Pivot Rock Permittee; Walter C Richburg, Representative for the Fossil Creek and Thirteen Mile Rock Creek Allotment; Arizona Department of Environmental Quality; Erik Ryberg; and Arizona Game and Fish Department [PR#74].

Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. Issues are best identified during scoping early in the process to help set the scope of the actions, alternatives, and effects to consider; but, due to the iterative nature of the NEPA process, additional issues may come to light at any time. Issues were defined as those directly or indirectly caused by implementing the proposed action. The Forest Service evaluated public comments and separated the various issues and concerns into categories. Some of the concerns were identified as: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Forest Service analyzed all the public comments received during scoping and documented responses to those comments in [PR# 76].

Public scoping comments on the Proposed Action were considered and analyzed during the development of this EA [PR# 26]. Based on the above criteria, there were no issues identified during public scoping [PR# 26], [PR# 41] that would generate an additional alternative.

However, internal resource concerns were identified and analyzed in the Proposed Action. These resource concerns were range condition and trend, soil conditions, riparian streams and reaches and wildlife habitat conditions and have been addressed in several places in the EA; proposed action, objectives and measures, adaptive management, monitoring, mitigation and design features.

Comments received on the Environmental Assessment during the 30-day Official Notice and Comment period were subject to a content analysis process whereby the comments were addressed by the Forest Service, [PR# 76]. Comments ranged from trailing of livestock across the Fossil Creek Allotment; to 'direct effects' have not been adequately addressed; economics; and effectiveness monitoring. All comments have been addressed in the final environmental assessment.

In addition to the above comments, an internal issue arose concerning the protection of Chiricahua leopard frogs and their habitat. This significant and recent development has prompted the Line Officer to direct the Interdisciplinary Team to analyze an additional alternative in detail which is described in this document. This alternative is called the: *No Trailing Action Alternative,* [PR# 82].

Applicable Laws and Regulations

Shown below is a partial list of federal laws and executive orders and Forest Service direction pertaining to project-specific planning and environmental analysis on federal lands. While most pertain to all federal lands, some of the laws are specific to Arizona. Disclosures and findings required by these laws and orders are contained in Chapter 3 of this analysis.

Clean Air Act of 1970, (as amended)
Clean Water Act of 1977, (as amended)
Multiple Use-Sustained Yield Act of 1960
National Historic Preservation Act (NHPA) of 1966, (as amended)
National Forest Management Act (NFMA) of 1976, (as amended)
National Environmental Policy Act (NEPA) of 1969, (as amended)
Endangered Species Act (ESA) of 1973, (as amended)
Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, (as amended)
American Indian Religious Freedom Act of 1978
Archaeological Resource Protection Act of 1980
Wild and Scenic Rivers Act of 1968, (as amended)
Executive Order 13007 (Indian Sacred Sites)
Executive Order 11593 (Cultural Resources)
Executive Order 12898 (Environmental Justice)
Executive Order 13186 (Migratory Birds)
Executive Order 12962 (Aquatic Systems and Recreational Fisheries)

The following is other direction pertaining to project-specific planning and environmental analysis on federal lands.

Forest Service direction on rangeland management (FSM 2202.1, FSM 2203.1, FSH 2209.13).

Federal regulation (36 CFR 222.2 (c)) which states that National Forest System lands would be allocated for cattle grazing and allotment management plans (AMPs) would be prepared consistent with land management plans.

Authorization of cattle grazing permits for a 10-year period is required by law (FLPMA Sec. 402 (a) & (b) (3) and 36 CFR 222.3), unless there is pending disposal, or it would be devoted to other uses prior to the end of 10 years, or it would be in best interest of sound land management to specify a shorter term.

Decision Framework

This EA documents the environmental analysis of the **No Graze/No Action Alternative**; the **Proposed Action Alternative** and the **No Trailing Action Alternative**. The Mogollon Rim District Ranger is the responsible official for deciding whether or not lands within the Hackberry and Pivot Rock Allotments currently authorized for grazing would be authorized in the future and in what manner. Elements of this decision include: *Permitted Livestock (authorization); Season of Use; Management System; Grazing Utilization; Grazing Intensity; Pasture Grazing Period; Deferred Pastures; Structural Improvements; Monitoring; Adaptive Management; and Resource Protection and Mitigation Measures.*

The decision is based on a consideration of the area's existing resource conditions, desired conditions, environmental issues, and the environmental effects of implementing the various alternatives. The District Ranger may select any of the alternatives analyzed in detail, or may modify an alternative, as long as the resulting effects are within the range of effects displayed in this document.

This document is not a decision document. Rather, it discloses the environmental consequences which may occur if the No Graze/No Action Alternative, the Proposed Action Alternative or the No Trailing Action Alternative is implemented. When a Decision Notice (DN) and Finding of No Significant Impact (FONSI) are signed by the Mogollon Rim District Ranger, it will document the decisions made as a result of this analysis. Should the decision authorize livestock grazing, any and all grazing practices adopted and within the scope of this analysis would be further detailed in the terms and conditions of a new term grazing permit, and a new Allotment Management Plan (AMP).

Project Record Availability

The official Project Record (PR) is located at the Mogollon Rim Ranger District office at the Blue Ridge Ranger Station in Happy Jack Arizona. These records are available for public review pursuant to the Freedom of Information Act (5 U.S.C. 552). Copies of the EA are available at the Mogollon Rim Ranger District office and on the Internet at the following addresses:

Mogollon Rim Ranger District, HC 31, Box 300, Happy Jack, Arizona 86024, (928-477-2255)

http://www.fs.fed.us/r3/coconino/nepa/index.shtml

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Chapter 2 – Alternatives

This chapter describes and compares the alternatives considered for the management of grazing on the Hackberry and Pivot Rock Allotments. This section also presents the alternatives in comparative form, 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 (such as variations in grazing utilization, or livestock numbers) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., authorizing or not authorizing livestock grazing). Mitigation and monitoring measures incorporated into the alternatives are also described.

This chapter describes the following:

- Alternatives Considered But Eliminated From Detailed Study
- Alternatives Analyzed in Detail
- Resource Protection Measures Applicable to the Action Alteratives
- Mitigation Measures
- Comparison of Alternatives

Alternatives Considered But Eliminated From Detailed Study

Current Management Alternative

The Interdisciplinary Team evaluated the current grazing management system following guidance in FSH 2209.13 92.31, the Grazing Permit Administration Handbook: "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."

The Hackberry and Pivot Rock Allotments are separated geographically, but are administered under one permit, resulting in a year-long grazing operation. The Hackberry Allotment is currently used for 7 months during the winter (approximately November 1 to May 31) and Pivot Rock Allotment is currently used for 5 months during the summer (approximately June 1 to October 31). The current permitted livestock numbers are 760 head of cattle and 10 head of horses. This permitted use equates to 9,240 Animal Unit Months (AUMs). The grazing management system currently used is an intensive deferred, rest-rotation management strategy and has been in place since 1990. The forage utilization guideline under current management is 50% (combined by livestock and/or wildlife as measured at the end of the growing season). Adjustments in livestock numbers, livestock use periods, and the sequence of pasture use periods are made annually through annual operating instructions (AOI). Under current management, existing structural improvements, including fences, stock tanks and cattle guards, would be maintained by the permittee, but no new infrastructure or improvements would be proposed or developed.

The Current Grazing Management system was not analyzed in detail as an alternative for the following reasons.

- Under the current management on the Hackberry Allotment, soil conditions have declined to where approximately 30% of the allotment is in impaired condition and 16% is in unsatisfactory condition. The remainder of the allotment is classified as inherently unstable (54%).
- Under current management on the Hackberry Allotment, vegetative conditions on the allotment have declined. Approximately 45% of permanent vegetation plots have declined in condition and 91% of the plots are indicating a downward trend.
- Under current management on both allotments, there has been a decline in the condition of riparian areas and headwater meadows. These areas are important habitat for wildlife and threatened and endangered species.
- Under current management on both allotments, there has been a reduction in the amount of riparian vegetation along several stream reaches and springs.

Continuation of current management is not expected to improve soil condition, vegetation condition, or riparian and wildlife habitat conditions. As a result, a current management alternative would not meet the purpose and need of the project and should not be analyzed in detail [PR#10, 11, 12, 18, 19, 38].

Alternatives Analyzed in Detail

The Forest Service analyzed three alternatives; the "**No Graze/No Action Alternative**"; the "**Proposed Action Alternative**" and the "**No Trailing Action Alternative**". A comparison of the design features and environmental effects for these alternatives are found at the end of this chapter.

No Graze/No Action Alternative

The Forest Service is required to analyze the No Action Alternative under the provisions of NEPA (40 CFR 1502.14). For livestock grazing projects, this is considered to be equivalent to No Grazing.

The No Graze/No Action Alternative would not authorize livestock grazing on either the Hackberry or Pivot Rock Allotments. This alternative does not preclude livestock grazing or livestock management on these allotments in the future if a decision is made through another comprehensive analysis to resume these actions.

Under this alternative, all livestock would be removed from the allotment and a term grazing permit would not be issued. Since no grazing would occur there would be no livestock capacity determinations, no utilization or grazing intensity guidelines, no grazing management system, and no implementation or effectiveness monitoring.

Under this alternative, no new structural improvements would be built. Existing structural range improvements would require a separate analysis and coordination with other agencies to determine whether or not to maintain or remove these improvements.

Proposed Action Alternative

The Proposed Action has been developed to meet the project's purpose and need. The Proposed Action consists of five components: ***Authorization, Improvements, 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 Decisionmaking,* September 2009) [PR#5] and the Southwestern Region 3 Supplement (September 2007), [PR#36].

Hackberry Allotment
Maps of allotment features and proposed actions are shown in Figures 2 and 3.

Authorization
Permitted Livestock:
The maximum permitted livestock use level for the Hackberry Allotment will be 3,800 AUMs. This figure represents the maximum number of AUMs that will be permitted when all pastures on the allotment are available for livestock use, desired conditions for vegetation and soil conditions have been reached, and favorable climate conditions exist. Current vegetation and soil conditions on the allotment will not support this level of livestock use.

Current conditions in the Teepee pasture will not support livestock grazing and this pasture will be deferred from livestock use for a minimum of 10 years due to unsatisfactory soil conditions. Until soil conditions improve in the Teepee pasture, permitted livestock on the Hackberry Allotment will be limited to 3,650 AUMs. This figure represents the maximum number of AUMs that will be permitted when desired conditions for vegetation and soils have been reached on the remainder of the allotment, and favorable climate conditions exist. Current vegetation and soil conditions on the remainder of the allotment will not support this level of livestock use.

Based on current conditions, the permit will be issued for a maximum 2,250 AUMs. This figure represents the maximum number of AUMs that can be supported under current conditions during times of favorable climate. Increases in this permitted use level, up to a maximum of 3,800 AUMs, will not occur until monitoring documents improvement in vegetation and soil condition.

Annual authorized livestock numbers will be based on existing conditions, available water and forage, and predicted forage production for the year. Adjustments to the annual authorized livestock numbers (increase or decrease; increases will not exceed permitted livestock numbers) may occur during the grazing year, based on conditions and/or range inspections.

Season of Use:
The typical season of use will be 5 months; from December 1 to April 30. The initial permitted livestock use level of 2,250 AUMs equates to 450 Animal Units for the 5 month season of use. At the maximum permitted livestock use level of 3,800 AUMs, this equates to 760 Animal Units

for the 5 month season of use. The season of use may be extended to 6 months if necessary to achieve management objectives. If the season of use is extended, the permitted AUMs will not be exceeded.

Management:
Livestock grazing will occur through a rotational management system (either deferred or deferred, rest-rotation grazing) which will allow for plant growth and recovery.

The spring move from the Hackberry Allotment to the Pivot Rock Allotment will be completed using vehicles to transport the livestock.

Certain water bodies are deemed important for wildlife use. It is important that a sufficient amount of water be left for wildlife after domestic livestock have been removed from the grazing unit. These water bodies include: Big Willow Spring, Keg Spring, Cedar Spring, Grapevine Spring, Doren's Defeat Spring, Hackberry Springs, Wet Prong Spring, Towel Creek Perennial Pool, Partnership Tank, Phroney Spring and Pipeline Drinker.

There will be only one authorized emergency watering access point to the Verde River and that will be at Gospel Hollow.

Grazing Utilization:
A management guideline of conservative use (30-40% forage utilization as measured at the end of the growing season) will be employed to maintain or improve rangeland vegetation and long term soil productivity. Within riparian areas (Management Area 12 – Riparian and Open Water), utilization will not exceed 20% on the woody vegetation. Annual reductions in the allowable use guideline may be made based on resource conditions.

Grazing Intensity:
Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the grazing period. Grazing intensity will be managed to allow for the physiological needs of plants. Generally, a moderate grazing intensity (40-50%) will be managed for in the winter and spring months when sufficient opportunity exists for plant regrowth. Annual reductions in the grazing intensity guideline may be made based on resource conditions.

Pasture Grazing Period:
The grazing period within each pasture will be based upon weather/climate conditions, current growing conditions and the need to provide for plant regrowth following grazing. The length of the grazing period within each pasture will also consider and manage for the desired grazing intensity and utilization guidelines. The grazing period per pasture will generally not exceed 30 days.

Generally pastures will be grazed only once during the grazing year. However, if the need arises to provide rest (or deferment) for other pastures, a pasture may be used twice provided there has been sufficient vegetative growth/regrowth and grazing is managed within the intensity and utilization guidelines.

To protect and enhance woody riparian vegetation, pastures with riparian areas (Management Area 12, perennial and intermittent streams, springs and seeps) that are grazed during the critical growth period for woody riparian species (3/1-4/30) one year will not be grazed during the critical growth period the following year. Pastures that have these types of riparian areas include: Basin, Bull Run, Doren, Hackberry, Pambo, Phroney, and Lower, Middle and Upper Towel.

When livestock exclosure fences are constructed at spring/seep riparian areas (as identified in the Improvements section, #1 and #2), alternate year livestock deferment during the critical growth period will no longer be necessary.

Structural Improvements:

1. Livestock exclosure fencing will be constructed at the following spring/seep riparian areas: Grapevine Spring (Bull Run pasture), Towel Creek Perennial Pool (Middle Towel pasture), and Wet Prong Spring (Middle Towel pasture). Exclosure fencing will be designed and constructed to protect the important riparian areas while still providing for livestock watering.

2. Lower authorized numbers of livestock combined with pasture rotation schedules are expected to reduce livestock grazing in sensitive areas and allow riparian conditions to improve. However, livestock exclosure fencing may be constructed at additional spring/seep riparian areas if desired conditions are not achieved through the control of livestock grazing. Exclosure fencing will be designed and constructed to protect the important riparian areas while still providing for livestock watering. Pastures with springs or seeps include: Basin, Bull Run, Doren, Hackberry Springs, Pambo, Phroney, and Lower, Middle and Upper Towel.

Deferred Pastures

Teepee Pasture: Livestock use will be deferred in the Teepee pasture due to unsatisfactory soil conditions and the desire to determine the effects of livestock exclusion on soil condition recovery. This pasture will be deferred from livestock grazing for a minimum of 10 years.

Pivot Rock Allotment

Maps of allotment features and proposed actions are shown in Figures 4 and 5.

Authorization

Permitted Livestock:

The maximum permitted livestock use level for the Pivot Rock Allotment will be 5,250 AUMs. This figure represents the maximum number of AUMs that will be permitted when all pastures on the allotment are available for livestock use and favorable climate conditions exist. Current conditions within the Kehl pasture will not support this level of livestock use.

Current conditions in the Kehl pasture will not support livestock grazing and this pasture will be deferred until desired conditions in the headwater meadow/riparian areas are achieved. Until

vegetation and soil conditions improve in the Kehl pasture, Kehl pasture will be deferred from livestock use and the maximum permitted livestock use level on the remainder of the Pivot Rock allotment will be 4,650 AUMs. This figure represents the maximum number of AUMs that can be supported during times of favorable climate. Increases in this permitted use level, up to a maximum of 5,250 AUMs, will not occur until monitoring documents improvement in vegetation and soil condition within Kehl pasture.

Annual authorized livestock numbers will be based on existing conditions, available water and forage, and predicted forage production for the year. Adjustments to the annual authorized livestock numbers (increase or decrease; increases will not exceed permitted livestock numbers) may occur during the grazing year, based on conditions and/or range inspections.

Season of Use:
The typical season of use will be 7 months; from May 1 to November 30. The initial permitted livestock use level of 4,650 AUMs equates to 664 Animal Units for the 7 month season of use. The maximum permitted use level of 5,250 AUMs equates to 750 Animal Units for the 7 month season of use. The season of use may be reduced to 6 months if necessary to achieve management objectives. If the season of use is reduced, the maximum permitted use level of 4,650 AUMs will not be exceeded.

Management:
Livestock grazing will occur through a rotational management system (either deferred or deferred, rest-rotation grazing) which will allow for plant growth and recovery.

The late fall move from the Pivot Rock Allotment to the Hackberry Allotment may be completed using vehicles to transport the livestock or by trailing livestock across the Fossil Creek Allotment. Livestock trailing across the Fossil Creek Allotment will require Forest Supervisor approval. If livestock trailing across the Fossil Creek Allotment is authorized, the trailing activity will be completed in one day and watering of livestock at stock tanks on the Fossil Creek Allotment will not be allowed.

Certain water bodies are deemed important for wildlife use. It is important that a sufficient amount of water be left for wildlife after domestic livestock have been removed from the grazing unit. These water bodies include: Fuller Tank, Dry Lake Tank, Miller Canyon, Lee Johnson Spring and various natural springs in the Huffer and Toms Creek Pastures.

Grazing Utilization:
A management guideline of conservative use, 30-40% forage utilization as measured at the end of the growing season, will be employed to maintain or improve rangeland vegetation and long term soil productivity. Within riparian areas (Management Area 12 – Riparian and Open Water), allowable use will not exceed 20% on the woody vegetation. Annual reductions in the allowable use guideline may be made based on resource conditions.

Grazing Intensity:
Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the grazing period. Grazing intensity will be managed to allow for the physiological

needs of plants. Generally, a moderate grazing intensity of 40-50% in late spring and early summer will be managed for when sufficient opportunity exists for plant regrowth. During the late summer and fall, grazing intensity will be managed at conservative levels, 30-40% for the remainder of the year, when the potential for plant regrowth is limited. Annual reductions in the grazing intensity guideline may be made based on resource conditions.

Pasture Grazing Period:
The grazing period within each pasture will be based upon weather/climate conditions, current growing conditions and the need to provide for plant regrowth following grazing. The length of the grazing period within each pasture will also consider and manage for the desired grazing intensity and utilization guidelines. The grazing period per pasture will generally not exceed 30 days.

Generally pastures will be grazed only once during the grazing year. However, if the need arises to provide rest (or deferment) for other pastures, a pasture may be used twice provided there has been sufficient vegetative growth/regrowth and grazing is managed within the intensity and utilization guidelines.

Structural Improvements

1. Construct approximately 1.7 miles of new 3-strand barbwire fence in Bald pasture. This fence will create the North and South Bald pastures and will allow better control of the timing, intensity, frequency and duration of livestock grazing. This fence will be constructed in accordance with wildlife specifications.

2. If necessary to improve vegetation and soil conditions, construct approximately 3.5 miles of new 3-strand barbwire fence in the Toms Creek pasture. This fence will create the North and South Toms Creek pastures and will allow better control of the timing, intensity, frequency and duration of livestock grazing. This fence will be constructed in accordance with wildlife specifications.

3. The existing 2-wire electric fence that separates Miller and Kehl pastures is no longer functional and will be reconstructed with a standard 4-strand barbwire fence. This fence will be constructed in accordance with wildlife specifications.

4. Construct a new livestock/wildlife exclosure at Cienega Draw in the Potato South pasture to protect important riparian habitat.

5. If necessary to facilitate livestock pasture movement, construct a small (5-10 acre) holding/gathering pasture in the West Bed Bug pasture. This holding/gathering pasture may be constructed either in the northeast corner of the West Bed Bug pasture or near Cart Cabin Tank in the center portion of the West Bed Bug pasture. This fence will be constructed in accordance with wildlife specifications.

Deferred Pastures
Kehl Pasture: Livestock grazing will be deferred from the Kehl pasture until desired conditions in the headwater meadow/riparian areas are achieved. Currently, there are 17 miles of riparian

streams and reaches that need improvement towards Proper Functioning Condition, (PFC). Also, riparian conditions of woody vegetation throughout the allotment are poor and in need of improvement. The primary stressor in these important areas is over-utilization by wild ungulates (principally elk). Until wild ungulate grazing is reduced, the ability for these areas to improve in condition is limited. As a result, it is anticipated that long-term livestock deferment from this pasture will be necessary.

Miller Pasture: Livestock grazing will be temporarily deferred in the Miller pasture until the existing electric fence that separates Miller and Kehl pastures is reconstructed with a standard 4-strand barbwire fence as identified under 'Structural Improvements – No. 3' above.

Potato South Pasture: Livestock grazing will be temporarily deferred in the Potato South pasture until a livestock/wildlife exclosure is constructed at Cienega Draw as identified under 'Structural Improvements' – No. 4' above.

Monitoring

Two types of monitoring will be used, *implementation and effectiveness* monitoring. Implementation monitoring will be conducted on an annual basis and will include: livestock actual use data, grazing intensity evaluations during the grazing season (within key areas), utilization at the end of the growing season (within key areas), and visual observation of vegetation and ground cover.

Effectiveness monitoring to evaluate the success of management in achieving the desired objectives will 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 (annual monitoring) indicate a need. Initial baseline monitoring will occur.

Both qualitative and quantitative monitoring methods will be used in accordance with the Interagency Technical References, Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Handbook (USDA-Forest Service 1997) [PR#68-231].

See Chapter 4, Monitoring and Adaptive Management for further information on rangeland monitoring. Additional monitoring required for other resources is described in this chapter.

Adaptive Management

The Proposed Action Alternative and the No Trailing Action Alternative 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 will be modified in cooperation with the permittee. Adaptive management allows the Forest Service to adjust: the timing, intensity, frequency and duration of grazing; the grazing management system, and livestock numbers. An example of a situation that could call for adaptive management adjustments is drought conditions. If adjustments are needed, they are implemented through the Annual Operating Instructions (AOI). Adaptive management will also allow for the construction of rangeland improvements if they have been identified and are determined, through monitoring,

to be necessary for moving the allotment towards desired conditions. See Chapter 4, Monitoring and Adaptive Management for further information.

Summary Details of the Proposed Action Alternative

Details of the Proposed Action Alternative are displayed in comparison format in Table 8 below for both allotments.

Table 8. Summary of Proposed Action Alternative

Component	Hackberry Allotment	Pivot Rock Allotment
Maximum Permitted Animal Unit Months	Maximum of 3,650 AUMs (with Teepee pasture deferment)	Maximum of 4,650 AUMs (with Kehl pasture deferment)
Initial Permitted Stocking Level	2,250 AUMs	4,650 AUMs
Season of Use	5 months.	7 months.
Grazing Management System	Rotational Management System (either deferred or deferred, rest-rotation grazing)	Rotational Management System (either deferred or deferred, rest-rotation grazing)
Verde River Emergency Water Access	One emergency water access point at Gospel Hollow.	N/A
Maximum Grazing Utilization Guideline	Non- Riparian Areas - 30-40% Riparian Areas – utilization will not exceed 20% on the woody vegetation.	Non- Riparian Areas - 30-40% Riparian Areas – utilization will not exceed 20% on the woody vegetation.
Maximum Grazing Intensity Guideline	Winter/Spring: 40-50% Reductions as Needed.	Late Spring/Early Summer: 40-50% Remainder of the Year: 30-40% Reductions as Needed.
Pasture Grazing Period (Maximum Days)	Generally will not exceed 30 days.	Generally will not exceed 30 days.
Deferred Pastures	**Teepee Pasture.**	**Kehl Pasture.** **Potato South Pasture (Temporary)** Livestock grazing will be temporarily deferred in the Potato South Pasture until a livestock/wildlife exclosure is constructed at Cienega Draw as identified under 'Structural Improvements'. **Miller Pasture: (Temporary)** Livestock grazing will be temporarily deferred in the Miller pasture until the existing electric fence that separates Miller and Kehl pastures is reconstructed with a standard 4-strand barbwire fence as identified under 'Structural Improvements'.
Structural Improvements	1. Livestock exclosure fencing will be constructed at the following spring/seep riparian areas:	1. Construct approximately 1.7 miles of new 3-strand barbwire fence in the Bald pasture.

Component	Hackberry Allotment	Pivot Rock Allotment
	Grapevine Spring (Bull Run pasture), **Towel Creek Perennial Pool** (Middle Towel pasture), **Wet Prong Spring** (Middle Towel pasture).	2. If necessary to improve vegetation and soil conditions, construct approximately 3.5 miles of new 3-strand barbwire fence in the Toms Creek pasture. 3. The existing 2-wire electric fence that separates Miller and Kehl pastures will be reconstructed with a standard 4-strand barbwire fence. 4. Construct a new livestock/wildlife exclosure at Cienega Draw in the Potato South pasture to protect important riparian habitat. 5. If necessary to facilitate livestock pasture movement, construct a small (5-10 acre) holding/gathering pasture in the West Bed Bug pasture.
Monitoring	Annual Implementation Monitoring: Livestock actual use data, grazing intensity evaluations during the grazing season (within key areas), Utilization at the end of the growing season (within key areas), Visual observation of vegetation and ground cover. Effectiveness Monitoring, (Within key areas on permanent transects at an interval of 10 years or less): Both qualitative and quantitative monitoring methods will be used in accordance with the Interagency Technical References, Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Handbook. Effectiveness monitoring may also be conducted if data and observations from implementation monitoring (annual monitoring) indicate a need. Initial baseline monitoring will occur.	Annual Implementation Monitoring: Livestock actual use data, grazing intensity evaluations during the grazing season (within key areas), Utilization at the end of the growing season (within key areas), Visual observation of vegetation and ground cover. Effectiveness Monitoring, (Within key areas on permanent transects at an interval of 10 years or less): Both qualitative and quantitative monitoring methods will be used in accordance with the Interagency Technical References, Region 3 Rangeland Analysis and Management Training Guide, and the Region 3 Allotment Analysis Handbook. Effectiveness monitoring may also be conducted if data and observations from implementation monitoring (annual monitoring) indicate a need. Initial baseline monitoring will occur.
Adaptive Management	Utilize 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.	Utilize 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.

Component	Hackberry Allotment	Pivot Rock Allotment
	Refer to Chapter 4 – Monitoring and Adaptive Management for details.	Refer to Chapter 4 – Monitoring and Adaptive Management for details.
Resource Protection Measures	See Chapter 2 - Alternatives	See Chapter 2 - Alternatives

No Trailing Action Alternative

This alternative is exactly like the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between Hackberry and Pivot Rock Allotments across the Fossil Creek Allotment. All other action items, monitoring and adaptive management options remain the same as in the Proposed Action.

Figure 2. Hackberry Allotment Pastures and Waters

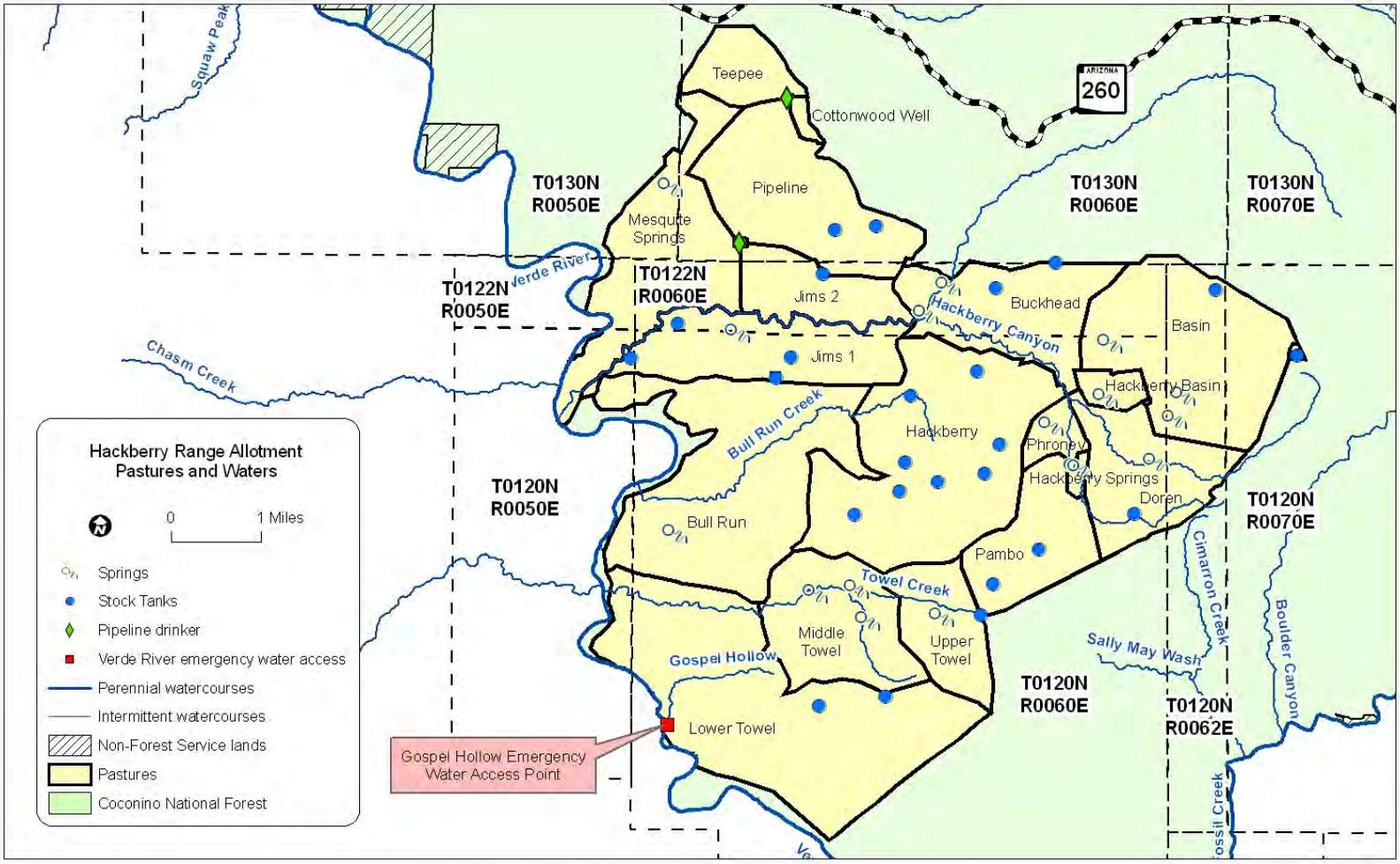


Figure 3. Hackberry Allotment – Proposed Action and No Trailing Action Alternative

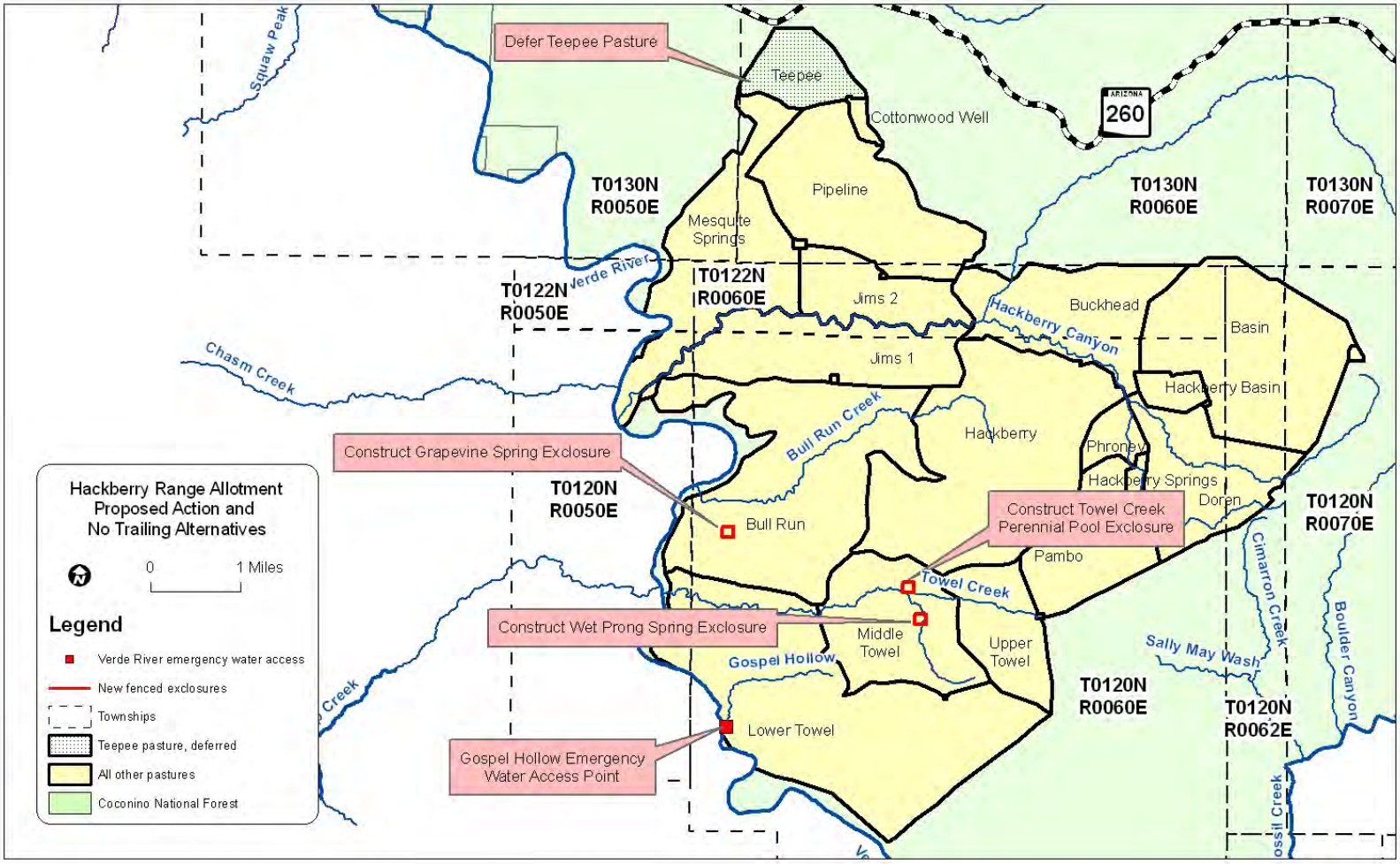


Figure 4. Pivot Rock Range Allotment Pastures and Waters

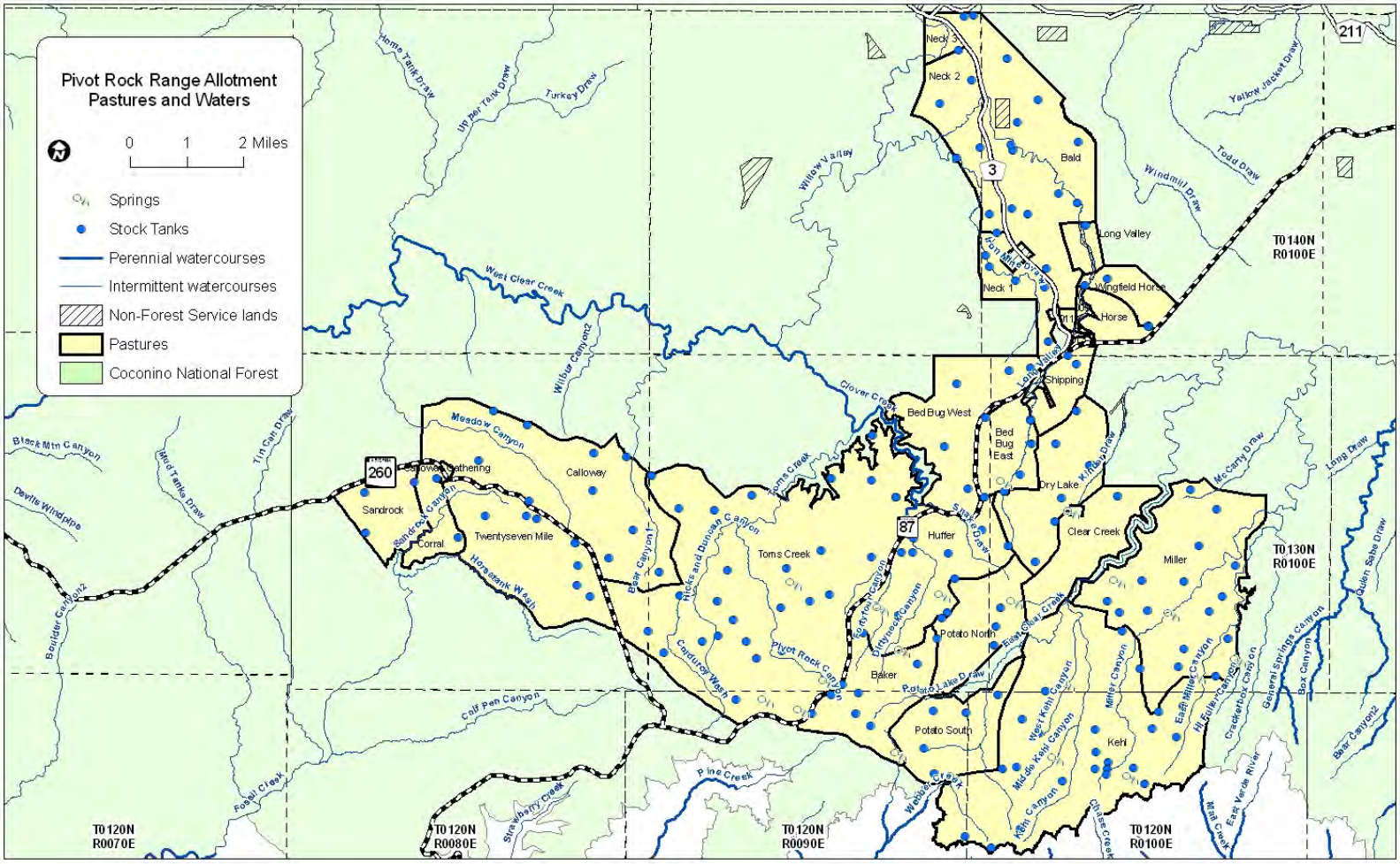
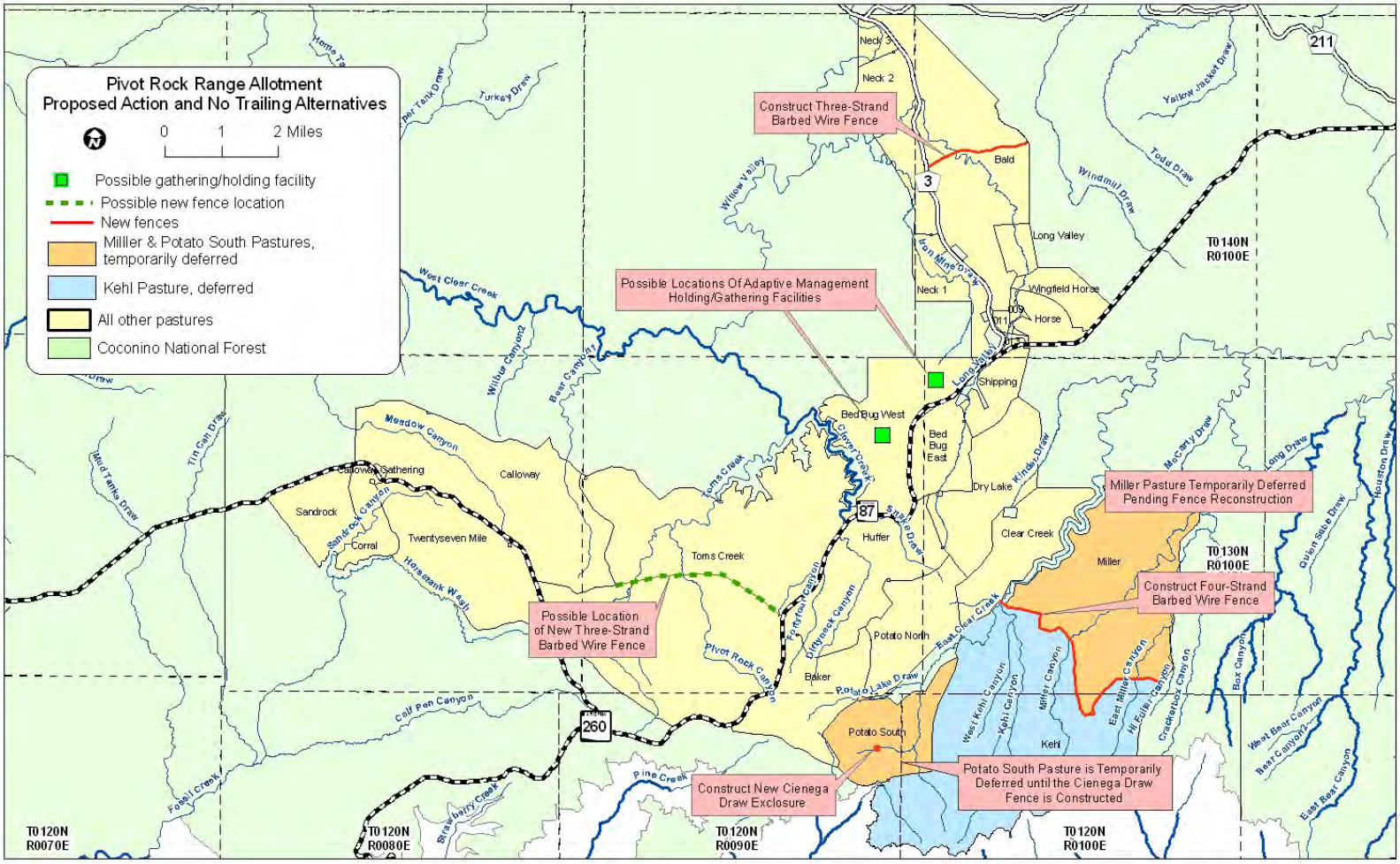


Figure 5. Pivot Rock Allotment – Proposed Action and No Trailing Action Alternative



Resource Protection Measures Applicable to Action Alternatives

The Proposed Action and No Trailing Action Alternatives are designed to comply with Forest Plan Standards and Guidelines, as amended. Design features are incorporated into the project to protect forest resources of rangelands, soil, water, scenery values, wildlife and aquatic habitat, and rare plants. Mitigation Measures and Best Management Practices (BMPs) will be implemented to reduce non-point source pollution into connected waters, prevent the introduction and spread of invasive plants, to retain water in stock tanks for wildlife, to protect heritage resources, and to protect public health and safety during project implementation.

The following design features are incorporated into both the Proposed Action Alternative and the No Trailing Action Alternative. The design features include standard operating procedures and best management practices. Best Management Practices (BMPs) are designed to minimize the potential adverse effects of sedimentation and turbidity of downstream perennial waters. Unless monitoring proves to the contrary, implementation of the following site-specific BMPs constitutes compliance with Arizona State and Federal Water Quality Standards.

Design Features

Range Management

The following actions will be implemented to provide resource information to make adjustments in management and to achieve, maintain or improve the long-term diversity, density, and production of upland vegetation, and achieve the objective of improving and/or maintaining long-term soil productivity and enhancing water quality. [PR# 10, 11, 12, 38, 39]

Permit Compliance

- The District Range Staff will monitor permittee compliance with the Term Grazing Permit, Allotment Management Plan, and Annual Operating Instructions throughout the annual grazing period for the life of the Permit. Compliance with the terms and conditions of the livestock grazing permit will be strictly enforced including livestock grazing scheme, contingencies for drought conditions, monitoring agreements and any cost sharing for structural range improvements.
- Manage livestock grazing intensity and utilization to improve vegetative ground cover and to improve the quality and quantity of desirable vegetation.
- Design and implement a planned grazing system that will provide for adequate rest during the plants' growing season. Monitoring and adaptive management will be used to modify the grazing system to account for the continually changing effects of resource conditions and climate.
- Key grazing areas will be monitored for grazing intensity, utilization, production, and vegetation condition and trend. Areas other than key areas may be monitored to obtain resource information necessary for management decisions.
- To avoid unintentional grazing, ensure that fences (allotment boundary, pasture boundary, exclosure, etc.) are functional prior to moving livestock into a pasture.

Salt

- Utilize temporary salt to improve livestock distribution. Temporary salt will generally be placed no closer than ¼ mile from waters or natural congregating areas such as swales, drainages, riparian areas and meadows. Avoid placement of temporary salt within heritage resource sites. Temporary salt will be moved when livestock distribution objectives are not being achieved or when there is a need to correct localized over use by livestock grazing and when the livestock grazing period ends within a pasture.

Structural Improvements

- Existing range structural improvements are to be maintained. New range structural improvements are to be constructed to standard and maintained as necessary. New structural range improvements such as corrals, troughs, trails, storage tanks, should not be located in areas such as swales, drainages, riparian areas, meadows and heritage sites. The permittee will be responsible for maintaining exclosure fences into Clear Creek and other riparian areas and will ensure that all pasture and exclosure fences are functional before moving any cattle into a pasture. Installation and maintenance of approved range structural improvements will allow for the implementation of proper livestock control and distribution, shorter graze periods and longer rest periods, and other livestock management techniques.

Soil and Watershed Resources

The following measures are designed to achieve the objectives of improving or maintaining long-term soil productivity and enhancing water quality. Applicable Best Management Practices (BMPs) adopted from the *Best Management Practices and Rangeland Guidance Practices for Grazing Activities in Arizona* will be implemented in this project. [PR# 39]

Objectives:

Manage livestock grazing to move towards satisfactory soil conditions through ground cover objectives listed below.

Manage livestock grazing to improve vegetative ground cover on inherently unstable soils.

Ground cover

- Manage livestock grazing at an intensity that will improve vegetative ground cover (primarily the litter component) to enhance soil function (minimizes soil erosion, promotes water infiltration and enhances nutrient recycling) and to improve the quality and quantity of desirable vegetation. Each pasture is grazed in a planned sequence. Adequate rest during the plants' growing season allows plants to become established and grow undisturbed. Adequate rest during the plants dormant season allows for the accumulation of plant litter. Key grazing areas will be monitored to determine when cattle should be moved to prevent over use. A planned grazing system is designed to promote flexibility in the grazing program and to buffer the adverse effects of drought.
- Manage livestock grazing at an intensity that will improve effective ground cover (effective ground cover is defined as the % litter greater than 1.25 cm in size and % total plant basal area) to enhance soil function (minimizes soil erosion, promotes water infiltration and enhances nutrient recycling) and to improve the quality and quantity of desirable vegetation. Target effective ground covers for each Terrestrial Ecosystem Survey (TES) Map Unit should be at a minimum 2/3 of maximum effective ground cover.

- Livestock grazing should be designed to be moving towards these effective ground cover goals or maintaining at the effective ground cover goals. During drought, these effective ground covers will be difficult to attain, but livestock grazing should not decrease existing effective ground cover.
- To filter sediments and maintain bank stability, leave a minimum 10 centimeter residual stubble height of hydrophilic vegetation (sedge/rush) to improve conditions in riparian areas. (Clary and Leininger, 2000).

Table 9. Ground Cover Objectives for Hackberry and Pivot Rock Allotments

Map Unit	2/3 of Natural Ground Cover (%)	Max % Natural Ground Cover	Map Unit	2/3 of Natural Ground Cover (%)	Max % Natural Ground Cover
33	20	30	520	44	65
34	17	25	530	50	75
53	60	90	546	60	90
55	54	80	549	60	90
350	13	20	550	57	85
382	20	30	555	57	85
383	20	30	567	54	80
385	13	20	575	47	70
401	13	20	578	54	80
402	13	20	579	50	75
403	17	25	582	57	85
420	13	20	584	57	85
430	13	20	611	67	100
462	17	25	650	67	100
463	20	30	651	67	100
492	17	25	654	67	100

Noxious and Invasive Weeds

The following Best Management Practices are listed to prevent and control weeds during range management, minimize transport of weed seed into and within allotments, maintain healthy desirable vegetation that is resistant to weed establishment, minimize ground disturbances, and encourage permittees to prevent the introduction and spread of weeds [PR#37]. They are taken from the Range Management BMPs in the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds" (USDA, 2005a).

Best Management Practices (BMPs) for Range Management

- Include weed prevention practices, inspection and reporting direction provisions for inspection of livestock concentration areas in Allotment Management Plans and Annual Operating Instructions for active grazing allotments.
- For each grazing allotment containing existing weed infestations, include prevention practices focused on preventing weed spread and cooperative management of weeds in the annual operating instructions.

- If livestock are potentially a contributing factor to seed spread, schedule units with existing weed infestations to be treated prior to seed set before allowing livestock on those units. Schedule these infested units to be the last in the rotation.
- If livestock were transported from a weed-infested area, corral livestock with weed-free feed, and annually inspect and treat allotment entry units for new weed infestations.
- Designate pastures as unsuitable range to livestock grazing when infested to the degree that livestock grazing will continue to either exacerbate the condition on site or contribute to weed seed spread.
- Through the allotment management plan or annual operating instructions, manage the timing, intensity (utilization), duration, and frequency of livestock activities associated with harvest of forage and browse resources to maintain the vigor of desirable plant species and retain live plant cover and litter.
- Manage livestock grazing on restoration areas to ensure that vegetation is well established. This may involve exclusion for a period of time consistent with site objectives and conditions. Consider practices to minimize wildlife grazing on the areas if needed.
- Include weed prevention practices that reduce ground disturbance in allotment management plans and annual operating instructions. Consider for example: changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.
- Inspect known areas of concentrated livestock use for weed invasion. Inventory and manage new infestations.
- Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with permittee livestock management practices.
- To aid in their participation in allotment weed control programs, encourage permittee to become certified pesticide use applicators.

General Practices for All Site-Disturbing Projects and Maintenance Programs

- Remove mud, dirt, and plant parts from project equipment before moving it into a project area. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean all equipment before entering National Forest System lands; a forest officer, in coordination with the unit invasive species coordinator, needs to approve use of on-forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on a clean roadway. Seeds and plant parts need to be collected when practical and incinerated.
- If operating in areas infested with weeds, clean all equipment before leaving the project site. To minimize time spent cleaning equipment, time all work in infested areas last and concurrently, designate a “contaminated” parking lot where project vehicles working in the infested area may be parked for the duration of the project. This area should be monitored in follow-up mitigation and should be near a “clean” vehicle/equipment lot. Identify sites where equipment and vehicles can be cleaned before leaving the site at the end of the project. Seeds and plant parts need to be collected when practical and incinerated.

- Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment after being trained to recognize the priority species in the area. Proper disposal means bagging the seeds and plant parts and incinerating them.

Mitigation Measures

The following mitigation measures listed in Table 10 below are an integral part of the Action Alternatives. The environmental effects described in Chapter 3 are estimated with the assumption that these measures would be implemented. They have been used on previous projects and are considered to be effective at reducing environmental impacts. They are consistent with applicable Forest Plan Standards and guidelines, and the terms, conditions and conservation measures of existing biological opinions. Implementation of the mitigation measures in combination with project design features will avoid the occurrence of potentially significant environmental impacts.

Table 10. Mitigation Measures and Design Features for the Action Alternatives

#	Mitigation	Purpose & Rationale
Range		
R1	Design and implement a planned grazing system that will provide for adequate rest during the plants growing season. **Applicable to the Soil and Water Resource.**	To achieve the objective of improving and/or maintaining long-term diversity, density, and production of upland vegetation and minimize impacts to riparian areas and habitats of concern.
R2	Utilize salt to improve livestock distribution. Generally, temporary salting will be placed no closer than ¼ mile from the edge of any riparian area, waters or natural congregating areas such as swales, drainages, riparian areas and meadows. Move salt when livestock distribution objectives are not being achieved or to correct localized over use by livestock grazing. There are no permanent salting areas within either of the two allotments. **Applicable to the Soil and Water Resource and Wildlife Resource**	To achieve the objective of improving and/or maintaining long-term diversity, density, and production of upland vegetation.
R3	Existing range structural improvements are to be maintained by the permittee. New range structural improvements and exclosure fencing are to be constructed to standard. New structural range improvements such as corrals, troughs, storage tanks, should not be located in areas such as swales, drainages, riparian areas and meadows. The permittee is responsible for maintaining exclosure fences into Clear Creek and other riparian areas. Ensure that all pasture and	To achieve the objective of improving and/or maintaining long-term diversity, density, and production of upland vegetation. To achieve the objective of protection of Spinedace populations, limit impacts to riparian and other important wildlife habitats that are fenced from grazing; protect overgrazing of pastures that are due to be rested. Installation and maintenance of approved range structural improvements will allow for the implementation of proper livestock control and

#	Mitigation	Purpose & Rationale
	exclosure fences are functional before moving any cattle into a pasture. **Applicable to the Soil and Water Resource, Fisheries Resource and the Wildlife Resource.**	distribution, shorter graze periods and longer rest periods, and other livestock management techniques.
R4	During drought conditions, adjust grazing timing, intensity, frequency, numbers, and the management system as necessary to protect the upland vegetation resource. **Applicable to the Soil and Water Resource.**	To achieve the objective of improving and/or maintaining long-term diversity, density, and production of upland vegetation.
Soil and Water		
SW1	Do not graze soils in unsatisfactory soil condition.	To achieve the objective of improving long-term soil productivity
SW2	Leave a minimum 10 centimeter residual stubble height of hydrophilic vegetation (sedge/rush) to improve riparian conditions in riparian areas.	To filter sediments and maintain bank stability
Fisheries		
F1	If woody riparian vegetation utilization by livestock exceeds 20%, then other actions may be implemented such as fencing, decreasing numbers of livestock, removing livestock or changing the timing of grazing.	To maintain riparian vegetation and maintain age-class distribution of woody riparian vegetation.
F2	If the Palmer Drought Index displays a severe or extreme drought for 3 years or greater in a row, utilization levels will be reduced or grazing deferred until drought conditions lessen and there is conservative utilization for 3 growing season following initiation of wet cycle.	To minimize the effects of drought on plant production and corresponding above ground plant production available for litter.
Wildlife		
W1	Livestock grazing and management activities will occur within PACs, but no human disturbance or construction activities associated with cattle grazing operations would occur within PACs during the breeding season (March 1 through August 31). Although fence construction and reconstruction would not be allowed during the breeding season, fence maintenance, cattle gathering and herding may be allowed if necessary.	To minimize disturbance to MSO during the breeding season, in accordance with Mexican spotted owl recovery plan, 1995, and Region 3 FS Framework for streamlining informal consultation for livestock grazing activities, 2004.
W2	Water will be left in stock tanks for wildlife use after domestic livestock have been removed from the grazing unit. Critical water tanks for wildlife include: Big Willow Spring, Keg Spring, Cedar	To provide for wildlife needs.

#	Mitigation	Purpose & Rationale
	Spring, Grapevine Spring, Doren's Defeat Spring, Hackberry Springs, Wet Prong Spring, Towel Creek Perennial Pool, Partnership Tank, Phroney Spring and Pipeline Drinker, Fuller Tank, Dry Lake Tank, various natural springs in the Huffer Pasture and Toms Creek Pasture, Miller Canyon, and Lee Johnson Spring.	
W3	Fences will be built to wildlife standards (from Coconino Forest Plan page 69).	To facilitate wildlife movement from one pasture to another.
W4	All open storage tanks and drinkers will be provided with entry and escape ramps for wildlife (from Coconino Forest Plan page 69).	To provide for wildlife needs.
W5	Do not place salt in or near riparian areas, mountain meadows or non-riparian drainages in ponderosa pine. Do not place salt in spotted owl PACs or goshawk PFAs. Rotate salt blocks regularly, at least every 2 weeks, within spotted owl restricted habitat.	To minimize grazing impacts to Mexican spotted owls or goshawks.
Wild and Scenic Rivers		
WS1	Monitor and maintain fences along Verde River. There is only one authorized emergency watering access point along the Verde where livestock have access to the river and that is at Gospel Hollow on the Hackberry Allotment.	Minimize impacts to Wild and Scenic Outstanding, Remarkable Values, (ORVs).
Heritage Resources		
HR1	Activities associated with allotment improvements and maintenance will be managed to avoid cultural resource sites and ensure no effect to cultural resources. Any improvements that will be constructed within two years of the decision will be surveyed and cleared prior to authorizing grazing on the allotment. Other improvements will be surveyed prior to construction activities once they have been proposed and located on the ground.	To protect the integrity of the archaeological resource.
HR2	Management practices that tend to concentrate livestock, such as placement of salt, construction of fences, etc., will be located away from cultural resources.	To protect the integrity of the archaeological resource.
HR3	Before initiating any activities, apart from the grazing activity, as part of this project, a District Archaeologist will be notified to ensure the proposed activities have cultural resource clearance and project personnel are	To protect the integrity of the archaeological resource.

#	Mitigation	Purpose & Rationale
	aware of the conditions specified in the final Hackberry and Pivot Rock Range Allotment Cultural Resource Clearance Report. Any additional ground disturbing activities that are proposed in the future must receive archaeological clearance prior to implementation.	
HR4	Located sites will be marked for avoidance and will be avoided during construction of structural improvements. If any new sites are discovered during construction of the improvements, all construction will cease and such findings will be reported to the District Archaeologist. The drive trail between the Hackberry and Pivot Rock Allotments, as it traverses the Fossil Creek Allotment, has not been identified on the ground. The trail will be surveyed and any archaeological sites avoided.	To prevent additional archaeological resource damage.
Botany and Rare Plants		
B1	Survey areas containing proposed structural improvements before construction for TES plants and noxious or invasive weeds before construction of improvement. Identify populations and mitigate impacts of management actions if needed.	Identifies locations of TES plants and identifies potential impacts to TES plants that may found during construction of improvements. Incorporate the appropriate Best Management Practices for soil disturbing activities as outlined in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forest (2005).
B2	Avoid TES plants (if found during survey) during the construction of structural improvements	Mitigates impacts to TES plants.
B3	Identify and treat noxious or invasive weed populations that may occur in areas of proposed structural improvements (refer to noxious or invasive weed report for treatments and mitigations)	Mitigates impacts to TES plants by reducing the risk of noxious or invasive weed infestations in populations or habitats
Invasive Plants		
IP1	A weeds assessment and inventory was completed for this analysis [PR#37]. Weeds species of concern in the allotment would be treated as necessary following guidelines in the Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott National Forest, (USDA, 2005).	To protect and minimize the spread of invasive populations to other uninfested areas.
IP2	Identify and treat noxious or invasive weed populations that may occur in areas of proposed structural improvements. Mitigate impacts to threatened, endangered and R3 Regional Forester's sensitive (TES) plants	To protect and minimize the spread of invasive populations to other areas.

#	Mitigation	Purpose & Rationale
	by reducing the risk of noxious or invasive weed infestations in populations or habitats [PR#37].	

Monitoring

Please refer to Chapter 4, Monitoring and Adaptive Management, for details relative to monitoring.

Future Review of the Decision

In accordance with Forest Service Handbook direction (FSH 1909.15(18) and 2209.13(96)) an interdisciplinary review of the decision will occur within 10 years, or sooner if conditions warrant. If this review indicates that management is meeting standards and achieving desired condition, the initial management activities would be allowed to continue. If monitoring demonstrates that management options beyond the scope of the analysis are warranted, or if new information demonstrates significant effects not previously considered, further analysis under NEPA would occur.

Comparison of Alternatives

This section provides a comparison summary between the three alternatives. Information in Table 11 below is focused on activities that would be implemented within each alternative.

Table 11. Comparison of Alternatives

Grazing Authorization	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
Maximum Permitted Animal Unit Months (AUMs)	0	3,800 AUMs (all pastures used)	5,250 AUMs (all pastures used)	Same as PA
Percent change from current permitted use	100%	29% Reduction	36% Increase	Same as PA
Maximum Animal Units (AUs) based on Proposed Action Season of Use	0	760 AUs	750 AUs	Same as PA
Percent change from current permitted use	100%	1% Reduction	3% Reduction	Same as PA
Initial Permitted Livestock Numbers (AUMs)	0	2,250 AUMs	4,650 AUMs	Same as PA
Percent change from current management	100% Reduction	58% Reduction	21% Increase	Same as PA

Grazing Authorization	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
Initial Permitted Maximum Animal Units (AUs) based on Proposed Action Season of Use	0	450 AUs	664 AUs	Same as PA
Percent change from Current Management	100%	42% Reduction	14% Reduction	Same as PA
Season of Use - (Typical)	0	5 months (December – April)	7 months (May – November)	Same as PA
Season of Use – Current Management	NA	7 months (November – May)	5 Months (June – October)	NA
Grazing Management System	None	Deferred Rotation Or Deferred, Rest-Rotation	Deferred Rotation Or Deferred, Rest-Rotation	Same as PA
Maximum Grazing Utilization Guideline	0	30-40%	30-40%	Same as PA
Percent Change in Grazing Utilization Guideline from Current Management	100% Reduction	20-40% Reduction	20-40% Reduction	Same as PA
Grazing Utilization within Riparian Areas	0	20% woody vegetation	20% woody vegetation	Same as PA
Maximum Grazing Intensity Guideline	0	Winter/Spring: 40-50%	Late Spring/Early Summer: 40-50% Remainder of the Year: 30-40%	Same as PA
Percent Change in Grazing Intensity Guideline From Current Management	NA	Grazing Intensity Limits Not Established in Current Management	Grazing Intensity Limits Not Established in Current Management	Same as PA
Frequency of Pasture Use	0	Pastures Will Generally Only be Grazed Once During a Grazing Year	Pastures Will Generally Only be Grazed Once During a Grazing Year	Same as PA
Pasture Grazing Period (maximum days)	0	Generally will not exceed 30 days.	Generally will not exceed 30 days.	Same as PA
Deferred Pastures	NA	Teepee Pasture.	Kehl Pasture **Potato South Pasture (Temporary)**	Same as PA

Grazing Authorization	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
			Miller Pasture (Temporary)	
Verde River Emergency Water Access	No	One Location at Gospel Hollow.	N/A	Same as PA
Authorization of Trailing Across Fossil Creek Allotment	No	No Spring Move From Hackberry to Pivot Rock Yes Fall Move From Pivot Rock to Hackberry		No
Utilizes Monitoring and Adaptive Management	No	Yes	Yes	Yes

Table 12. Proposed Structural Improvements by Alternative

Structural Improvements	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
Fence – Livestock Exclosures at Spring/seep Riparian Areas.	0	**1)** 3 Locations: **Grapevine Spring** in the Bull Run Pasture. **Towel Creek Perennial Pool** in the Middle Towel Pasture. **Wet Prong Spring i**n the Middle Towel Pasture. **2.** If monitoring indicates a need, additional livestock exclosure fences may be constructed at spring/seep riparian areas if desired conditions are not being achieved through the control of livestock grazing. Pastures with springs or seeps that may require these livestock exclosure fences	NA	Same as PA

Structural Improvements	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
		include: Basin, Bull Run, Doren, Hackberry Springs, Pambo, Phroney, and Lower, Middle and Upper Towel.		
Pasture Fence – Bald Pasture	0	NA	New 3-strand barbwire fence; approximately 1.7 miles in length.	Same as PA
Pasture Fence - Toms Creek Pasture	0	NA	If monitoring indicates a need, a new 3-strand barbwire fence; approximately 3.5 miles in length will be constructed.	Same as PA
Pasture Fence - Miller/Kehl Pasture	0	NA	Reconstruct existing electric fence to 4-wire barbwire; approximately 4.0 miles in length.	Same as PA
Fence – One Livestock and Wildlife Exclosure	0	NA	1 location: Cienega Draw in Potato South Pasture	Same as PA
Fence – One 5-10 acre Holding and Gathering Pasture in Bed Bug West Pasture.	0	NA	If needed, location may be in the approximate area of either Clints Well or Cart Cabin Tank. The exact location to be determined.	Same as PA

Table 13. Alternative Comparison For Meeting the Purpose and Need

Purpose and Need	No Graze/No Action Alternative	Proposed Action Alternative (PA)		No Trailing Action Alternative
		Hackberry	Pivot Rock	
Authorizes livestock grazing	No	Yes	Yes	Same as PA
Consistent with National Forest System Objectives, Policy, and Rangeland Management Planning,	Consistent	Consistent	Consistent	Same as PA
Consistent with the Coconino Forest Plan	Consistent	Consistent	Consistent	Same as PA
Improves or moves towards improving soil conditions on the both allotments towards a satisfactory level	Yes	Yes	Yes	Same as PA
Improves or moves toward improving vegetative conditions and trends	Yes	Yes	Yes	Same as PA
Improves or moves towards improving riparian streams to proper functioning conditions	Yes	Yes	Yes	Same as PA
Improves or moves toward improving wildlife and TES species habitat conditions at stock tanks, springs and seeps.	Yes	Not as Much as the No Trailing Alternative	Not as Much as the No Trailing Alternative	Yes[2]

Response to Internal Issues

Table 14. Comparison of Alternatives to Internal Resource Issues

Issue	No Graze/No Action Alternative	Proposed Action Alternative (PA)	No Trailing Action Alternative
Upland Vegetation	Vegetation density and	Vegetation density and diversity	Same as PA

[2] Because trailing would not be authorized under this alternative, there would be no opportunity for Hackberry and Pivot Rock Allotments livestock to access Chiricahua leopard frog occupied habitat nor cause any direct effects on CLF.

Issue	No Graze/No Action Alternative	Proposed Action Alternative (PA)	No Trailing Action Alternative
Condition and Trend - Vegetation Density and Diversity	diversity is expected to remain static or improve, except in areas where overstory species limit improvement potential. The ability for improvement in vegetation density and diversity will be most affected by climatic conditions. Measurable differences in vegetation density and diversity between any of the alternatives is not expected.	is expected to remain static or improve, except in areas where overstory species limit improvement potential. The ability for improvement in vegetation density and diversity will be most affected by climatic conditions. Measurable differences in vegetation density and diversity between any of the alternatives is not expected.	
Upland Vegetation Condition and Trend - Vegetation Height and Canopy Cover	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing would not occur.	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing will occur. The reduction in plant height and cover, as a result of grazing, does recover with favorable climatic conditions. Long-term measurable differences between any of the alternatives are not expected.	Same as PA
Upland Vegetation condition and Trend - Vegetation Production	Forage production and forage quality are expected to have a short-term increase (1-3 years), followed by a period of stabilization and then declining (5+ years)	Forage production and forage quality is expected to be maintained and enhanced by light to moderate grazing.	Same as PA
Effective Ground Cover and Litter	Soil condition will improve over time with increased effective vegetative ground cover and litter due to no cattle grazing. An exception to this will be the meadows within the Pivot Rock Allotment that have competition from foraging elk all during the growing season; which amounts to approximately 2% of the two allotments. The amount and probability of success of improved effective ground cover will be dependent on timing and amount of precipitation, but is expected to have a higher probability of success than the Proposed Action. Improved soil condition equates to improved watershed condition, and thus this alternative will move towards	In the Hackberry and Pivot Rock Allotments, the conservative utilization level should increase litter on-site during average to moderate wet cycles. The 30-40% may be too high during prolonged drought and should be adjusted for years of multiple droughts to a lower utilization level or through removal of cattle. Under an adaptive management scenario, utilization levels of 0% up to the maximum of 30-40% can occur. The goal of maintaining at least 2/3 of maximum vegetative ground cover will maintain long-term soil productivity and improve wet cycles. If utilization levels are adjusted for drought and wet cycles, then I believe the net effect will 1) move impaired soils to satisfactory over time and 2)	Same as PA

Issue	No Graze/No Action Alternative	Proposed Action Alternative (PA)	No Trailing Action Alternative
	the Forest Plan standard and guideline for improving watershed condition by the year 2020, although it may not be fully attained by this time if drought conditions persists. Water quality is expected to be maintained in all streams and sedimentation coming from the watershed should be decreased from the Proposed Action with improved vegetative ground cover and litter. The rate of decreased sediment loads will be faster with this alternative than the Proposed Action Alternative.	maintain current satisfactory soil condition on sites that are currently satisfactory. An exception to this will be the meadows within the Pivot Rock allotment that have competition from forage from elk all during the growing season; which amounts to approximately 2% of the two allotments. The rate of improvement will have a slightly lower probability of success than the No Graze/No Action Alternative because standing crop will still be removed. Improved soil condition equates to improved watershed condition, and thus this alternative will move towards the Forest Plan standard and guideline for improving watershed condition by the year 2020, although it may not be fully attained by this time if drought conditions persists. Water quality is expected to be maintained in all stream reaches and sedimentation coming from the watershed should be decreased from current with improved effective vegetative ground cover and litter. Recovery rate of the watershed will be slower than the No Graze/No Action Alternative due to biomass removal and will be dependent upon the measures taken under adaptive management scenarios. Similar to the rate of improvement, the probability of improved effective ground cover and litter is dependant on the adaptive management measures undertaken.	
Water Quality and Condition of Riparian Streams and Reaches	Removal of cattle should maintain stream PFC and improve at-risk reaches through removal of cattle grazing stressor in the Hackberry Allotment. This alternative will have the quickest rate of	Managing utilization at 20% and adaptive management are designed to maintain or improve riparian conditions. This is expected to occur on the Hackberry Allotment. The rate of recovery will be dependent on	Same as PA

Issue	No Graze/No Action Alternative	Proposed Action Alternative (PA)	No Trailing Action Alternative
	improvement and the highest probability of effectiveness for improving riparian condition for the Hackberry Allotment. For the Pivot Rock Allotment, the riparian condition will stay the same for all reaches (including Cienega Draw) and will not show improvement due to elk grazing throughout the growing season.	time of use and precipitation. If persistent riparian damage is occurring adaptive management will fence sites to minimize impacts. It is felt that riparian function will improve over time and that reaches that are currently in PFC will maintain this status and reaches that are not in PFC will move towards PFC. The riparian condition for the Pivot Rock Allotment will stay the same even with the exclusion of the Kehl Pasture from cattle grazing and will not show improvement due to elk grazing throughout the growing season. An exception to this will be at Cienega Draw where an elk exclosure will be constructed.	
Wildlife Habitat Conditions Habitat for Threatened and Endangered Species at Important Waters, Springs, Tanks and Riparian Areas.	The No Graze/No Action Alternative will allow for optimal upland vegetative and soil conditions; increased vegetative biomass that provides food and cover for wildlife and their prey ultimately resulting in increased quality and quantity of wildlife food, cover, and shelter; increased rodent and small mammal density and diversity, increased rodent species richness, increased songbird and raptor diversity, increased abundance and diversity of lizards, and increased reproductive success.	Livestock grazing, as proposed under the Proposed Action Alternative, will result in less than optimal vegetative conditions, which ultimately leads to reduced species abundance and diversity. Under this alternative there would be trailing of Hackberry and Pivot Rock Allotment livestock in the late fall from Pivot Allotment through the Fossil Creek Allotment to the Hackberry Allotment thus allowing the potential for livestock to wander and access occupied Chiricahua leopard frogs and their habitat.	No livestock from the Hackberry and Pivot Rock Allotment would have access to Chiricahua leopard frogs or their habitat on the Fossil Creek Allotment.
Aquatic and Riparian, Vegetation, Disturbance, Sedimentation, Water Quality/Quantity	No Graze/No Action Alternative will allow for optimal riparian conditions, whereas the Proposed Action will not.	The grazing proposed action will result in less than optimal conditions in riparian areas that are accessible to livestock, leading to reduced species abundance and diversity.	Same as PA

The following Table 15 is a summary of environmental effects by resource area. More detailed information and analysis is disclosed in Chapter 3 – Affected Environment and Environmental Consequences.

Table 15. Summary of Environmental Effects by Resource Area

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
Vegetation and Soil Condition and Trend			
Upland Vegetation Condition and Trend – Vegetation Density and Diversity	For all alternatives, vegetation density and diversity is expected to remain static or improve, except in areas where overstory species limit improvement potential. The ability for improvement in vegetation density and diversity will be most affected by climatic conditions. Measurable differences in vegetation density and diversity between any of the alternatives is not expected.		
Upland Vegetation Condition and Trend - Vegetation Height and Canopy Cover	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing would not occur.	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing will occur. The reduction in plant height and cover, as a result of grazing, does recover with favorable climatic conditions. Long-term measurable differences between any of the alternatives are not expected.	Same as PA
Upland Vegetation Condition and Trend - Vegetation Production	Forage production and forage quality are expected to have a short-term increase (1-3 years), followed by a period of stabilization and then declining (5+ years)	Forage production and forage quality is expected to be maintained and enhanced by light to moderate grazing.	Same as PA
Soil Conditions	Standing crop of biomass should increase as would litter. There would be a 57% reduction in the analysis area of direct grazing impacts (loss of biomass and compaction). Current soil conditions would be maintained. Overall, the current Fossil Creek, Upper Clear Creek and West Clear Creek watershed soil conditions are classified as impaired, and the expected increase in litter that would not be removed by elk would improve vegetative ground cover over time. How much of an improvement would occur is tied to the timing and amount of precipitation that will occur in the future. This may move the soil condition towards Forest Plan Standards and	Both Kehl and Teepee pastures are deferred from cattle grazing. This equates to approximately 8,000 acres of deferral. The conservative utilization level of 30-40% on the remaining allotment acres should increase litter on-site during average to moderate wet cycles. The goal of maintaining at least 2/3 of maximum vegetative ground cover will maintain long-term soil productivity. If utilization levels are adjusted for drought and wet cycles, then the net effect will move impaired soils to satisfactory over time in the Proposed Action. This alternative will move towards the Forest Plan	Same as PA

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
	Guidelines of satisfactory soil condition by the year 2020. The riparian PFC is not expected to improve greatly over time due to elk and drought impacts.	standard and guideline for improving watershed condition by the year 2020. Proper functioning condition of riparian areas is not expected to greatly improve under this alternative because of persistent elk grazing. An exception to this will be the elk exclosure at Cienega Draw that will be protected from all grazing and is expected to respond quickly. Woody riparian vegetation is not expected to become established, even in the livestock excluded Kehl pasture. The exclusion of livestock grazing will at least remove pressure from the riparian drainages within this pasture.	
Wildlife			
Threatened and Endangered Species, Habitat or their Designated Critical Habitat.	No Effect	**May Affect Not Likely to Adversely Affect:** *Mexican spotted owl,* *Southwestern Willow Flycatcher and its Habitat* *Bald Eagle,* *Yuma clapper rail* **May Adversely Affect:** *Chiricahua Leopard Frog and it's Habitat*	This alternative does not change the fact that the Hackberry and Pivot Rock Allotment livestock would have access to one earthen tank that has been recently occupied and others that may provide suitable habitat for dispersing Chiricahua leopard frog on the Hackberry portion of the allotment over the next 10 years. Despite the reduction in effects to Chiricahua leopard frogs and their habitat, this alternative has the same outcome in

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
			the grazing guidance criteria as that of the PA.
Management Indicator Species	No Effect	Will not result in a change in the forest-wide trend: *All 5 MIS species analyzed.*	Same as PA
Forest Service Sensitive Species	No Effect	May impact but is not likely to result in a trend toward federal listing or a loss of viability: *All 27 Sensitive species analyzed.*	Same as PA
Fisheries			
Fossil Creek	No direct effects since there would not be any access to Fossil Creek from the Hackberry or Pivot Rock Allotments.	No direct effects. Indirect effects such as increased sedimentation, altered hydroperiod, and channel morphology changes would increase albeit at a lower rate due to reduced utilization and intensity of grazing.	Same as PA
Verde River	No Direct Effects.	Direct effects to the watershed are minimal. No indirect effects to the Verde River.	Same as PA
East Clear Creek	No Direct Effects. Beneficial effects to stream habitat	Direct effects: Watershed degradation will continue to East Clear Creek from direct cattle use. Reduced grazing use will allow for direct effects to an area identified as not being in functional condition and where adverse effects will continue under the PA. Indirect effects: It is likely that the PA will have beneficial indirect effects to the East Clear Creek watershed with the deferred pastures combined with the lower livestock utilization, intensity and AUMs.	Same as PA
West Clear Creek	No Effect	Direct effects: Livestock do not access the mainstream of West Clear Creek, however, they do utilize pastures of several tributaries.	Same as PA

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
		Tributaries Hicks and Duncan have PFC ratings of Nonfunctional and Functional at Risk respectively. Although these stream reaches are ephemeral in nature and do not have fish present, degradation of these reaches contribute to impaired conditions downstream. Indirect effects: Livestock access to headwater tributaries of West Clear Creek, such as Toms, Clover and Long Valley streams, (which do not contain riparian vegetation but contain moisture attractive to ungulates) would destabilize soil conditions and increase the amount of sediment produced from these areas, resulting in higher levels of sediment reaching the perennial waters of West Clear Creek. Indirect effects such as increased sedimentation, altered hydroperiod, and channel morphology changes would still increase albeit at a lower rate, due to reduced utilization and intensity of grazing.	
Threatened and Endangered Fish	**No Effect:** *Colorado Pikeminnow* *Razorback Sucker – and its critical habitat* *Loach Minnow* *Spikedace* *Little Colorado Spinedace – and its critical habitat*	**May Affect Not Likely to Adversely Affect:** *Colorado Pikeminnow* *Razorback Sucker – and its critical habitat* *Loach Minnow* *Spikedace* *Gila topminnow* *desert pupfish* **May Affect Likely to Adversely Affect:** *Little Colorado Spinedace – and its critical habitat*	Same as PA
Forest Service Sensitive Fish Species	No Effects: *Headwater Chub* *Roundtail Chub*	May effect individuals, but is not likely to result in a trend toward Federal listing or loss of viability: *Headwater Chub*	Same as PA

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
	Desert Sucker *Sonora Sucker* *Longfin Dace* *Little Colorado Sucker* *Bluehead Sucker*	*Roundtail Chub* *Desert Sucker* *Sonora Sucker* *Longfin Dace* No Effect: *Little Colorado Sucker* *Bluehead Sucker*	
Management Indicator Species - Macroinvertebrates	No change in the Forest-wide trend in macroinvertebrates.	It is unlikely that the PA will have any adverse affects on the macroinvertebrate composition in Forest streams and will have no effect to Forest-wide trends.	Same as PA
Botany and Sensitive Plants			
	No Effect for all 8 Sensitive Species and 1 Endangered Specie (Arizona Cliffrose) analyzed. May impact individuals of Arizona sneezeweed but will not result in a trend toward federal listing or loss of viability	Small areas of potential habitat for certain R3 sensitive species occur in the Teepee and Mesquite Springs pastures. Since the Teepee Pasture will be deferred from livestock grazing, there will be no effect these species and its potential habitat. Grazing will continue in the Mesquite Springs Pasture but it will likely be at a reduced utilization level and hence a lessened impact.	Same as PA
Invasive Plants			
Spread of Existing Populations	There will be no spread of existing populations from livestock grazing or associated activities.	Existing populations will continue to spread. This will be at a rate less than the current rate of spread due to the application of BMPs and the reduction in AUMs.	Same as PA
Establishment of New Populations	There will be no new populations established due to the presence of livestock grazing or associated activities.	New populations will continue to be established. This will be at a rate less than the current due to the application of BMPs and the reduction of AUMs.	Same as PA
Recreation			
Developed and Dispersed Sites, Trails	Because no livestock grazing would occur under this alternative there is not expected to be any direct, indirect, or cumulative effects to developed sites,	There will not be any direct, indirect or cumulative effects on developed sites, trails or dispersed recreation sites.	Same as PA

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
	trails, dispersed recreation and recreational special uses. ROS and VQOs will remain the same and within Land Management Plan guidelines	Proposed range improvements are not near any developed sites or trails.	
Wilderness			
	There are no direct, indirect or cumulative effects expected since there are no new improvements proposed in either wilderness and grazing would continue similar to how is has in the past.	There are no direct, indirect or cumulative effects expected. Livestock have grazed in what is now the allotment for upwards of 100 years.	Same as PA
Wild and Scenic Rivers – Verde River			
	There are no direct, indirect or cumulative effects expected relative to the eligibility or classification of the Verde River Wild and Scenic designation, it's free flows or it's Outstanding Remarkable Values.	There are no direct, indirect or cumulative effects to the eligibility or classification of the Verde River Wild and Scenic River designation, it's free flows or it's Outstanding Remarkable Values.	Same as PA
Inventoried Roadless Areas			
	There are no direct, indirect or cumulative effects on IRA's and their designation, as there would be no activities that would create new roads that would impact the character of IRAs.	Grazing would continue similar to how is has in the past, there will be no direct, indirect or cumulative effects on IRA's since there are no activities creating new roads.	Same as PA
Heritage Resources			
	There will be no direct, indirect and cumulative effects from grazing on heritage resources.	This alternative will keep cattle utilization levels at or below current permitted levels. These stocking levels would not constitute an effect on heritage resources. Any improvements constructed within 2-years of the Decision Notice will be surveyed and cleared prior to authorizing grazing on the allotment. By avoiding archaeological sites during construction and in areas of concentrated use, there should be no effects to cultural resources.	Same as PA
	No additional damage is expected from livestock grazing activity to any sites in the project area.	Some sites may continue to be impacted from grazing activity until such time as mitigation measures can be implemented	Same as PA

Summary of Environmental Effects by Alternative and by Resource Area			
Resource Area or Issue	**No Graze/No Action Alternative**	**Proposed Action Alternative (PA)**	**No Trailing Action Alternative**
Economics			
	Loss of annual Federal payments to Yavapai and Coconino counties for livestock grazing, plus lost revenues from taxes on structural improvements and the state would lose tax revenues based on the permittee use of Federal lands. Most indirect jobs will likely be maintained because the need for ranching supplies and services will continue to be filled by other area ranches and individuals/businesses from the surrounding communities.	Yavapai and Coconino counties will continue to receive Federal payments for livestock grazing and tax revenues on structural improvements. State tax revenues will continue based on the permittees continued use of Federal lands. Jobs directly associated with the livestock operation will be maintained.	Same as the PA.
	Zero benefit cost ratio.	Positive present net value of benefits to the Forest Service Permitee and All Partners.	Values are the same for the Forest Service as the PA. No trailing increases costs to the permitee and lowers their Benefit/Cost Ratio as compared to the Proposed Action. Similar effects for All Partners due to the increased costs.

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Chapter 3 – Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the previous chapter linked to references and specialist reports. The following analysis of environmental consequences is organized by resource area and discloses the direct, indirect, and cumulative effects of the No Graze/No Action Alternative, the Proposed Action Alternative and the No Trailing Action Alternative on those resources. Also, acres used in effects analysis may differ from one resource to another and may not always agree down to the exact acre. This may be due to the type of data base that is being queried to generate acres or rounding parameters identified. The acre differences will not affect conclusions made by the resource specialist.

The planning record includes all project specific information including specialist reports, ecosystem analyses, and other results of project related investigations. The record also contains information resulting from public involvement efforts.

Past, present and reasonably foreseeable future actions for the analysis area are presented at the beginning of the chapter.

Effects of the alternatives are discussed in this section for the following resource areas:

- Range Resources, includes upland vegetation
- Soil and Water Resources, including riparian vegetation
- Wildlife
- Fisheries
- Botany and Sensitive Plants
- Invasive Plants
- Other Environmental Components
    - Recreation
    - Wilderness
    - Wild and Scenic Rivers
    - Inventoried Roadless Areas
    - Heritage Resources
    - Economics
    - Environmental Justice

Past, Present and Reasonably Foreseeable Future Actions

This section discloses actions considered in the cumulative effects sections of each resource area evaluated in Chapter 3 of the EA. Past and present activities are incorporated into each resource's existing conditions because they help explain the current condition of the resource. That is, past and present activities are described in the context of how these actions affect present conditions. Similarly, foreseeable future actions are evaluated as to how they would increase, reduce or not change conditions for the resource.

It is also important to note several historic activities which have altered natural conditions so much that trends cannot be reversed and a new environmental "baseline" exists. These historic activities are included below:

• Grazing of cattle has occurred for more than 100 years. In the 1870s, ranchers began grazing cattle with the numbers of cattle peaking in 1891 [PR#38]. Cattle numbers have been greatly reduced since the turn of the century as better management strategies have been implemented;

• Utilization levels on vegetation from cattle have declined over time as well;

• In the late 1800s and early 1900s, settlers farmed and cut hay on deep soils, which included wetlands and meadows. General wetland and meadow ecosystem health declined as native vegetation was disturbed and/or removed. These sites were hayed and planted with various crops which changed the vegetation component, compacted soils, and changed water flow dynamics. Farming declined after the establishment of the Coconino National Forest in 1908;

• Past wildlife grazing, specifically from elk, increased from the 1950s to peak numbers in the mid-1980s and has generally declined since the mid-1980s [PR#38]. Utilization levels from elk on vegetation have decreased as their population numbers have decreased.

By definition, direct effects are those caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance. Cumulative effects are 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.

To analyze cumulative effects, activities and natural events that overlap in time and space with the proposed activities and project area were considered. This area is referred to as the cumulative effects area in this EA. The cumulative effects area varies by resource type and is defined under each resource area analyzed in this chapter.

Also, acres used in the effects analysis may differ from one resource to another and may not always agree down to the exact acre. This may be due to the type of database that is being queried to generate acres or rounding parameters used. The acre differences will not affect conclusions made by the resource specialist.

The following Table 16 lists projects that were evaluated by each resource within their scope of analysis. Resources specialists may be using a 'subset' of the complete list below for inclusion into their analysis. Past actions are those that have been implemented. For most resources, the time frame evaluated for effects of past actions ranged from 10 to 20 years. Effects to vegetation structural stage from older timber sales that occurred more than 30 years ago in the 1970s along with past private timber harvesting in the area (Aztec Land and Cattle Company) were considered by vegetation and wildlife specialists. Ongoing actions are those that have Decisions made and are ready to implement or are being implemented. Projects that are being appealed are also included. Reasonably foreseeable future actions are those projects that are in the planning stages and have developed a proposed action or alternatives, but a Decision has not been made. Projects listed are on the Coconino National Forest except where otherwise noted.

Past Actions

Table 16. List of Past Wildfire Occurrences, Thinning, Broadcast Burning and Miscellaneous Actions - 1997-2006.

Past Wildfires			
5th CODE WATERSHED NAME	**FIRE NAME**	**YEAR**	**ACRES**
Fossil Cr - Lower Verde River	Bull Run	2005	884
	Sand	1998	125
	Sandrock	1997	93
	Towel	2006	279
Fossil Cr - Lower Verde River Total			1,381
Upper Clear Creek	Kinder	1998	38
	Mile	2000	19
	Packrat	2002	827
	Tater	2005	166
	Webber	2004	59
Upper Clear Creek Total			1,109
West Clear Creek	Chilson	2000	0
	Deeper	1999	56
	Ghost	1998	35
	Middle	1998	18
	Independence	2009	1,370
West Clear Creek Total			1,479
Grand Total			**3,969**

Past Thinning and Broadcast Burning Actions					
Project Name	**Year**	**Acres**	**Upper Clear Creek**	**West Clear Creek**	**Description**
Baker Multiproduct Sale	2004	913		913	Mechanical thinning of ponderosa pine trees up to 16" dbh, lop and scatter and machine pile landings of created slash

Bald Mesa Urban Interface	2006–2009	2,112		2,112	Hand thinning up to 12" dbh, lop and scatter, machine piling and hand piling & burning of created slash
Good Enough Multiproduct Sale	2006	757		757	Mechanical thinning of ponderosa pine trees up to 13" dbh, lop and scatter and machine pile landings of created slash
Pack Rat Salvage	2005	71	71		Mechanical thinning of fire killed trees up to 24" dbh, lop and scatter and machine pile landings of created slash
Bald Mesa Urban Interface	2006	2,880		2,880	Broadcast burn
TOTAL ACRES		**6,733**	**71**	**6,662**	

Past Miscellaneous Actions	
Activity Name	**Description**
Dispersed Recreation	Non-developed recreation activities including: hunting, fishing, camping, driving for pleasure, hiking, biking, bird-watching etc.
Road maintenance	Only occurring on main roads on each forest
Decommissioning/restoration activities	Removal of Childs/Irving Power plant infrastructure. Completed to date summarized in Childs-Irving Hydroelectric Project 2005 – 2006 Decommissioning Progress Report (http://www.aps.com/images/CI/2006_Progress_Report.pdf)
Domestic Grazing	Has occurred in the area since late 1870's. Permitting began around 1908 with the establishment of the National Forests.

Present Actions

Table 17. List of Present Actions

Present Actions	
Activity Name	**Description**
Dispersed Recreation	Non-developed recreation activities including: hunting, fishing, camping, driving for pleasure, hiking, biking, bird-watching etc.
Road maintenance	Only occurring on main roads on each forest
Wild animal grazing	Grazing by wild animals
Off-Highway Vehicle Closure order	Closure order that limits vehicular traffic to existing roads in the headwaters of West Clear Creek and East Clear Creek
Domestic Grazing	Continuation of grazing under authorized permit.
Fossil Creek Range Allotment EA	Grazing authorization decision was made April, 2009. Implementation is ongoing.

Spring Cattle Exclosure Fencing		
Spring Name	**Allotment**	**Status**
Big Willow, Doren's Defeat	Hackberry	Partially fenced
Cedar, Keg, Big Willow, Willow, Doren's Defeat, Hackberry, and Phroney	Hackberry	NEPA complete-to be built

Present Thinning Actions					
Project Name	**Year**	**Acres**	**Upper Clear Creek**	**West Clear Creek**	**Description**
Huffer Multiproduct Sale	2007	550		550	Mechanical thin dwarf mistletoe infected trees up to 24" on approximately 200 acres, hand thin up to 12" on approximately 350 acres

Present Grazing Actions Within Cumulative Effects Area by Watershed			
5TH CODE NAME	**ALLOTMENT_NAME**	**ACRES**	**% of Cum Effects Watershed**
Fossil Cr - Lower Verde River	Baker Lake/Calf Pen	3,813	6%
	Fossil Creek	18,723	31%
	Hackberry and Pivot Rock	29,221	48%
	Ikes Backbone	1,419	2%
	Not An Allotment	3,851	6%
	Thirteen-Mile Rock	3,999	7%
Fossil Cr - Lower Verde River Total		61,026	100%
Upper Clear Creek	Bar T Bar	1,446	5%
	Buck Springs	9,609	31%
	Hackberry and Pivot Rock	16,014	52%
	Not An Allotment	3,930	13%
Upper Clear Creek Total		30,999	100%
West Clear Creek	Baker Lake/Calf Pen	492	1%
	Bar T Bar	1,269	3%
	Buck Springs	813	2%
	Buckhorn	4,691	10%
	Hackberry and Pivot Rock	30,919	67%
	Not An Allotment	2,520	6%
	Thirteen-Mile Rock	5,017	11%
	Walker Basin	9	0%
	Willow Valley	87	0%
West Clear Creek Total		45,817	100%
Total Acres		**137,841**	

Future and Reasonably Foreseeable Actions

Table 18. List of Future and Reasonably Foreseeable Actions

Future Actions		
Project Name	**Forest**	**Description**
Coconino National Forest Managing Motorized Travel EIS	Coconino	Designate a system of roads, trails, and areas that will be open to public motorized use on the Coconino National Forest.
Issuance of New Special Use Permits for Expired Permits or New Owners 2006 CE	Coconino	Proposal to reissue permits that have expired or have new owners throughout the ranger district area.
Thinning and Burning Within Pivot Rock Allotment		

Project Name	Year	Acres	Upper Clear Creek	West Clear Creek	Description
East Clear Creek Watershed Health	2008	4,515	3,795	720	Broadcast burning
Good/Tule	2008	2,409		2,409	Broadcast burning
Clear Creek Mulitproduct Sale	2008	1,052	1,052		Mechanical thinning of ponderosa pine trees up to 18" dbh, lop and scatter and machine pile landings of created slash
East Clear Creek Watershed Health	2008	1,776	1,474	303	Hand and mechanical thinning of ponderosa pine trees up to 12" DBH
Pocket Multiproduct Sale	2008	641		641	Broadcast burn
Total Acres		**10,393**	**6,321**	**4,073**	

RANGE RESOURCES

The following section describes the affected environment and effects of the No Graze/No Action Alternative, the Proposed Action Alternative and the No Trailing Action Alternative for the range resource which includes upland vegetation density and diversity, upland vegetation height and canopy cover, and upland vegetation production. This analysis as presented is summarized from the following report which is incorporated by reference: *Range Specialists's Report* and *Addendum to the Range Specialist's Report* by by G. Hase Jr., 2007., 2008 [PR#38, 38.1].

Affected Environment for Range Resources

Grazing History

The grazing history of the Hackberry and Pivot Rock Allotments most likely reflect the Coconino National Forest trends; starting with high numbers and generally dropping to the current levels. Actual use averaged 95% of permitted numbers from 1996 to 2001 with slight reductions in stocking level primarily in response to operational requirements and dry years. In response to drought conditions, actual use was reduced from 2002 to 2004 and livestock were completely removed from both allotments from July 1, 2002 to November 9, 2003. Livestock numbers were gradually increased in 2005 and 2006.

Grazing Capability

Grazing capability of a land area is dependent upon the interrelationship of the soils, topography, plants and animals. Grazing capability is expressed as one of three capability classes; Full Capacity, Potential Capacity, and No Capacity, (Region 3 Rangeland Analysis and Management Training Guide; June, 1997; 2.8-2.10).

The analysis of grazing capability on the Hackberry and Pivot Rock Allotments indicate that the major factors in determining and classifying capability are slope and soil condition/soil stability. The following is a summary of the Grazing Capability classification for the allotments.

Hackberry Allotment:

Table 19. Hackberry Allotment Grazing Capability Classification

Grazing Capability Class	Acres	Description
Full Capacity	0	0 to 10% slope; Satisfactory Soil Condition
Potential Capacity Condition	15,752	0 to 40% slope; Impaired/Unsatisfactory Soil Condition
No Capacity	8,367	>40% slope; Inherently Unstable Soil Condition
Unclassified	0	Unclassified Soil Condition
Allotment Total Acres	**24,119**	

Pivot Rock Allotment:

Table 20. Pivot Rock Allotment Grazing Capability Classification

Grazing Capability Class	Acres	Description
Full Capacity	52,016	0 to 40% slope; Satisfactory Soil Condition
Potential Capacity Condition	340	31 to 40% slope; Impaired/Unsatisfactory Soil Condition
No Capacity	1,569	>40% slope; Inherently Unstable Soil Condition
Unclassified	0	Unclassified Soil Condition
Allotment Total Acres	**53,925**	

Range Condition and Trend

Range Condition and Trend are assessed at permanent monitoring locations; the Parker 3-Step method is used on the Hackberry and Pivot Rock Allotments. See [PR#38, PR#19] for summaries of range trend data.

Hackberry Allotment:

A total of 11 Parker 3-Step clusters were established on the allotment in 1958 and 1961. The following summary reflects data collected from these 11 permanent locations in 2006 and compares it with data from the previous readings (5 clusters – 1999; 3 clusters – 1983; 3 clusters – 1967).

Table 21. Hackberry Allotment Range Condition and Trend

Range Condition	# of Locations	Range Trend	# of Locations
Improved Condition	0 (0%)	Improving Trend	0 (0%)
Static Condition	6 (55%)	Static Trend	1 (9%)
Decreased Condition	5 (45%)	Downward Trend	10 (91%)

Pivot Rock Allotment:

A total of 14 Parker 3-Step clusters were established on the allotment in 1956/57; 6 of those locations have been lost or destroyed. The following summary reflects data collected from these 7 Parker 3-Step clusters in 2006 and compares it with data from the previous readings (1979).

Table 22. Pivot Rock Allotment Range Condition and Trend

Range Condition	# of Locations	Range Trend	# of Locations
Improved Condition	2 (29%)	Improving Trend	3 (42%)
Static Condition	5 (71%)	Static Trend	2 (29%)
Decreased Condition	0 (0%)	Downward Trend	2 (29%)

In summary, the decline in range condition and trend are attributable to a reduction in ground cover (vegetation and litter), a reduction in perennial grasses (primarily cool-season grass species), and an increase in unpalatable shrub species. In some areas, the reduction in ground cover and perennial grasses is due to encroachment of ponderosa pine, pinyon pine, and juniper. Impacts from the 1998-2006 drought period, coupled with livestock grazing, are believed to be the significant factors in the decline in range condition and trend.

Forage Production

Hackberry Allotment:
Forage production measurements were taken at the 11 Parker 3-Step clusters in November/December, 2006. Only current year's production on perennial grass species were considered in these measurements. Forage production averaged 931 pounds per acre; the lowest measured forage production was 135 pounds per acre and the highest measured forage production was 1,503 pounds per acre.

Pivot Rock Allotment:
No forage production measurements were taken during 2006. Ocular estimates of forage production were made at the time the Parker 3-Step clusters were read and during allotment inspections to determine if the areas produced greater than 100 pounds of forage/acre. All areas on the Pivot Rock Allotment that were observed during 2006 exceeded forage production of 100 pounds/acre.

Grazing Capacity

Estimated Maximum Grazing Capacity
Grazing capacity is a function of grazing capability, forage production, topography, allowable use, and the level of management that may be applied. This analysis was conducted to determine an estimated maximum grazing capacity for the two allotments assuming full capacity classification and satisfactory soil conditions for all acres within the allotments that are less than 40% slope. Based on the factors used in the analysis, the total estimated maximum grazing capacity for all main grazing pastures on the Hackberry allotment is approximately 3,800 Animal Unit Months. The estimated maximum grazing capacity for all main grazing pastures on the Pivot Rock allotment is approximately 5,250 Animal Unit Months.

Initial Permitted Stocking Level
This analysis was conducted to determine an initial permitted stocking level for the two allotments based on the existing grazing capability conditions, existing soil conditions, topography, and deferred pastures. Based on the factors used in the analysis, the initial permitted stocking level for the Hackberry allotment is 2,250 Animal Unit Months (450 head for 5

months). The initial permitted stocking level for the Pivot Rock allotment is 4,650 Animal Unit Months (664 head for 7 months).

Vegetation

The analysis area consists of seven major vegetation types: mixed conifer, ponderosa pine, mountain grasslands, pinyon-juniper woodland, pinyon-juniper grasslands, semi-desert grassland/desertscrub, and riparian. The following Table 23 summarizes the vegetation types within the analysis area.

Table 23. Summary of Vegetative Types Within the Analysis Area.

Vegetation Community Type	Hackberry Allotment		Pivot Rock Allotment		Percent of Analysis Area
	Acres	%	Acres	%	
Mixed Conifer	0	0 %	9,998	18.4 %	12.7 %
Ponderosa Pine	0	0 %	42,763	78.8 %	54.4 %
Mountain Grassland	0	0 %	59	<1 %	<1 %
Pinyon-Juniper Woodland	23,118	95.1 %	562	1 %	30.1 %
Pinyon-Juniper Grasslands	396	1.6 %	0	0 %	<1 %
Semi-Desert Grassland/Desertscrub	473	1.9 %	0	0 %	<1 %
Riparian	313	1.3 %	871	1.6 %	1.5 %
TOTAL	**24,300**	**100 %**	**54,253**	**100 %**	**100 %**

Environmental Consequences for the Range Resource

This section describes the environmental consequences to vegetation found in the uplands, woodlands, and grasslands. Effects on riparian vegetation are not covered in this section but are described in the Soils and Water analyses in this chapter. To compare alternatives, the following units of measure were used for upland vegetation condition and trend: vegetation density and diversity, vegetation height and canopy cover, and vegetation production. [PR#38].

No Graze/No Action Alternative

Direct and Indirect Effects

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. Wildlife will continue to graze on the allotment, creating localized impacts and potential areas of excessive utilization.

When livestock graze, herbaceous plant height and canopy cover is reduced; however this is only a temporary reduction because these plants recover with favorable climatic conditions. Under this alternative, short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing would not occur.

Short-term changes in range condition and trend (as measured by changes in vegetation density and diversity) may be observed under this alternative. These changes would be most noticeable,

and occur most rapidly, in the more mesic sites within the analysis area (less than 5% of the analysis area). Within the drier sites (greater than 95% of the analysis area), these changes would likely occur much slower. However, a long-term increase in vegetation density and diversity is not expected due to livestock removal. Courtois, et al (2004) found few differences in species composition, cover, density, and production in comparing 16 long-term livestock exclosures (65 years) with adjacent areas that had been moderately grazed. Similar results have been found locally on the Coconino National Forest at exclosures on the Pickett Lake and Anderson Springs Allotments (Peaks Ranger District records; Loeser (2004). Under this alternative, range condition and trend is expected to remain static or move upward, except in areas where overstory species limit improvement potential. The ability for improvement in range condition and trend will be most affected by climatic conditions.

Cool-season species will continue to receive a disproportionate share of the grazing by wildlife. If wild ungulate numbers across the landscape fluctuate up or down (which could be the result of weather or AGFD hunt numbers or a combination of these two main factors), this would also affect the vegetative resource on the allotment as plants are either allowed to recover from grazing effects or are continually grazed. In the latter case, the eventual result may be a loss in plant species diversity (Vavra, et al 1994; Briske D.D. 1991; Szaro, et al 1999; Archer, et al 1991).

Forage production and forage quality are expected to have a short-term increase (1-3 years), followed by a period of stabilization and then declining (years 5+). Holechek (1981) reported that forage production and quality is maintained and enhanced by light to moderate grazing. Under this alternative, wildlife will continue to graze within the analysis area and maintain forage production and forage quality on small areas. However, with no livestock grazing, maintenance of forage production and forage quality over large areas will no longer occur.

Under this alternative, structural range improvements would not be constructed and as a result there would be no direct or indirect effects relating to that activity. An additional direct effect would be that the existing improvements would not be maintained or removed. Indirect effects would be realized through a loss of water available for wildlife as stock tanks fill with sediment and other existing water systems are not maintained.

Cumulative Effects

The focus of this analysis is on upland vegetation which receives very little influence from off site activities. As a result, the geographical extent of the cumulative effects analysis is confined to the Hackberry and Pivot Rock Allotments. The timeframe selected for this analysis is 20 years; 10 years in the past and 10 years in the future. This timeframe was selected because ground disturbing activities that have occurred within the analysis area are expected to recover within 10 years. The past, present, and reasonably foreseeable future activities considered in the cumulative effects analysis for vegetation include: wildfires, prescribed burning, timber management activities, dispersed recreation, firewood gathering, hunting, roads, OHV use, and wildlife grazing.

Livestock grazing, in combination with wildfires, prescribed burning, timber management activities, dispersed recreation, firewood gathering, hunting, roads, OHV use, and wildlife

grazing, can cumulatively affect the vegetation density, vegetation diversity, plant height, and canopy cover of understory plants. Under this alternative, there would be no direct or indirect effects from cattle grazing on range condition and trend, plant height and canopy cover.

Short term changes in range condition and trend (both positive and negative) are expected with changes driven primarily by climatic conditions and overstory species competition. Similarly, forage production and quality is expected to improve over the short term, but will decrease over time unless wildlife grazing increases substantially or prescribed fire is used to maintain foraging areas. Available water for wildlife is expected to see a short term increase followed by a steady decline as water sources begin to fail and fill with sediment due to a lack of maintenance. These cumulative effects are considered to be minor beneficial short term effects. Long term effects are expected to be neutral to negative.

This alternative provides the most cumulative protection to upland vegetation by not authorizing livestock grazing. Wildlife grazing would still occur as would other uses. Changes in road management and elimination of cross country off-road travel through the Managing Motorized Travel EIS will cumulatively lessen the impact to the upland vegetation across both allotments.

Proposed Action Alternative

Direct and Indirect Effects

Under this alternative, grazing would occur and as a result, there would be direct and indirect effects from livestock grazing on upland vegetation. Adaptive management and monitoring will be used to mitigate the direct and indirect effects by adjusting the timing, intensity, frequency, and duration of livestock grazing. Wildlife will continue to graze on the allotments, creating localized impacts and potential areas of excessive utilization.

Livestock grazing effects to vegetation occur through a reduction in plant height and cover and are primarily managed through forage utilization and grazing intensity; the actual numbers of livestock grazed is largely irrelevant. The reduction in plant height and cover, as a result of grazing, does recover with favorable climatic conditions. Provided forage utilization and grazing intensity are properly managed, the effects to vegetation based on the actual number of livestock grazed are negligible.

Under this alternative, the following management guidelines for forage utilization and grazing intensity by livestock and wildlife would be established:

- 30 to 40 percent forage utilization, reductions as needed.
- 40-50 percent - moderate grazing intensity during the winter, spring and early summer months.
- 30-40 percent - conservative grazing intensity during the remainder of the year.

Adaptive management and monitoring will provide the ability to reduce these management guidelines if needed to maintain or improve vegetation conditions. See Chapter 4 for more details on adaptive management and monitoring. In Galt, et al. (2000), a 25 percent utilization guideline is recommended for livestock, with 25 percent allocated for wildlife and natural disturbance, and the remaining 50 percent left for site protection. Under this alternative, wildlife use is included within the proposed forage utilization guideline of 30-40 percent. As a result, this

alternative leaves 60 to 70 percent of the forage production available at the end of the growing season for site protection, which is above what Galt, et al. recommend. Using the same rationale for grazing intensity, the grazing intensity guidelines established for this alternative would result in minimum of 50 to 70 percent of the current forage production remaining on site after livestock grazing occurs 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. Again, this would meet or exceed the recommendations proposed by Galt, et al.(2000).

This alternative would have direct effects to understory plants by reducing plant height and canopy cover. This reduction could lead to a decrease in grass, forb and shrub plant species composition, plant canopy cover, plant abundance, plant production and ground cover. However, findings in Courtois, et al (2004), Loeser (2004), and data available from the Coconino National Forest, Peaks Ranger District, indicates that there is not an increase in grass, forb, and shrub abundance, diversity, and production when the areas are rested or excluded from cattle grazing. Under this alternative, through effective implementation of monitoring and adaptive management, upland vegetation condition and trend is expected to remain static or move upward, except in areas where overstory species limit improvement potential. The ability for improvement in range condition and trend will be most affected by climatic conditions. The overall effects of this alternative with respect to upland vegetation condition and trend are similar to the No Graze/No Action Alternative.

Livestock grazing can have an effect in improving or decreasing plant species composition depending on the timing of grazing. For instance, spring and early summer grazing occurs mainly on cool season species. After the monsoon season, grazing occurs mainly on warm season species. As the weather cools in the fall, use changes back to cool season species. Under the Proposed Action Alternative, the grazing use period within a pasture is seasonally rotated so that forage is grazed and rested at a different time each year. Loeser, et al. (2004) showed evidence of increased vegetative production in response to defoliation from livestock grazing. Additionally, Holecheck (1981) reported that forage production and quality is maintained and enhanced by light to moderate grazing. By alternating the livestock use and rest periods on cool and warm season species, forage production, forage quality, and plant species composition will be maintained or improved. Additionally, adaptive management and monitoring will 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.

The construction of pasture fences on the Pivot Rock Allotment and livestock exclosure fencing for riparian areas on both allotments is likely to have short-term direct effects to upland vegetation. Plant height and canopy cover will be reduced in the immediate area due to construction activities; however, plant height and canopy cover will recover with favorable climate conditions. The proposed pasture fences on the Pivot Rock Allotment are designed to have long-term effects to upland vegetation in the affected pastures. These fences will allow for improved control in the timing, intensity, and frequency of livestock grazing which will result in improved upland vegetation condition. There will not be any long-term, direct or indirect effects to upland vegetation as a result of the proposed riparian exclosure fencing as these improvements are designed mainly as mitigations for wildlife and riparian vegetation.

Cumulative Effects

The geographical extent, timeframe, and past, present, and reasonably foreseeable future activities are the same as described in the No Graze/No Action Alternative.

Livestock grazing, in combination with wildfires, prescribed burning, timber management activities, dispersed recreation, firewood gathering, hunting, roads, OHV use, and wildlife grazing, can cumulatively affect the vegetation density, vegetation diversity, plant height, and canopy cover of understory plants.

Under this alternative, livestock grazing would have direct effects to understory plants by reducing plant height and canopy cover. When the effects from cattle grazing are added to the effects from the other activities, the overall cumulative effect of cattle grazing on upland plant height and canopy cover is greater than the No Graze/No Action Alternative and equal to the No Trailing Action Alternative. Cumulatively, condition and trend for upland vegetation is expected to remain static or move upward with cattle grazing additive to other activities and natural events. This alternative does not cumulatively change the upland vegetation condition or trend downward. There would be no measurable differences in upland vegetation condition and trend between any of the alternatives.

Wildlife will continue to graze on the allotments creating localized impacts and potential areas of excessive utilization; this effect will be additive to the other activities. Prescribed burning and timber management activities will continue which will cumulatively improve upland vegetation.

Changes in road management and OHV use by eliminating cross country off-road travel and coming from the Managing Motorized Travel EIS will cumulatively lessen the impact to the upland vegetation across both the Hackberry and Pivot Rock Allotments.

No Trailing Action Alternative

Direct and Indirect Effects

The direct and indirect effects are nearly identical to those described in the Proposed Action since the area affected by the trailing activity will still be grazed by permitted livestock from the Fossil Creek allotment.

Cumulative Effects

The geographical extent, timeframe, and past, present, and reasonably foreseeable future activities are the same as described for the Proposed Action and No Action Alternatives. The cumulative effects are the same as the Proposed Action since the area affected by the trailing activity will still be grazed by permitted livestock from the Fossil Creek allotment.

Comparison of Alternatives

Table 24. Comparison of Alternatives for the Range Resource

Indicator	Unit of Measure	No Graze/ No Action Alternative	Proposed Action Alternative (PA)	No Trailing Alternative
Upland Vegetation Condition and Trend	Vegetation Density and Diversity	Vegetation diversity and density is expected to remain static or move upward, except in areas where overstory species limit improvement potential. The ability for improvement in vegetation density and diversity will be most affected by climatic conditions. Measurable differences in vegetation density and diversity between any of the alternatives is not expected.		
	Vegetation Height and Canopy Cover	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing would not occur. Long-term measurable differences between the alternatives are not expected.	Short term reductions in the height and canopy cover of herbaceous vegetation from livestock grazing will occur. The reduction in plant height and cover, as a result of grazing, does recover with favorable climatic conditions. Long-term measurable differences between the two alternatives are not expected.	Same as PA
	Vegetation Production	Forage production and forage quality are expected to have a short-term increase (1-3 years), followed by a period of stabilization and the declining (years 5+).	Forage production and forage quality is expected to be maintained and enhanced by light to moderate grazing.	Same as PA

SOIL AND WATER RESOURCES

The following section describes the affected environment and effects of the No Graze/No Action Alternative, the Proposed Action Alternative and the No Trailing Action Alternative for soil and water resources. This analysis as presented is summarized from the following report which is incorporated by reference: *Soil and Water Specialists Report*, by D.Fleishman, (2007)[PR#39] and *Addendum to the Soil and Water Specialist Report*, by D.Fleishman, (2008) [PR#39.1]and *Soil and Water Existing and Desired Condition Report* by D.Fleishman [PR#12].

Affected Environment for the Soils Resource

The Hackberry and Pivot Rock Range Allotments planning area are located in several 5th Code Watersheds; Fossil Creek – Lower Verde River, Upper Clear Creek, and West Clear Creek. All of these are located on the Coconino National Forest.

The timeframe of the analysis will be 10-years because ground disturbing activities are expected to recover in this timeframe. The analysis will be narrative in form, relying on overall soil condition ratings for the Terrestrial Ecosystem Survey for map units described on the Coconino National Forest and PFC data that occur within the cumulative effects boundary and a discussion of hydrologic condition of the watershed.

Overall watershed condition is based on evaluation of the soil, aquatic and riparian systems as prescribed by the watershed classes defined in Forest Service Manual 2520. A description of watershed condition and classes are found in Forest Service Manual 2520. This report assesses soil condition, water quality, and riparian conditions.

Cumulative effects were analyzed in light of the past, present and reasonably foreseeable actions as listed at the beginning of Chapter 3.

Soil Condition

The current soil conditions for the Hackberry and Pivot Rock Allotments are shown in Table 25. Soil conditions were determined by using Terrestrial Ecosystem Survey (TES) Miller et al 1995) and field data collection in 2006 using the soil condition protocol developed in Region 3 (FSH 2509.18-99-1). This protocol assesses three soil functions which include the ability of the soil to resist erosion, infiltrate water and recycle nutrients. Copies of data sheets are available in the project record, [PR#10].

Table 25. Soil Conditions of the Hackberry and Pivot Rock Range Allotments

(Source: Miller et al, 1995)

SOIL CONDITION CLASS	ACRES	RELATIVE PERCENT
Satisfactory	53,071	67%
Satisfactory-Inherently Unstable	7,623	10%
Unsatisfactory	4,658	6%
Impaired	13,567	17%
Grand Total	**78,919**	**100%**

Satisfactory: Indicators signify that 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.

Satisfactory/Inherently Unstable: Indicators signify that soil is functioning properly but soils are eroding faster than they are renewing themselves due to steep slopes.

Unsatisfactory: Indicators signify that a loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs or recover from impacts. Unsatisfactory soils are candidates for improved management practices or restoration designed to recover soil functions.

Impaired: Indicators signify a reduction in soil function. The ability of the soil to function properly and normally has been reduced and/or there exists an increased vulnerability to degradation.

Environmental Consequences for the Soils Resource

Units of Measure and Indicators of Effects

The most dynamic feature of soil condition is the vegetation type and density and litter

production that guides the nutrient cycling function, as well as aids in reduction of erosion. The unit of measure for evaluating effects to soil conditions is effective ground cover. The analysis will focus on change to vegetation resources (plants and litter) that provide nutrient cycling and erosion control through litter development (effective ground cover). Two other components of soil condition are used as measurements of effects; infiltration and compaction. The rate of infiltration and the degree of compaction affects the density and type of vegetation cover which in turn affects litter development and nutrient cycling. The discussion will be narrative and effects will be measured qualitatively.

No Graze/No Action Alternative

Direct Effects

There will be no direct effects from livestock under this alternative. There will be no direct effects from removal of biomass, standing crop should increase and no compaction should occur from livestock grazing. Precipitation (timing and amount) will influence the amount and extent of vegetative ground cover that occurs on the allotments. Bredy et al. (1989) noted in a 16 year study of grazed and ungrazed semi-desert grasslands that ground cover increased more on the ungrazed plot, but that ground cover increased on both grazed and ungrazed plots and suggest precipitation was the reason for the increase in ground cover on both plots. As stated in the range management section above, the effects to ground cover over the long-term may be negligible.

Indirect Effects

The indirect effect of accelerated erosion and sediment delivery to connected stream courses caused from livestock grazing would be eliminated. There would not be an effect of other wild animals re-grazing on succulent re-growth after livestock have left a pasture as there would be in the Proposed Action. Grazing by wild animals would be the only agent causing direct and indirect effects to soil condition. There should be no effect to riparian proper functioning condition (PFC) from livestock grazing.

Cumulative Effects

The cumulative effects boundary for the soil and watershed resource are 17 6th code watersheds that lie within the Upper Clear Creek, West Clear Creek and Fossil Creek-Lower Verde River 5th code watersheds. A small portion of the Pivot Rock Allotment falls within the East Verde River 5th code watershed, however, the small acreage and the geologic separation will minimize any effects from grazing to the watershed. The Mogollon Rim will keep this portion of the allotment out of the cumulative effects boundary. The timeframe of the analysis will be 10-years because ground disturbing activities have had suitable time to recover in this timeframe. The analysis will be narrative in form, relying on overall soil condition rating for the Terrestrial Ecosystem Survey for map units described on the Coconino, Prescott and Tonto National Forests that occur within the cumulative effects boundary. The analysis has considered the listing of past, ongoing and future foreseeable projects in Chapter 3.

As there would be no livestock grazing, there would be no cumulative effects to add to past, ongoing and future foreseeable action in the analysis area. This would leave about 79,000 less acres of grazing, within the cumulative effects boundary that could potentially increase the

standing crop available for litter production left on-site. This would leave about 61,000 acres of the 137,000 acres within the cumulative effects area still in grazing. This would be a 57% reduction of direct grazing impacts (loss of biomass and compaction). How this affects the soil condition is tied to the amount and timing of precipitation.

In summary, the No Graze/No Action Alternative within the Hackberry and Pivot Rock Range Allotments would maintain current soil conditions. How much of an improvement would occur is tied to the timing and amount of precipitation that will occur in the future. This action will move the soil condition towards Forest Plan Standards and Guidelines of satisfactory soil condition by the year 2020.

Proposed Action Alternative

Direct Effects

Vegetation and Litter Production

The most dynamic feature of soil condition is the vegetation type and density and litter production that guides the nutrient cycling function, as well as aid in reduction of erosion. The unit of measure for the soil section of this report will focus on change to vegetation resources (plants and litter) that provide nutrient cycling and erosion control through litter development. No quantitative measure will be used to discuss effects; rather, the effects will be discussed in narrative fashion using research as a guide for effects.

The following summary of research discusses the effects of grazing on plant production, which in turn affects the potential for the amount of biomass produced. Grazing can stimulate plant production, increase Annual Net Primary Production (ANPP) which can produce more above ground biomass that would be available for litter and thus improve soil conditions (Loeser et al 2004 and Eneboe 2002). Drought also has effects on ANPP and above ground standing crops, which again affects litter available for nutrient cycling (Enoboe et al and Heinshmidt et al (1999). Light grazing (30% utilization) does leave a higher amount of vegetation standing crop than moderately grazed sites and that perennial grass survival is higher in a lightly grazed scenario than a moderately grazed scenario of 50% utilization (Holecheck et al, 2003) .

Holecheck further went on to summarize differences in forage production reported in studies between heavy, moderate, and light grazing intensities. Holecheck noted that when averaging forage production reported in studies that “heavy stocking overall resulted in a 20% decline in forage production, moderate stocking had no change, and light stocking resulted in an 8% increase. In drought years moderately stocked pastures produced 20% more forage than those heavily stocked. Forage production was 49% higher under light than heavy grazing and 24% higher under light than moderate grazing. These studies consistently showed that the greatest benefit of light or conservative stocking in terms of forage production occurred in the dry years. Holecheck further went on to discuss that “Heavy stocking consistently caused a downward trend in ecological condition, light stocking caused an upward trend, and slight improvement occurred under moderate stocking” (p. 13). The effect to soil resources, and in particularly litter

production, is the lower the utilization level, the greater the amount of standing crop available for litter for nutrient cycling, (Holecheck et al. 1999, p. 13).

Examining the Palmer Drought Severity Index (PDSI) as an indicator, soil condition assessments for the Hackberry Allotment area together displays a strong relationship between precipitation and litter production, namely, the greater the precipitation, the greater the litter production. Brady et al (1989) noted in a 16 year study of grazed and ungrazed semidesert grasslands that ground cover increased on both grazed and ungrazed plots and suggest precipitation was the reason for the increase on both plots. Gottfried and Pieper (2000), in Milchunas 2006, p. 26) seem to be consistent with this thought stating that water stress limits plant growth in pinyon-juniper woodlands and Semmartin et al. (2004) add that in temperate grasslands, litter quality varies as a consequence of two forces: mean annual rainfall and grazing regime.

The conclusion of this is that soil resources will be improved under this management scenario. There will be improved vegetative conditions and greater improvement in wet cycles because litter creation will increase with wetter conditions. The use of Adaptive Management principles, especially varying utilization and stocking numbers during and immediately after drought, will improve vegetative conditions that will in turn improve soil conditions.

Infiltration and Compaction

Related to infiltration is soil compaction. Soil compaction refers to a change in physical structure of soil and relates to available pore spaces within a soil. The more compacted or dense a soil, the less space there is available for water in the soil and vegeative growth. Increased soil compaction means a reduced water infiltration rate into the soil and increased surface water runoff or overland flow.

Infiltration and compaction can affect above ground biomass production as well. The greater the compaction, the less the infiltration and the more difficult it is for plants to grow (Belsky et al. 1999). A variety of studies show that the greater the intensity of the graze, the greater the detrimental affect to soil physical properties (compaction) and that less infiltration occurs (Gifford and Hawkins 1978, Warren et al. 1986, Belsky et al. 1999). Warren et al. (1986) note that low and moderate intensity grazing had a minmal effect on infiltration and that high intensity grazing had a high, negative effect to infiltration.

In Compaction is expected to occur where cattle congregate, primarily near water sources. This is a small percentage of the allotment. Compaction is evident more in the Hackberry Allotment than the Pivot Rock Allotment. On the Hackberry Allotment, no evidence of compaction was evident in 12 of 19 soil condition sites, mild compaction in 3 of 19 samples and compaction in 4 of 19 soil conditions sites (one site is in a small holding pasture and one site within 100 yards of a stock tank). Sites with mild compaction and compaction also had low effective ground cover. The soil condition sample points do not equally represent the entire site but do display that adequate ground cover also helps protect a site from compaction. Increasing vegetative ground cover under this alternative will be the first step towards improved soil condition, with compaction decreasing over a longer time frame.

In the Hackberry and Pivot Rock Allotments, the conservative utilization level should increase effective ground cover on-site during average to moderate wet cycles. The 30-40% may be too high during prolonged drought and should be adjusted for years of multiple droughts to a lower utilization level or through removal of cattle, which should increase forage production (Holecheck et al., 1999). Under an adaptive management scenario, utilization levels of 0% up to the maximum of 30-40% can occur. The goal of maintaining at least 2/3 of maximum vegetative ground cover will maintain long-term soil productivity and improve wet cycles. When utilization levels are adjusted for drought and wet cycles, then I believe the net effect will move impaired soils to satisfactory over time in the Proposed Action. Unsatisfactory soils will be much slower to display improvement, but should slowly improve over the long run. Additional monitoring of unsatisfactory soils will be necessary to examine the affects of the Proposed Action on soil condition on these soils. Overall, improved soil condition equates to improved watershed condition, and thus this alternative will move towards the Forest Plan standard and guideline for improving watershed condition by the year 2020, although it may not be fully attained by this time if drought conditions persists.

Indirect Effects

By implementing livestock grazing on the Hackberry and Pivot Allotments, there may be an indirect effect of other wild animal grazing following the succulent re-growth. This can have a negative effect to soil condition through a reduction in biomass. Therefore, wild ungulate grazing is an indirect (and cumulative) effect of cattle grazing.

Cumulative Effects

The cumulative effect boundary and duration of the effects are the same as the No Graze/No Action Alternative. The lists of projects of past, present, and future and foreseeable projects are also the same as the No Graze/No Action Alternative.

This alternative will decrease livestock grazed acres in the Teepee Pasture (524 acres) within the Fossil Creek-Lower Verde River sub-watersheds, which is less than 1% of the acres in the sub-watersheds in this 5th code watershed. This alternative will also decrease livestock grazed acres for at least the first 10 years in the Kehl Pasture (7,586 acres) within the Upper Clear Creek sub-watersheds, which is approximately 24% of the sub-watersheds in this 5th code watershed that are within the cumulative effects boundary.

Overall, this alternative will decrease grazing by about 8,000 acres over current grazing. This will reduce grazing from about 127,500 to 119,400 acres of grazing over the entire cumulative effects analysis; a reduction of about 7% of area grazed by livestock, and leaving 86% of the entire cumulative effects area with livestock grazing. In addition, the adjacent Fossil Creek Allotment is also being proposed for lower utilization standards than current and using adaptive management with a goal to improve overall soil condition and litter creation and retention. However, the improvement in ground cover with no grazing will be difficult to attain in drought conditions as discussed in the Proposed Action. Also, the presence of elk will continue to utilize flora within the entire cumulative effects analysis area—especially the riparian communities within the Pivot Rock Allotment.

The past thinning, prescribed burning and wildfire have a short-term affect to litter, of about 1-3 years until needle cast and understory vegetation becomes re-established. The sub-watersheds within the West Clear Creek 5th code has the largest acreage of the past, present and future foreseeable acreage of past thinning, prescribed burning and wildfire (about 12,770 acres), with the sub-watersheds within the Upper Clear Creek 5th code having the next greatest acreage of past, present and future foreseeable acreage of past thinning, prescribed burning and wildfire (about 7,500 acres), and the sub-watersheds within the Fossil Creek-Lower Verde River 5th code having the least amount of acreage of past, present and future foreseeable acreage of past thinning, prescribed burning and wildfire (about 1,400 acres). For the purpose of this analysis, we will assume 1-5% of the acres of burning and thinning have short-term soil impairment from projects or wildfire, or about 125-640 acres for the sub-watersheds within the West Clear Creek 5th code, or about 75-375 acres for the sub-watersheds within the Upper Clear Creek 5th code, and about 10-70 acres for the sub-watersheds within the Fossil Creek-Lower Verde 5th code. This is less than 1% of each of the sub-watersheds.

The new Travel Management Rule and the Managing Motorized Travel EIS is proposing to close roads and limit off-road travel for all forests within the watershed boundary. The lower utilization standards and adaptive management that are being proposed within this Proposed Action Alternative, as well as on the Fossil Creek Range Allotment analysis are designed to improve current soil conditions. Cumulative effects can be summarized by current soil conditions and water hydrologic conditions for the entire watershed. The Proposed Action Alternative will have minimal affects to soil and water resources, and these will be mainly positive effects from proposed road decommissioning and changes in management on the Fossil Creek, Hackberry and Pivot Rock Allotments that encompass about 68% of the acres grazed in the watershed that are aimed at improving soil conditions. Overall, improved soil condition equates to improved watershed condition, and thus this alternative will move towards the Forest Plan standard and guideline for improving watershed condition by the year 2020, although it may not be fully attained by this time if drought conditions persists.

No Trailing Action Alternative

Direct and Indirect Effects

The direct and indirect effects are nearly identical to the Proposed Action Alternative due to the short duration of the graze in the trailing corridor.

Cumulative Effects

The cumulative effects boundary for soil and watershed effects is the same as for the No Action and Proposed Action Alternatives. The cumulative effects are the same as the Proposed Action because these acres are still being grazed under the Fossil Creek Allotment.

WATER AND RIPARIAN RESOURCES

The following section describes the affected environment and effects of the alternatives for the water resource which includes riparian conditions, and water quality. The analysis presented is summarized from the following reports which are incorporated by reference: *Soil and Water Specialists Report,* by D.Fleishman (2007) [PR#39] *Addendum to the Soil and Water Specialist Report,* by D.Fleishman, (2008) [PR#39.1]and *Soil and Water Existing and Desired Condition Report* by D.Fleishman [PR#12].

Affected Environment for the Water and Riparian Resource

Water Quality

East Clear Creek in the Little Colorado River 4th Code watershed and the Verde River and West Clear Creek in the Verde River 4th code watershed are the only perennial streams in the allotments and are the only streams that have water quality measurements by the Arizona Department of Environmental Quality. East and West Clear Creek are associated with the Pivot Rock Allotment and the Verde River is associated with the Hackberry Allotment.

The most recent assessment of water quality for East Clear Creek, West Clear Creek and the Verde River were completed in 2006 (ADEQ 2006). Water quality measures display that there are no exceedances for water quality standards in East Clear Creek and West Clear Creek, and that turbidity in the Verde River impairs this reach for Agriculture and Wildlife watering.

A Total Maximum Daily Load (TMDL) for turbidity was completed in 2002 for the Verde River. The 2006 report notes that there is a "Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new Suspended Sediment Concentration (SSC). Only 1 of 11 SSC samples exceeded the 80 mg/L." In other words, the turbidity standard has changed and that it is very likely that the new SSC standard will display this reach as attaining the new standard. See the *Soil and Water Specialist Report* [PR#39] for the water quality data from the draft 2006 water quality assessment from ADEQ.

Riparian Condition

There are approximately 271 miles of stream courses within and adjacent to the Hackberry and Pivot Rock Allotment. Of these, approximately 52 miles are riparian in nature (see tables below). Proper functioning condition assessments were completed in 1998, 1999, and 2002 using protocol set forth in the BLMs Riparian Proper Functioning Condition Assessment (Prichard et al., 1998) on a majority of the reaches. Reaches within the Kehl Pasture of the Pivot Rock Allotment were further reviewed in 2007 using the same PFC protocol. The Verde River is the only perennial stream that borders the western portion of the Hackberry Allotment and is mainly in proper functioning condition. East Clear Creek, Kehl Canyon and Miller Canyon are perennial interrupted streams that occur in the center of the Pivot Rock Allotment.

Table 26 displays the riparian streams on the Hackberry Allotment and their PFC rating. Most all of the streams are intermittent in nature and riparian vegetation is associated with springs primarily. The entire reach lengths are not riparian in nature, only small portions of the reach. The condition of these portions is tied to spring condition, which is primarily PFC to functional,

at-risk, depending on grazing pressure. Non–riparian streams cannot be analyzed under PFC due to a lack of riparian species. The non-riparian streams flow only in response to moisture events.

Table 26. PFC Class for Streams Within the Verde 4th Code Watershed on the Hackberry Range Allotment

PFC Class	Stream Name	Pasture name	Miles
FUNCTIONAL AT RISK		Middle Towel	1.2
	Hackberry Canyon	Buckhead	2.4
		Hackberry Springs	0.0
	Sycamore Canyon	Buckhead	0.7
	Towel Creek	Lower Towel	1.0
	(blank)	Hackberry	0.0
		Jims 1	1.0
		Middle Towel	1.4
		Phroney	0.8
		Upper Towel	0.6
NON-FUNCTIONAL	Unnamed Spring	Middle Towel	0.4
	Wet Prong Spring	Middle Towel	0.4
PFC	Dorens Defeat Canyon	Doren	0.3
	Verde River	Lower Towel	1.4
	(blank)	Mesquite Springs	1.3
UNK		Bull Run	1.0
	(blank)	Hackberry	0.0
Grand Total			13.9

On the Pivot Rock portion of the allotment, streams occur in both the Little Colorado River 4th code watershed and the Verde River 4th code watershed. The following Tables 27 and 28 displays the PFC rating for each stream reach within the Pivot Rock Allotment by 4th code watershed.

Table 27. PFC Class for Streams Within the Little Colorado 4th Code Watershed on the Pivot Rock Range Allotment

PFC Class	Stream Name	Pasture name	Miles
AT RISK	Christianson Creek	Kehl	0.6
	East Clear Creek	Kehl	0.2
	East Miller Canyon	Kehl	0.1
	Fleishman Creek	Kehl	0.2
		Potato South	0.3
	Hi Fuller Canyon	Miller	0.1
	Kehl Canyon	Kehl	3.5
		Kehl	0.4
	Keller Creek	Kehl	1.3
	Middle Kehl Canyon	Kehl	0.7
		Kehl	0.3
	Potato Lake Draw	Potato South	0.2
		Potato Lake Exclosure	1.0
	SEC Right East Miller Canyon	Kehl	0.4

PFC Class	Stream Name	Pasture name	Miles
	Upper East Miller	Kehl	0.5
		Kehl	0.4
	Upper Miller	Kehl	0.3
	Upper Right East Miller	Kehl	0.6
	Upper Right Miller (West Miller)	Kehl	1.0
NON-FUNCTIONAL	Cienega Draw	Potato South	0.5
	East Clear Creek	Kehl	1.3
		Potato Lake Exclosure	0.0
		Potato Lake Exclosure	1.0
	Immigrant Springs	Kehl	0.2
	Kehl Canyon	Kehl	0.5
	Miller Canyon	Miller	1.9
		Kehl	2.6
		Miller	2.3
		Kehl	0.8
	Poverty Draw	Clear Creek	0.8
		Potato North	0.1
	(blank)	Miller	0.5
PFC	East Miller Canyon	Kehl	0.8
		Miller	2.8
	Hi Fuller Canyon	Miller	0.5
	Quaking Aspen Canyon	Kehl	0.5
		Potato South	1.6
		(blank)	0.1
Grand Total			**30.7**

Table 28. PFC Class for Streams Within the Verde 4th Code Watershed on the Pivot Rock Range Allotment

PFC Class	Stream Name	Pasture name	Miles
AT RISK	101 Springs	Huffer	0.3
	Clover Creek	Toms Creek	0.5
	Forty-four Canyon	Huffer	0.4
	Pivot Rock Canyon	Toms Creek	2.0
	Pivot Rock Springs	Toms Creek	0.7
	Toms Creek	Toms Creek	1.6
NON-FUNCTIONAL	Hicks and Duncan Canyon	Toms Creek	1.8
	(blank)	Toms Creek	0.1
Grand Total			**7.3**

Nineteen springs occur within the Pivot Rock allotment, most are either non-functional, or functional at-risk due to ungulate grazing. The two springs that are PFC are Clover Springs and Windfall Springs and have been excluded from all ungulate grazing by elk fences. When grazed, the springs experience trampling and loss of vegetative ground cover. PFC ratings for these

springs are from personal visits to the sites since 1990 by Dick Fleishman, but do not have PFC documentation forms. Sixteen springs exists within the Hackberry allotment. The amount of water from each spring has not been quantified; however, during drought cycle flow is diminished from each spring. Proper Functioning Condition assessments were completed on a majority of the springs in the Hackberry allotment in 2002 and 2003. Only Mesquite Springs which was fenced is in PFC. The remaining springs are Functional At-Risk or Nonfunctional. In field review in January of 2007, Towel Spring and Phroney spring had little flow, and Big Willow Spring had a flow that extended only 200 feet downstream from the spring source. When grazed, the springs experience trampling which effects functions through plant removal and compaction on-site.

Table 29: PFC class for springs within the Little Colorado 4th Code Watershed on the Pivot Rock Range Allotment

PASTURE	Spring Name	PFC Rating
Kehl	Immigrant Spring	Non-functional
	Mud Springs	Non-functional
	unnamed Spring in Kehl Canyon	Functional at-risk
	Willow Spring	Unknown
Miller	Coldwater Spring	Non-functional
	Hi Fuller Spring	Functional at-risk
Potato North	Poverty Spring	Non-functional

Table 30: PFC class for springs within the Verde 4th Code Watershed on the Pivot Rock Range Allotment

PASTURE	Spring Name	PFC Rating
Baker	Patton Spring	Non-functional
	Windfall Spring	PFC
Bed Bug East	Long Valley Spring	Non-functional
Huffer	101 Spring	Functional at-risk
	Fortyfour Spring	Functional at-risk
	Little Fortyfour Spring	Functional at-risk
Lee Johnson Waterlot	Lee Johnson Spring	Functional at-risk
Toms Creek	Baker Spring	Unknown
	Clover Springs	PFC
	Huffer Spring	Unknown
	Pivot Rock Spring	Functional at-risk
	Wildcat Springs	Non-functional

Table 31: PFC class for springs within the Verde 4th Code Watershed on the Hackberry Range Allotment

Pasture name	Spring Name	PFC Rating
Basin	Cedar Springs	NON-FUNCTIONAL
Basin	Willow Springs	FUNCTIONAL AT RISK
Basin	Big Willow Springs	NON-FUNCTIONAL
Buckhead	unnamed spring in Sycamore	

Pasture name	Spring Name	PFC Rating
Buckhead	unnamed spring in Sycamore	
Doren	Doren's Defeat Spring	FUNCTIONAL AT RISK
Hackberry Springs	Hackberry Springs	FUNCTIONAL AT RISK
Hackberry Springs	Hackberry Springs	FUNCTIONAL AT RISK
Jims 1	unnamed trib to Sycamore	
Mesquite Springs	unnamed Cottonwood Basin	PFC
Middle Towel	Wet Prong Springs	NON-FUNCTIONAL
Middle Towel	unnamed spring Towel Cr	
Middle Towel	unnamed spring Towel Cr	NON-FUNCTIONAL
Phroney	Phroney Springs	NON-FUNCTIONAL
Upper Towel	Towel Springs	NON-FUNCTIONAL
	Keg Springs	FUNCTIONAL AT RISK

Environmental Consequences for the Water and Riparian Resource

No Graze/No Action Alternative

WATER QUALITY

Direct Effects

There will be no direct effects from livestock under this alternative. There should be no effect to water quality from livestock grazing.

Indirect Effects

There will not be a re-graze on succulent re-growth as stated in the Proposed Action.

Cumulative Effects

The cumulative effect boundary and duration of the effects are the same as the Proposed Action. The lists of projects of past, present, and future and foreseeable projects are the same as the Proposed Action.

There will be an increase in standing biomass that should improve watershed condition by leaving biomass on site to trap sediments. This should decrease total sediments lost off-site. In addition to the reduction of open road miles proposed by the Travel Management Rule and the Managing Motorized Travel EIS, there should be a reduction of sediments formed and transported off-site that will ensure maintenance of current water quality standards in all streams.

RIPARIAN CONDITION

Direct Effects

There will be no direct effects from livestock under this alternative. There should be no effect to riparian proper functioning condition (PFC) from livestock grazing.

Indirect Effects
There will not be a re-graze on succulent re-growth as stated in the Proposed Action.

Cumulative Effects
The cumulative effect boundary and duration of the effects are the same as the Proposed Action. The lists of projects of past, present, and future and foreseeable projects are the same as the Proposed Action.

Riparian proper functioning condition would have livestock removed as a source of site impact, however, elk would continue to graze (on some sites year round), negatively affecting riparian vegetation. The elk exclosure at Cienega Draw would not be built under this alternative. The riparian PFC is not expected to improve greatly over time due to elk and drought impacts on the Pivot Rock Allotment. The riparian conditions within the Hackberry Allotment would have improved vegetative conditions without livestock because elk use is currently low within the Hackberry Allotment

Proposed Action Alternative

WATER QUALITY

Direct Effects
Livestock can directly have a variety of effects to water quality including bacterial contamination from cattle waste, including fecal coliform, Cryptosporidium, Giardia, and Salmonella (Belsky et al. 1999). The occurrence of these pathogens increases with an increase in livestock intensity (numbers and duration). Grazing ungulates can also increase the sediment load and suspended solids resulting in turbidity. This is accomplished through trampling, disturbance, erosion from denuded streambanks, reduced sediment trapping by stream bank vegetation that has been removed by grazing, and increased peak flows from soil conditions that are in less than satisfactory condition (see discussion above on infiltration, compaction, and litter). These factors all come into play when grazing intensity is high, which does occur in the headwater meadows in the allotment.

Water quality in the State of Arizona is determined by the Arizona Department of Environmental Quality (ADEQ). Currently, water quality within the East and West Clear Creek are in full compliance with ADEQ standards (ADEQ 2006). The Verde River has one constituent element that is in non-compliance for turbidity and there is no indication of bacterial waste from livestock in any of the water quality samples. Water quality is expected to improve on about 31 miles of stream (20 miles of riparian) due to the proposed deferral of livestock grazing in Kehl Pasture.

Indirect Effects

Upland grazing (as well as other activities, such as roads and recreation activities) can increase sediment production. Using the Coconino National Forest Terrestrial Ecosystem survey modeled soil loss over a non-disturbed condition. Modeling indicated soil loss has increased from an average of .2 tons per hectare per year to .5 tons per hectare per acre per year on the Pivot Rock

Allotment and from 1.7 tons per hectare per year to 2.3 tons per hectare per year on the Hackberry Allotment. This does have the potential to negatively affect water quality, but has not been displayed in water quality data on any of the streams associated with the two allotments.

Cumulative Effects

With a decrease in open roads and a decrease in utilization from current levels that will retain more standing crop, it is expected that less sediments will be produced within the cumulative effects boundary. A reduction of direct cattle access of 31 miles of streams in the Kehl Pasture of the Pivot Rock allotment will also minimize direct cattle impacts that could affect water quality. Water quality at springs within the Hackberry Allotment that are scheduled to be fenced will maintain water quality at these sites. Water quality is expected to remain within standards under this alternative.

RIPARIAN CONDITION

Direct Effects

Grazing can negatively affect stream channel morphology, decrease the ability of stream channels to filter sediments and maintain streambank stability which can change stream channel morphology (Haines 1993, Belsky et al., 1999, Rosgen 1996, Clary and Leininger 2000, Trimble and Mendel 1995).

Proper function condition (PFC) assessments for the Pivot Rock Allotment display that approximately 84% of the riparian streams in the Little Colorado 4th code watershed (Upper Clear Creek 5th code watershed) are functional at-risk (46%) or nonfunctional (38%) and 16% at Proper Functioning Condition. Proper function condition (PFC) assessments for the Pivot Rock Allotment display that approximately 100% of the riparian streams in the Verde River 4th code watershed (West Clear Creek 5th code watershed) are functional at-risk (74%) or nonfunctional (26%).

The Kehl Pasture contains nearly half of the streams within the Upper Clear Creek portion of the Pivot Rock allotment (see table below). The temporary removal of cattle from this pasture until PFC conditions improve will remove cattle impacts on 17 miles of stream channel. Approximatley .5 miles of non-functional riparian condition will be protected from livestock and elk within the Potato South pasture at Cienaga Draw. This site should show drastic improvement, similar to the exclosure at Potato Lake Draw. All riparian reaches within the Upper Clear Creek 5th code watershed are expected to remain in a static trend, even though cattle will be excluded from about 17 miles of riparian reaches in the Kehl Pasture---mainly from continued and persistent grazing from elk and drought. Coldwater Springs was fenced from all ungulates on 1995, however on field review in 2007 there is little evidence of any riparian vegetation inside the exclosure. There is evidence of headcutting within the draw that may have dewatered this site. Even with the elk proof fence, this site is non-functional and not expected to improve.

Riparian conditions on woody vegetation throughout the allotment are poor. There is evidence of woody riparian vegetation in most all reaches from histroic photos, however, woody plant

species are lacking from almost all meadow positions (exception are the two Bebb's Willows at the Kehl Springs Campground). PFC assessments in 2007 note little or no grazing on woody vegetation where elk are restricted by geology, however, where elk can access willows, they are heavily grazed and are almost absent from the stream channels. Alders within reaches in the Upper Clear Creek area show limited browsing.

For the West Clear Creek watershed, all reaches are either non-functioning or are functioning at-risk, with the Tom's Creek pasture containing the bulk of the streams that are in poor riparian condition. Much of the poor riparian condition problems within these pastures are due to ATV use and drought. A recent off-road vehicle closure order in this portion of the watershed is expected to limit ATV use. Grazing by all ungulates is also a factor in poor riparian condition. Woody riparian vegetation is abundant in Tom's Creek proper (primarily alder with some willow). Ironically, the ATV use may be a deterrent to animal use, but there is no proof this is occurring. No improvements in springs that are not fenced from all ungulates is expected under this Alternative. Clover Springs will continue to be at PFC.

For the Hackberry Allotment, there are about 14 miles of riparian reaches, about 71% are either functional at-risk (65%) or nonfunctional (6%), about 22% are in proper functioning condition and the remaining 7% of the miles of riparian have not be assessed. The riparian stream reaches in the Hackberry portion of the allotment are different in nature than in the Pivot Rock Allotment. The riparian plants are primarily gallery forest riparian areas, consisting primarily of sycamore, cottonwood, ash, and walnut, with little herbaceous riparian vegetation. The streams are on the average, steeper in gradient that the stream channels in the Pivot Rock Allotment. During field review in January of 2007, multiple age classes of woody riparian vegetation were observed in Towel Creek and Hackberry Creek. During field visits in 2009, multiple age classes of woody riparian vegetation was also observed in the Doren's Defeat stream reach. Grazing within this portion of the allotment is primarily late fall, winter and early spring. Grazing on woody riparian vegetation is preferable when plants are dormant (Wyman et al. 2006). However, care must be taken if grazing extends into the early season when plants begin to grow (Wyman et al. 2006).U Ripaian vegetation and soil conditions at the two springs and one pool in Towel Creek scheduled for fencing should remove cattle impacts from these sites. Elk use in the desert sites has been minimal in the past, however, there is documented elk use at Keg Spring in the 2003 PFC assessment that may compromise the effectiveness of cattle exclosures if use increases.

Grazing is currently excluded along the Verde River, except at one emergency watering point—this will continue under this alternative. Grazing in the dormant season will have little effect to woody riparian vegetation, again, care must be taken to move cattle out of Middle Towel and Lower Towel pasture before woody riparian plants begin to grow on Towel Creek and out of Buckhead Pasture on Sycamore Creek. The Forest Plan utilization standard of 20% use on woody riparian species should maintain woody species within these streams. If woody riparian use exceeds 20%, then measures to protect streams need to be implemented, including pasture exclusion or fencing.

Grazing at springs can be very heavy. Proper Functioning Condition Assessments were completed on most of the springs in the Hackberry allotment in 2002 and 2003. A majority of the springs were either non-functional or functional at-risk (see table below). The Red Rock District

has completed NEPA to fence Cedar, Keg, Willow, Hackberry, and Phroney Springs and has completed small fences around the source at Big Willow and Doren's Defeat springs. Riparian vegetation and soil conditions at the two springs and one pool in Towel Creek scheduled for fencing should remove cattle impacts from these sites. Elk use in the desert sites has been minimal in the past; however, there is documented elk use at Keg Spring in the 2003 PFC assessment that may compromise the effectiveness of cattle exclosures if use increases. Again, use needs to be monitored to ensure that excessive trampling and woody riparian use is not exceeded at all springs. If woody riparian use exceeds 20%, then measures to protect streams need to be implemented, including pasture exclusion or fencing. Use guides for herbaceous vegetation in riparian areas in both the Hackberry and Pivot Rock allotments should leave a minimum 10 centimeter residual stubble height to improve riparian conditions in riparian areas (Clary and Leininger, 2000).

Indirect Effects

Indirect effects to riparian area include upland livestock grazing that can increase sediments to riparian areas. This process can result in aggradation of riparian areas if litter is kept in place.

Cumulative Effects

Proper functioning condition of riparian areas in the Pivot Rock Allotment is not expected to greatly improve under this alternative because of persistent elk grazing. An exception to this will be the elk exclosure at Cienega Draw that will be protected from all grazing and is expected to respond quickly. Woody riparian vegetation is not expected to become established, even in the livestock excluded Kehl pasture. The exclusion of livestock grazing will at least remove livestock grazing pressure from the riparian drainages within this pasture. The implementation of off-highway vehicle use on approximately 25,000 acres will reduce vehicular pressure on vegetation in the headwaters of West and East Clear Creek. In particular, Toms Creek, Corduroy Wash and Pivot Rock Canyon are expected to see reduced impacts from off-road vehicles in the sub-watersheds of West Clear Creek. This may improve alder vegetative conditions in Toms Creek where ATV trails bisect alder within the drainage. This may be offset by elk use that may have been reduced from vehicular disturbance—but this is not a confirmed affect. Water quality is expected to remain within standards under this alternative.

The riparian conditions in the Hackberry Allotment may show improvement. Managing utilization at 20% and any adaptive management are designed to maintain or improve riparian conditions. The rate of recovery will be dependent on time of use and precipitation. If persistent riparian damage is occurring, an adaptive management action, such as, fencing sites, will be implemented to minimize impacts. It is felt that riparian function will improve over time in the Hackberry Allotment and that reaches that are currently in PFC will maintain this status and reaches that are not in PFC will move towards PFC. Water quality is expected to remain within standards under this alternative.

No Trailing Action Alternative

Water Quality and Riparian Condition

Direct and Indirect Effects

The direct and indirect effects are nearly identical to the Proposed Action Alternative due to the short duration of the graze in the trailing corridor.

Cumulative Effects

The cumulative effects boundary for soil and watershed effects is the same as for the No Action and Proposed Action Alternatives. The cumulative effects are the same as the Proposed Action because these acres are still being grazed under the Fossil Creek Allotment.

WILDLIFE

The following section describes the affected environment and effects of the No Graze/No Action Alternative, the Proposed Action Alternative and the No Trailing Action Alternative for wildlife resources. The terrestrial wildlife resource includes special status species of: threatened and endangered species, and their critical habitats, Forest Service sensitive species, management indicator species and migratory birds. Other non-special status species considered in the effects analysis include general wildlife: game species, mammals, amphibians and reptiles. The analysis presented is summarized from the following reports which are incorporated by reference: *Wildlife Specialist's Report,* by J. Agyagos and J. Oertley 2007; [PR#34] and the *Wildlife Specialist's Report Addendum #1,* J. Agyagos and J. Oertley 2008, [PR# 34.1].

Affected Environment for Wildlife Resources

General Wildlife (Non-Special Status Species)

Game species within the Hackberry and Pivot Rock Allotments include elk, mule deer, white-tailed deer, bear, mountain lion, bobcat, gray fox, coyote, javelina, cottontail and jackrabbits, squirrels, and raccoons. Non-game mammal species include chipmunks, mice, rats, woodrats, skunks, ring-tailed cats, and approximately 22 species of bats. There are close to two hundred species of birds that may occur on the Hackberry and Pivot Rock Allotments. The majority of these birds are passerines but other groups of birds include waterfowl, wading birds, fowl-like birds, raptors, and various non-passerine birds such as kingfishers, doves, hummingbirds, and woodpeckers. Amphibians and reptiles on the allotment include several species of toads, frogs, lizards, and snakes. Non-special status amphibians include canyon tree frogs, striped chorus frogs, mountain tree frog, and tiger salamanders. Numerous species of lizards occur throughout the uplands (non-riparian areas); collared, fence, earless, side-blotched, and tree lizards. Snake species that occur in the area include: various garter snakes such as the black-necked and wandering; whip snakes; king snakes; gopher (bull) snake; and rattlesnakes such as the black-tailed and Western diamondback.

Threatened & Endangered Species and Critical Habitats

Threatened and Endangered (TE) species and/or their habitat, that may occur within or adjacent to the project area are shown in Table 32 below.

Table 32. List of Federally Listed or Proposed Species Within Hackberry and Pivot Rock Allotments

Common Name	Scientific Name	Status
Mexican spotted owl	*Strix occidentalis lucida*	Federally Threatened
Southwestern willow flycatcher	*Empidonax traillii*	Federally Endangered
Yuma clapper rail	*Rallus longirostris yumanensis*	Federally Endangered
Bald Eagle (Sonoran Desert Form)	*Haliaeetus leucocephalus*	Federally Threatened
Chiricahua leopard frog	*Rana chiricahuensis*	Federally Threatened

Mexican Spotted Owl

Three levels of habitat management – protected, restricted and other forest and woodland types - are defined in the MSO Recovery Plan to achieve a diversity of habitat conditions across the landscape. Protected habitat includes Protected Activity Centers (PACs), all mixed-conifer and pine-oak types with slope >40%where timber harvest has not occurred in the past 20 years, and all legally and administratively reserved lands. Total protected habitat consists of 7,659 acres or 10% of the FS lands within the allotment, 6,415 acres which are within 14 PACs. Restricted MSO habitat is outside protected habitat and includes 1) pine oak stands consisting of ≥ 10 basal area (sq.ft./acre) of oak outside protected areas, 2) mixed conifer stands and 3) riparian forests. There is a total of 25,241 acres of restricted habitat or 32% of the project area. The remainder of the acres in the allotment (43,939) are considered to be other forest and woodland. There are 53,157 acres of designated Mexican spotted owl critical habitat within the allotment which are within the Upper Gila Mountain Recovery unit (GMU#10), and entirely in the Pivot Rock portion of the allotment. These habitat types are further broken down in Table 33 below.

33. Mexican spotted owl habitat in the Hackberry Pivot Rock Range Allotment

MSO Habitat	Acres in Project Area, % of Allotment Area	Description
Other Forest and Woodland Types	43, 939 Acres, 56%	Forest and Woodland Types Outside Projected and Restricted Habitat
Protected	6,415 Acres in 14 PACs	PACs
Protected (outside PACs)	26 Acres	Pine Oak and Mixed Conifer
Protected (outside PACs)	1,218* Acres	Wilderness 0, Wild & Scenic Rivers 1,175*, Special Areas 43
Total Protected Habitat	7,659 Acres, 10%	
Restricted	15,000 Acres	Pine-oak >=10 Basal Area Outside Protected Areas
Restricted	9,376 Acres	Mixed Conifer Stands Outside Protected Areas
Restricted	5 Acres	Riparian Forest Outside Protected Areas
Total Restricted	25,241 Acres, 32%	
Acres of Protected and Restricted Habitat	32, 900 Acres, 42%	
Protected Habitat in Critical Habitat Designation	6,712 Acres	6,415 Acres are in PACs
Restricted Habitat in Critical Habitat Designation	16,181 Acres	Pine Oak and Mixed Conifer
Other Habitat in Critical Habitat Designation	30,264 Acres	Mostly Pinyon-Juniper
Total Designated Critical Habitat	**53,157 Acres, 68%**	

*1,175 acres of Wild and Scenic designation occur along Verde River, 13 miles from nearest PAC, and 11 miles west of critical MSO habitat, and therefore are unlikely to provide useable habitat for MSOs.

Southwestern Willow Flycatcher
Nesting southwestern willow flycatchers prefer dense riparian thickets in areas where perennial flow, surface water, or saturated soil is present from April through September. In most riverine situations, associated channels are wide and shallow with a well-defined floodplain and a broad valley. Extensive surveys for potential and suitable flycatcher habitat has occurred throughout the Verde Valley. On and adjacent to the allotment, it has been determined that suitable habitat only occurs along the Verde River.

Yuma Clapper Rail
The Yuma Clapper Rail lives and nests in freshwater marshes or along riverine riparian systems where wet soil and dense vegetation occurs. Yuma Clapper Rails have only recently been detected in the Verde Valley. There is potential for suitable rail habitat to occur along the Verde River where large stands of cattails persist. No surveys have been conducted.

Bald Eagle (Sonoran Desert Southwestern Form)

Due to a court order (CV 07-0038-PHX-MHM) on March 6, 2008. bald eagles in the Sonoran Desert of central Arizona are again protected as "threatened" under the Endangered Species Act.

Nesting Bald Eagles
Bald eagles are known to nest along the Verde River on the Prescott, Coconino, and Tonto National Forests. Two bald eagle nesting areas occur along the Verde River within the vicinity of the Hackberry portion of the allotment: Coldwater and Ladders. Nests associated with the Coldwater BA are located as far upstream as 6.0 miles upstream of the Child's power plant and downstream to halfway between the Child's Power Plant and the confluence of Fossil with the Verde. The Ladder's BA is located from the Falls to ½ mile downstream of Chasm Creek. According to James Driscoll, Bald Eagle Program Manager for the Arizona Game and Fish (Pers comm., June 5,2000), the Coldwater eagles, even when nesting 6.0 miles upstream of Child's frequently use the reach between Child's and the Fossil confluence for foraging.

Wintering & Roosting Bald Eagles
Wintering bald eagles can be found foraging throughout the allotment, particularly along highways where they feed opportunistically on carrion and along riparian zones where they forage on fish and waterfowl. Wintering bald eagles have been detected on the allotment during mid-winter bald eagle counts along Highway 87, FH3 and Highway 260. Wintering bald eagles will also forage opportunistically throughout the uplands.

On the Hackberry and Pivot Rock Allotments, communal roosting may potentially occur in mixed conifer, ponderosa pine, and pine/oak vegetation types where suitable conditions such as steep slopes, wind protection, open canopy, and larger trees occur. Although no roosts data was present for the Hackberry and Pivot Rock Allotments despite various Forest bald eagle roost surveys and reports (Grubb et al. 1989, Grubb 1996, Grubb and Kennedy 1982), roost locations

are extremely hard to detect because eagles don't begin roosting until after dusk and leave the roost before dawn.

Chiricahua Leopard Frog

Chiricahua leopard frogs are habitat generalists, breeding in perennial slack waters (natural and man-made) that support heterogeneous aquatic vegetation. Chiricahua leopard frogs are known to occur in the Buckskin Hills Conservation Management Zone (CMZ) between 5,020 and 5,780 ft. Historically, Chiricahua leopard frogs were present in various locations on the Pivot Rock Allotment. Recently Chiricahua leopard frogs persisted in an earthen livestock tank on the Hackberry portion of the allotment.

Forest Service Sensitive Species

All species on the Coconino National Forest's Threatened, Endangered and Sensitive Species List were considered in this analysis. Of these, 27 sensitive species are present or have potential habitat within the analysis area and have been evaluated. The following Table 34 summarizes these species and their status in the analysis area.

Table 34. Sensitive Species and Description of Their Habitat on the Hackberry and Pivot Rock Allotments

Common Name	Habitat and Presence in and Adjacent to the Project Area
Sensitive Mammals (9)	
Merriam's Shrew	Occupies cool grassy areas near conifer forests and can be found in similar areas as the Mexican vole. Although limited habitat occurs on the allotment, potential occurs in the Pivot Rock portion of the allotment. These insectivorous animals may occur in the burrows of other animals while hunting.
Western Red Bat	Roosts solitarily in deciduous trees along riparian corridors
Spotted Bat & Greater Western Mastiff Bat	Roosts in cracks and crevices along high cliff ledges
Allen's lappet-browed Bat	Roosts underneath exfoliating bark on standing ponderosa pine snags. Ponderosa pine forests occur on the Pivot Rock portion of the allotment and it is possible that these bats roost there.
Pale Townsend's Big-eared Bat	Roosts in caves, mines, and other man-made structures including cliff dwellings and abandoned shacks.
Wupatki Arizona Pocket Mouse	This pocket mouse may be found in desert scrub habitats and on the Hackberry portion of the allotment, where creosote bush, cactus, mesquite, and scrub oak occur. They sleep and rear their young in burrows and feed extensively on seeds. They over-winter in burrows.
Plains Harvest Mouse	May be found in desert scrub, chaparral, and riparian habitats and are known to occur in the Verde Valley. They feed on the green parts and seeds of a variety of plants and use grasses for constructing nests above ground. They over-winter in burrows.
Mogollon Vole (formerly Navajo Mountain Mexican Vole)	No documented populations or sightings of voles in the project area. Suitable habitat exists within the allotment, in Ponderosa pine and mixed conifer forest and montane willow riparian forest. Voles use runways that access burrow entrances and feeding sites.
Sensitive Birds (7)	
Bald Eagle	Nesting bald eagles occur along the Verde River. Wintering and roosting bald eagles may occur throughout the allotment, particularly along highways where they feed opportunistically on carrion and along

Common Name	Habitat and Presence in and Adjacent to the Project Area
	riparian zones where they forage on fish and waterfowl.
Northern Goshawk	All ponderosa pine and mixed conifer is considered goshawk habitat (52,758 acres. There are two known northern goshawk territories within the Hackberry and Pivot rock Allotment boundary.
American Peregrine Falcon	Suitable nesting habitat (200-300 foot tall cliff faces) for peregrine falcons occurs on the allotment; one nesting pair known on allotment and four others within 3 miles of allotment.
Common Black Hawk	Nest in low elevation riparian areas and has been observed in all reaches of the Verde River
Western Yellow-billed Cuckoo	Suitable habitat where deciduous riparian forest and mesquite bosques occur.
Ferruginous Hawk	Occurs in grassland and open woodlands, particularly during the winter. The feed on mammals, mainly rabbits, hares, ground squirrels and pocket gophers.
Abert's Towhee	Occurs in dense brush and woodlands found along riparian areas. This ground forager feeds on insects and seeds. They prefer to build their nests in tree rather than shrubs and often build their nests in clumps of mistletoe.
Burrowing Owl	Found in grasslands and open range and desert habitats that support burrowing animals. They either dig their own burrow or else nest in the burrows of other animals like kangaroo rats, coyotes, foxes, and badgers.
Sensitive Amphibians (3)	
Lowland Leopard Frog	Suitable habitat occurs along perennial streams and where perennial pools persist in intermittent washes.
Northern Leopard Frog	Suitable habitat for northern leopard frogs include quiet slow moving water along streams and rivers, wetlands associated with lakes, permanent or temporary pools, beaver ponds, and human-constructed habitats such as cattle ponds. Within the assessment area, there are four historic locations of northern leopard frogs, none of which have been recently occupied.
Arizona Toad	The Arizona toad occurs in rocky streams, canyons, and floodplains with dense riparian vegetation where they breed in gently flowing waters generally with well-developed riparian vegetation. Arizona toads have been reported historically from the Verde River.
Sensitive Reptiles (3)	
Narrow-headed Garter Snake	The most aquatic of the garter snakes and is seldom found far from quiet, rocky pools in large streams and rivers. Known to occur in the Verde River and may occur in perennial streams on the allotment.
Mexican Garter Snake	Usually found in or near streams and ponds with shallow, slow-moving, or impounded waters where they feed on leopard frogs, toads, tadpoles, and fish. Mexican garter snakes have been sighted along the Verde River and several of its tributaries. Additionally, perennial springs are potential habitat, especially if prey items such as frog and tadpoles exist.
Reticulated Gila Monster	Known to occur in the Verde Valley and has been sighted in various locations in the Verde Valley, including along the Fossil Creek road. It spends most of it's time in burrows; only a handful of weeks are spent above ground each year. Gila monsters may only feed four to five times a year on nestling mammals and birds, the eggs of lizards and birds, lizards, and even carrion.
Sensitive Invertebrates (5)	

Common Name	Habitat and Presence in and Adjacent to the Project Area
A Mayfly	Occurs in the benthic portions of aquatic systems. Not much is known about the species life history.
Blue-black Silverspot Butterfly	Suitable habitat consists of soils hosting Viola and thistle plants. Population status is unknown
Mountain Silverspot Butterfly	Abundant potential habitat on the allotment consisting of pinyon-juniper, ponderosa pine, and mixed conifer
Spotted Skipperling	Abundant potential habitat on the allotment consisting of pinyon-juniper, ponderosa pine, and mixed conifer.
California Floater	Known historically from the Verde River and its tributaries. Floaters occur in shallow, unpolluted water where, after maturation attaches to the fins of fish.

Management Indicator Species (MIS)

Management Indicator Species (MIS) have been identified for each Management Area (MA) described in the Coconino National Forest's *Land and Resources Management Plan* (1987, as amended). Forest-wide trends of all MIS have been assessed and are reported in Management Indicator Species Status Report for the Coconino National Forest, 2002.

Table 35. Management Indicator Species by Management Areas Found on the Hackberry and Pivot Rock Allotments

Management Area (MA)	Management Indicator Species	Acres within Project Area
MA-3: Ponderosa pine and mixed conifer, less than 40 percent slopes	Mexican spotted owl, red squirrel, Abert squirrel, elk, northern goshawk, pygmy nuthatch, turkey, and hairy woodpecker	47,210
MA-4: Ponderosa Pine and mixed conifer on greater than 40% slope	Turkey, goshawk, pygmy nuthatch, elk, Abert squirrel, red squirrel, hairy woodpecker, Mexican spotted owl	1181
MA-7: Pinyon Juniper on less than 40% slope	Plain (juniper) titmouse, mule deer, elk	280
MA-8: Pinyon Juniper on greater than 40% slope	Plain (juniper) titmouse, mule deer, elk	26
MA-9: Mountain Grasslands	Pronghorn	59
MA-10: Grassland and sparse pinyon-juniper above the rim	Pronghorn	398
MA-11: Verde Valley	Pronghorn	22,701
MA-12: Riparian and open water	Yellow-breasted chat, Lucy's warbler, Cinammon teal, and Lincoln's sparrow	632

Table 36. Coconino National Forest MIS; the Habitat They Were Chosen to Represent, and Whether Habitat or Population Monitoring is Required

Species	Habitat	Monitoring Requirement*
Red squirrel	Late seral mixed conifer and spruce-fir	Habitat
Abert squirrel	Early seral ponderosa pine	Habitat
Mexican spotted owl	Late seral mixed conifer and spruce-fir	Habitat
Northern goshawk	Late seral ponderosa pine	Habitat
Pygmy nuthatch	Late seral ponderosa pine	Habitat

Turkey	Late seral ponderosa pine	Population
Elk	Early seral ponderosa pine, mixed conifer, and spruce-fir	Population
Hairy woodpecker	Snag component of ponderosa pine, mixed conifer, and spruce-fir	Habitat
Mule deer	Early seral aspen and pinyon-juniper	Population
Juniper (Plain) titmouse	Late seral and snag component of pinyon-juniper	Habitat
Pronghorn antelope	Early and late seral grasslands	Population
Lucy's warbler	Low elevation riparian	Habitat
Yellow-breasted Chat	Low elevation riparian	Habitat
Cinammon Teal	Wetlands and aquatic habitat	Habitat
Lincoln's Sparrow	High elevation riparian	Habitat

*Coconino National Forest Plan, Table 14, pp. 211-214

Habitat components for five species of management indicators were selected for further analysis in this project based on the fact that livestock grazing can affect grasslands, low elevation riparian, high elevation riparian, and wetlands and aquatic habitats. The five MIS species that have been fully analyzed include: pronghorn, Lucy's warbler, yellow-breasted chat, Lincoln's sparrow, and cinnamon teal [PR#34].

Table 37. Summary of Trend and Acres of Habitat for MIS Within the Hackberry and Pivot Rock Allotments

MIS Species	Forest Habitat Trend	Forest Population Trend	Habitat in Project Area
Pronghorn	Stable to Declining	Declining	398 acres grasslands above the rim and 59 acres of montane grasslands for a total of 457 acres. Plus 468 acres of grassland within the Verde Valley Management Area. Grand total of 925 acres.
Lucy's Warbler	Inconclusive	Increasing	314 acres of cottonwood willow riparian For a total of 8 reaches
Yellow-breasted Chat	Stable to Declining	Increasing	314 acres of cottonwood willow riparian For a total of 8 reaches
Cinnamon Teal	Inconclusive	Semi permanent – increasing. Seasonal – stable below potential. Open water – stable.	632 acres of riparian and open water.
Lincoln's Sparrow	Inconclusive	Stable, but well below potential	632 acres of riparian and open water

Pronghorn occur in low numbers on the allotment and may be found in grassland and open pinyon-juniper and ponderosa pine woodlands. Both the Lucy's warbler and yellow-breasted chat occur in low elevation riparian, which on the allotment consists of the Verde River, Towel Creek, Boulder Canyon, Sally May Wash, Hackberry Canyon, Cimarron Creek, Dorens Defeat Canyon, Wet Prong, Sycamore Canyon, and a number of springs such as Cottonwood/Mesquite, Dorens, Big Willow, Willow, Cedar, Keg, Hackberry, and Phroney. Suitable habitat for the

Lincoln's sparrow occurs on the Pivot Rock portion of the allotment along riparian corridors with a shrubby willow component such as Clover Creek, East Clear Creek, Tom's Creek, Hi Fuller canyon, Poverty Draw, Kehl Canyon, East Miller Canyon, Miller Canon, Hicks and Duncan Canyon, Keller Creek, Potato Lake Draw, Quaking Aspen Canyon, Cienega Draw, Christiansan Creek, and Fleishman Creek. Suitable habitat for the cinnamon teal occurs on the allotment in 6 seasonal wetlands, all in the Pivot Rock area, totaling 13.5 acres, with the largest area (9.8 acres) at Potato Lake.

Migratory Birds

Executive Order 13186 requires that an analysis be made of the effects of Forest Service actions on species of concern listed by Partners in Flight; the effects on important bird areas (IBA) identified by Partners in Flight (Latta et al. 1999); and the effects to important over-wintering areas. There are no IBAs within the project area. The migratory birds to be addressed are included in Table 38 below.

Table 38. Migratory Birds Found Within the Hackberry and Pivot Rock Allotments

Priority Species	Habitat and Presence
Olive-sided flycatcher	Forest openings and edges within mature ponderosa pine forests with snags. Known to occur on the allotment.
Cordilleran flycatcher	Snags and high overstory canopy closure in ponderosa pine. Potential habitat in small patches, on steep slopes, or in pine stringers in small drainages. Known to occur on the allotment.
Purple martins	Uncommon summer resident in ponderosa pine. This species has been nearly extirpated from ponderosa pine forests due to loss of habitat. Very likely to occur on the allotment based on the presence of purple martins in similar habitats outside the project area.
Gray flycatchers	Pinyon pine and juniper, or ponderosa pine with an open overstory. Requires ground cover to support insect populations for foraging. Larger taller stands of sagebrush and greasewood are also used. Known to occur on the allotment.
Pinyon jays	Common to uncommon permanent residents in the pinyon influenced portion of the project area. Very likely to occur on the allotment based on the presence of pinyon jays in similar habitats outside the project area.
Gray vireos	Open and mature juniper woodlands where there is an understory of broadleaf shrubs. Nest low in a small tree or shrub and are known hosts to brown-headed cowbirds. Known to occur on the allotment.
Black-throated gray warblers	Open woodlands and are commonly encountered nesting in pinyon-juniper woodlands. Encountered much more frequently in tall stands with a higher density of mature pinyon pine. Known to occur on the allotment.
Swainson's hawk	Prefer grasslands and open desert scrub habitats.
Grasshopper sparrow	Prefers pure grassland habitats without trees or shrubs and they require abundant thatch and dry grass for nest concealment. During the summer, these sparrows are insectivorous, but depend almost entirely on grass seeds during the winter months when insects are not available.
MacGillivaray's warbler	Occurs in high elevation riparian areas where Ribes and willow occur. This warbler nests close to the ground in dense shrubbery.
Red-face warbler	Known to occur along the Mogollon Rim in pine-oak woodlands and sometimes in oak thickets and aspen stands on slopes adjacent to

Priority Species	Habitat and Presence
	riparian areas.

Environmental Consequences for Wildlife Resources

No Graze/No Action Alternative

General Wildlife (Non-Special Status Species)

Direct, Indirect and Cumulative Effects

Because livestock grazing and livestock management activities will not occur under the No Graze/No Action Alternative, this alternative will have a beneficial affect to general non-special status species within the allotments. The No Graze/No Action Alternative can reasonably be expected to: increase rodent and small mammal density and diversity, increase songbird and raptor diversity, increase abundance and diversity of lizards, increase abundance of garter snakes and other riparian dependent species. A standing crop of biomass and litter should increase as a result of the No Graze/No Action Alternative. Soil compaction from livestock grazing would not continue. Current soil conditions would be maintained and would improve over time. These changes in soil and vegetative conditions will benefit wildlife. Herbaceous vegetation is a food source for many species and their prey, and herbaceous vegetation is necessary for cover for many species, and for some species herbaceous cover is used to construct and conceal nests which is critical for species recruitment. The No Graze/No Action Alternative will also allow for optimal riparian conditions, increasing species abundance and diversity. Where riparian conditions are currently classified as nonfunctional, continued elk use may not lead to markedly improved habitat conditions even with elimination of livestock grazing.

Because there will be no livestock grazing and livestock management activities under this alternative, there will be no cumulative effects to threatened and endangered species and their critical habitat, Forest Service Sensitive Species, Management Indicator Species and Migratory Birds.

Threatened and Endangered Species and Critical Habitat

Livestock grazing and livestock management activities will not occur under the No Graze/No Action Alternative. The No Graze/No Action Alternative will have a beneficial effect to listed species or their habitat – refer to the General Wildlife section above.

Forest Service Sensitive Species

Because livestock grazing and livestock management activities will not occur under the No Graze/No Action Alternative, this alternative will have a beneficial effect on sensitive species or their habitat – refer to the General Wildlife section above.

Management Indicator Species

Because livestock grazing and livestock management activities will not occur under the No Graze/No Action Alternative, this alternative will have a beneficial effect to management

indicator species but would not likely result in a change to the forest-wide trend for MIS species – refer to the General Wildlife section above.

Migratory Birds

Because livestock grazing and livestock management activities will not occur under the No Graze/No Action Alternative, this alternative will have a beneficial effect on migratory birds and their habitat - refer to the General Wildlife section above.

Proposed Action Alternative

General Effects of Grazing to Wildlife

The following discussion describes general effects to wildlife associated with grazing management.

Direct, Indirect and Cumulative Effects

Activities associated with the management of Hackberry and Pivot Rock Allotments include: grazing, construction and maintenance of infrastructure such as earthen water tanks, pasture and boundary fences, pipelines, troughs, cattle guards, and livestock management. These activities can directly affect wildlife species when ranch employees, vehicles, livestock, and dogs cause aural and visual disturbance to individuals that may be present in the allotment. Most bird, mammal, reptile, and aerial invertebrate species are mobile and are capable of dispersing from disturbance. However disturbance that is frequent or of long duration can result in the abandonment of the area, which is equivalent to loss of habitat. Individuals incapable of dispersal (nestling, terrestrial invertebrates, young) or individuals unwilling to disperse (adults with immobile young) can experience negative affects including: trampling and crushing, collection and handling; increased physiological stress; flushing of birds from incubating eggs thus increasing potential for eggs to become unviable; premature fledging of young from nests; and increased potential for predation.

Disturbance to bats may occur when noise from livestock management activities such as personnel, vehicles, and dogs are present within close enough proximity to roost locations. Noise disturbance of high intensity can disturb bats in their roosts and result in premature exiting or unnecessary arousal from hibernation. Since hibernating bats often have only enough fat reserve to bring them out of hibernation once, disturbance during the winter can trigger bats to arouse from hibernation, only to go resume hibernation without enough fat reserves to come back out in the spring. Noise disturbance of long duration can cause temporary or permanent roost abandonment.

Activities related to the management of the allotment, including livestock grazing, can directly affect wildlife habitat through the loss, destruction, modification, or fragmentation of vegetation. More specifically, activities proposed within the planning area, especially the riparian zone, results in: loss of soil-stabilizing ground cover; soil compaction; decreased amount of grasses, forbs, shrubs, and recruitment trees; increased potential for invasion of exotic weeds; decreased infiltration of water during rain events; increase rates of runoff; increased sedimentation into streams; increase of contaminants into streams; decreased water quality, and exacerbated flooding.

The proposed construction of fences may affect ground-dwelling species such as rodents and reptiles on a localized scale, but any associated disturbance is considered of short duration and would have limited habitat modification.

There are only a handful of studies that measure the effect of grazing on lizard habitat and only one was found to have addressed livestock grazing in similar habitats and with similar species as the proposed action area. In Arizona, the abundance and diversity of open-space and wide-ranging foraging lizards was higher on lightly grazed sites (versus heavily grazed sites) in four habitat types including chaparral and desert grassland (Jones 1981). Declines in the abundance and diversity of lizards were attributed to a change in vegetative structure which was described as a reduction of low vegetation, primarily perennial grasses (Jones 1981).

Livestock grazing can indirectly affect wildlife by affecting their prey such as small mammals, lizards, and arthropods. Small mammal prey is important for many species of higher trophic levels, including raptors, carnivorous mammals, snakes, and avian predators (Hayward et al. 1997; Saab et al. 1995). When rodent prey decrease in response to reduced vegetative cover, so do the avian predators (Saab et.al 1995). Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by removing rodent food sources such as seed heads (Heske and Campbell, 1991; Hayward et al., 1997; Adler and Lauenroth, 2000). In one study, rodent burrow densities were higher in ungrazed plots when compared to grazed plots (Adler and Lauenroth, 2000). Numerous studies support that the abundance of rodents is higher in ungrazed and lightly grazed areas (Valone and Sauter, 2004; Jones and Longland, 1999; Bock and Bock 1984 Reynolds & Trost 1980). Indirect effects of livestock grazing on rodents can occur when grazing changes the composition of vegetative species (Heske and Campbell, 1991; Hayward et al., 1997) and structure of vegetative species (Jones and Longland 1999; Hayward et al., 1997; Adler and Lauenroth, 2000).

In addition to small mammal and lizards, arthropods are important food for various species of mammals, birds, reptiles, amphibians, and other invertebrates. Songbirds of the grasslands primarily prey on arthropods (Milchunas et.al. 1998). Aboveground macro arthropods (insects and arachnids) experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998).

Birds are indirectly affected by the impacts grazing has on vegetation (Saab et al. 1995). Livestock reduce forage production which reduces litter production, increases soil compaction, and reduces infiltration (see watershed section). These changes to the soil and consequently the vegetation as a result of livestock grazing affect some breeding birds negatively (Saab et al. 1995). Birds that depend on dense herbaceous ground cover for nesting and/or foraging are most likely to be adversely affected by grazing (Saab et.al. 1995). Grazing during the breeding season of ground nesting birds can reduce herbaceous vegetation necessary for concealing nests (Saab et al. 1995). A reduction in herbaceous vegetation can expose nests resulting in an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure. In shrub steppe habitats (which includes desert scrub and pinyon-juniper woodlands), Saab et al. (1995) recommends managing livestock grazing to maintain current season growth through 15

July and then retain greater than 50% of perennial bunchgrass annual growth through the next nesting season. This would likely increase successful nesting for ground nesting birds.

Riparian habitat is a dwindling resource; in the Western U.S., less than 20% of historic levels of riparian still exist (Belsky et al. 1999). Confounding the loss of riparian habitat is the number of animals dependent either entirely or partly on riparian areas. Upwards of 80% of southwestern wildlife species (Chaney et al. 1990) and approximately 60 to 70 percent of western bird species (Ohmart 1996) depend on riparian areas. Despite their importance, riparian areas have historically experienced the most degradation.

In general, livestock grazing negatively affects riparian dependent wildlife (Belsky et al. 1999). Livestock grazing in riparian areas can directly affect aquatic species such as frogs, toads, salamanders, and garter snakes by trampling. Livestock can indirectly affect riparian obligate and aquatic species by: trampling aquatic vegetation in which these species use for hiding cover, temperature regulation, and substrate (that supports birds nest and frog and toad eggs masses); and by increasing sediments in and turbidity of the water body thereby decreasing water quality for these species and their prey base. Southwestern riparian areas that were excluded from livestock grazing had 50% more small mammals when compared to plots with livestock grazing (Hayward et al. 1997). One third of riparian bird species showed significant differences in diversity between heavily and lightly grazed riparian sites (Mosconi and Hutto, 1982). Although the bark-foraging guild was unaffected, grazing affected three other guilds of riparian birds: flycatching, ground-foraging, and foliage-gleaning (Mosconi & Hutto 1982). In a study in Utah, there was a 350% increase in use and diversity of songbirds, raptors, and small mammals after eight years of no grazing in a riparian area (Duff, 1979 in Fleischner 1994). The abundance and diversity of lizards was higher on ungrazed sites in mixed riparian scrub and cottonwood-willow deciduous forests (Jones 1981, Jones 1988). Wandering garter snakes were five times more abundant in ungrazed riparian sites in New Mexico (Szaro et al. 1985).

As described in detail in the fisheries section, the primary negative impacts to aquatic systems, riparian habitat, and their associated biota from livestock grazing come as indirect effects such as: increased sedimentation into stream channels, loss of riparian vegetation, altered macroinvertebrate assemblages, lowering of groundwater tables and decreased perennial flows, increased stream temperature, larger peak flows, stock tank impacts, and changes in channel form (Belsky et al. 1999; Fleischner 1994). Indirect effects to aquatic species from sediment can occur by modifications to stream habitat. These changes include: altered channel morphology, loss of fish spawning and rearing habitat, and changes in the macroinvertebrate assemblage (Lisle 1989; Miller and Benda 2000; Wood and Armitage 1997). When livestock grazing indirectly affect fish and macroinvertebrates, grazing subsequently affects those species that forage on fish and macroinvertebrates. Frogs and toads depend on invertebrates for food. Garter snakes depend at least partly on fish, frogs, toads, tadpoles, and salamanders for food. Insectivorous birds (flycatchers, warblers, and others) and bats depend at least partly on the aerial life forms of aquatic macroinvertebrates for food. Birds such as blackhawks, herons and kingfishers depend on fish and other aquatic organisms for their food. Mammals such as raccoons and river otters depend at least partly on fish and aquatic invertebrates for their food.

Nutrients in livestock waste create algal growth in ponds. The decomposition of algae causes low dissolved oxygen concentration which negatively affects aquatic organisms (Belsky et al. 1999). Ponds used by livestock had been documented to have lowered amphibian reproduction due to increased levels of phosphorus and increased turbidity (Knutson et al. 2004). Accumulating evidence suggests that nitrates and ammonium, among other chemicals, can negatively impact amphibians, and that ranids are particularly sensitive to levels of these compounds (Baker and Waights 1994; Nebeker, et al. 2000; Burgett, et al. 2007; Johansson, et al. 2001; Hatch and Blaustein 2000; Hatch and Blaustein 2003; Hecnar 1996; Rouse et al. 1999; Macias et al. 2007; and Marco et al. 1999). Livestock commonly congregate around water sources such as tanks which are also important to aquatic wildlife and are some of the last refugia available to leopard frogs since natural systems have been invaded by non-native aquatic organisms such as fish, bullfrogs, and crayfish. Because leopard frogs often represent the most sensitive aquatic organisms to water quality indices such as nitrates and ammonium, certain levels could impact the existence of frog populations in a tank or preclude the water source from providing habitat for frogs. In times of drought, tanks with residual water attract more terrestrial wildlife and livestock, increasing input of nitrates and ammonium, which is concentrated as water continues to evaporate. In order to improve the quality of water and lower nitrogen input, Knutson et al. (2004) recommend reducing livestock access to ponds.

As demonstrated by the literature review above, livestock grazing can cause: a decrease in the quality and quantity of wildlife food, cover, and shelter; reduced animal abundance; reduced abundance of prey species; and decreased nest success. Grazing by wildlife ungulates, especially large numbers of elk, compounds these effects.

Certain waters in the Hackberry and Pivot Rock Allotments have been identified as important to wildlife. The proposed action calls for water to be left in stock tanks for wildlife use after domestic livestock have been removed from the grazing unit. Critical water tanks for wildlife include: Big Willow Spring, Keg Spring, Cedar Spring, Grapevine Spring, Doren's Defeat Spring, Hackberry Springs, Wet Prong Spring, Towel Creek Perennial Pool, Partnership Tank, Phroney Spring and Pipeline Drinker, Fuller Tank, Dry Lake Tank, various natural springs in the Huffer Pasture and Toms Creek Pasture, Miller Canyon, and Lee Johnson Spring. This will be particularly beneficial to wildlife during drought years. Other mitigation measures such as building fences to wildlife standards and providing wildlife ramps in troughs and drinkers will also benefit wildlife.

Threatened and Endangered Species and Critical Habitat

Mexican Spotted Owl

Under the proposed action, cattle grazing or cattle management activities will occur within PACs, but no human disturbance or construction actions associated with the cattle grazing will occur in PACs during the breeding season (March1 through August 31). Cattle grazing and cattle management activities within PACs will be managed for levels that provide the woody and herbaceous vegetation necessary for cover for rodent prey species, the residual biomass that will support prescribed natural and ignited fires that would reduce the risk of catastrophic wildfire in the Forest, and regeneration of riparian trees. Owl foraging habitat should be maintained in the Proposed Action Alternative by the conservative level of grazing utilization in the 7,659 acres of

protected habitat, the 25,241 acres of restricted habitat, and in the 53,157 acres of designated critical habitat that is within the Hackberry and Pivot Rock Allotments.

In fact, because the PACs and restricted habitat occur in mixed conifer and pine stands, often with high canopy closure, grazing utilization should be the light in comparison with more open areas in the allotment that produce more forage. In some PACs, steep slopes, cliffs, lack of water and distance from large meadows should discourage cattle use.

The proposed improvements (fence building and removal and erosion control maintenance) should have no effect on spotted owls or their habitat. Fenced areas are expected to show improvements in vegetative growth over time and therefore potentially improve MSO prey habitat.

The existence of several water sources within the designated critical habitat and other MSO habitat, contribute to congregation of livestock and increase trampling and removal of vegetative forage above the moderate utilization objective in localized areas. However, with rotational management system (deferred or rest-rotation grazing) objectives for plant growth and recovery should be met overall on the allotment.

Southwestern Willow Flycatcher

Under the proposed action, livestock can only access one place along the Verde River to water. Because use of this one water access point is infrequent, livestock grazing along the Verde will be minimal. Indirect effects may occur from indirect watershed effects, from direct habitat modification, and from attracting foraging brown-headed cowbirds, that in turn parasitize southwestern willow flycatcher nests. Indirect effects occurring within the action area resulting from livestock grazing on the allotment are determined to be insignificant or discountable based on criteria established by the document "Framework for Streamlining Informal Consultation for Livestock Grazing Activities" (2005). The proposed action, therefore meets guideline number 1, 2, 3a, and 3b under may affect not likely to adversely affect and so formal consultation is not required provided that grazing regimes meet the guidelines listed in the recovery plan.

Yuma Clapper Rail

No surveys have been conducted for rails, however, there is potential habitat for rails along the Verde River. Livestock grazing and livestock management activities can directly affect rail habitat where livestock have access to the one place along the Verde River. Because use of this one water access point is infrequent, livestock grazing along the Verde will be minimal.

Indirect effects to uplands in the watershed could affect riparian habitat for the rail. As stated in the fisheries section, the primary negative impacts to aquatic systems and their associated biota from livestock grazing come as indirect effects such as: increased sedimentation into stream channels, loss of riparian vegetation, altered macroinvertebrate assemblages, lowering of groundwater tables and decreased perennial flows, increased stream temperature, larger peak flows, stock tank impacts, and changes in channel form (Belsky et al. 1999; Fleischner 1994). Livestock grazing in the uplands can result in watershed effects that contribute to erosion and sediment, which can increase turbidity in the Verde River and result in reduced water quality.

The project design feature and mitigation of 20% maximum utilization on woody riparian vegetation will reduce the amount of effects livestock have on riparian vegetation along the Verde River.

Bald Eagle

Under the proposed action, livestock can access one place along the Verde River to water during emergency situations. Because use of this one water access point is infrequent, livestock grazing along the Verde will be minimal. The water access point is less than 0.5 miles from a known eagle nest and in an area where nesting eagles may be foraging. Although nesting bald eagles forage mainly along the river, they also forage in the uplands for small mammals. Livestock management activities can disturb eagles foraging in the uplands. Livestock grazing in the uplands can result in watershed effects that contribute to erosion and sediment, which can increase turbidity in the Verde River and result in reduced water quality which affects prey availability, quality and numbers.

Grazing will also occur near bald eagle winter roosts and in areas where wintering bald eagles forage. While the presence of livestock should not disturb bald eagles, livestock graze the same forage upon which upland prey species depend. In addition, livestock management activities involving the use of vehicles and ATVs may disturb bald eagles. There will be grazing and livestock management activities in areas with foraging and roosting eagles.

Chiricahua Leopard Frog

The proposed action allows for livestock grazing in recently occupied and suitable sites, resulting in direct and indirect effects to Chiricahua leopard frog habitat. Earthen tanks provide suitable habitat and may be reoccupied via re-colonization from nearby occupied tanks upon a year with good reproductive success and adequate monsoon precipitation. Should re-colonization occur, livestock grazing as proposed could result in direct and indirect affects to the frogs. Livestock trailing through the Fossil Creek Allotment has and can continue to result in direct effects to Chiricahua leopard frogs and their habitat on the Fossil Creek Allotment. Hackberry cattle, that became separated while trailing across Fossil Creek Allotment, have been left behind on the Fossil Creek allotment for months at a time, even when Fossil Creek livestock were not permitted. This can contribute to additional direct and indirect effects to leopard frog habitat on the Fossil Creek allotment. Should trailing occur in the fall, as proposed, livestock could be trailed in a way that minimizes effects to Chiricahua leopard frogs and their habitat on the Fossil Creek allotment if: livestock are trailed in one day and no livestock are left behind even for that day; livestock are not allowed to access waters that have been or are occupied by Chiricahua leopard frogs; and livestock are routed well around tanks that have been or are currently occupied by Chiricahua leopard frogs to avoid inadvertent access.

Livestock grazing can affect the Chiricahua leopard frog by: trampling aquatic and aquatic vegetation in which these species use for hiding cover, temperature regulation, substrate to support frog and toad eggs masses, and for foraging; and increasing sediments in and turbidity of the water body thereby decreasing water quality for these species and their prey base. In addition, nutrients in livestock waste create algal growth in ponds. The decomposition of algae causes low dissolved oxygen concentration which negatively affects aquatic organisms (Belsky

et al. 1999). Ponds used by livestock had been documented to have lowered amphibian reproduction due to increased levels of phosphorus and increased turbidity (Knutson et al. 2004).

Accumulating evidence suggests that nitrates and ammonium, among other chemicals, can negatively impact amphibians, and that ranids are particularly sensitive to levels of these compounds. Examples of literature on this topic include: Baker and Waights (1994), Nebeker, et al. (2000), Burgett, et al. (2007), Johansson, et al. (2001), Hatch and Blaustein (2000), Hatch and Blaustein (2003), Hecnar (1996), Rouse et al. (1999), Macias et al. (2007), and Marco et al. (1999). Livestock commonly congregate around water sources such as tanks which are also important to aquatic wildlife and are some of the last refugia available to leopard frogs since natural systems have been invaded by non-native aquatic organisms such as fish, bullfrogs, and crayfish. Because leopard frogs often represent the most sensitive aquatic organisms to water quality indices such as nitrates and ammonium, certain levels could impact the existence of frog populations in a tank or preclude the water source from providing habitat for frogs. In times of drought, tanks with residual water attract more terrestrial wildlife and livestock, increasing input of nitrates and ammonium, which is concentrated as water continues to evaporate. In order to improve the quality of water and lower nitrogen input, Knutson et al. (2004) recommend reducing livestock access to ponds. Water quality monitoring may be conducted periodically in tanks that are deemed otherwise suitable habitat for leopard frogs.

Livestock concentrations at tanks is traditionally higher than away from water, therefore, livestock grazing in the uplands and adjacent to tanks indirectly affects Chiricahua leopard frogs when livestock grazing reduces perennial grasses, reduces ground litter, increases compaction, decreases infiltration, which leads to increased erosion, and increased sediment transport. An increase in sediment into earthen tanks reduces the water-holding capacity of the tank, making it susceptible to drying out during drought years. Watering features would experience some level of impact from wildlife grazing even when cattle are not present. Leopard frogs are highly aquatic and need year-round water and aquatic vegetation during their active period.

Forest Service Sensitive Species

Merriam's Shrew

The Merriam's shrew occupies cool grassy areas near conifer forest and can be found in similar areas as the Mexican vole (refer to specialist report, [PR#34]). Although limited habitat occurs on the allotment, potential occurs in the northeast portion of the allotment. Affects to this species from livestock grazing and management activities would include trampling and removal of grass needed for food and cover which may make them more susceptible to predation.

The effects of livestock grazing on vegetation has been documented to affect insects, upon which this shrew feed. Aboveground macroarthropods (insects and arachnids) experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998). Light grazing (30% utilization) has been found to leave a greater amount of standing vegetative crop than moderately grazed sites and forage production was 24% higher under light than moderate grazing (Holecheck et al. 2003 and 1999). Although shrews do not make burrows themselves, they may use other animals' burrows while hunting. Livestock grazing can directly impact small mammals by trampling and

collapsing burrows and compacting soils which hinder burrow construction (Heske and Campbell, 1991; Hayward et al., 1997).

Western Red Bat
Western red bats roost solitarily in deciduous trees along riparian corridors. Disturbance to any bat species may occur when noise from livestock management activities such as personnel, vehicles, and dogs are present within close enough proximity to roost locations. Noise disturbance at certain intensities can disturb bats in their roosts and result in premature exiting or unnecessary arousal from hibernation. Since hibernating bats often have only enough fat reserve to bring them out of hibernation once, disturbance during the winter can trigger bats to arouse from hibernation, only to go resume hibernation without enough fat reserves to come back out in the spring. Noise disturbance of long duration can cause temporary or permanent roost abandonment.

Livestock grazing and management activities in riparian areas are limited, but when they do coincide, they may disturb roosting red bats. Indirect effects may occur when grazing on woody vegetation affects the recruitment of large deciduous tree that are used for roosting. Direct effects to riparian vegetation are lessened in both alternatives since the maximum pasture grazing period is 30 days during the spring use period, and livestock use of a pasture will occur in alternate years if grazed during the critical growth period for woody riparian species. The mitigation of 20% maximum utilization on woody riparian vegetation will reduce the amount of effects livestock have on riparian vegetation.

Spotted Bat and Greater Western Mastiff Bat
The spotted bat and greater western mastiff bat all roost in cracks and crevices along high cliff ledges that would not be accessible to livestock grazing and management activities. Mitigation measures such as retaining water in livestock tanks and supplying drinkers with wildlife escape ramps will benefit this species.

Allen's Lappet-browed Bat
Allen's lappet-browed bat mainly roost underneath exfoliating bark on standing ponderosa pine snags. Ponderosa pine forests occur throughout the Pivot Rock portion of the allotment and it is possible that these bats roost there. It is not anticipated that livestock grazing will have direct effects to the lappet-browed bat. However, noise from livestock management activities (particularly people, equipment and vehicles) could disturb roosting bats. Indirect effects are the same as those described for spotted bat, above. Mitigation measures such as retaining water in livestock tanks and supplying drinkers with wildlife escape ramps will benefit this species.

Pale Townsend's Big-eared Bat
The pale Townsend's big-eared bat roosts in caves, mines, and other man-made structures including cliff dwellings and abandoned shacks. Livestock management activities in particular may disturb roosting bats when activities occur near occupied roosts. Indirect effects are the same as those described for spotted bat, above. Mitigation measures such as retaining water in livestock tanks and supplying drinkers with wildlife escape ramps will benefit this species.

Wupatki Arizona Pocket Mouse

The Wupatki Arizona pocket mouse is known from northern Arizona north of the Peaks and around Wupatki National Monument, however, its range is not fully known. This pocket mouse may be found in desert scrub habitats and on the two allotments, where creosote bush, cactus, mesquite, and scrub oak occur. They sleep and rear their young in burrows. They feed extensively on seeds; so much so that precipitation and drought is thought to be the main factor affecting populations.

Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by removing rodent food sources such as seed heads (Heske and Campbell, 1991; Hayward et al., 1997). Indirect effects of livestock grazing on rodents can occur when grazing changes the composition of vegetative species (Heske and Campbell, 1991; Hayward et al., 1997) and structure of vegetative species (Jones and Longland 1999; Hayward et al., 1997; Adler and Lauenroth, 2000). In one study there were significantly more pocket mice in areas with > 30% ground cover when compared to grazed areas with less than 25% ground cover (Valone and Sauter, 2004). In another study, pocket mice were more abundant in lightly grazed areas than in heavily grazed areas (Jones and Longland, 1999). Pocket mice and harvest mice were significantly more abundant in ungrazed areas when compared to grazed areas (Bock and Bock 1984). Rodent burrow densities were higher in ungrazed plots when compared to grazed plots (Adler and Lauenroth, 2000). Livestock grazing that results in loss of cover and food for pocket mice can make them more susceptible to starvation and predation.

Plains Harvest Mouse and Mogollon Vole (formerly Navajo Mountain Mexican Vole)
The plains harvest mouse may be found in desert scrub, chaparral, and riparian habitats. Individuals have been collected along the Verde River south of Camp Verde. Plains harvest mice co-occur with western harvest mice and the literature states that western harvest mice need cover in the form of grasses. Livestock grazing and management activities can affect harvest mice by collapsing burrows and by grazing vegetation that provides cover and produces seeds that these mice feed upon.

Mogollon voles live in grassy meadows or grassy understories primarily in open ponderosa pine, but occasionally occur at lower elevations in ponderosa pine-Gambel oak and pinyon-juniper woodland, or higher elevations in spruce-fir. They are strictly herbivores relying on herbs and green grasses in the summer, and bark, bulbs, and roots in the winter. They do not hibernate or store food and therefore forage all year round, following the same routes and pathways. Mogollon vole populations are denser where adequate herbaceous cover exists and there is threshold of vegetation cover necessary for a population of Microtus to increase. Therefore grazing and drought could affect populations of Mogollon voles (Yarborough and Chambers, 2007). Even though pastures are not proposed to be grazed every year, voles have limited ability for movement. Certain individuals may therefore be impacted but only during years that their home ranges are grazed, since regrowth of graminoids is expected between grazing periods.

Although the Plains Harvest Mouse and Mogollon Vole species differ in habitat and behavior, grazing affects them in similar ways, including directly (trampling), and their habitat (cover) and food sources (grasses, seeds or forbs). Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by

removing rodent food sources such as seed heads (Heske and Campbell, 1991; Hayward et al., 1997). Indirect effects of livestock grazing on rodents can occur when grazing changes the composition of vegetative species (Heske and Campbell, 1991; Hayward et al., 1997) and structure of vegetative species (Jones and Longland 1999; Hayward et al., 1997; Adler and Lauenroth, 2000). Pocket mice and harvest mice were significantly more abundant in ungrazed areas when compared to grazed areas (Bock and Bock 1984). Livestock grazing that results in loss of cover and food for the plains harvest mouse can make them more susceptible to starvation and predation.

American Peregrine Falcon

Grazing activities may cause disturbance to local falcons, or degrade the habitat for bird species on which they prey. Cattle ranching associated activities such as those that involve off road vehicles, or even horses, and general motorized traffic close to nesting sites, can cause disturbance, stress or even abandonment by peregrine falcons, especially during breeding season. The proposed construction of fences is not expected to have direct effects on this species or its habitat. Livestock grazing can result in impacts to peregrine falcon's prey habitat which is primarily birds. Prey depend on seeds and insects as their food source. Livestock grazing can indirectly affect wildlife by affecting their prey such as arthropods. Arthropods are important food for various species of birds, including species upon which peregrine falcon prey. Aboveground macroarthropods (insects and arachnids) experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998). Birds, including peregrine falcon prey species, are indirectly affected by the impacts grazing has on vegetation (Saab et al. 1995). Livestock reduce forage production which reduces litter production, increases soil compaction, and reduces infiltration (see watershed section). These changes to the soil and consequently the vegetation as a result of livestock grazing affect some breeding birds negatively (Saab et al. 1995). Birds that depend on dense herbaceous ground cover for nesting and/or foraging are most likely to be adversely affected by grazing (Saab et.al. 1995). Grazing during the breeding season of ground nesting birds can reduce herbaceous vegetation necessary for concealing nests (Saab et al. 1995). A reduction in herbaceous vegetation can expose nests resulting in an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure.

Northern Goshawk

Grazing can impact the density and abundance of a number of prey species that northern goshawks hunt, including ground nesting birds and most rodents. Small mammal prey is important for many species of higher trophic levels, including raptors, carnivorous mammals, snakes, and avian predators (Hayward et al. 1997; Saab et al. 1995). When rodent prey decrease in response to reduced vegetative cover, so do the avian predators (Saab et.al 1995). Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by removing rodent food sources such as seed heads (Heske and Campbell, 1991; Hayward et al., 1997; Adler and Lauenroth, 2000). In addition to mammalian prey, northern goshawks also prey on birds. Birds are indirectly affected by the impacts grazing has on vegetation (Saab et al. 1995). Livestock reduce forage production which reduces litter production, increases soil compaction, and reduces infiltration (see watershed section). These changes to the soil and consequently the vegetation as a result of livestock grazing affect some breeding birds negatively (Saab et al. 1995). Birds that depend on dense

herbaceous ground cover for nesting and/or foraging are most likely to be adversely affected by grazing (Saab et.al. 1995). Grazing during the breeding season of ground nesting birds can reduce herbaceous vegetation necessary for concealing nests (Saab et al. 1995). A reduction in herbaceous vegetation can expose nests resulting in an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure. The use of a rotational grazing system and adaptive management should help mitigate any significant effects of grazing on goshawk prey species. The proposed construction of fences are not expected to have direct effects on goshawk prey species or their habitat, due to the short duration and limited habitat modification. In goshawk prey species' habitat that occurs in pastures that will be deferred or fenced to provide improved grazing regime options, small mammal and ground nesting bird habitats are expected to improve..

Common Black Hawk and Western Yellow-billed Cuckoo

Under the proposed action, livestock can access one place along the Verde River to water and that is at Gospel Hollow. Because use of this one water access point is infrequent, livestock grazing along the Verde will be minimal. However, livestock access to the Verde River will result in slight effects to these birds and their habitat. In addition to direct effects, livestock grazing in the uplands can indirectly affect these birds' habitat when decreased watershed conditions contribute to increased sedimentation and decreased water quality. Due to the potential for these sensitive birds to nest along riparian corridors on the allotment, livestock grazing and livestock management activities may cause direct and indirect effects to the species and their habitat. Ongoing grazing of elk and other wildlife in the area can exacerbate these impacts.

Direct effects to riparian vegetation are lessened in both alternatives since the maximum pasture grazing period is 30 days during the spring use period, and livestock use of a pasture will occur in alternate years if grazed during the critical growth period for woody riparian species. The mitigation of 20% maximum utilization on woody riparian vegetation will reduce the amount of effects livestock have on riparian vegetation.

Ferruginous Hawk

The Ferruginous hawk occurs in grassland and open woodlands, particularly during the winter. The feed on mammals, mainly rabbits, hares, ground squirrels and pocket gophers. Livestock management activities can disturb individuals, however, since these hawks are most likely only present during the winter, they will not be affected during the critical breeding season. Livestock grazing can affect this hawk by grazing vegetation that serves as food and cover for prey species.

Avian predators (raptors) are dependent on small-mammal prey. Numerous studies support that the abundance of rodents is higher in ungrazed and lightly grazed areas (Valone and Sauter, 2004; Jones and Longland, 1999; Bock and Bock 1984. When rodent prey decrease in response to reduced vegetative cover, so do the avian predators (Saab et.al 1995). In a review of studies measuring the relative abundance of birds in grazed habitats compared to either ungrazed or lightly grazed areas, Saab et al. (1995) summarized that the ground-nesting ferruginous hawk show a negative response to grazing where nesting cover is limited but show a positive response in areas where they prefer open grasslands for hunting.

Abert's Towhee
The Abert's towhee occurs in dense brush and woodlands found along riparian areas. This ground forager feeds on insects and seeds. They prefer to build their nests in tree rather than shrubs and often build their nests in clumps of mistletoe. Due to their larger size, towhees are not frequent hosts for brown-headed cowbird parasitism. Livestock grazing in riparian areas has been implicated in the decline of Abert's towhees.

Livestock grazing in riparian areas has been implicated in the decline of Abert's towhees through the modification and loss of riparian habitat. Livestock grazing may also indirectly affect towhees when grazing affect towhee food sources. Abert's towhees forage on insects found on the floor within dense riparian scrub. Moderate and heavy grazing has been found to result in a decrease in macroarthropods (insects and arachnids), conversely light grazing showed slight increases in macroarthropods (Lavigne et al. 1972 in Milchunas et al. 1998). Ongoing grazing of elk and other wildlife in the area can exacerbate these impacts.

Direct effects to riparian vegetation are lessened in both alternatives since the maximum pasture grazing period is 30 days during the spring use period, and livestock use of a pasture will occur in alternate years if grazed during the critical growth period for woody riparian species. The mitigation of 20% maximum utilization on woody riparian vegetation will reduce the amount of effects livestock have on riparian vegetation.

Burrowing Owl
The Arizona Partners in Flight Plan (1999) specifically mentions livestock grazing as a threat to this owl, particularly when overgrazing results in a change from grassland to woodland, destruction of burrows, and reduction of prey. Grazing and grazing management activities could disturb individual birds as well as impact their habitat and habitat for prey species. However, it is not anticipated that grazing will cause a conversion of grasslands to woodlands nor result in a reduction of prey and grasslands are a small percentage of the allotment.

Lowland and Northern Leopard Frogs
The proposed action allows for livestock grazing in recently occupied and suitable habitats, resulting in direct and indirect effects to leopard frogs and their habitat. Grazing will be allowed around tanks and can affect the leopard frog by: trampling aquatic and aquatic vegetation in which these species use for hiding cover, temperature regulation, substrate to support frog and toad eggs masses, and for foraging; and increasing sediments in and turbidity of the water body thereby decreasing water quality for these species and their prey base. In addition, nutrients in livestock waste create algal growth in ponds. The decomposition of algae causes low dissolved oxygen concentration which negatively affects aquatic organisms (Belsky et al. 1999). Ponds used by livestock had been documented to have lowered amphibian reproduction due to increased levels of phosphorus and increased turbidity (Knutson et al. 2004).

Grazing in the uplands can indirectly affect frog habitat and aquatic prey. Livestock grazing can indirectly affect water quality when upland grazing removes biomass, reduces the protective vegetative ground cover that normally traps sediments, increases soil compaction, reduces water infiltration, increases sediment production and non-point source pollution into streams.

Increased sediment transport into earthen tanks reduces the water-holding capacity of the tank making it susceptible to drying out during drought years.

Stock tanks have been developed on public lands throughout the southwest for livestock and wildlife use. In many areas, they have both indirect beneficial effects and detrimental effects on aquatic systems. They benefit aquatic systems by limiting and trapping sediment that otherwise would continue down ephemeral channels into perennial streams. They also capture surface water and precipitation that has the potential to increase the flashiness of a stream during a storm event and allow it to percolate into the soil providing some recharge of the subsurface aquifer and potentially adding to stream base flows. Stock tanks are detrimental to aquatic systems when the sediment berms that are built to capture overland flow fail and create sediment pulses that can create acute sediment pulses into aquatic systems.

Livestock commonly congregate around water sources such as tanks which are also important to aquatic wildlife and are some of the last refugia available to leopard frogs. An additional negative impact of stock tanks to aquatic systems is the potential spread of nonnative organisms including crayfish, nonnative fish and bullfrogs. These nonnative species can negatively affect native herptefauna in the area and the nonnative species can be transported downslope to perennial aquatic systems during high flow events where they can have dramatic negative effects to the native ecosystem.

Accumulating evidence suggests that nitrates and ammonium, among other chemicals, can negatively impact amphibians, and that ranids are particularly sensitive to levels of these compounds. Examples of literature on this topic include: Baker and Waights (1994), Nebeker, et al. (2000), Burgett, et al. (2007), Johansson, et al. (2001), Hatch and Blaustein (2000), Hatch and Blaustein (2003), Hecnar (1996), Rouse et al. (1999), Macias et al. (2007), and Marco et al. (1999). Because leopard frogs often represent the most sensitive aquatic organisms to water quality indices such as nitrates and ammonium, certain levels could impact the existence of frog populations in a tank or preclude the water source from providing habitat for frogs. In times of drought, tanks with residual water attract more terrestrial wildlife and livestock, increasing input of nitrates and ammonium, which is concentrated as water continues to evaporate. In order to improve the quality of water and lower nitrogen input, Knutson et al. (2004) recommend reducing livestock access to ponds. Water quality monitoring may be conducted periodically in tanks that are deemed otherwise suitable habitat for leopard frogs.

Watering features would experience some level of impact from wildlife grazing even when cattle are not present.

Arizona Toad, Narrow-headed Garter Snake, Mexican Garter Snake

There is potential for the Arizona toad, the narrow headed garter and Mexican garter snakes, (all of which are riparian obligates), to occur along riparian corridors on the allotment and for livestock grazing and livestock management activities to cause direct and indirect effects. Livestock grazing and livestock management activities within riparian areas can directly affect aquatic herptefauna species when ranch employees, vehicles, livestock, and dogs cause aural and visual disturbance to individuals that may be present in the allotment. Direct effects to riparian vegetation are lessened in both alternatives since the maximum pasture grazing period is 30 days

during the spring use period, and livestock use of a pasture will occur in alternate years if grazed during the critical growth period for woody riparian species. The mitigation of 20% maximum utilization on woody riparian vegetation will reduce the amount of effects livestock have on riparian vegetation.

Proposed activities can indirectly affect aquatic herptefauna species by: trampling aquatic and streamside vegetation in which these species use for hiding cover, temperature regulation, and substrate to support frog and toad eggs masses; and increasing sediments in and turbidity of the water channel thereby decreasing water quality for these species and their prey base. The primary negative impacts to aquatic systems and their associated biota from livestock grazing come as indirect effects such as: increased sedimentation into stream channels, loss of riparian vegetation, altered macroinvertebrate assemblages, lowering of groundwater tables and decreased perennial flows, increased stream temperature, larger peak flows, and changes in channel form (Belsky et al. 1999; Fleischner 1994). Indirect effects to aquatic species from sediment can occur by modifications to stream habitat. These changes include: altered channel morphology, loss of fish spawning and rearing habitat, and changes in the macroinvertebrate assemblage (Lisle 1989; Miller and Benda 2000; Wood and Armitage 1997).

Reticulated Gila Monster

The reticulated Gila monster is known to occur in the Verde Valley and has been sighted in various locations in the Verde Valley, including along the Fossil Creek road. It spends most of it's time in burrows; only a handful of weeks are spent above ground each year. Gila monsters may only feed four to five times a year on nestling mammals and birds, the eggs of lizards and birds, lizards, and even carrion.

Gila monsters spend most of their time in burrows. They eat small mammals, lizards and lizard eggs. Livestock grazing can trample and collapse burrows, and compact soils which hinders burrow construction. Livestock grazing can remove plant seeds on which Gila monsters' small mammal prey depend, and it can decrease arthropods on which their lizard prey depend (Heske and Campbell, 1991; Hayward et al., 1997). In Arizona, the abundance and diversity of open-space and wide-ranging foraging lizards was higher on lightly grazed sites (versus heavily grazed sites) in four habitat types including chaparral and desert grassland (Jones 1981). Declines in the abundance and diversity of lizards were attributed to a change in vegetative structure which was described as a reduction of low vegetation, primarily perennial grasses (Jones 1981). Many species of lizards feed on insects. Aboveground macroarthropods (insects and arachnids) experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998). Therefore, grazing can affect the insects which are food for lizards, upon which Gila monsters prey.

Mountain Silverspot Butterfly and Blue-black Silverspot Butterfly

Livestock grazing and livestock management activities can directly and indirectly affect habitats and potential habitats in which these species depend, such as wet meadows, springs, riparian areas, as well as upland areas where host plant species occur. Direct effects include aural and visual disturbance to individuals; trampling/removal of plant species, especially those host plants upon which these invertebrates are dependent; and disturbing plants to which these species may be attached. In general, livestock grazing affects above ground macroarthropods which is a

group of invertebrates in which butterflies belong. Aboveground macroarthropods experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998). The Kehl pasture may represent some of the best potential habitat on the allotment. In the proposed action, livestock grazing will be deferred in Kehl pasture until desired conditions in the headwater meadow/riparian areas are achieved which will reduce impacts to host plants and any larvae that may be present. However, impacts from wildlife grazing will continue throughout the allotments, and tend to be concentrated in many of the same habitats preferred by these two butterfly species.

Spotted Skipperling
In general, livestock grazing affects above ground macroarthropods which is a group of invertebrates in which butterflies belong. Aboveground macroarthropods experienced large decreases with moderate or heavy grazing, but conversely with light grazing showed slight increases (Lavigne et al. 1972 in Milchunas et al. 1998).Grazing and livestock management activities can have direct and indirect effects on the spotted skipperling, causing aural and visual disturbance to individuals; affect plant species, especially those host plants upon which these invertebrates are dependent; disturb plants to which these species may be attached; crush non-aerial life forms such as caterpillars; and denude stream banks and compact soils.

A Mayfly
The mayfly Homoleptohyphes quercus occurs in the benthic portions of aquatic systems. Not much is known about the species life history. At the least, water quality and embeddedness of gravels and cobbles can affect this species. Livestock grazing in the uplands and in riparian areas can affect water quality as well as contribute to sedimentation which causes embeddedness and affects water quality. Livestock grazing can indirectly affect water quality when upland grazing removes biomass, reduces the protective vegetative ground cover that normally traps sediments, increases soil compaction, reduces water infiltration, increases sediment production and non-point source pollution into streams. Excessive sedimentation can result in the stream substrate becoming embedded with soil. This reduces the surface area for macroinvertebrates to attach. Ongoing grazing of elk and other wildlife in the area can exacerbate these impacts.

California Floater
The California floater is known historically from the Verde River and its tributaries. Floaters occur in shallow, unpolluted water where, after maturation attaches to the fins of fish. Livestock grazing activities may directly affect this species' habitat in riparian areas. Grazing in the uplands can indirectly affect aquatic habitat and aquatic prey. Livestock grazing can indirectly affect water quality when upland grazing removes biomass, reduces the protective vegetative ground cover that normally traps sediments, increases soil compaction, reduces water infiltration, increases sediment production and non-point source pollution into streams. Ongoing grazing of elk and other wildlife in the area can exacerbate these impacts.

Management Indicator Species (MIS)

Pronghorn
Early season grazing by cattle or wildlife has the potential to reduce fawn hiding cover provided by new growth and residual growth from the prior year. Reduced hiding cover may facilitate

predation of pronghorn fawns. The magnitude of effects varies by the number of animals, and timing and duration of graze during the fawning season as directed in the AOIs. Over time, cattle grazing can alter plant composition, species diversity, vegetative ground cover, plant community structure, and plant vigor over large areas. These changes are largely dependent on the grazing intensity, number of cattle grazed, season of use, climatic conditions, and amount of rest an area receives. Competition for forage between domestic cattle and antelope is usually minimal, but competition for early spring forage occurs at times (Lee et al. 1998).

Despite grazing in pronghorn country, when compared to the total amount of grassland habitat on the forest, the direct and indirect effect of the alternative will not result in a change in the forest-wide trend from this management indicator species.

Lucy's Warbler
This species may be affected directly and indirectly by livestock grazing and livestock management activities if the Lucy's warbler should nest within line-of-site of any proposed water access points, or within riparian corridors throughout the allotment.
Despite access to some riparian areas, when compared to the total riparian on the forest, the action alternative will not result in a change in the forest-wide trend from this management indicator species.

Yellow-breasted Chat
Should this riparian obligate nest within line-of-site of the proposed Gospel Hollow water access point, or within the other riparian corridors throughout the allotment, this species may be affected directly and indirectly by livestock grazing and livestock management activities. However, when compared to the total riparian on the forest, the action alternative will not result in a change in the forest-wide trend from this management indicator species.

Cinnamon Teal
Should this riparian obligate occur in wetlands and other riparian areas throughout the allotment, this species may be affected directly and indirectly by livestock grazing and livestock management activities. However, when compared to the total riparian on the forest, the action alternative will not result in a change in the forest-wide trend from this management indicator species.

Lincoln's Sparrow
Should this riparian obligate occur on the allotment, this species may be affected directly and indirectly by livestock grazing and livestock management activities. However, when compared to the total riparian on the forest, the action alternative will not result in a change in the forest-wide trend from this management indicator species.

Migratory Birds

Olive-sided Flycatcher
Livestock grazing in mixed conifer will have limited direct and indirect effects to olive-sided flycatcher since flycatcher depend on trees, snags for nesting and roosting, and insects for foraging.

Cordilleran Flycatcher
Concerns about the loss of suitable habitat and habitat components ideal for Cordilleran flycatchers are primarily: (1) loss of snags and downed logs for nesting and (2) loss of closed canopy causing reduction in cool microclimate that they are most frequently associated with (Latta et al. 1999). Cattle grazing at the levels proposed in this alternative do not impact recruitment of snags and downed logs. Cattle grazing in pine habitat is considered to have no impact on habitat for Cordilleran flycatchers.

Purple Martin
Effects are similar to those for the Cordilleran flycatcher. Habitat loss, especially snags and large old trees, is the primary concern with purple martins. Livestock grazing is not expected to impact this species. As with the purple martin, there may be some long term cumulative impacts from overgrazing in habitat for this species, but conservative grazing levels do not result in loss of snag recruitment or large old trees.

Gray Flycatcher
Impacts on gray flycatchers are usually related to breeding habitat loss and modification of pinyon-juniper woodlands. Grazing by wildlife and cattle reduces ground cover, inhibits regeneration of shrubs, and increases local cowbird populations (Latta et al. 1999). Cattle grazing in the project area is expected to occur at a level that maintains grass cover and the shrub component, although there would be some impact to grass and shrubs. Gray flycatchers nests may be parasitized by brown-headed cowbirds when grazing occurs in nesting habitat during the nesting season. This is offset by grazing schedules that rest or vary the timing of grazing in gray flycatcher habitat, so that not all nesting habitat has the potential for parasitism every year.

Pinyon Jay and Black-throated Gray Warbler
None of the grazing or grazing related activities in the action alternative should have an impact on these species due to lack of impact to pinyon pines. There are no direct, indirect or cumulative effects to these two pinyon associated species.

Gray Vireo
Livestock grazing is not listed as one of the management issues in the Arizona Partners in Flight Plan (1999). Grazing could have slight impacts to gray vireo if grazing results in hedging on shrubs. However, under the utilization and intensities proposed, grazing on shrubs should be at a minimum.

Swainson's Hawk
The Arizona Partners in Flight Plan (1999) specifically mentions livestock grazing as a threat to this hawk and consequently recommend setting allowable grazing utilization levels throughout all grasslands to maintain the long-term sustainability of grassland habitat. Grazing and grazing management activities could have direct and indirect effects to individual hawks as well as impact their habitat, particularly habitat for prey species.
Given the small percent of grasslands on the allotment, these impacts will be minimal.

Grasshopper Sparrow

The Arizona Partners in Flight Plan (1999) specifically mentions livestock grazing as a threat to this sparrow, particularly when grazing removes the thatch build-up under bunchgrasses, when grazing occurs during the breeding season when cover is so important, when overgrazing results in an absence of grass seeds during the winter months, and when grazing during drought contributes to winter die-offs of sparrow populations. Grazing and grazing management activities could disturb individual birds as well as impact their habitat and habitat for prey species. Since grasshopper sparrows are not known to nest on the Coconino National Forest, and may only occur as accidental, and the allotment has very little habitat of this species, there would be no effects to the Grasshopper Sparrow.

MacGillivray's Warbler
The Arizona Partners in Flight Plan (1999) mentions livestock grazing as a threat to this warbler particularly when grazing occurs in riparian areas. The plan consequently recommends managing upland and riparian soil conditions to improve water infiltration and retention to reduce peak flows and increase peak flows as well as timing livestock and human impacts to avoid the nesting season. Grazing and grazing management activities could have direct and indirect effects on individual birds as well as impact to their habitat.

Despite measures to construct a new livestock/wildlife exclosure at Cienega Draw in the Potato South pasture to protect important riparian habitat and deferring grazing in Kehl Springs pasture until conditions improve, other riparian areas with willows will not be protected. On this allotment the MacGillivray's warbler may be affected as a result of this alternative.

Red-faced Warbler
Livestock grazing is not listed as one of the management issues in the Arizona Partners in Flight Plan (1999). Although grazing and grazing management activities could disturb individual birds, these birds nest in areas likely unused by livestock. So there would be no direct or indirect effects to this species.

No Trailing Action Alternative

Description of Alternative:

The purpose of this specialists' report addendum for Hackberry Pivot Rock EA, [PR#34.2] is to disclose effects of a third alternative, referred to as the *'No Trailing Action Alternative'*. This alternative is exactly like the Proposed Action Alternative, except that it does not include trailing in either direction of livestock between Hackberry and Pivot Rock portions across the Fossil allotment.

All effects disclosed in the original Wildlife Specialist's report under the Proposed Action Alternative and therefore the biological determinations are the same for the *'No Trailing Action Alternative'* with the exception of lesser effects on Chiricahua Leopard Frogs.

Direct and Indirect Effects

No livestock from the Hackberry Pivot Rock Allotment would have access to Chiricahua Leopard Frogs or their habitat on Fossil Creek Allotment, because this alternative does not allow trailing between the two portions of the allotment. Because trailing of livestock across the Fossil Creek Allotment would not occur in this alternative, Hackberry and Pivot Rock Allotment livestock would not have access nor cause any direct effects on Chiricahua Leopard Frogs or their habitat on the Fossil Creek Allotment. On the Fossil Creek Allotment, there are 2 currently occupied tanks and 16 recently occupied and suitable tanks; these would not be directly or indirectly affected by Hackberry and Pivot Rock Allotment livestock under this alternative.

This alternative does not change the fact that the Hackberry and Pivot Rock Allotment livestock would have access to one earthen tank that has been recently occupied and one that may provide suitable habitat for the Chiricahua leopard frog on the Hackberry portion of the allotment. All other effects described in the Wildlife Specialist Report for Chiricahua Leopard frog for Hackberry and Pivot Rock Allotment would be the same.

This *'No Trailing Action Alternative'* will eliminate effects of livestock grazing on Chiricahua leopard frogs and their habitat on the Fossil Creek Allotment. Effects to Chiricahua leopard frogs and their habitat on the Hackberry Allotment will remain the same. This *'No Trailing Action Alternative'*, when compared to the Proposed Action, has a reduced level of effects to frogs and their habitat, especially to occupied habitat on the Fossil Creek Allotment.

COMPARISON OF ALTERNATIVES

No Graze/No Action Alternative, versus the Proposed Action Alternative and No Trailing Action Alternative

Following is a general comparison of the alternatives against one another. The comparison deals with broad differences on effects to watershed and habitat conditions. Summaries for a few sources that speak specifically to a group of animals are included. Species specific comparisons of the alternatives occur later in the document, under each species.

Upland Species and Their Habitat

Southwestern arid grasslands have been drastically modified by grazing in that plant species composition has been changed, perennial grass cover has been reduced, and in some cases, conversion of former grasslands to desert scrub (Buffington and Herbel, 1965; Chew 1982, Bredy et a. 1989 all in Bock et al. 1990). A review by Jones (2000) found 11 of 16 response variable showed detrimental effects from livestock grazing. Soil related variables were most negatively impacted, followed by vegetative cover variables and biomass and rodent diversity and richness. Effects to soil are described in detail in the soil section of this chapter but in summary include trampling, compaction, increased bulk density, erosion, infiltration, and cryptogrammic crusts (Jones 2000). All these effects affect wildlife habitat, prey habitat, and herbaceous forage for wildlife or their prey.

Livestock grazing can indirectly affect wildlife by affecting their prey. Indirect effects of livestock grazing on rodents can occur when grazing changes the composition of vegetative species (Heske and Campbell, 1991; Hayward et al., 1997) and structure of vegetative species

(Jones and Longland 1999; Hayward et al., 1997; Adler and Lauenroth, 2000). Small mammal prey is important for many species of higher trophic levels, including raptors, carnivorous mammals, snakes, and avian predators (Hayward et al. 1997; Saab et al. 1995). When rodent prey decrease in response to reduced vegetative cover, so do the avian predators (Saab et.al 1995). Livestock grazing can directly impact rodents by trampling and collapsing burrows, compacting soils which hinders burrow construction, and by removing rodent food sources such as seed heads (Heske and Campbell, 1991; Hayward et al., 1997; Adler and Lauenroth, 2000). In one study, rodent burrow densities were higher in ungrazed plots when compared to grazed plots (Adler and Lauenroth, 2000). Numerous studies support that the abundance of rodents is higher in ungrazed and lightly grazed areas (Valone and Sauter, 2004; Jones and Longland, 1999; Bock and Bock 1984 Reynolds & Trost 1980). In addition to rodents, lizards are prey for many carnivorous mammals, raptors and other avian predators, snakes, and other lizards. In Arizona, the abundance and diversity of lizards was higher on ungrazed sites in chaparral and desert grassland (Jones 1981, Jones 1988).

Birds are indirectly affected by the impacts grazing has on vegetation (Saab et al. 1995). Livestock reduce forage production which reduces litter production, increases soil compaction, and reduces infiltration (see watershed section). These changes to the soil and consequently the vegetation as a result of livestock grazing affect some breeding birds negatively (Saab et al. 1995). Birds that depend on dense herbaceous ground cover for nesting and/or foraging are most likely to be adversely affected by grazing (Saab et.al. 1995). Grazing during the breeding season of ground nesting birds can reduce herbaceous vegetation necessary for concealing nests (Saab et al. 1995). A reduction in herbaceous vegetation can expose nests resulting in an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure. In shrub steppe habitats (which includes pinyon-juniper woodlands) Saab et al. (1995) recommends managing livestock grazing to maintain current season growth through 15 July and then retain greater than 50% of perennial bunchgrass annual growth through the next nesting season. This would likely increase successful nesting for ground nesting birds.

In summary, the No Graze/No Action Alternative will allow for optimal upland vegetative and soil conditions; increased vegetative biomass that provides food and cover for wildlife and their prey ultimately resulting in increased quality and quantity of wildlife food, cover, and shelter; increased rodent and small mammal density and diversity, increased rodent species richness, increase songbird and raptor diversity, increase abundance and diversity of lizards, and increased reproductive success. Livestock grazing, as proposed under the Proposed Action Alternative and the No Trailing Action Alternative, will result in less than optimal vegetative conditions, ultimately leading to reduced species abundance and diversity. In either alternative, some level of impact from wildlife grazing would continue regardless of the added effects of livestock.

Riparian

Riparian Obligates and Their Habitat

Under the Proposed Action Alternative, livestock grazing is allowed in some riparian areas. Riparian habitat is a dwindling resource; in the Western U.S., less than 20% of historic levels of riparian still exist (Belsky et al. 1999). Confounding the loss of riparian habitat is the number of animals dependent either entirely or partly on riparian areas. Upwards of 80% of southwestern

wildlife species (Chaney et al. 1990) and approximately 60 to 70 percent of western bird species (Ohmart 1996) depend on riparian areas. Belsky et al. (1999) concluded grazing has damaged approximately 80% of stream and riparian ecosystems in the western United States, that "riparian recovery is contingent on total rest from grazing", and that livestock grazing negatively affects riparian dependent wildlife.

In general, livestock grazing negatively affects water quality, seasonal water quantity, hydrology and morphology of the stream channel, aquatic and adjacent vegetation, and riparian dependent wildlife (Belsky et al. 1999). As summarized in Platts (1981), "Grazing can affect the streamside environment by changing, reducing, or eliminating vegetation bordering the stream. Channel morphology can be changed by accrual of sediment, alteration of channel substrate, disruption of the relation of pools to riffles, and widening the channel. The water column can be altered by: increasing water temperature, nutrients, suspended sediment, bacterial populations, and changing the timing and volume of stream flow. Livestock can trample streambanks, causing banks to slough off, creating false setback banks, and exposing banks to accelerated soil erosion".

Livestock grazing in riparian areas can directly affect aquatic species such as frogs, toads, salamanders, and garter snakes by trampling. Livestock can indirectly affect riparian obligate and aquatic species by: trampling aquatic vegetation in which these species use for hiding cover, temperature regulation, and substrate (that supports birds nest and frog and toad eggs masses); and by increasing sediments in and turbidity of the water body thereby decreasing water quality for these species and their prey base. The primary negative impacts to aquatic systems, riparian habitat, and their associated biota from livestock grazing come as indirect effects which, though a series of cause and effect, ultimately affect the primary food source for many aquatic and riparian obligate species. When livestock grazing indirectly affect fish and macroinvertebrates, grazing subsequently affects those species that forage on fish and macroinvertebrates. Frogs and toads depend on invertebrates for food. Garter snakes depend at least partly on fish, frogs, toads, tadpoles, and salamanders for food. Insectivorous birds (flycatchers, warblers, and others) and bats depend at least partly on the aerial life forms of aquatic macroinvertebrates for food. Birds such as blackhawks, herons and kingfishers depend on fish and other aquatic organisms for their food. Mammals such as raccoons and river otters depend at least partly on fish and aquatic invertebrates for their food.

Southwestern riparian areas that were excluded from livestock grazing had 50% more small mammals when compared to plots with livestock grazing (Hayward et al. 1997). Although the bark-foraging guild was unaffected, grazing affected three other guilds of riparian birds: flycatching, ground-foraging, and foliage-gleaning (Mosconi & Hutto 1982). In a study in Utah, there was a 350% increase in use and diversity of songbirds, raptors, and small mammals after eight years of no grazing in a riparian area (Duff, 1979 in Fleischner 1994). In a study in Utah, there was a 350% increase in use and diversity of songbirds, raptors, and small mammals after eight years of no grazing (Duff, 1979). The abundance and diversity of lizards was higher on ungrazed sites in mixed riparian scrub and cottonwood-willow deciduous forests (Jones 1981, Jones 1988). Wandering garter snakes were five times more abundant in ungrazed riparian sites in New Mexico (Szaro et al. 1985).

Watering features including riparian areas would experience some level of impact from wildlife grazing even when cattle are not present.

In addition to natural riparian areas, earthen livestock tanks are important habitats for native wildlife, especially since many natural riparian habitats have been altered or destroyed. Livestock use of these tanks can affect aquatic organisms when the nutrients in livestock waste create algal growth in ponds. The decomposition of algae causes low dissolved oxygen concentration which negatively affects aquatic organisms (Belsky et al. 1999). Ponds used by livestock had been documented to have lowered amphibian reproduction due to increased levels of phosphorus and increased turbidity (Knutson et al. 2004). Accumulating evidence suggests that nitrates and ammonium, among other chemicals, can negatively impact amphibians, and that ranids are particularly sensitive to levels of these compounds (Baker and Waights 1994; Nebeker, et al. 2000; Burgett, et al. 2007; Johansson, et al. 2001; Hatch and Blaustein 2000; Hatch and Blaustein 2003; Hecnar 1996; Rouse et al. 1999; Macias et al. 2007; and Marco et al. 1999). Because leopard frogs often represent the most sensitive aquatic organisms to water quality indices such as nitrates and ammonium, certain levels could impact the existence of frog populations in a tank or preclude the water source from providing habitat for frogs. In times of drought, tanks with residual water attract more terrestrial wildlife and livestock, increasing input of nitrates and ammonium, which is concentrated as water continues to evaporate. Under the No Graze/No Action Alternative, since no livestock grazing or management activities associated with grazing management would occur, these effects to earthen livestock tanks would not occur or would be negligible (from wildlife use). Improvements such as earthen stock tanks that are also important to wildlife would remain and would be beneficial for as long as they are maintained or at least until they degrade to the point that they no longer hold water. Water quality in the absence of grazing is expected to be maintained or improved with no addition of waste products from livestock. The absence of livestock would also decrease the chances of the spread of diseases from one water source to another although wildlife usage presents a certain amount of risk even in the absence of livestock.

In summary, wildlife will benefit from the absence of pressure caused by direct and indirect effects from livestock grazing on species and their habitat. Based on the a literature review, the No Graze/No Action Alternative, when compared to the Proposed Action Alternative and the No Trailing Action Alternative, can reasonably be expected to: increase in the quality and quantity of wildlife food, cover, and shelter; increase rodent and small mammal density and diversity, increase rodent species richness, increase songbird and raptor diversity, increase abundance and diversity of lizards, increase abundance of garter snakes, increasing/improving habitat components; and increased reproductive success.

Cumulative Effects for All Species

For the purpose of this analysis, the cumulative effects boundary are the 17 6th code watersheds that lie within the Upper Clear Creek, West Clear Creek and Fossil Creek-Lower Verde River 5th code watersheds. The timeframe selected for this analysis is 20 years; 10 years in the past and 10 years in the future. The timeframe of the analysis is 10-years because ground disturbing activities recover in this timeframe. Because no activities are proposed in the No Graze/No Action Alternative, there are no direct, indirect, or cumulative effects from this alternative.

In addition to proposed activities, there are many other activities that occur in the uplands of the Hackberry and Pivot Rock Allotments that contribute to cumulative effects to species and their habitats. These other activities include: personal use activities; livestock grazing from other allotments; maintenance of utility lines; road management (Travel Management Rule and the Managing Motorized Travel EIS), road maintenance; watershed improvement projects, timber sales and salvages, wildfire, prescribed burning, fire use, and recreation. All these activities can directly and indirectly affect wildlife species as well as cause destruction or modification to wildlife and plant habitat.

Riparian Species

Other activities within the riparian zone may directly affect wildlife species, through aural and visual disturbance, particularly during critical periods such as breeding, roosting, and feeding. Disturbance can result in increased physiological stress, nest, roost, or site abandonment, flushing of birds from eggs, premature fledging of young from nests, and reduction in the amount of suitable nesting and foraging areas.

These other activities, can indirectly affect riparian obligate wildlife species when those activities alter or destroy riparian habitat. Trails, roads, and recreation sites within the riparian corridor fragments habitat, disrupts wildlife movement, and reduces the amount of unaltered habitat. When these activities occur in the uplands they cause degraded upland conditions which subsequently cause increased water runoff, increased soil deposition, decreased water quality; further contributing to decreased quality of riparian habitat. Excessive sedimentation into perennial streams can result in the stream substrate becoming embedded with soil. This reduces the surface area for macroinvertebrates to attach. Macroinvertebrates are the food source for many for many aquatic and riparian obligate species; when macroinvertebrate populations decline, the effects carries over to predator species as well. With implementation of the Travel Management Rule and the Managing Motorized Travel EIS, banning cross country travel and closing roads will reduce these impacts.

Other activities in the uplands can indirectly affect aquatic and riparian obligate wildlife and their habitat. While they may have short-term negative effects on wildlife and habitat, watershed improvement projects, wildfires, prescribed burning, and fire use all generally improve wildlife habitat in the long-term.

Upland Species

Activities associated with the Hackberry and Pivot Rock Allotments can directly affect wildlife species when ranch employees, vehicles, livestock, and dogs cause aural and visual disturbance to individuals that may be present in the allotment. Indirect effects occur when livestock grazing affects: the structure and composition of vegetative species; prey species and their habitat; reducing standing biomass that is needed for food, cover, nest substrate, and nest concealment; exposing nests resulting in an increased chance for nest predation, nest parasitism, exposure to elements, and ultimately nest failure; trampling burrows and compacting soils which hinders burrow excavation. Literature supports that grazing affects the abundance and diversity of wildlife lizards, rodents, and rodent-eating predators such as carnivorous mammals, snakes and avian predators.

Other activities in the watershed, above and beyond those associated with the grazing operation, can also affect wildlife and their habitat. The presence of people, vehicles, and equipment can result in aural and visual disturbance to wildlife species, particularly during critical periods such as breeding, roosting, and feeding. The presence of people, vehicles, and equipment can also directly affect species by: collecting, handling, and trampling individuals; disturbing rocks and vegetation to which some species may be attached; crushing non-aerial life forms such as eggs and caterpillars; and collapsing burrows. Disturbance that occurs frequently and over a period of time can result in increased physiological stress, nest, roost, or site abandonment, flushing of birds from eggs, premature fledging of young from nests, and reduction in the amount of suitable nesting and foraging areas. Implementation of the Travel Management Rule and the Managing Motorized Travel EIS, will ban cross country travel and close a percentage of roads. This will benefit wildlife and their habitat by reducing the extent of area where people and vehicles can travel.

In addition to direct disturbance to wildlife species, these other activities can indirectly affect wildlife habitat reducing the quality and quantity of vegetation which is used by wildlife for hiding cover, nesting cover, and forage. While watershed improvement projects, wildfires, prescribed burning, and fire use may have short-term negative effects on wildlife and habitat, they generally improve wildlife habitat in the long-term. Trails, roads, and recreation sites fragments habitat, reduces hiding cover, disrupts wildlife movement, all of which increase the potential for predation and loss of nesting, roosting, and hiding areas. With the Travel Management Rule and the Managing Motorized Travel EIS, banning cross country travel and reducing the number of open roads will reduce these impacts. Hackberry and Pivot Rock Allotment is bounded by other grazing allotments including Fossil Allotment. The proposal for the Fossil Creek grazing allotment is designed to improve effective ground cover and soil condition through increased retention of litter. This will improve vegetation which is used as hiding cover, nesting cover, and forage for wildlife, including prey species.

FISHERIES

The following section describes the affected environment and effects of the No Graze/No Action Alternative and the Proposed Action Alternative for the fisheries resource. These resources includes: threatened and endangered species, Regional Forester's sensitive species, management indicator species and habitat components. This analysis as presented is summarized from the following report which is incorporated by reference: *Fisheries Specialist Report,* and the Fisheries Specialist Report Addendum #1by D.Renner (2007) [PR# 45 and 45.1].

Affected Environment for Fisheries

The primary watersheds that are influenced by the Hackberry and Pivot Rock Allotments are the Verde River, East Clear Creek and West Clear Creek. These watersheds contain either species or suitable habitat for both threatened and endangered species and forest service sensitive species.

Fossil Creek

The Pivot Rock Allotment has 5,589 acres in the Fossil Creek watershed. Although the pastures of this allotment are in the uplands and there is no direct access to Fossil Creek. Other

allotments on both the Coconino and Tonto National Forests allow cattle direct access to the stream. Grazing has occurred in these pastures for the last 100-125 years and most of the watershed impacts that would degrade riparian and aquatic habitat have likely already occurred. Understanding the influence these past and current impacts have had on stream habitat is confounded by the fact that stream flows were only recently returned to the channel. Prior to 2005, only 4% of the spring flow made it past the diversion dam, currently 100% of the flows have been returned to the channel. It is likely that the spring fed nature of Fossil Creek boosts its resiliency against negative effects of increased sedimentation. In comparison to West Clear Creek the next major watershed to the north, Fossil Creek has much greater flow. Fossil Creek watershed is less than half the size (approximately 90,000 acres) than the West Clear Creek watershed (190,000 acres) and it has comparatively much greater with a median flow of 43 cfs at the springs not accounting for any increase due to baseflow or groundwater additions further down the drainage. While West Clear has a median flow of 18 cfs near its confluence with the Verde River (USGS gage 09505800). The high discharge that Fossil Creek has in comparison to watershed size may enable the creek to transport higher sediment loads and is potentially more tolerant to watershed disturbances.

The existing native fish community in Fossil Creek consists of headwater chub (*Gila nigra*), roundtail chub (*Gila robusta*), speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), Sonora sucker (*Catostomus insignis*), and desert sucker (*Catostomus clarki*). Prior to the fisheries restoration project, that constructed a barrier and removed nonnative species from Fossil creek, a native assemblage existed only in the upper 0.3 miles of stream above the Childs-Irving diversion dam. Currently the dam is still present but scheduled to be removed by 2010 and it serves to separate the populations of headwater and roundtail chub. A fish barrier was constructed in 2004 to prevent the upstream incursion of nonnative species from the Verde River following the extirpation of these species from Fossil Creek. The barrier is located approximately 4.5 miles upstream from Verde River confluence. It is expected that below the barrier the community of nonnative species is still comprised primarily of smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), flathead catfish (*Pylodictis olivaris*), and yellow bullhead (*Ameiurus natalis*).

Recently the repatriation of several federally listed fish species has taken place. The species that have been reintroduced include Spikedace (*Meda fulgida*), Loachminnow (*Tiaroga cobitis*), and. Gila topminnow (*Poeciliopsis occidentalis occidentalis*) There is also consideration of stocking razorback suckers (*Xyrauchen texanus*). Additionally desert pupfish (*Cyprinodon macularius*), and Colorado Pikeminnow (*Ptychocheilus lucius*) are being considered for placement in Fossil Creek, but the introduction of these species is lower priority to the Fossil Creek Native Fish Working Group [PR# 22].

Verde River

The Hackberry and Pivot Rock Allotments have 61,226 acres that drain to the Verde River, including Fossil Creek and West Clear Creek. The Verde watershed upstream and including the project area is approximately 3,200,000 acres in size, therefore the project area makes up about 1.9% of the watershed. The remaining 98% of the watershed is influenced by grazing, agriculture, recreation, or urbanization this causes any quantification of the effects of the project area on the Verde River to be complicated and likely trivial in comparison.

The fish community of the Verde River is dominated by non-natives, which include channel (*Ictalurus punctatus*) and flathead catfish, largemouth (*Micropterus salmoides*) and smallmouth bass, bluegill (*Lepomis macrochirus*), green sunfish, yellow bullhead, common carp (*Cyprinus carpio*), and red shiners (*Cyprinella lutrensis*). The fish assemblage also includes a few native species as well. The native species list includes roundtail chub, Sonora and desert suckers, Colorado pikeminnow (*Ptychocheilus lucius*), and razorback suckers (*Xyrauchen texanus*). Arizona Game and Fish Department has stocked hundreds of pikeminnows and razorbacks, within the vicinity of the Childs Power Plant, over the last several years. In spite of these stockings, these two species comprise only a very small percentage of the overall collection made during monitoring surveys (Robinson 2007).

East Clear Creek

Grazing by cattle and elk are limiting the recovery of the riparian headwater areas by not allowing riparian vegetation to re-establish. In pastures where cattle grazing is reduced or eliminated continued use by elk may negate or minimize any beneficial results. In the Pivot Rock Allotment, most of the streams are ephemeral due in part to past degradation. If riparian vegetation can re-establish it is likely that many of the streams would have running water for longer periods and there is potential for pools to have year round water increasing habitat for Little Colorado Spinedace. The Pivot Rock Allotment has 16,000 acres in the East Clear Creek watershed and under the Proposed Action 13,887 acres will be deferred until improvements are completed limiting any watershed level effect that livestock grazing will have on aquatic species. Additionally, the presence of the C.C.Cragin Reservoir acts as a sediment trap and minimizes any sedimentation effects of ungulate grazing upstream on the Little Colorado Sucker, Bluehead sucker, and roundtail chubs found in perennial waters below the reservoir.

The native fish community in the East Clear Creek watershed is comprised of Little Colorado spinedace (*Lepidomeda vittata*), bluehead (*Catostomus discobolus*), Roundtail Chub (*Gila robusta*) and Little Colorado suckers (*Catostomus sp.*). The nonnative species that have been introduced into the East Clear Creek watershed are; fathead minnows, brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*), green sunfish (*Lepomis cyanellus*), and smallmouth bass (*Micropterus dolomieu*).

West Clear Creek

The Pivot Rock Allotment has 32,000 acres in the West Clear Creek watershed, all of these acres are in the uplands, and there is not cattle access to West Clear Creek. However, there is cattle access to ephemeral tributaries. The majority of West Clear Creek is buffered from ungulate grazing due to steep canyon walls that limit access and prevent direct effects to the riparian from livestock grazing.

Forest Service sampling in 2002 and 2007 found the following native species present; roundtail and headwater chub, speckled and Longfin dace, desert sucker, and Sonora sucker. Sampling also found the following nonnative species; yellow bullhead, red shiner, smallmouth bass, rainbow trout, brown trout, and green sunfish. The lower portion of West Clear Creek was historically known to support the spikedace and contains suitable, although degraded, habitat for the fish.

Fish Species Occurrence within Affected Environment

For a thorough discussion on special status fish species' life histories, please refer to the Hackberry and Pivot Rock Fisheries Specialist Report [PR#45] in the project record file. There are nine fish species that are either federally listed or forest service sensitive species in or down slope/stream from the Hackberry and Pivot Rock Allotments project area. Six of the species are either federally listed as endangered, threatened or a candidate for listing (headwater chub). The remaining four species are on the Southwestern Region, Regional Foresters sensitive species list as of October 1, 2007, (Table 4). Spikedace and loach minnow are not presently in any of the waters affected by this allotment but there are plans for them to be reintroduced into Fossil Creek in the near future (USDI-BOR and USDA-FS, 2004).

Threatened and Endangered Species

The Threatened, Endangered, Sensitive Species (TES) List for the Coconino National Forest was reviewed, and a list of TES fish species was created for this project based on known occurrence or, in the absence of survey data, the presence of suitable habitat. Further information and detailed descriptions of species occurrence, habitats, habitat condition and rationale for including or excluding species from analysis are found in Fisheries Specialist Report [PR#45].

Rare wildlife species that are known to occur, or have existing or potential habitat within the project area include five federally listed or candidate species: Colorado Pikeminnow (*Ptychocheilus lucius*), Razorback Sucker (*Xyrauchen texanus*), loach minnow (*Rhinichthys {=Tiaroga} cobitis*), spikedace (*Meda fulgida*), headwater chub (*Gila nigra*), and Little Colorado spinedace (*Lepidomeda vittata*).

Table 39. Threatened and Endangered Fish and/or Their Habitat Expected to Occur in the Fossil Creek and Middle Verde River Watersheds

Species	Scientific Name		Occurrence2
Colorado pikeminnow	*Ptychocheilus lucius*	Federally Endangered	O Experimental, nonessential
razorback sucker	*Xyrauchen texanus*	Federally Endangered	O Critical habitat, Δ
loach minnow	*Rhinichthys cobitis*	Federally Threatened	H* ,Δ
Spikedace	*Meda fulgida*	Federally Threatened	H*, Δ
Little Colorado Spinedace	*Lepidomeda vittata*	Federally Threatened	O*

Status:

- **WC=**Wildlife of Special Concern in Arizona (1996 Arizona Game & Fish Department classification pending revision to Article 4 of the State Regulations)
- **FS-S=**Forest Service Sensitive Species (USFS, Southwestern Region, Regional Forester's List – 01 October, 2007)
- **2** Occurrence:
- **O=**Species known to occur in the project area, or in the general vicinity of the area.
- **H=**Species not known to occur in the project area, but whose suitable or potential habitat does.
- *=Species have historically been known to occur in project area, no recent confirmation of presence.
- ∞=Species does not occur in project area, not known to historically occupy Verde Watershed
- Δ= species likely to be stocked into Fossil Creek

Forest Service Sensitive Species

The Southwestern Regional Forester's Sensitive Species List, (October 1, 2007) was reviewed, and a list of sensitive fish species was created for this project based on known occurrence or, in the absence of survey data, the presence of suitable habitat. Further information and detailed descriptions of species occurrence, habitats and habitat condition can be found in the Fisheries Specialist Report, [PR# 45].

Table 40. Sensitive Fish and/or Their Habitat Expected to Occur in the Fossil Creek and Middle Verde River Watersheds

Species	Status1	Occurrence2
Little Colorado Sucker	FS-S, WC	O
Bluehead Sucker	FS-S, WC	O
roundtail chub	FS-WC,	O
headwater chub	FS-S, WC, Candidate	O
longfin dace	FS-S	O, Δ
desert sucker	FS-S	O
Sonora sucker	FS-S	O

1 Status:

- **WC=**Wildlife of Special Concern in Arizona (1996 Arizona Game & Fish Department classification pending revision to Article 4 of the State Regulations)
- **FS-S=**Forest Service Sensitive Species (USFS, Southwestern Region, Regional Forester's List – 01 October, 2007)
- **2** Occurrence:
- **O=**Species known to occur in the project area, or in the general vicinity of the area.
- **H=**Species not known to occur in the project area, but whose suitable or potential habitat does.
- *=Species have historically been known to occur in project area, no recent confirmation of presence.
- ∞=Species does not occur in project area, not known to historically occupy Verde Watershed
- Δ= species likely to be stocked into Fossil Creek

Management Indicator Species

Macroinvertebrates

As a group, aquatic macroinvertebrates (macroinvertebrates) are identified in the Coconino National Forest Land and Resource Management Plan (as amended) as a management indicator for high and low elevation late-seral riparian areas. The Coconino National Forest has collected macroinvertebrate data from several sources in the past, including USFS collections. However, only the Arizona Department of Environmental Quality (ADEQ) has consistently collected macroinvertebrate data at the same location over a time scale that allows for trend analysis. ADEQ prepares a biennial Arizona Water Quality Assessment which includes such elements as water quality condition, water pollutants, and designated uses. As part of a biocriteria evaluation, ADEQ uses a macroinvertebrate-based bioassessment to evaluate the health of aquatic communities. These bioassessments are generally used as supporting evidence of impaired or good water quality.

The macroinvertebrate-based bioassessment uses an index developed for the macroinvertebrate communities in Arizona. The index is known as the Index of Biological Integrity (IBI). This index, and the one for coldwater communities, was developed following the Environmental Protection Agency's 1999 Rapid Bioassessment Protocols guidance document. Through this

approach a set of macroinvertebrate community characteristics (metrics) have been measured at least-impacted or best available reference sites. These reference metrics are combined into an index and can then be compared to measurements taken at other monitoring sites to assess whether the Aquatic and Wildlife (A&W) designated use is attained.

As of December 2006 macroinvertebrate sampling on streams either on or close to the Coconino National Forest by ADEQ spans an 11-year time from 1992 to 2003. This analysis examined 10 streams, 5 coldwater (above 5000ft), and five warm water (below 5000ft). Examination of both the warm water sites and the coldwater sites found that across the Forest, of the warm water sites 4 sites had an upward trend and one had a downward trend in IBI based solely on a simple linear regression line analysis. However, since the equation explained less than 70% of the variation in data for these sites the confidence in these trends is low. For the coldwater sites, three had downward trends with high confidence and two sites had upward trends with low confidence. Warm water sample sites have had high amounts of variation over the sample period. This variation could have a variety of causes, from changing environmental factors such as, flooding and drought cycles, microhabitat variation between collections (Heino et al. 2004), and contributing upland condition and the associated runoff effects to water quality. Irregardless of the trend, the IBI for warm water sites high and all but one of the sites have maintained attaining levels for water quality, one site most recent IBI rating was inconclusive. In contrast to the warm water sites, the cold-water sites have less unaccounted for variability and have generally seen a downward trend in IBI. Only the sites with upward trends have variability that results in low confidence trends. Forest wide IBI trend is upward with seven sites having upward trends and only four sites with downward trends.

Environmental Consequences for Fisheries

The cumulative effects boundary for aquatic habitat and biota effects are the 17 6th code watersheds that lie within the Upper Clear Creek, West Clear Creek and Fossil Creek-Lower Verde River 5th code watersheds. A small portion of the Pivot Rock Allotment falls within the East Verde River 5th code watershed; however, the small acreage and the geologic separation of the Mogollon Rim will minimize any effects from grazing to the watershed. Therefore this watershed was not included in the cumulative effects boundary. The timeframe of the analysis will be 10-years because ground disturbing activities have had suitable time to recover in this timeframe.

The following discussions include both general and specific direct and indirect effects of livestock grazing on aquatic habitat, biota and Threatened and Endangered Species. These general effects are common to alternatives; however, the degree of impacts varies by alternative and will be described in detail for each alternative. General effects and their importance are described in narrative form below. Site-specific consideration of each effect will be described for each alternative. Cumulative effects will be described in detail only once since these past, ongoing and future foreseeable activities will apply to both alternatives.

General Direct Effects of Grazing to Aquatic Habitat and Biota

Direct and indirect effects of grazing on aquatic habitat and biota are generally localized and can be easily or prevented through exclusion fencing or by limited livestock to specific access points. Aquatic habitat is altered by the direct removal of riparian vegetation from cattle grazing and altered channel morphology from bank shearing by trampling hooves; while these effects are often localized they contribute to more deleterious indirect effects.

Cattle tend to avoid hot, dry environments and congregate in wet areas for water and forage, which is more succulent and abundant than in uplands. They area also attracted to shade and lower temperatures near streams (Belsky et al. 1999). Studies have found that cattle spend 5-30 times as much time in these cool, productive zones than would be predicted from surface area alone (Belsky et al. 1999). With the disproportionate use of riparian habitat comes the over utilization of riparian species by cattle for forage. Riparian vegetation is altered by livestock in several ways: 1) compaction of soil, which increases runoff and decreases water availability to plants; 2) herbage removal, which allows soil temperatures to rise, thereby increasing evaporation; 3) physical damage to vegetation by rubbing, trampling, and browsing; and 4) altering the growth form of plants by removing terminal buds and stimulating lateral branching. (Fleischner 1994). An important direct effects to fish from cattle use of riparian areas is the removal of vegetative cover and the trampling of overhanging banks (Fleischner 1994). Vegetative banks and overhanging banks provide critical habitat to fish; they provide shade, refuge habitat for young fish and important resting habitats (Keim et al. 2002, Spangler and Scarnecchia 2001, Wilzbach 1985). Riparian areas act as landscape sponges that store moisture and slowly release this moisture into stream channels (Belsky et al. 1999). Loss of riparian areas also leads to decreased perennial stream flows that are critical for native species of the Southwest where drought conditions are common, so a direct effect to a riparian area can have important indirect effects to species that occur downstream.

General Indirect Effects of Grazing

Most effects to aquatic habitat and biota are the result of upland terrestrial changes that result in changes to sediment and water transport in the watershed. The primary negative impacts to aquatic systems and their associated biota from cattle grazing come as indirect effects. These indirect effects include: increased sediment, loss of riparian vegetation, altered macroinvertebrate assemblages, lowering of groundwater tables and decreased perennial flows, increased stream temperature, larger peak flows, stock tank impacts, and changes in channel form (Belsky et al. 1999, Fleischner 1994).

Sedimentation and erosion are natural processes and ecosystems have evolved to handle the natural background levels. When land management activities alter the natural levels in the watershed deleterious effects to the habitat and biota can occur. Grazing of upland vegetation contributes to the deterioration of soil stability and porosity and increases erosion and compaction. Grazing reduces the roughness coefficient of watersheds, resulting in more surface runoff, more soil erosion, and larger floods (Fleischner 1994). These factors lead to increased sedimentation into streams and changes in the hydroperiod.

Sediment adversely impacts stream fishes directly through: changing fish behavior, altering fish physiology, impairing growth, shifting blood chemistry, inducing gill trauma, reducing disease resistance, increasing egg mortality, and direct mortality of juveniles and adults if strong enough (Anderson 1996, Argent and Flebbe 1999, Bisson and Bilby 1982). Sediment indirectly affects fish through behavior modifications including, increased frequency of the cough reflex, avoidance of suspended sediment, reduction in feeding, and temporary disruption of territoriality. The severity of changes in fish behavior is associated with the timing of disturbance, the level of stress, and the importance of the habitat that the fish may be excluded from (Anderson 1996, Bisson and Bilby 1982, Rice et al. 2001). Other indirect effects on stream fishes from sediment can occur by modifications to stream habitat. These changes include: altered channel morphology, loss of spawning habitat, loss of rearing habitat, changes in the food supply (macroinvertebrate assemblage), and decreased over wintering habitat (Lisle 1989, Miller and Benda 2000, Wood and Armitage 1997).

Watershed hydroperiod can be altered by cattle grazing in the uplands with loss of soil productivity, and increased soil compaction. Reductions in soil productivity can limit the vegetation potential resulting in decreased precipitation that is taken up by plants. Increased soil compaction decreases the amount of water infiltration into the soil. Both of these factors compound to lead to higher surface runoff and higher flood pulses in stream channels (Belsky et al. 1999). Simulations of storm runoff in Arizona found that peak storm runoff events would be 2-3 times greater when watersheds were “heavily” grazed than when “lightly” grazed, resulting in higher energy erosive floods that would deepen and reshape stream channels (USDI -Bureau of Land Management and USDA-Forest Service 1994). The erosive energy of floods can cause stream channel downcutting or incision causing water to drain from floodplains into the channel resulting in lower ground water tables (Belsky et al. 1999). This results in a narrowing or loss of riparian vegetation since they are left in drier soils. Additionally, with less water entering upslope and riparian soils less water is available to provide late season flows. Therefore, the higher flows during precipitation events are often followed by low or no flow during the drier weather periods (Belsky et al. 1999, Fleischner 1994).

The effects of hydroperiod alterations listed above can result in deleterious effects to aquatic biota. Lower water tables that reduce or eliminate riparian vegetation affect macroinvertebrate communities. Streamside vegetation provides both allochthonous (produced outside stream system) and autochthonous (produced within stream ecosystem) food sources for macroinvertebrates and the quantity and quality of these inputs plays a critical role in regulating the macroinvertebrate assemblage that is present in the system (Gregory et al. 1991). In turn, macroinvertebrates are a primary food source for aquatic vertebrates (icthyofauna and herptefauna) and alterations to the food web at the lower levels will have repercussions to these higher-level consumers. Additionally, riparian plant communities with rooted plants retard streambank erosion, filter sediments out of the water, build and stabilize streambanks and streambeds, and provide shade and nutrients for aquatic species. In fact healthy riparian areas act as sponges during high water periods and raise water tables maintaining streamwater during dry seasons, resulting in more flow throughout the year (Belsky et al. 1999). The loss of riparian vegetation therefore can result in a negative feedback loop where conditions continue to break down until active management is undertaken to repair or retard degraded areas.

Stock tanks have been developed on public lands throughout the southwest for livestock and wildlife use. In many areas, they have both indirect beneficial effects and detrimental effects on aquatic systems. They benefit aquatic systems by limiting and trapping sediment that otherwise would continue down ephemeral channels into perennial streams. They also capture surface water and precipitation that has the potential to increase the flashiness of a stream during a storm event and allow it percolate into the soil providing some recharge of the subsurface aquifer and potentially adding to stream base flows. Stock tanks are detrimental to aquatic systems when the sediment berms that are built to capture overland flow fail and create sediment pulses that can create acute sediment pulses into aquatic systems. An additional negative impact of stock tanks to aquatic systems is the spread of nonnative organisms including crayfish, nonnative fish, and bullfrogs. These nonnative species can negatively affect native herptefauna that may occur nearby and the nonnative species can be transported downslope to perennial aquatic systems during high flow events where they can dramatic negative effects to the native ecosystem.

Continued actions that will be occurring in all watersheds include, ongoing recreation, OHV use, and ongoing impacts from the current road network. Likely future actions include the implementation of the Travel Management Rule and the Managing Motorized Travel EIS, which should reduce some of the impacts from OHV use and the road network. Additionally in the Fossil Watershed, re-issuance of the grazing permit, may either reduce or continue its current watershed conditions.

Cumulative Effects

The cumulative effects boundary for fisheries is the same as for soil and watershed effects. There are 17 6th code watersheds that lie within the Upper Clear Creek, West Clear Creek and Fossil Creek-Lower Verde River 5th code watersheds. A small portion of the Pivot Rock Allotment falls within the East Verde River 5th code watershed, however, the small acreage and the geologic separation that will minimize any effects from grazing to the watershed by the Mogollon Rim will keep this portion of the allotment out of the cumulative effects boundary.

Continued actions that will be occurring in all watersheds include, ongoing recreation, OHV use, and ongoing impacts from the current road network. Likely future actions include the implementation of the Travel Management Rule and the Managing Motorized Travel EIS, which should reduce some of the impacts from OHV use and the road network. Additionally in the Fossil Watershed, re-issuance of the grazing permit, may either reduce or continue its current watershed conditions.

No Graze/No Action Alternative

Fossil Creek

Direct Effects and Indirect Effects

Under the No Graze/No Action Alternative, grazing would not be authorized and watershed improvements would not occur under this alternative. This alternative would have no direct or indirect effects to Fossil Creek.

Cumulative Effects

Under the no graze alternative there would be no direct or indirect effects and therefore no cumulative effects would occur to Fossil Creek.

Verde River

Direct and Indirect Effects

Under the No Graze/No Action Alternative, grazing would not be authorized. There would be no livestock access to the Verde River. This alternative would have no direct effects to the Verde River.

With the absence of livestock on the allotment, upland soil and vegetation conditions would continue to improve as climatic conditions allow. However due to the small percentage of the Verde River watershed affected by the Hackberry Allotment the beneficial effects of the No Graze/No Action Alternative would not be measurable. Therefore, this alternative would have no indirect effect to the Verde River.

Cumulative Effects

Under the No Graze/No Action Alternative there would be not direct or indirect effects and therefore no cumulative effects would occur to Fossil Creek.

Past and present actions, as well as those that may occur within the reasonably foreseeable future, occurring within the Hackberry and Pivot Rock Allotments cumulative effects area include livestock grazing, wildlife grazing, thinning, burning, wildfires, watershed treatments, riparian protection efforts, developed and dispersed recreation, road maintenance, special uses, and the future implementation of the Travel Management Rule and the Managing Motorized Travel EIS which will prohibit off-road driving and decrease road densities on the National Forest. The main cumulative effects are those occurring from livestock grazing and recreation in riparian areas and the presence of non-native aquatic organisms. Grazing and recreation in riparian areas can destroy frog habitat over time by denuding stream banks and point bars, compacting soil thereby eliminating regrowth of riparian vegetation, removing vegetation, and affecting water quality directly through human and animal wastes and indirectly by facilitating erosion and sediment runoff.

Livestock grazing on the Verde River has been documented to be extremely high along portions of the Verde River. Some of this grazing was from authorized grazing on the Prescott and Coconino National Forests, while other was unauthorized grazing from Forest Service permittees and private land owners. A comprehensive study conducted by Sillas and Ross in 2002 (USDA-Forest Service 2002), show that use by livestock (owners unknown) was extremely high on portions of the Verde River that falls along the boundary of the Hackberry Allotment, particularly from ½ mile above and ½ mile below the confluence of Sycamore Canyon with the Verde and from the confluence of Bull Run Creek downstream to the confluence of Gospel Hollow.

East Clear Creek

Direct and Indirect Effects

Under the No Graze/No Action Alternative, grazing would not be authorized. This alternative would have no direct effects to East Clear Creek. Riparian conditions would improve over time with continued rest of the associated pastures and with enough time could see major improvements in watershed condition. However, the benefits of the No Graze/No Action may be diminished by the ongoing influence of grazing by elk. This alternative would likely have beneficial effects to East Clear Creek.

With the absence of livestock on the allotment and in the East Clear Creek watershed soil and riparian conditions would continue to improve as climatic conditions and elk grazing allow. As upland conditions improve, there would be associated beneficial effects to stream habitat. Studies have shown that 2-15 yeas of total livestock exclusion may be required to initiate watershed and riparian recovery (Belsky et al. 1999, Magilligan and McDowell 1997). Therefore, it may take extended periods of rest to rehabilitate the watershed from past degradation. Resting the watershed from grazing will reduce background loads of sediment produced by the watershed and indirectly improve stream conditions in East Clear Creek, even with continued grazing by elk.

Cumulative Effects

The No Graze/No Action Alternative when added to the direct and indirect effects and to other past, present, and reasonably foreseeable future actions would result in overall beneficial effects to East Clear Creek.

West Clear Creek

Direct and Indirect Effects

There will not be any direct or indirect effects to West Clear Creek under the No Graze/No Action Alternative. Watershed conditions should improve over time, reducing the sediment load resulting in beneficial effects to West Clear Creek.

Cumulative Effects

The No Graze/No Action Alternative when added to the direct and indirect effects and to other past, present, and reasonably foreseeable future actions would result in overall beneficial effects to West Clear Creek.

Threatened, Endangered, and Candidate Species

Direct and Indirect Effects

Colorado Pikeminnow

The Colorado Pikeminnow are present in the Verde River within the project area. While there is the potential for beneficial affects from resting, the allotment and allowing upland conditions to improve these affects will not be measurable to the Verde River.

Razorback Sucker
The No Graze/No Action Alternative will have beneficial effects on razorback suckers. Razorback suckers will likely be repatriated to Fossil Creek in the next few years. If the watershed is allowed to rest without cattle grazing, upland conditions will improve and the amount of sediment entering the watershed will decrease. Although due to the only a small piece of the Fossil Creek watershed is affect by the PA, therefore any beneficial effects would not likely be measurable.

Razorback Sucker - Critical Habitat
The Verde River is critical habitat for razorback suckers. However, it is unlikely that there will be measurable effects to the Verde River from this alternative. There is the potential for beneficial affects; however, due to the small proportion of the Verde Watershed (~2%) that the allotment comprises, any affects will not be measurable.

Loach Minnow and Spikedace
There will be no effect to either Loach Minnows or spikedace, nor their habitat under this alternative. The small percentage of the Fossil Creek watershed that may see habitat conditions improve is not large enough to have any measurable benefit to the stream as a whole.

Little Colorado Spinedace
There will be no direct effects to spinedace if the No Graze/No Action Alternative is chosen. There will likely be indirect beneficial effects from this alternative. The lack of livestock grazing to the watershed will likely improve riparian and watershed condition, including lower sedimentation and increases in woody riparian vegetation. However, these beneficial effects may be nullified if heavy grazing by elk continues.

Little Colorado Spinedace - Critical Habitat
The No Graze/No Action Alternative has potential for beneficial effects to Little Colorado spinedace critical habitat. The removal of livestock from East Clear Creek and its associated watersheds will reduce sediment production and allow riparian vegetation to establish, as long as elk grazing does not negate these benefits.

Headwater Chub
Headwater Chubs are present in the upper reaches of Fossil Creek and West Clear Creek. The No Graze/No Action Alternative may have minor beneficial effects for this species, through slight reduction in sedimentation in the upper reaches of Fossil Creek and West Clear Creek from the improved upland watershed condition that will result from this action. There are no negative direct or indirect effects to the Headwater Chub.

Gila Topminnow
Gila topminnow have recently been repatriated to Fossil Creek and they are historic to the Verde River. Under the No Graze/No Action Alternative cattle will not graze the Hackberry and Pivot

Rock Allotments therefore there will be no direct or indirect effects to this species under this alternative.

Desert Pupfish
Desert pupfish may be introduced to Fossil Creek and they are historic to the Salt River but are considered to have been extirpated. Cattle do not have access to Fossil Creek therefore; there will be no direct effects. The no graze alternative will not result in any direct or indirect effects to this species therefore this alternative will have not effect to desert pupfish if and when they are introduced to Fossil Creek.

Cumulative Effects for all Threatened and Endangered, and Candidate Species under the No Graze/No Action Alternative

This alternative would not graze the allotment. There would be no direct or indirect effects to any threatened and endangered or candidate species. Therefore, this alternative will not contribute to cumulative effects.

Forest Service Sensitive Species

Direct and Indirect Effects

Roundtail Chub:
The absence of grazing and livestock in the Fossil Creek watershed will have no direct effects to roundtail chubs and will lead to improved watershed condition resulting in beneficial effects to the habitat of this species. There are no indirect effects to the Roundtail Chub.

Desert and Sonora Sucker
The No Graze/No Action Alternative will have beneficial watershed affects and may improve habitat conditions for desert and Sonora suckers. There are no negative direct or indirect affects to the Desert and Sonora Sucker.

Little Colorado Sucker, Bluehead Sucker, Longfin Dace
The No Graze/No Action Alternative will have no direct or indirect effects to these species.

Cumulative Effects for all Forest Service Sensitive Species under the No Graze/No Action Alternative

This alternative would not graze the allotment. There would be no direct effects and any indirect effect to species will be beneficial. Therefore this alternative will not contribute to cumulative effects.

Management Indicator Species

Direct, Indirect and Cumulative Effects

Macroinvertebrates
If the No Graze/No Action Alternative were selected, no cattle grazing or improvements would be implemented so there would be no direct, indirect or cumulative effects associated with the project. Therefore, there would be no change in the Forestwide trend in macroinvertebrates

Proposed Action Alternative

Fossil Creek

Direct and Indirect Effects
Cattle will not have access to Fossil Creek; therefore, there will be no direct effects to this system.

There are 5,590 acres of the Pivot Rock Allotment that are within the Fossil Creek watershed. These acres are in the Sandrock, Corral, Twentyseven Mile, and a small portion of Toms Creek Pastures. The proposed action for grazing management is a reduction in utilization and intensity from past management and may slow watershed degradation. Studies have found that new grazing systems similar to the Proposed Action only serve to slow the rate of degradation of watersheds, not reverse it, only livestock exclusion has consistently resulted in ecosystem recovery (Armour et al. 1994, Belsky et al. 1999, Elmore and Kauffman 1994). Under the Proposed Action Alternative indirect effects would increase albeit at a lower rate: increased sedimentation, altered hydroperiod, and channel morphology changes.

Cumulative Effects
The Proposed Action Alternative when added to the direct and indirect effects (which would not be measurable) and to other past, present, and reasonably foreseeable future actions would result in only beneficial effects to the Little Colorado Spinedace, and its habitat.

Verde River

Direct and Indirect Effects
Cattle have only one access to the Verde River on the Hackberry Allotment at Gospel Hollow. This may result in riparian impacts at this location. Trampling of stream banks may contribute to localized sediment inputs although the scale and relative size of these impacts to the watershed is minimal. Additionally, woody vegetation utilization is limited to 20% preventing any decrease in riparian vitality at these sites. However, this access point is only used in emergency situations when other water sources are not available and is rarely used.

Considering that the allotment consists of just over 2% of the Verde River watershed, it is unlikely that the Proposed Action will have any measurable impacts to the Verde River. This alternative will likely result in indirect effects through increased sedimentation from uplands,

however, the relative scale of these effects is inconsequential and will not be measurable, regardless of the levels of utilization, intensity, and stocking rates. Therefore, this alternative would have no effect to the Verde River.

Cumulative Effects

Except for the emergency watering use access to the Verde River at Gospel Hollow and when added to the direct and indirect effects (which would be minimal and immeasurable) and to other past, present, and reasonably foreseeable future actions would result in no cumulative effects to the Verde River.

East Clear Creek

Direct and Indirect Effects

Livestock must be excluded from East Clear Creek as a "Reasonable and Prudent Measures" stated in a USFWS Biological Opinion (dated 6 May, 1997) for the Hackberry and Pivot Rock Allotments. Poor fence maintenance and livestock management has greatly decreased the effectiveness of these exclosures and riparian conditions in East Clear Creek and its associated drainages have degraded under past management. Mitigations include the construction and maintenance of fences to exclude livestock from East Clear Creek. As long as livestock management and fence maintenance is conducted as described under mitigations, Table 10, there will be no direct effects to East Clear Creek from the Proposed Action. The deferment of the Kehl, and the temporary deferral of Miller, and Potato South Pasture will defer grazing from approximately 80% of the pastures within the East Clear Creek drainage (Table 41). This will allow for some riparian improvement, especially in Kehl and Miller canyons, during the time that the allotment pastures are deferred.

The Proposed Action states that livestock use of woody riparian vegetation will not exceed 20%, however in East Clear Creek the only woody riparian vegetation that remains are in areas that are inaccessible to cattle and wild ungulates, such as around rock outcroppings and walled in channel units.

The Proposed Action Alternative for grazing management is a reduction in utilization and intensity from past management and may slow current watershed degradation. Studies have found that new grazing systems similar to the Proposed Action Alternative only serve to slow the rate of degradation of watersheds, not reverse it, only livestock exclusion has consistently resulted in ecosystem recovery (Armour et al. 1994, Belsky et al. 1999, Elmore and Kauffman 1994). While the deferment of approximately 80% of the pastures in the East Clear Creek watershed will definitely have beneficial indirect effects to the watershed (Table 41), the uncertainty in the length of the deferments compromises the assessment of these effects. Although since the Kehl pasture is deferred until conditions improve, and if current levels of elk grazing continue, this may take some time (10+ years). The Kehl pasture comprises approximately 43% of the pasture grazed in East Clear Creek watershed, and with it rested, cattle no longer have access to the Kehl Canyon or its tributaries.

Under the Proposed Action Alternative, the effects of watershed degradation should decrease over time by implementation of the project design features, mitigation measures and monitoring

for soils, watershed, and fisheries resources and timely implementation of adaptive management responses to changes in conditions. In summary, it is likely that the Proposed Action will have beneficial indirect effects to the East Clear Creek watershed with the deferred pastures combined with the lower livestock utilization, intensity, and AUMs.

Table 41. East Clear Creek Pastures and Those Temporarily Deferred

Pasture Name	Acres	Percent of watershed	Temporarily Deferred	Reason for Deferment
Dry Lake	743	5	No	
Miller	4,622	29	Yes	Deferred only until the pasture fence dividing the Miller and Kehl Pastures has been upgraded to a 4-wire barbwire fence.
Clear Creek	1,450	9	No	
Potato North	648	4	No	
Potato South	1,389	9	Yes	Deferred only until the Cienega Draw Exclosure has been constructed.
Kehl	6,834	43	Yes	This is deferred for the life of the permit authorization which is 10 years; (which is why Kehl is shown in this table as 'temporary'. If monitoring shows that watershed conditions have improved and elk use has declined to the point that watershed conditions have significantly improved, only then would livestock grazing be allowed back on Kehl Pasture.
Baker	322	2	No	
Total Deferred	**12,845**	**80**		

Cumulative Effects

Past and present actions, as well as those that may occur within the reasonably foreseeable future, occurring within the Hackberry and Pivot Rock Allotments cumulative effects area include livestock grazing, wildlife grazing, thinning, burning, wildfires, watershed treatments, riparian protection efforts, developed and dispersed recreation, road maintenance, special uses, and the future implementation of the Travel Management Rule and the Managing Motorized Travel EIS which will prohibit off-road driving and decrease road densities on the National Forest. The main cumulative effect to the East Clear Creek watershed are those occurring from livestock grazing and recreation in riparian areas and the presence of non-native aquatic organisms. Grazing and recreation in riparian areas can degrade habitat over time by denuding stream banks and point bars, compacting soil thereby eliminating regrowth of riparian vegetation, removing vegetation, and affecting water quality directly through human and animal wastes and indirectly by facilitating erosion and sediment runoff.

West Clear Creek

Direct and Indirect Effects

Direct effects will occur on drainage tributaries to West Clear Creek. Although livestock do not have access to the mainstem of West Clear Creek, they utilize pastures of several tributaries. These tributaries include Hicks and Duncan a tributary to Toms Creek that have PFC ratings of Nonfunctional and Functional at Risk respectively; Clover Creek rated as Functional at Risk, and Willow Valley also rated as Functional at Risk. Continued livestock grazing will not result in improvement of these impaired stream reaches, and it is likely that these riparian areas will continue to degrade. Although these stream reaches are ephemeral in nature and do not have fish present, degradation of these reaches contribute to impaired conditions downstream.

Livestock have access to the headwater tributaries of West Clear Creek including, Toms, Clover, and Long Valley streams. While these headwater channels may not contain riparian vegetation, they are low points in the topography, which contain more moisture content than the uplands, and therefore have more vegetative growth, making them more attractive to grazing by livestock and wild ungulates. Increased grazing in these areas would destabilize soil conditions and increase the amount of sediment produced from these areas, resulting in higher levels of sediment reaching the perennial waters of West Clear Creek.

The Proposed Action for grazing management is a reduction in utilization and intensity from past management and may slow watershed degradation. Studies have found that new grazing systems similar to the Proposed Action only serve to slow the rate of degradation of watersheds, not reverse it, only livestock exclusion has consistently resulted in ecosystem recovery (Armour et al. 1994, Belsky et al. 1999, Elmore and Kauffman 1994). Under this alternative the following indirect effects would continue: increased sedimentation, altered hydroperiod, and channel morphology changes. Under the Proposed Action, these effects should decrease over time by implementation of the project design features, mitigation measures and monitoring for soils, watershed, and fisheries resources and timely implementation of adaptive management responses to changes in conditions. If utilization, intensity, and AUMs are managed at the lower levels until, an interdisciplinary determination is made that conditions have improved prior to raising these levels there is a strong possibility that the Proposed Action will result in beneficial watershed effects.

Cumulative Effects

Past and present actions, as well as those that may occur within the reasonably foreseeable future, occurring within the Hackberry and Pivot Rock Allotments cumulative effects area include livestock grazing, wildlife grazing, thinning, burning, wildfires, watershed treatments, riparian protection efforts, developed and dispersed recreation, road maintenance, special uses, and the future implementation of the Travel Management Rule and the Managing Motorized Travel EIS which will prohibit off-road driving and decrease road densities on the National Forest. The main cumulative effect to the West Clear Creek watershed are those occurring from livestock grazing and recreation in riparian areas and the presence of non-native aquatic organisms. Grazing and recreation in riparian areas can degrade habitat over time by denuding stream banks and point bars, compacting soil thereby eliminating regrowth of riparian vegetation, removing vegetation, and affecting water quality directly through human and animal

wastes and indirectly by facilitating erosion and sediment runoff. Nonnative aquatic organisms, can further degrade water quality and stream habitat (Crayfish) and nonnative species can out compete and predate on native species, often resulting in their extirpation.

Threatened and Endangered, and Candidate Species

Colorado Pikeminnow

Direct and Indirect Effects

Colorado Pikeminnow are present in the Verde River downstream of the project area but do not occur in any of the tributary streams directly associated with these allotments; therefore the Propose Action Alternative will have no direct effects to the Colorado Pikeminnow.

There is potential for indirect effects to this species due to cattle access to the Verde River at Gospel Hollow, however, this impact would be discountable. Possible indirect effects to this species would continue along with potential increases in sedimentation to the Verde River from Fossil Creek and West Clear Creek and directly into the Verde River from the project area. However, it is unlikely that any sediment production from the project area into the Verde River would be measurable in comparison to current background levels of sediment in the system. Additionally, the reduction in grazing should slow the rate of watershed degradation, potentially reducing impacts from these allotments on Colorado Pikeminnow.

Cumulative Effects

The cumulative effects of the proposed action are relatively minor and will not be measurable when compared to other activities in the watershed that affects this species. The majority of these effects are due to the presence of nonnative species in the watershed that compete and predated on Colorado pikeminnow. Additional activities such as water diversion, urbanization, and watershed degradation from roads, and impaired soils elsewhere in the Verde watershed are the primary factors influencing this species. The cumulative effects from the proposed action will be negligible in comparison.

Razorback Sucker

Direct and Indirect Effects

While razorback sucker do not currently occupy portions of Fossil Creek their reintroduction into the stream is imminent. Razorback suckers do occupy the Verde River. Therefore, the potential exists for limited direct effects to occur to the species. This includes potential trampling of fish and spawning habitat by livestock at the one watering access point near Gospel Hollow along the Verde River, however, these effects would be undetectable and are unlikely to occur.

The indirect effects of the proposed action include continued and potentially increased upland erosion resulting in sedimentation to the Verde River and its watersheds. Sediment may cover and suffocate razorback sucker eggs deposited on stream substrates. However, the relative influence of continued grazing at lower intensities is unlikely to measurably increase sediment to the Verde River.

Cumulative Effects

The cumulative effects of the proposed action are relatively minor and will not be measurable when compared to other activities in the watershed that affects this species. The majority of these effects are due to the presence of nonnative species in the watershed that compete and predated on razorback suckers. Additional activities such as water diversion, urbanization, and watershed degradation from roads, and impaired soils elsewhere in the Verde watershed are the primary factors influencing this species. The cumulative effects from the proposed action will be negligible in comparison.

Razorback Sucker - Critical Habitat

Direct and Indirect Effects

There will be limited direct effects to razorback sucker habitat present in the Verde because livestock only have access to the Verde River at one location, Gospel Hollow. This one access point is used infrequently and in emergency cases only and the amount of habitat affected is likely inconsequential in comparison to the amount of riparian habitat present on the Verde.

There is the potential of indirect effects occurring to critical habitat from continued or increased erosion occurring from the project area; however, increases in sediment to the Verde River from the Proposed Action Alternative would be undetectable, due to the reduced stocking rates and decreased utilization.

Cumulative Effects

The Proposed Action Alternative when added to the direct and indirect effects to habitat (which would be undetectable) and to other past, present, and reasonably foreseeable future actions would result in no cumulative effects to razorback sucker critical habitat

Loach minnow

Direct and Indirect Effects

Loach minnow have recently been repatriated to Fossil Creek and they are historic to the Verde River but are considered to have been extirpated. Cattle do not have access to Fossil Creek therefore; there will be no direct effects.

The indirect effects of the Proposed Action Alternative may lead to continued or increased sedimentation. Sediment has been shown to limit or affect loach minnow habitat by altering macroinvertebrate assemblages and loach minnow abundances decrease where sediment fills interstitial spaces in the substrate. However, the affects to the Fossil Creek watershed from this allotment and any effects will not be detectable above the sediment produced from other ongoing activities, especially in light of reduced AUMs, utilization levels, and intensity levels.

Cumulative Effects

The Hackberry Pivot rock allotment only comprises a small portion of the Fossil Creek watershed. There will be very limited indirect effects occurring to the stream and the species its associated species. The primary cumulative effects occurring in the stream are the effects of ongoing grazing (Fossil Allotment and Ikes Backbone allotment), recreation, and road

maintenance. Due to the limited effects of the proposed action, the additive cumulative effects from the proposed action would be minimal and not likely to affect loach minnow in Fossil Creek.

Spikedace

Direct and Indirect Effects

No direct effects to spikedace will occur, as the species does not occupy any area within the allotment. As with loach minnow, spikedace are historic to the Verde River and its tributaries, and it is believed that they may have been extirpated. However, spikedace have been repatriated to Fossil Creek in the Fall of 2007. Sedimentation that affects the ability of spikedace eggs to adhere to gravel and sand substrates could negatively affect the species reproductive success. Since only 5,000 acres of the Fossil Creek watershed are affected by this Proposed Action and that the grazing intensity, utilization and numbers of livestock allowed will decrease it is unlikely that there will be any measurable affects to Fossil Creek from the Pivot Rock Allotment.

Cumulative Effects

The Hackberry Pivot rock allotment only comprises a small portion of the Fossil Creek watershed. There will be very limited indirect effects occurring to the stream and the species its associated species. The primary cumulative effects occurring in the stream are the effects of ongoing grazing (Fossil Allotment and Ikes Backbone Allotment), recreation, and road maintenance. Due to the limited effects of the proposed action, the additive cumulative effects from the Proposed Action would be minimal and not likely to affect spikedace in Fossil Creek.

Little Colorado Spinedace

Direct and Indirect Effects

There are no known current populations of spinedace within the allotment however; there are several locations outlined in the East Clear Creek Watershed Strategy for the repatriation of spinedace within the allotment boundaries (USDA et al. 1999).

Under past management poor livestock management and fence maintenance has allowed livestock to access East Clear Creek, allowing damage to streambanks and over-utilization of riparian vegetation. The Proposed Action Alternative contains mitigations to construct and maintain fences that will prevent this from occurring. Therefore, there should be no direct effect to Little Colorado spinedace that may occur in East Clear Creek, however, there is still potential for direct effects to occur once the deferment of Kehl, Miller and Potato South Allotments ends. Direct effects such as direct trampling of species could occur but would be discountable. The majority of effect to this species would be indirect.

Under the Proposed Action Alternative, there will be temporarily reduced indirect effects of livestock grazing to the East Clear Creek watershed, with the deferments of Kehl, Miller, and Potato South pastures (approximately 80% of the acreage) combined with the reduced grazing intensity, utilization, and AUMs. Depending on the levels of elk use in the watershed, this should allow for some riparian recovery to Kehl and Miller Canyon tributaries and result in

associated beneficial effects downstream to East Clear Creek. However, with the lack of a functional fence keeping livestock out of East Clear Creek from the Clear Creek and Potato North Pastures continued grazing under the Proposed Action Alternative will have negative direct effects to East Clear Creek and any recovery of the riparian vegetation and habitat of East Clear Creek will be limited.

Little Colorado Spinedace - Critical Habitat

Direct and Indirect Effects

East Clear Creek from Potato Lake to C.C. Cragin Reservoir is designated Critical Habitat for Little Colorado spinedace. Mitigation in the Proposed Action Alternative seeks to prevent direct livestock access to East Clear Creek and if successful would eliminate any direct effects to Critical Habitat. As described above there is potential for some habitat recovery due to the reduced indirect effects under the Proposed Action Alternative.

With riparian condition currently classified as nonfunctional and continued elk use, even reductions in livestock numbers may not lead to improved habitat conditions. However, since current conditions are due to both elk and livestock effects the removal of direct livestock access to East Clear Creek and reduced utilization in the uplands there is potential to see improved riparian and habitat conditions in East Clear Creek.

Cumulative Effects to the Little Colorado Spinedace and Critical Habitat

Past and present actions, as well as those that may occur within the reasonably foreseeable future, occurring within the Hackberry and Pivot Rock Allotments cumulative effects area include livestock grazing, wildlife grazing, thinning, burning, wildfires, watershed treatments, riparian protection efforts, developed and dispersed recreation, road maintenance, special uses, and the future implementation of the Travel Management Rule and the Managing Motorized Travel EIS which will prohibit off-road driving and decrease road densities on the National Forest. The main cumulative effects on Little Colorado spinedace habitat is the presence of non-native aquatic organisms in otherwise potentially suitable habitat, and effects from livestock and ungulate grazing around previously occupied and potential habitat. Grazing and recreation in riparian areas can destroy frog habitat over time by denuding stream banks and point bars, compacting soil thereby eliminating regrowth of riparian vegetation, removing vegetation, and affecting water quality directly through human and animal wastes and indirectly by facilitating erosion and sediment runoff.

Gila Topminnow

Direct and Indirect Effects

Gila topminnow have recently been repatriated to Fossil Creek and they are historic to the Verde River. Cattle do not have access to Fossil Creek therefore; there will be no direct effects.

The indirect effects of the Proposed Action Alternative may lead to continued or increased sedimentation. Sediment can decrease habitat for Gila topminnow by reducing the amount and quality of backwater and side channel habitats. However, the affects to the Fossil Creek watershed from this allotment and any effects will not be detectable above the sediment

produced from other ongoing activities, especially in light of reduced AUMs, utilization levels, and intensity levels.

Cumulative Effects

The Hackberry Pivot rock allotment only comprises a small portion of the Fossil Creek watershed. There will be very limited indirect effects occurring to the stream and the species its associated species. The primary cumulative effects occurring in the stream are the effects of ongoing grazing (Fossil Allotment and Ikes Backbone Allotment), recreation, and road maintenance. Due to the limited effects of the proposed action, the additive cumulative effects from the proposed action would be minimal and not likely to affect Gila topminnow in Fossil Creek.

Desert Pupfish

Direct and Indirect Effects

Desert pupfish may be introduced to Fossil Creek and they are historic to the Salt River but are considered to have been extirpated. Cattle do not have access to Fossil Creek therefore; there will be no direct effects.

The indirect effects of the Proposed Action Alternative may lead to continued or increased sedimentation. Sediment can decrease habitat for desert pupfish by reducing the amount and quality of backwater and side channel habitats. However, the affects to the Fossil Creek watershed from this allotment and any effects will not be detectable above the sediment produced from other ongoing activities, especially in light of reduced AUMs, utilization levels, and intensity levels.

Cumulative Effects

The Hackberry Pivot rock allotment only comprises a small portion of the Fossil Creek watershed. There will be very limited indirect effects occurring to the stream and the species its associated species. The primary cumulative effects occurring in the stream are the effects of ongoing grazing (Fossil Allotment and Ikes Backbone Allotment), recreation, and road maintenance. Due to the limited effects of the proposed action, the additive cumulative effects from the proposed action would be minimal and not likely to affect desert pupfish in and when they are introduced to Fossil Creek.

Forest Service Sensitive Species

Roundtail Chub

Direct and Indirect Effects

Roundtail chubs were one of the native fish that had been able to persist in Fossil Creek and the Verde River under past management actions and the presence of nonnative predators. The Lower Colorado River populations (Arizona and New Mexico) were petitioned for listing under the Endangered Species Act as a distinct vertebrate population segment (DPS) but a 2006 find

found that it was not warranted. However, populations of roundtail chub in Arizona and New Mexico are still vulnerable. With the restoration of streamflow to Fossil Creek in 2005 habitat conditions have improved and increased in for this species throughout the stream and roundtail chub are abundant where habitat is available.

The Proposed Action has the potential to continue and increase sedimentation into Fossil Creek. However, it is not believed that the increased sediment will notably affect the roundtail populations or imperil their existence in Fossil Creek. In the Verde River, potential sediment production from the allotment under the Proposed Action Alternative will not be measurable in comparison to current background levels and will have no effects to roundtail in the Verde River. In East Clear Creek populations of roundtail chub are located downstream of the C.C. Cragin Reservoir which would effectively trap any increase in sediment and negate any change in the hyrdrograph that could result from the Propose Action.

Cumulative Effects

Past and present actions, as well as those that may occur within the reasonably foreseeable future, occurring within the Hackberry and Pivot Rock Allotments cumulative effects area include livestock grazing, wildlife grazing, thinning, burning, wildfires, watershed treatments, riparian protection efforts, developed and dispersed recreation, road maintenance, special uses, and the future implementation of the Travel Management Rule and the Managing Motorized Travel EIS which will prohibit off-road driving and decrease road densities on the National Forest. The main cumulative effects on roundtail chub habitat is the presence of non-native aquatic organisms in otherwise potentially suitable habitat, and effects from livestock and ungulate grazing around previously occupied and potential habitat. Grazing and recreation in riparian areas can destroy frog habitat over time by denuding stream banks and point bars, compacting soil thereby eliminating regrowth of riparian vegetation, removing vegetation, and affecting water quality directly through human and animal wastes and indirectly by facilitating erosion and sediment runoff.

Headwater Chub

Direct and Indirect Effects

Headwater chubs have persisted in Fossil Creek and in West Clear Creek with historic higher use grazing systems. As their name implies they are generally found in the headwater reaches and in Fossil Creek are abundant upstream of the diversion dam of the now decommissioned Irving Power Plant. In West Clear Creek, they are present in the upper reaches from below Calloway Trail upstream to near Tramway trail. While grazing will continue to occur in the contributing watersheds, cattle will not have access to areas of Fossil Creek or West Clear Creek where headwater chub occur. Therefore, there will be no direct effects to this species from the Proposed Action.

Continued cattle grazing in the watershed under the Proposed Action Alternative has the potential to continue current watershed conditions, improve conditions, or degrade conditions. Any degradation would occur at a slower rate than is currently occurring and would most likely occur during drought periods when AUMs are greater than forage production. Continued or degraded upland watershed conditions have the potential to increase sedimentation that may alter

channel form and fill pools, negatively affecting headwater chubs. While this may occur in West Clear Creek it is unlikely in Fossil Creek, due to its spring fed nature. Higher flow levels can transport sediment above what is being provided by the watershed. Additionally, the travertine formations in the reaches where headwater chubs are present provide continued development of important pool habitat. Headwater Chub have persisted in West Clear Creek under more intensive grazing regimes and the lower intensity use of headwater areas under the Proposed Action Alternative will not reduce the continued viability of headwater chubs in the stream. Under the Proposed Action Alternative, sedimentation should decrease over time by implementation of the project design features, mitigation measures and monitoring for soils, watershed, and fisheries resources and timely implementation of adaptive management responses to changes in conditions.

Cumulative Effects

The Hackberry Pivot rock allotment only comprises a small portion of the Fossil Creek watershed. There will be very limited indirect effects occurring to the stream and the species its associated species. The primary cumulative effects occurring in the stream are the effects of ongoing grazing (Fossil Allotment and Ikes Backbone allotment), recreation, and road maintenance. Due to the limited effects of the proposed action, the additive cumulative effects from the proposed action would be minimal and not likely to affect headwater chub in Fossil Creek. There is a higher probability that effects from the proposed action will influence West Clear Creek, although the majority of this watershed is in wilderness, the primary cumulative effects come from recreation and grazing from other allotments (Buckhorn and Thirteen Mile Rock). The contribution from the proposed action will be minimal and not likely to adversely effect headwater chub.

Desert and Sonora Sucker

Direct and Indirect Effects

Livestock have emergency access only at Gospel Hollow on the Verde River where there is potential for egg nests of this species to be trampled.

Both sucker species are found throughout Fossil Creek, West Clear Creek and in the Verde River although the Sonora sucker's range in Fossil Creek is a little more restricted to areas downstream of the Irving power plant diversion barrier. Desert suckers are tolerant of a wide range of temperatures and environmental conditions. While both species build nests for eggs in gravel and could be susceptible to increased sedimentation that would negatively affect eggs, the short time period in which the eggs remain in the substrate greatly reduce the potential affects of sediment on their survival.

Cumulative Effects

The removal of predatory nonnative species in Fossil Creek has reduced a primary stressor that has led to the species decline throughout the Verde and Gila Rivers (Rinne and Miller 2006) and sucker populations are expected to persist and increase in Fossil Creek even if there is increased sediment loading from the allotment area. The species also persist with nonnative species in West Clear Creek and the Verde River, however the cumulative effects from the proposed action will not result in additive negative impacts on the species.

Little Colorado Sucker

Direct and Indirect Effects

This species is found downstream of C.C. Cragin Reservoir in East Clear Creek and its perennial tributaries. There is no potential for direct effects to this species

Any indirect effects, increased sediment or changes in the hydroperiod will be tempered by the C. C. Cragin Reservoir.

Cumulative Effects

This species is found in East Clear Creek downstream from the C.C. Cragin reservoir, there will be no indirect effects from this action occurring below the reservoir and therefore there will be no cumulative effects to this species.

Bluehead Sucker

Direct and Indirect Effects

This species is found downstream of C.C. Cragin Reservoir in East Clear Creek and its perennial tributaries. There is no potential for direct effects to this species. Any indirect effects, increased sediment or changes in the hydroperiod will be tempered by the reservoir.

Cumulative Effects

This species is found in East Clear Creek downstream from the C.C. Cragin reservoir, there will be no indirect effects from this action occurring below the reservoir and therefore there will be no cumulative effects to this species.

Longfin Dace

Direct and Indirect Effects

Longfin dace are currently present in Fossil Creek, and are assumed present in the Verde River and may be present in West Clear Creek. The Proposed Action Alternative may negatively affect this species through continued degradation of the watershed and associated increases in sedimentation to the stream. However, the primary threat to this species is from introduced nonnative fishes. Since Fossil Creek is one of the only purely native assemblages of native fishes in the Southwest, it is likely that they will persist and the effects of increased sedimentation to this species will be negligible. The species spawns by creating shallow nests in sand and the eggs usually hatch within 4 days. Because of the short time period, the eggs in the substrate would have to have an unusually large pulse of sediment to affect the eggs.

Cumulative Effects

The Proposed Action Alternative when added to the direct and indirect effects to the Longfin Dace (which would be negligible) and to other past, present, and reasonably foreseeable future actions would result in no cumulative effects to the Longfin Dace.

Management Indicator Species

Macroinvertebrates

Direct and Indirect Effects

Aquatic macroinvertebrates are found in all aquatic habitats, the assemblage of species is a Forest Management Indicator Species (MIS) due their utility in assessing water quality (Barbour et al. 1999). Macroinvertebrate assemblages vary by elevation, stream gradient, and channel unit type, i.e., pool or riffle. For this reason, the ADEQ has developed different Indices of Biological Integrity (IBI) for warm water and cold water streams (below and above 5000 feet). The comparison of IBI's for specified sites across the Forest is how trend is tracked for macroinvertebrates. There are six sites monitoring for warm water assessments and two of the sites are potentially influenced by the Proposed Action Alternative (East Clear Creek above Yeager Canyon and West Clear Creek near Maxwell trailhead). The location in East Clear Creek is downstream of the C.C. Cragin Reservoir and will not be affected, as any impacts (water yield and sediment) will be stored by the reservoir. There may be increased sediment to the site in West Clear Creek but the relative size of this increase will likely be negligible in comparison to current background levels of sediment. The limited watershed area affected by the Proposed Action Alternative reduces the potential increased sedimentation into Fossil Creek and would have minimal affects on the availability of habitats for macroinvertebrate species.

Cumulative Effects

The primary cumulative effects that have the potential to influence fisheries resources within the project is the implementation of the Travel Management Rule (TMR), the Managing Motorized Travel EIS and ongoing vegetative treatments in the affected watersheds. The TMR will greatly reduce the forest road network, eliminate off road driving, and better manage dispersed camping. The effects of TMR will reduce soil disturbance, and watershed alterations from roads and off-road vehicle use, this will reduce the background level of sediment in both the Fossil Creek, East Clear Creek and West Clear Creek watersheds. Vegetation treatments that are occurring are primarily taking place in West Clear Creek with 11,400 acres being either thinned or prescribed burned to reduce fuel loads, in East Clear Creek there are 7,500 acres being treated, and in Fossil creek only about 1,400 acres. These treatments in the short term will increase soil disturbance and runoff having short-term increase in sediment potentially entering the associated watersheds. However, the majority of the effects from vegetation treatments and prescribed burning will dissipate within several years and the benefits of reducing the spread and scale of stand replacing wildfire should outweigh any negative impacts.

No Trailing Action Alternative

Description of Alternative:

The purpose of this specialists' report addendum for Hackberry Pivot Rock EA, is to disclose effects of a third alternative, referred to as the *'No Trailing Action Alternative'*. This alternative is exactly like the Proposed Action Alternative, except that it does not include trailing in either

direction of livestock between Hackberry and Pivot Rock portions across the Fossil Creek Allotment.

All effects disclosed in the original Fisheries Specialist's Report under the Proposed Action Alternative and therefore the biological determinations are the same for the *'No Trailing Action Alternative.*

Direct and Indirect Effects
Direct and indirect effects are the same as discussed in the original Fisheries Specialist Report for all species, habitats and waters.

Cumulative Effects
The cumulative effects for this alternative are the same as for the original Fisheries Specialist Report.

COMPARISON OF ALTERNATIVES

Table 42. Comparison of Alternatives for the Fisheries Resource

Waters	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
Fossil Creek			
	Limited beneficial effects to the watershed. There is only a small portion of the allotment in the watershed. Small part of watershed would see improved conditions, probably no measurable improvement to stream habitat.	The proposed action will have limited effects to Fossil Creek. There is only a small portion of the allotment in the watershed. Improvement over current grazing strategy but with some continuing negative effects, primarily erosion leading to sedimentation in streams. Will have limited adverse effects to the watershed in comparison to the No Graze/No Action Alternative. With the increased flow in Fossil Creek will not likely have any measurable effects	Same at the Proposed Action Alternative.

Waters	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
Fossil Creek Aquatic Species Species: Loach minnow, spikedace, roundtail chub, headwater chub, Sonora and desert suckers, longfin dace, and razorback suckers	Small beneficial effects may occur. Likely not measurable and may be insignificant in relation to cumulative affects from Fossil Allotment and ongoing recreation in the watershed.	Not likely to affect any of these species since any effects to the stream will not be measurable. There could be deleterious cumulative affects from Fossil Allotment and ongoing recreational activities in the watershed	Same as the Proposed Action Alternative.
Verde River			
	Beneficial effects to the Verde will result from the selection of the No Graze/No Action Alternative. The Hackberry Allotment would see soil conditions improve resulting in decreased sediment entering the Verde River. However, in comparison to background level of sediment in the Verde River the effects would not be measurable.	The proposed action would be an improvement over current management. Reduced utilization and intensity and lower AUMs and the deferment of Teepee pasture will result in soil and watershed improvements. These improvements should reduce the rate of current degradation, resulting in reduced sediment entering the Verde. However, the continued grazing will still see sediment production from use of the allotment entering the Verde. Although in comparison to other activities occurring in the Verde the amount of sediment produced by the allotment will not be measurable.	Same as the Proposed Action Alternative.

Waters	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
Verde River Aquatic Species Species: Loach minnow, spikedace, roundtail chub, headwater chub, Sonora and desert suckers, longfin dace, and razorback suckers	The No Graze/No action Alternative has the potential for beneficial effects to water quality by limiting the sediment derived from poor watershed condition on the allotment. This would result in beneficial effects to most species occupying the system. However due to other influences (upstream land use, water use, and nonnative aquatic species the benefits of the No Graze/No Action Alternative would be inconsequential to the species in the Verde River.	The Proposed Action has the potential to improve watershed conditions and could reduce sediment to the Verde which would be beneficial to the species in the system. However, the other influences on the Verde from the rest of the watershed and the presence of nonnative species are having a greater effect on species than this watershed so any improvement would not be measurable. Therefore, effects from the PA are inconsequential to species in the Verde.	Same as the Proposed Action Alternative.
West Clear Creek			
	Beneficial effects to the West Clear Creek will result from the selection of the No Graze/No Action Alternative. The Hackberry Allotment would see soil conditions improve resulting in decreased sediment entering the West Clear Creek.	The proposed action would result in lower AUMS and intensity of grazing in the watershed. This would be an improvement over current management. This may result in improved watershed conditions, although the time period of improvement is unknown as climate trends are unknown and grazing will continue regardless of climate.	Same as the Proposed Action Alternative.
West Clear Creek Aquatic Species Species: roundtail chub,	Decreased sedimentation entering the watershed due to degraded upland watershed conditions would have beneficial effects to aquatic species.	The PA has the potential to decrease sedimentation to the watershed and benefit aquatic species. However, with continued grazing in the watershed the rate of improvement is unknown and will be slower than compared to the No Graze/No Action	Same as the Proposed Action Alternative.

Waters	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
headwater chub, Sonora and desert suckers, and longfin dace		Alternative.	
East Clear Creek			
	Would have beneficial effects to the watershed. Upland watershed conditions should improve, resulting in less erosion and sediment entering stream channels. Riparian conditions should improve, however the extent depends on the effects of elk, and climate.	The PA is an improvement over past management: Short term benefits to the watershed from the deferment of Kehl, Miller, and Potato South pastures. The deferment of Kehl pasture until conditions improve will result in more permanent watershed benefits, including reduced sedimentation and improved riparian conditions. Continued degradation to East Clear Creek from elk and cattle grazing will continue, establishment of woody riparian vegetation is unlikely, so PFC rating will maintain nonfunctional status. Once improvements are completed in Potato South, and Miller pastures upland and riparian conditions may resume deterioration resulting in continued and potentially increased sedimentation and channel form alterations. Adept adaptive management, favorable climate, and limited elk effects are necessary to see improved watershed conditions and improved stream habitat.	Same as the Proposed Action Alternative.
East Clear	No effect to bluehead	No effect to bluehead	Same as the Proposed

Waters	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
Creek Aquatic Species Species: Little Colorado spinedace, bluehead suckers, Little Colorado suckers, and roundtail chub	suckers, LC suckers, or roundtail chub since blueridge reservoir traps sediment and negates any alteration to the hydrograph. No Graze/No Action Alternative should benefit LC spinedace by improving watershed and riparian conditions resulting in improved stream habitat. Magnitude of effect depends on climate and elk.	suckers, LC suckers, or roundtail chub since blueridge reservoir traps sediment and negates any alteration to the hydrograph. The PA is an improvement over current management; however, over the long-term (once Miller and Potato South come back online) grazing even at reduced levels will still have negative effects to East Clear Creek and Little Colorado spinedace critical habitat.	Action Alternative.

BOTANY AND SENSITIVE PLANTS

The following section describes the affected environment and effects of the alternatives for the botany and sensitive plants. This analysis as presented is summarized from the following reports which are incorporated by reference: *Botany Specialist's Report* by D.Crisp, (2007*),* [PR#35] *Botany Specialist's Report Addendum #1* by D.Crisp, (2007), [PR#35.1] *Biological Assessment and Evaluation of Region 3 Sensitive Plants* by D.Crisp, (2008), [PR#35.2] *Botany Specialist's Report Addendum #2* by D.Crisp, (2008*)* [PR#35.3].

Affected Environment for Botany and Sensitive Plants

Past surveys were reviewed and there were no documented occurrences of threatened, endangered or Forest Service Sensitive (TES) plant species in the allotment. Plant surveys were not conducted on the allotment due to time and budgetary constraints. Potential habitat for various plant species was determined based on soil types from the Terrestrial Ecosystem Survey database or plant associations. Table 43 below lists the nine Region 3 Sensitive plants having potential habitat in the project area.

Table 43. Region 3 Sensitive Plant Species Analyzed and Potential Habitats in and Adjacent to the Hackberry and Pivot Rock Allotments

Common Name Scientific Name	Habitat and Presence in and Adjacent to the Project Area
Tonto Basin Agave *Agave delamateri*	Potential habitat, no documented occurrences or documented surveys within the allotment.
Heathleaf Wild Buckwheat *Eriogonum ericifolium var.*	Potential habitat within the Hackberry Allotment, no documented occurrences or documented surveys within this allotment. The potential habitat is limited to specific soil types within the Teepee and Mesquite Springs pastures.

Common Name Scientific Name	Habitat and Presence in and Adjacent to the Project Area
ericifolium	
Ripley Wild Buckwheat *Eriogonum ripleyi*	Potential habitat within the Hackberry Allotment, no documented occurrences or documented surveys within the allotment. The potential habitat is limited to specific soil types within the Teepee and Mesquite Springs pastures.
Hualapai Milkwort *Polygala rusbyi*	Potential habitat within the Hackberry Allotment, no documented occurrences or documented surveys within this allotment.
Verde Valley Sage *Salvia dorrii mearnsii*	Potential habitat within the Hackberry Allotment, no documented occurrences or documented surveys within the allotment. The potential habitat is limited to specific soil types within the Teepee and Mesquite Springs pastures.
Cliff Fleabane *Erigeron saxatilis*	Potential habitat, no documented occurrences or documented surveys within the allotments. Habitat is sheer canyon walls, generally growing on Coconino sandstone.
Arizona sneezeweed *Helenium arizonicum*	Potential habitat and documented occurrences within the allotments.
Eastwood Alum Root *Heuchera eastwoodiae*	Potential habitat, no documented occurrences or documented surveys within the allotments. The habitat is moist slopes in ponderosa pine forests and canyons where it typically grows on slopes or cliffs.
Flagstaff Beardtongue *Penstemon nudiflorus*	Potential habitat, no documented occurrences or surveys within the allotments. Potential habitat includes dry pine forests, pine/oak, pine/oak/ juniper and pinyon - juniper forests. Numerous locations of this species have been recorded on the Mogollon Ranger District in areas such as the Upper Beaver Creek Fuels Reduction Project.

Environmental Consequences for Botany and Sensitive Plants

The unit of measure for Region 3 sensitive plant species is to maintain or enhance potential habitat within the allotment area. Manual direction (FSM 2670.5(19)) emphasizes that management actions would avoid or minimize impacts to sensitive species. Mitigating measures have been incorporated into project design and implementation as necessary to minimize impacts to Region 3 sensitive plants.

No Graze/No Action Alternative

There will be no direct actions to Region 3 sensitive plants from the No Graze/No Action Alternative because none of the management actions outlined in the Proposed Action will occur. There will be no livestock grazing and no construction or modification of structural improvements in the allotment. Maintenance of existing structural improvements would require separate NEPA analysis. Indirect and cumulative effects to Region 3 sensitive plants by the No Graze/No Action Alternative would not occur because there would be no livestock grazing in potential habitats within the allotments. Absent livestock grazing, effects would include slight reductions in factors such as compaction of soils, but these beneficial effects would be insignificant.

Proposed Action Alternative

Direct and Indirect Effects

Measures used to address the direct and indirect effects are generally qualitative.

Currently there are no documented effects to Region 3 Sensitive plants in the allotment. Examples of possible direct effects would be grazing on individual plants (livestock eating plants), trampling, or grazing within sensitive habitats. Other direct effects to Region 3 Sensitive plants within the allotment include possible impacts to potential habitat (or to individuals that may have been previously undetected) during the construction of structural improvements. However, these effects would be mitigated by surveying the areas before construction and through implementing best management practices to reduce the introduction or spread of noxious or invasive weeds to potential habitat. The management actions outlined in the proposed action will indirectly benefit Region 3 Sensitive plants by reducing impacts to potential habitat that may be currently occurring. For example, objectives common to the proposed action include improvement of range conditions and improved control of livestock. Improved range conditions and improved control of livestock will indirectly benefit Region 3 Sensitive plants by reducing the possible effects of grazing to potential habitat.

Proposed Action Alternative could possibly lead to a larger immediate increase in ground cover and vegetation on the allotment. However, the overall effect of this to the Region 3 Sensitive plants discussed in this document would probably be minimal and insignificant. Heath-leaf wild buckwheat, Ripley's wild buckwheat, Hualapai milkwort and Verde Valley sage typically grow in harsh environments where minimal ground cover is naturally present. There could be a minimal effect from lower levels of grazing for Flagstaff beardtongue by reducing the likelihood of trampling and grazing on the plants.

There are no known occurrences of Tonto Basin agave in the allotment so there would be no direct or indirect effects to the species. There would be no direct or indirect effects to cliff fleabane or Eastwood alum root through management actions that are included in the Proposed Action. These plants generally occur in steep, cliffy areas such as occur in the Fossil Creek Wilderness that would not be affected by any of the management actions.

There may be limited direct or indirect effects to Arizona sneezeweed in the allotment areas. The effects addressed here are those that affect potential habitat since there are no documented occurrences of the species in the allotment areas. Occurrences of this species are currently limited to the Pivot Rock Allotment. Management actions for these areas would be limited to livestock grazing. No structural improvements are planned for the areas around the locations. Direct effects to these plants would be limited to incidental grazing by livestock. Some minor trampling may occur in these areas. Effects to Arizona sneezeweed from grazing and trampling in these areas will be minor and insignificant.

In the proposed action, several areas that would be potential habitat for the Arizona sneezeweed would be deferred from grazing and protected from grazing through the construction of exclosures to protect water sources and riparian areas. Areas deferred include Kehl, Miller and Potato South pastures. These deferrals focus on improving conditions to meet the desired future

condition for headwater meadows and riparian areas. These actions will indirectly benefit Arizona sneezeweed by protecting or improving potential habitat in these areas.

An indirect effect to the potential habitat for Region 3 Sensitive plants would be the introduction of noxious or invasive weeds during construction of structural improvements. Best management practices to reduce the potential for introduction and spread of noxious and invasive weeds are incorporated in to the project as design features described in Chapter 2 of the EA [PR#97]. These will mitigate this effect.

Cumulative Effects

The allotment boundary was chosen to analyze cumulative effects. The effects of past and present management actions on the potential habitats for Region 3 Sensitive plants in the allotment are largely unknown. Future actions such as implementation of cross-country travel restrictions under the guidance of the Travel Management Plan and actions to control noxious or invasive weeds will indirectly benefit the potential habitats of Region 3 Sensitive plants in the allotment by reducing impacts from vehicle travel and reducing the risks from noxious or invasive weed invasions. With the implementation of the project design features and mitigation measures for soil and watershed resources and noxious and invasive weeds as described in Chapter 2 of the EA, the effects of the Proposed Action Alternative would have a minimal cumulative impact when considered along with ongoing and future recreational and OHV impacts.

No Trailing Action Alternative

Direct, Indirect and Cumulative Effects

This alternative is exactly like the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock portions across the Fossil Allotment.

All direct, indirect and cumulative effects are the same as those disclosed under the Proposed Action.

NOXIOUS and INVASIVE WEEDS

The following section describes the affected environment and effects of the No Graze/No Action, Proposed Action Alternative and the No Trailing Action Alternative for noxious and invasive weeds. The analysis presented is summarized from the following reports which are incorporated by reference: *Invasive Plant Species Specialist's Report,* by C. Boyd, (2007), [PR#37] and the *Invasive Plant Species Specialist's Report Addendum #1,* by C.Boyd, (2008), [PR#37.1].

Affected Environment for Noxious and Invasive Weeds

A complete survey of the allotment and surrounding area has not been completed. There have been surveys in various parts of the allotment and adjacent area and these are used for this analysis.

Based on these sources, there are no invasive weed species of concern on the Hackberry Allotment although yellow star thistle is present just north of the allotment. There are 8 known invasive weed species of concern that exist on the Pivot Rock Allotment.

Each noxious or invasive weed species of concern is rated by the perceived severity and risk to Forest resources. Rating for each species is based on several factors including the invasiveness of the species and the predicted success of control measures of each species. These are ranked in the *Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab and Prescott National Forests (USDA- Forest Service, 2005a)*. Details of the ranking system are provided in the Invasive Plants Species Specialist Report, by C. Boyd, (2007), [PR#37].

Table 44. Weed Species of Concern in the Pivot Rock Range Allotment Project Area

Species Rank	Species Common Name	Objective	Occurrence in Pivot Rock Allotment
2	Yellow starthistle	Eradicate	The only mapped occurrences are just north of the Hackberry Allotment along Highway 260.
5	Russian knapweed	Contain/Control	Only mapped occurrences are along FH3 between the Bed Bug West and Huffer Pastures.
9	Diffuse knapweed	Contain/Control	Only one mapped occurrence along FR141 in the Kehl Pasture
10	Spotted knapweed	Eradicate	Several occurrences along FH3
11	Scotch thistle	Eradicate or Control	Only one mapped occurrence near the Clints Well Campground.
18	Dalmatian toadflax	Contain/Control	Common along roads, especially in eastern part of the allotment
20	Bull thistle	Contain/Control	Widespread throughout the allotment
22	Cheatgrass	Contain/Control	Occurs along Forest Roads 211 and 136 in the Bald Pasture; Forest Highway 3 in north end of Toms Pasture and Neck 1 Pasture; and along the far east boundary of the Miller Pasture.

Environmental Consequences for Noxious and Invasive Weeds

The discussion of effects of the alternatives will be qualitative as there is not a complete survey of the project area.

No Graze/No Action Alternative

Direct and Indirect Effects

The effects considered include spread of existing populations and establishment of new populations of invasive species. Removing livestock grazing from the allotment would eliminate the direct effects of introduction or spread of invasive species from the livestock and the

equipment used in the management of the allotment. There would be no spread of existing populations or establishment of new populations from livestock grazing operations. There would also be no indirect effects from livestock grazing and associated operations under this alternative as there would be no operations on the allotment. Overall, this alternative would have a slight minor benefit over the Proposed Action Alternative.

Cumulative Effects

The cumulative effects analysis includes the allotment area and areas adjacent to it. The time frame for analysis of cumulative effects is within the last 10 years and within the next 10 years. The two major ongoing activities considered in the cumulative effects analysis include recreational activities. Dispersed and developed recreation activities occur in the project area. There is one developed campground (Clint's Well) in the Pivot Rock Allotment. Dispersed recreation occurs throughout both allotments. These activities affect invasive species through vehicles, horses, and people spreading seeds and plant parts from existing populations. They can also introduce new populations (either species that currently occur or new species).

Thinning and burning activities have been occurring and are expected to continue to occur. Past projects did not generally include Resource Protection Measures for invasive plants so populations became established and spread through these projects. Treatment activities often left the ground bare which allowed the species to become established. Vehicles used in the projects introduced weed seeds from other areas. More recent projects (and all future projects) include Resource Protection Measures to limit the establishment of new populations and spread of existing populations of invasive plant species.

Road maintenance has the potential to spread invasive plants if they are growing next to the road being maintained. As with thinning and burning projects, we now follow Resource Protection Measures to limit the spread of plants from road maintenance.

Fire suppression activities can increase the establishment and spread of invasive plants by vehicles coming to the area from other places and bringing seeds and plant parts into the area. This is mitigated by the use of wash stations and avoidance of infested areas whenever possible.

The Off Highway vehicle closure in East Clear Creek (Pivot Rock Allotment) and the future elimination of cross country travel (both allotments) will substantially reduce the establishment and spread of invasive plants throughout the analysis area.

While there would be no direct or indirect effects from livestock grazing operations on the allotment under this alternative, invasive species would continue to occur and spread in the project area. Existing populations would continue to spread from annual seed production. These populations would be controlled through treatment as funding is available.

Current and future treatments of invasive plant populations will also reduce the establishment and spread of invasive plants throughout the analysis area.

The cumulative effects of the No Grazing/No Action Alternative would be the continued establishment and spread of invasive species. The rates of establishment and spread would be

less under the No Graze/No Action Alternative than they are currently due to the removal of livestock from the allotments. The effects are summarized below in Table 43.

Table 45. Cumulative Effects of No Graze/No Action Alternative

	Past Actions	Present Actions	No Graze/ No Action	Future Actions	Cumulative Effects
Spread of existing populations	Existing populations spread through the ground disturbance and distribution of seeds and plant parts.	Existing populations will continue to spread. BMPs and treatment will slow the spread from specific projects.	No spread of existing populations from livestock grazing or associated activities.	Existing populations will continue to spread. BMPs and treatment will slow the spread from specific projects.	Existing populations will continue to spread. This will be a rate less than the current rate of spread due to the removal of livestock.
Establishment of new populations	New populations of species were established through the development of a seed bed and spread of seeds and plant parts.	New populations will be established. BMPs and treatments will limit the number of new populations from specific projects.	No new populations established from livestock grazing or associated activities.	New populations will be established. BMPs and treatments will limit the number of new populations from specific projects.	New populations will continue to be established. This will be at a rate of establishment less than the current due to the removal of livestock.

Proposed Action Alternative

Direct and Indirect Effects

Implementation of the project design features, mitigation measures for noxious and invasive weeds as listed in Chapter 2 will minimize the spread of these species from livestock operations. They will not, however, eliminate the effect. Livestock and equipment associated with the management of the allotment will move seeds and plant parts from existing plants to new areas as well as bring new seeds and plant parts into the allotment. The spread of invasive species is expected to be slightly faster with the Proposed Action Alternative than if there were no livestock on the allotment in the No Graze/No Action Alternative because there is another source of spread with the Proposed Action.

Livestock and equipment will cause some ground disturbance in areas where invasive species occur which will allow the existing plants to spread as an indirect effect. The indirect effects of the Proposed Action Alternative are that invasive species will spread at a slightly faster rate than with the No Graze/No Action Alternative.

Cumulative Effects

The cumulative effects of the Proposed Action Alternative would consist of any direct and indirect effects added on to the effects caused by other projects and activities in the area. The projects, activities and time frames considered in the cumulative effects analysis are the same as

for the No Graze/No Action Alternative. There would be continued spread of existing weed populations by grazing activities, but that would be modified by limited treatments and implementation of mitigation measures. New populations discovered would be treated as they are found to eradicate or control them. Recreational activities would continue to spread seed and create new seed beds. Overall, when the effects are considered together, the cumulative effects are that there would be a faster spread of invasive species than if there were no livestock grazing on the allotment. The magnitude of this effect is small, and would not be a significant impact because Best Management Practices and monitoring would be implemented as part of grazing management, and existing and discovered weed populations would be controlled and treated as needed.

Table 46. Cumulative Effects of Proposed Action Alternative

	Past Actions	Present Actions	No Graze/No Action	Future Actions	Cumulative Effects
Spread of existing populations	Existing populations spread through the ground disturbance and distribution of seeds and plant parts.	Existing populations will continue to spread. BMPs and treatment will slow the spread from specific projects.	Continued spread of invasive species	Existing populations will continue to spread. BMPs and treatment will slow the spread from specific projects.	Existing populations will continue to spread. The rate of spread will be similar to the current rate.
Establishment of new populations	New populations of species were established through the development of a seed bed and spread of seeds and plant parts.	New populations will be established. BMPs and treatments will limit the number of new populations from specific projects.	Some new populations established	New populations will be established. BMPs and treatments will limit the number of new populations from specific projects.	New populations will continue to be established. The rate of establishment of new populations would be similar to the current rate.

No Trailing Action Alternative

Direct, Indirect and Cumulative Effects

This alternative is exactly like the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock portions across the Fossil Allotment.

There will be no difference in the direct, indirect and cumulative effects of this alternative on invasive plant species than those disclosed in the original Invasive Plant Species specialist report under the Proposed Action.

RECREATION

The following section describes the affected environment and effects of the No Graze/No Action Alternative, Proposed Action Alternative and the No Trailing Action Alternative for recreation resources which includes the following categories: recreation sites and uses; recreation and lands special uses; and wild and scenic rivers resource. The analysis presented is summarized from the following report which is incorporated by reference: *Recreation Specialist's Report* by J.Gonzales, (2007),[PR#46] *Recreation Specialist's Report Addendum #1,* by Jerry Gonzales (2008), [PR#46.1].

Affected Environment for Recreation

Recreation Sites/Uses

Developed sites in or adjacent to the Hackberry and Pivot Rock Allotments include the Kehl Springs Campground, situated along FR300, which has a vault toilet, parking, picnic tables, and 8 single-unit campsites. There is an old fence surrounding the Kehl Springs Campground that is somewhat effective in keeping livestock out of the campground. The District has plans to reconstruct this fence to make it effective. The Clints Well Campground is within the right of way fence near the junction of State Highway 87 and Forest Highway 3. This Campground has a vault toilet, parking, picnic tables, and 7 single-unit sites. There are no issues with cattle getting into this campground. The Long Valley Work Center Group Campground, is located off Forest Road 141, and has parking, grills, picnic tables, and 1 vault toilet. This Campground is not fenced to exclude livestock, but there have been minimal issues associated with livestock.

There are several trails within the boundaries of the both allotments.

Dispersed recreation is characterized by the common themes of summer activities, winter activities, consumptive use of forest resources, and educational/personal development type activities. The area provides a moderate degree of solitude and many opportunities for picnicking and camping at user-created sites throughout the area. None of the sites have developments other than those put there by visitors, and occupancy takes place largely on weekends during the summer and fall. There are many dispersed camping sites in the Pivot Rock Allotment and the area receives heavy use during the summer and during hunting season..

An estimated 70% of the visits to the area occur during the summer season (Memorial Day to Labor Day). It is estimated that a full 90% of the users are Arizona residents, with many users returning to their favorite sites or settings on an annual basis. Recreational activities include: hiking; viewing wildlife; hunting; dispersed car-camping; backpack camping; orienteering; horseback riding, caving, rock climbing, photography, picnicking; taking scenic drives; bicycling; shooting; and gathering in family or social groups. Off Highway Vehicle (OHV) use has increased dramatically in the last several years as neighboring Forests implement tighter restrictions on the use of jeeps, 4x4's and "quads". Family-oriented groups tend to gather at dispersed campsites, and explore from their campsite along old roads or off through the woods, making their own trails.

The local hunting seasons last from about mid-August through December and account for much of the fall use in the area. The area is popular for turkey, elk and deer hunting during various seasons.

Gathering forest resources often combines subsistence needs with the pursuit of recreational experiences. Consumptive uses in or adjacent to the allotments includes: firewood cutting; post and pole cutting; collecting boughs and cones; collecting and transplanting wildlings; hunting; gathering antlers; collecting food and medicinal resources such as berries, nuts, mushrooms, and bracken fern; and collecting biological specimens for research.

Lands and Recreation Special Uses

Recreational guides and outfitted service providers are authorized under temporary special use permits, on an annual basis, and currently include guided hunting, and ATV services in portions of the analysis area.

Environmental Consequences for Recreation

Effects of the alternatives to recreation sites and uses and recreational special uses are assessed qualitatively

No Graze/No Action Alternative

Recreation Sites/Uses and Special Uses

Direct and Indirect Effects

Use of developed sites is expected to remain at current high use levels.
Trail use is expected to remain at the low to moderate use level. Conflicts between motorized and non-motorized uses are expected to continue or accelerate. Dispersed recreational activities will continue as before, the increased pressure and degradation of riparian areas near popular dispersed camp sites may make them less desirable over time as use continues to increase. Conflicts between recreationists will continue, as off road vehicle use and extended occupancy of popular sites increases. Because no livestock grazing would occur under the No Graze/No Action Alternative there is not expected to be any direct or indirect effects on developed sites, trails, and dispersed recreation within the allotments. Likewise, there is not expected to be any direct or indirect effects on land and recreation special uses within the analysis area. The Recreational Opportunity Spectrum (ROS) and the Visual Quality Objective (VQO) will remain within Land Management Plan guidelines under the No Graze/No Action Alternative as there would not be any livestock grazing activities taking place.

Cumulative Effects

Since there are no direct or indirect effects from implementation of the No Graze/No Action Alternative, there will not be any cumulative effects on the recreation sites and uses, lands and special uses within the allotment analysis area.

Proposed Action Alternative

Recreation Sites/Uses and Special Uses

Indirect and Indirect Effects

Facilities at developed sites currently have low conflicts with livestock grazing in the campground. Maintenance of existing fencing would continue to occur.

Trail use is expected to remain at the low to moderate use level. Conflicts between motorized and non-motorized uses along trails are expected to continue or accelerate. Dispersed activities will continue as before however, the increased pressure and degradation of riparian areas near popular dispersed camp sites may make them less desirable over time as recreational use continues to increase. Conflicts between recreationists will continue, as off road vehicle use and extended occupancy of popular sites increases. Activities associated with this alternative, such as livestock management and construction of range improvements, occurring over time and space, will mostly go unnoticed by the recreating public. The proposed improvements are not near developed sites or trails

The Proposed Action Alternative will not have any direct or indirect effects on developed sites, trails or dispersed recreation sites.

The Proposed Action Alternative will not have any impacts on existing land and recreation special uses in the analysis area, as long as there is coordination between District Range staff and Lands and Special Uses staff when any improvement and maintenance projects are planned and implemented.

Cumulative Effects

Since there are no direct or indirect effects resulting from the activities of this alternative, there will be no cumulative effects on the recreation sites and uses, recreation and lands special uses,

No Trailing Action Alternative

This alternative is exactly the same as the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock Allotments across the Fossil Creek Allotment.

Direct, Indirect and Cumulative Affects:

There would be no direct, indirect or cumulative affects to recreational sites and uses from past, on-going, or reasonably foreseeable future actions. Apart from the livestock trailing route, all other affects as described in the Proposed Action Alternative remain the same.

WILDERNESS

The following section describes the affected environment and effects of the alternatives for the West Clear Creek Wilderness and the Fossil Springs Wilderness. The analysis presented is summarized from the following report which is incorporated by reference: *Recreation Specialist's Report* by J.Gonzales, (2007),[PR#46] *Recreation Specialist's Report Addendum #1,* by Jerry Gonzales (2008), [PR#46.1].

Affected Environment for Wilderness

The Fossil Springs Wilderness and the West Clear Creek Wilderness are located partially within the allotment.

Environmental Consequences for Wilderness

Effects to wilderness values are assessed qualitatively. A second measure of effect is whether there would be any changes to wilderness area designations.

No Graze/No Action and Proposed Action Alternative

The No Graze/No Action Alternative is not expected to have any direct, indirect or cumulative effects on wilderness values, as there would be no livestock grazing. As there are no new improvements proposed in either wilderness, and grazing would continue largely similar to how is has in the past, the Proposed Action Alternative will not have any direct or indirect or cumulative effects on wilderness values.

No Trailing Action Alternative

This alternative is exactly the same as the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock Allotments across the Fossil Creek Allotment.

Direct, Indirect and Cumulative Affects:
There would be no direct, indirect or cumulative affects to wilderness from past, on-going, or reasonably foreseeable future actions. Apart from the livestock trailing route, all other affects as described in the Proposed Action Alternative remain the same.

WILD AND SCENIC RIVERS

The following section describes the affected environment and effects of the No Graze/No Action Alternative and the Proposed Action Alternative for the wild and scenic rivers resource. This

analysis as presented is summarized from the following report which is incorporated by reference: *Recreation Specialist's Report* by J.Gonzales, (2007),[PR#46] *Recreation Specialist's Report Addendum #1,* by Jerry Gonzales (2008), [PR#46.1].

Affected Environment for Wild and Scenic Rivers

The Verde Wild and Scenic River forms the western end of the Hackberry Allotment. The Verde River is presently not impacted by livestock grazing as a result of pasture fences and terrain upslope of the river. The majority of the pasture fences along the Verde River are however within the ¼ mile of the Wild and Scenic river corridor. This was evaluated during the designation process of the Verde as a Wild and Scenic River. The Hackberry Allotment has been fenced from the Verde River, except for one emergency access point for livestock water and that is located at Gospel Hollow.

Environmental Consequences for Wild and Scenic Rivers

Effects to Wild and Scenic River's Outstanding, Remarkable Values (ORVs) are assessed qualitatively. Another measure of effect is whether the alternatives would change the eligibility, designation or classification.

No Graze/No Action Alternative

The No Graze/No Action Alternative is not expected to have any direct, indirect effects or cumulative effects on the eligibility or classification of the Verde River WSR designation, its free flows or its ORVs as there would be no livestock grazing. Under the No Graze/No Action Alternative, Verde River WSR will continue to be managed according to agency policy in FSH 1909.12, Chap. 8.12 and the Verde Wild and Scenic River Comprehensive River Management Plan (USDA – Forest Service 2004).

Proposed Action Alternative

The Proposed Action Alternative is not expected to have any direct, indirect or cumulative effects to the eligibility or classification of the Verde River WSR designation, its free flows or its ORVs. Similar to the current situation, the Verde River would not be impacted by Proposed Action Alternative because pasture fences and terrain restrict livestock access.

No Trailing Action Alternative

This alternative is exactly the same as the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock Allotments across the Fossil Creek Allotment.

Direct, Indirect and Cumulative Affects:

There would be no direct, indirect or cumulative affects to wild and scenic rivers from past, on-going, or reasonably foreseeable future actions. Apart from the livestock trailing route, all other affects as described in the Proposed Action Alternative remain the same.

INVENTORIED ROADLESS AREAS

The following section describes the affected environment and effects of the alternatives for the Inventoried Roadless Areas (IRAs). The analysis presented is summarized from the following report which is incorporated by reference: *Recreation Specialist's Report* by J.Gonzales, (2007),[PR#46] *Recreation Specialist's Report Addendum #1*, by Jerry Gonzales (2008), [PR#46.1].

Affected Environment for Inventoried Roadless Areas

There are three Inventoried Roadless Areas (IRAs) in or adjacent to the allotments: Hackberry Mountain, Boulder Canyon and Cimarron Hills Inventoried Roadless Areas.

Environmental Consequences for Inventoried Roadless Areas

Effects to IRAs are assessed qualitatively. Another measure of effect is whether the alternatives would change the eligibility, designation or classification.

No Graze/No Action Alternative

The No Graze/No Action Alternative is not expected to have any direct, indirect or cumulative effects on IRAs and their designation, as there would be no livestock grazing.

Proposed Action Alternative

There are several new range structural improvements proposed in the IRAs with the Proposed Action Alternative. These improvements within the IRAs include livestock exclosure fences at springs and seeps as needed. Since no new roads would be constructed, and grazing would continue similar to how it has in the past, the Proposed Action Alternative will not have any direct, indirect or cumulative effects to the IRAs and would not change their eligibility, designation or classification.

No Trailing Action Alternative

This alternative is exactly the same as the Proposed Action Alternative, except that it does not include trailing of livestock in either direction between the Hackberry and Pivot Rock Allotments across the Fossil Creek Allotment.

Direct, Indirect and Cumulative Affects:

There would be no direct, indirect or cumulative affects to recreational sites and uses from past, on-going, or reasonably foreseeable future actions. Apart from the livestock trailing route, all other affects as described in the Proposed Action Alternative remain the same.

There would be no direct, indirect or cumulative affects to Inventoried Roadless Areas from past, on-going, or reasonably foreseeable future actions. Apart from the livestock trailing route, all other affects as described in the Proposed Action Alternative remain the same.

HERITAGE RESOURCES

The following section describes the affected environment and effects of the No Graze/No Action Alternative, the Proposed Action Alternative and the No Trailing Action Alternative for Heritage Resource. The analysis presented is summarized from the following reports which are incorporated by reference: *Heritage Specialist's Report*, by M. Swift, (2007), [PR# 42] *Heritage Specialist's Report Addendum #1*, by M. Swift, (2008), [PR#42.1].

Affected Environment for Heritage Resources

A limited number of archaeological surveys for other projects have been conducted throughout the years within the Hackberry portion of the allotment. As a result, only 3.3 percent (797 acres) of the Hackberry Allotment area has been intensively surveyed. Many additional acres have been checked for sites in early archaeological research, para-archaeological training, and on-going volunteer survey. However, no clear survey routes or blocks have yet been reported for these activities.

Within the Hackberry Allotment, 92 sites have been located and recorded, and 38 potential sites have been reported but not fully recorded. This indicates that there are likely hundreds of unrecorded sites within the allotment area. Prehistoric sites make up 90 of the 92 recorded sites, with one protohistoric site and one historic site. The reported but unrecorded potential sites include 25 prehistoric sites, 4 historic sites, 5 natural features that may have been used, and four sites of unknown content.

Archaeological survey coverage and site types and densities for the Hackberry portion of the allotment are consistent with those of the surrounding areas. Similar site types and levels of survey were reported for the Fossil Creek Allotment to the north and east of the Hackberry Allotment. Known heritage properties include a wide variety of site types, ranging from simple artifact scatters to large pueblos. Historic sites are few in number, with only one corral recorded. In addition, one sheep corral, one ranch, one 1870s military patrol camp, and a wagon road are reported to be in the Hackberry portion of the allotment, but have not as yet been located or recorded. As evidenced by 93% of known sites in the area, the major prehistoric occupation of the allotment was that of the Southern Sinagua (A.D. 600 to 1350). Southern Sinagua occupation occurred at 82 of the 92 recorded sites (89%). These sites are primarily pueblos and associated field houses, agricultural fields, and features. There are 16 sites related to Yavapai/Apache occupation including 3 with wickiup rings, 1 possible wickiup ring, 10 sites with agave roasting pits, and 2 lithic quarries. One wickiup ring dates to the protohistoric (contact) time period (circa 1850-1875), and contains glass and metal items as well as traditional

Apache artifacts and features. Euro-American use of the Hackberry Allotment relates to ranching and military activities with dates ranging from the 1870s to the present.

Archaeological site distribution within the Hackberry portion of the allotment may be interpreted as a system of settlements designed to take advantage of various resources such as soil, water, and wild vegetation, and prominent geographic features for lookouts, forts and cliff dwellings. Site density ranges from moderate to very high, and sites tend to cluster around Hackberry Basin and adjacent springs and creeks, and along other seasonal wetlands. However, most of the past survey has been in the Hackberry Basin, and likely skews the settlement interpretation. Recent survey and site recording by volunteers have documented many sites along the Sycamore Canyon area. Many other areas have had no previous survey.

The Pivot Rock Allotment has had a great deal more survey in the past and far fewer sites have been found than in the Hackberry Allotment. This has primarily been due to timber sale surveys, which have covered many thousands of acres in this primarily ponderosa and oak forested area. As a result, intensively surveys have covered 19.5 percent (10,578 acres) of the Pivot Rock portion of the allotment. Within that area, 35 sites have been located and recorded, and 24 potential sites have been noted but not yet inventoried and fully recorded.

Prehistoric sites make up 11 of the 35 recorded sites in the Pivot Rock Allotment. These are primarily artifact scatters with two sites related to agricultural activities, and one prehistorically occupied rock shelter. Prehistoric site distribution within the Pivot Rock portion of the allotment seems to be concentrated along the western and northern edges of the project area in the transition zone between ponderosa-oak and open pinyon-juniper vegetation types. Other prehistoric sites along Forest Highway 3 may indicate upland utilization or travel routes. Historic sites are concentrated along streams, at springs, or along travel routes. Twenty-three historic sites have been recorded in the Pivot Rock Allotment and consist of cabins, sawmills, one fire lookout, two CCC camps, a Forest Service ranger station, a corral, a grave, a store, a military trail, a mine, water developments, several trash dumps, and a pile of sandstone blocks. The additional 25 potential sites noted within the Pivot Rock Allotment are primarily historic features found on early maps of the area. These include ranches, cabins, corrals and wells. However, one potential prehistoric rock art site and a potential proto-historic rock wall or fort have been reported.

Environmental Consequences for Heritage Resources

Livestock grazing has occurred in the Southwest since European contact and has been a permitted activity on the Black Mesa Forest Reserve created in 1898 which later became the Coconino National Forest in 1908. Grazing of what would become the Hackberry and Pivot Rock Allotment was heavy and unregulated from the 1870s to the early 1900s. In addition, wild ungulates have ranged free, potentially in substantial numbers, throughout time. This resulted in a reduction of vegetative cover, which may have affected heritage resources through soil loss, erosion, and trampling. Since the establishment of allotments and implementation of grazing management, the conditions of known heritage resources are generally considered stable. However, degradation continues in some areas.

The condition of sites are a result of numerous environmental, cultural and physical impacts. Sites deteriorate over time. A large portion of any material culture is made of perishable materials. Wood, basketry, cordage, leather, and even bone tools and refuse decay over time, impacting the archaeological and historic sites. Stone tools, pottery, masonry, glass, and metal items are more resistant to decay and weathering. These are the primary artifacts that remain on most sites. These items left as originally placed would constitute an undisturbed site. Impacts to heritage resources are anything that results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits of cultural material. Natural disturbances have impacted sites from their initial creation to the present time. The growth of tree roots into deposits can push artifacts around, and can tear apart structural remains. Rodent, badger, and other ground dwelling animals have damaged many sites across the west. Natural rockslide, erosion, wildfire, wind, and earthquake have also taken a toll on site condition. Human activity has had a great impact on sites. Recreational activities such as off road driving, shooting and camping have affected sites. Artifact collection and illegal excavation for artifacts have damaged many sites throughout the Nation. Past project activities have also impacted sites. Road and trail construction, logging, mining, grazing, fencing, and burning have all impacted sites.

In the case of heritage resources considered eligible for inclusion in the National Register of Historic Places, impacts might also include alterations of a property's setting or context. In the case of traditional cultural properties and sacred places, additional considerations may include alterations in the presence or availability of particular plant species, and impacts to sacred landscapes, or views of sacred landscapes, or impacts to the pristine or historic qualities of the landscape.

Although site condition assessments for heritage resources are not available for any time prior to the introduction of Eurasian cattle, sheep, goat and horse species to the Southwest, it is probable that wild game species have caused some level of impact from the prehistoric period to the present time. This impact as well as the historic period to present day permitted grazing activity has contributed to the current condition of all sites on the Hackberry and Pivot Rock Allotments. Given the nonrenewable nature of heritage resources, any damage diminishes their cultural and scientific value permanently. Therefore, all effects to heritage resources are considered cumulative.

Managed grazing has a low level of effect on heritage resources when the grazing strategy is designed to match herd size with capacity and distribute cattle as evenly as possible across the allotment. Dispersed water availability, placement of salt blocks, and use of pastures in rotation allow for the management of cattle distribution. These management features help to avoid localized concentrations of animals and the resultant impacts to soils and vegetation associated with intense trampling and over utilization. Changes in grazing strategy are likewise not considered to have a serious effect as long as whatever new strategy is implemented does not alter these conditions. The proposed adaptive management scheme allows for the maximum flexibility in adjusting herd locations, sizes, and rotation periods based on ongoing monitoring of conditions of the range. The goal of this adaptive management and good range management in general is to encourage and maintain healthy grass, forb, shrub and riparian components of the landscape. Such healthy vegetation also benefits the protection of cultural resources from water

and wind erosion and direct trampling. However, no grazing strategy can ensure that cattle do not concentrate in small areas from time to time.

Site Impacts Specific to the Project Area: Over the entire Hackberry and Pivot Rock Allotment landscape, cattle concentrations are generally low, and well dispersed. However, cattle do concentrate in some areas out of necessity. Watering features, holding pastures, corrals, fences, pasture gates, drive trails, and salt grounds concentrate cattle impacts in small areas. It is likely that some impacts to sites are and will occur in these cattle concentration areas.

Of the 127 previously recorded sites in the Hackberry and Pivot Rock Allotments, 29 have documented or potential direct and/or indirect impacts from grazing activity. Five of these sites have corrals located in or adjacent to them, five have stock watering ponds excavated into or near them, and fence lines cross sixteen of the sites. Three additional sites, have grazing impacts of an unspecified nature. A total of 63 potential sites do not have any data concerning condition. Such sites may be experiencing impacts from grazing activities.

No Graze/No Action Alternative and Proposed Action Alternative

Direct and Indirect Effects and Cumulative Effects

Both alternatives would keep cattle utilization levels at or below their currently permitted level. These utilization levels would not constitute an effect on heritage resources in general within the Hackberry and Pivot Rock Allotments. Watering features such as ponds, tanks and springs would experience some level of impact from wildlife grazing even if no cattle were permitted on these allotments.

The Proposed Action will reduce the current level of cattle utilization. This may be through lower numbers of permitted stock, shorter duration of pasture use, development of additional pastures to lessen impact on some heavily used areas, and deferment of some pastures until desired vegetative and soil conditions are met. In general, a healthy grass and shrub layer will prevent erosion which causes much of the grazing related damage.

The Proposed Action includes several range improvements. All of these improvement projects will be surveyed for cultural resources and a clearance report issued for them before any of them are implemented. Any improvements that will be constructed within two years will be surveyed and cleared prior to authorizing grazing on the allotment.

As part of the Proposed Action Alternative, livestock will be trucked from Hackberry Allotment in the spring up to the Pivot Rock Allotment and subsequently ‘trail driven’ back to Hackberry Allotment in the fall, crossing through the Fossil Creek Allotment. If this alternative is selected, the actual trail location will be surveyed to make sure sites are being avoided.

Under the proposed action, on-going damage to the sites adjacent to features that concentrate cattle grazing would experience continued degradation. Such features include watering areas (natural and man-made), corrals, gates, holding pastures, and the drive trail between the Hackberry and Pivot Rock Allotments. In addition, continued use of the ranch headquarters near

Hackberry Springs may cause continued impacts to sites. These features will be checked for cultural resources as time and funding permits.

Placement of salt blocks may also damage sites by encouraging cattle concentration. Known or potential sites will be avoided in the placement of salt blocks. Proposed salt block placements within high site density or sensitivity areas will be reviewed and approved by the District Archaeologist. Additional mitigation measures such as these can be found in Chapter 2 – Mitigation Measures, R2, W5, HR2.

Of the 127 previously recorded sites, 15 were previously determined eligible for but are not listed on the National Register of Historic Places. An additional 4 sites have been determined ineligible to the National Register of Historic Places. The remaining 108 sites and the 58 potential sites are currently unevaluated but shall be treated as if eligible for the National Register of Historic Places and will be protected until testing or additional information is available that would allow formal determinations of eligibility to be made. If any new sites are discovered during construction activities, or during range management activities they are to be reported to the District or Forest Archaeologist and ground-disturbing work halted until these sites can be assessed by the District or Forest Archaeologist.

By avoiding archaeological sites during construction, documenting potential sites and developing mitigations for sites that are experiencing damage from grazing, there should be no further effects to cultural resources from the implementation of the permit re-issuance as described in the Proposed Action.

Consultation with the Arizona State Historic Preservation Office (SHPO) for this project's effects to heritage resources and compliance with Section 106 of the National Historic Preservation Act has been completed [PR# 99]. Consultation with 13 tribes is also currently underway. Following the above monitoring mitigation, and inventory guidelines and site avoidance measures would result in no further direct, indirect or cumulative effects to cultural resources from on-going, proposed, or reasonably foreseeable future actions.

No Trailing Action Alternative

This alternative would be the same as the Proposed Action Alternative, with one exception, there would be no trailing of livestock across the Fossil Creek Allotment between the Hackberry and Pivot Rock Allotments.

Direct, Indirect and Cumulative Affects:

Twelve cultural resource sites lie along or near the existing livestock-trailing route. If the '*No Trailing Action Alternative'* is selected, none of the twelve sites would be impacted from the trailing of livestock and there would be no direct, indirect or cumulative affects relative to the trail route and these associated archaeological sites.

Apart from the livestock trailing route, all other effects as described in the Proposed Action Alternative remain the same.

ECONOMICS

The following economic analysis of the alternatives is summarized from the following report which is incorporated by reference: Range *Economic Analysis,* by G. Hase Jr, (2007), [PR#43] and *Economics Addendem #1* by G.Hase Jr. (2007), [PR#43.1].

Affected Environment for Economics

Although the contributions of livestock grazing to local economies and county governments is small in comparison to other businesses and funding sources, this section will discuss the effects based on National Forest fees, jobs, and other revenues.

Livestock grazing contributes to the livelihood of the Hackberry and Pivot Rock Allotments permittee as well as to the economy of local communities and counties. The Hackberry and Pivot Rock Allotments are located in Yavapai and Coconino Counties and the current permit is for 760 head of cattle and 10 horses, with a yearlong use period. The presence of cattle grazing does not limit hunting or recreational activities on lands contained within the allotments. The nearest communities to the Hackberry Allotment are located in the Verde Valley and include Camp Verde and Cottonwood. The nearest communities to the Pivot Rock Allotment include Pine, Strawberry, and Payson. The Verde Valley and Payson area economies are large and fairly diverse 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 Yavapai and Coconino 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 economy of Yavapai and Coconino 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. Yavapai County also receives National Forest fees from uses on the Tonto, Prescott and Kaibab National Forests; Coconino County also receives National Forest fees from uses on the Kaibab and Apache-Sitgreaves National Forests. National Forest fees are used primarily for highway maintenance and public schools in Yavapai and Coconino Counties. The Hackberry and Pivot Rock Allotments permittee directly contributes revenues to Yavapai and Coconino Counties through property taxes.

Environmental Consequences for All Alternatives

Estimates of direct and indirect jobs and payments to Yavapai and Coconino Counties from Federal receipts provide a relative comparison of economic effects that could occur due to changes in cattle grazing. Table 47 estimates the effects expected on these indicators in Yavapai and Coconino Counties from implementing the No Graze/No Action Alternative, the Proposed Action and the No Trailing Action Alternative on the Hackberry and Pivot Rock Allotments.

Table 47. Economic Effects for Yavapai and Coconino Counties

Economic Effects	No Graze/ No Action	Proposed Action	No Trailing Action Alternative
Direct and Indirect Jobs*	0	7.89	7.89
Federal Payments to Counties**	0	$2,802	$2,802

*Approximately 1.14 jobs per 100 cattle.

**The amount shown under Proposed Action is based on 25 percent of the Hackberry and Pivot Rock Allotments grazing fees paid to Yavapai and Coconino Counties at the 2007 grazing fee rate of $1.35/Head-Month. 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 improvments.

Quantifiable factors such as economic costs and outputs, along with projected animal months (AMs) or animal unit months (AUMs) have been used to help describe the economic effects of grazing on the Hackberry and Pivot Rock Allotments. The Quicksilver economic analysis program was used to calculate these factors. Although projections from the Quicksilver model are precise numbers, these results are best used as 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 Hackberry and Pivot Rock Allotments. Measures used to conduct an investment analysis include: present value of benefits, present value of costs, present net value and the benefit/cost ratio. Table 48 displays the results of this investment analysis for the No Graze/No Action Alternative, the Proposed Action and the No Trailing Action Alternative for the Hackberry and Pivot Rock Allotments. These values have been rounded to the nearest dollar.

Table 48. Investment Analysis for the Hackberry and Pivot Rock Range Allotments

Investment Analysis	No Graze/No Action Alt.	Proposed Action	No Trailing Action Alternative
Forest Service			
Present Value of Benefits[1]	0	$102,088	$102,088
Present Value of Costs[2]	($10,000)	($83,516)	($83,516)
Present Net Value[3]	($10,000)	$18,572	$18,572
Benefit/Cost Ratio[4]	0.00	1.22	1.22
Grazing Permittee			
Present Value of Benefits	0	$626,137	$626,137
Present Value of Costs	0	($255,412)	($291,856)
Present Net Value	0	$370,725	$334,281
Benefit/Cost Ratio	0.00	2.45	2.15
All Partners			
Present Value of Benefits	0	$728,225	$728,225
Present Value of Costs	($10,000)	($338,928)	($375,372)
Present Net Value	($10,000)	$389,297	$352,853
Benefit/Cost Ratio	0.00	2.15	1.94

Note: Dollar figures in ( ) indicate a negative amount, or loss of money

[1]*Present value of benefits* represents the income generated from grazing on the Hackberry and Pivot Rock Allotments by the permittee, along with the present value of the grazing fees collected by the Forest Service.
[2] *Present value of costs* represents the cost of range improvement maintenance, range improvement construction, and range inspections (permittee), along with the costs of range inspections, permit administration, monitoring and materials for new range improvements (Forest Service).
[3] *Present net value* represents present value of benefits minus present value of costs.
[4] *Benefit/cost ratio* represents the present value of benefits divided by the present value of costs.

Effects to the Hackberry and Pivot Rock Permittee

Gross revenue estimates are created by estimating the amount of calves produced each year for each alternative. Table 49 represents a comparison of the No Graze/No Action, Proposed Action and No Trailing Action Alternative for Estimated Gross Revenue and the following factors were used in the calculations: 15 percent of the permitted livestock are non-productive animals (young replacement animals and bulls); 80 percent calf crop; average sale weight of 500 pounds per calf; average sale price of $1.25 per pound (2006). These factors will vary annually but serve as a point of comparison.

Table 49. Estimated Gross Annual Revenue

Value	No Graze/No Action Alternative	Proposed Action Alternative	No Trailing Action Alternative
Estimated Gross Annual Revenue	0	$293,750	$293,750

If the allotment was not grazed, 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 Hackberry and Pivot Rock Allotments.

No complete projections were made for the permittee's actual costs, the ability to cover costs, or any supplemental income that may be available.

Effects to Local and Federal Economy

The No Graze/No Action Alternative will result in the loss fees to the U.S. Treasury and annual Federal payments to Yavapai and Coconino Counties for livestock grazing on the Hackberry and Pivot Rock Allotments. 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 the No Graze/No Action Alternative, all jobs directly associated with livestock grazing on the Hackberry and Pivot Rock Allotments would be eliminated. Some of the jobs indirectly associated with livestock grazing on the Hackberry and Pivot Rock Allotments may also be eliminated; however, most indirect jobs will likely be maintained because the need for ranching supplies and services will continue to be filled by other area ranches and individuals/businesses from the surrounding communities. Since livestock grazing does not limit recreational uses, it is not anticipated that the local economies will be enhanced due to increased recreational use once cattle are removed.

The Proposed Action and the No Trailing Action will help maintain current jobs within the surrounding communities and revenues to Yavapai County, Coconino County, the State of

Arizona and the Federal Government. As changes to the authorized livestock numbers on the Hackberry and Pivot Rock Allotments occur through the implementation of adaptive management, contributions to state, county and local economies from fees, taxes and jobs associated with cattle grazing on these allotments would change accordingly.

ENVIRONMENTAL JUSTICE

Environmental Justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Executive Order No. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (February 11, 1994) requires agencies to address environmental justice concerns within the context of existing laws, including NEPA. One goal of environmental justice is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and to identify alternatives that may mitigate these impacts.

Information summarized here is from the *Environmental Justice Report* and *Addendum #1*, prepared by C. Holland (2007), [PR#58, 58.1]. The majority of the Hackberry Range Allotment is contained within Yavapai County. Information and statistics used to evaluate minority and low income populations is summarized from U.S. Census data (U.S. Census Bureau 2007) and community profiles for Camp Verde, Lake Montezuma/Rimrock and McGuireville (Arizona Department of Commerce, 2007a; 2007b).

Yavapai County has a population estimate in 2006 of about 213,285 persons, and reports a median household income of $37,309 which is within 10% of the Arizona state median level for 2004 estimated at $43,696. Unemployment rates for local communities are 5.0% for Camp Verde and 3.8% for Montezuma Well/Rimrock and McGuireville (2006 data). These communities have a large retiree population. Ethnic minority populations in the county are dominated by persons of Hispanic or Latino origin estimated at 11.6% which is much lower than the state average of 28%. Relative percents of other ethnic groups are also lower than the statewide averages. Major employment in the Camp Verde area is provided by construction, ranching, light-industry, trade and service, a casino, government and schools, and tourism.

Coconino County has a population estimate in 2006 of about 132,270 persons, and reports a median household income of $48,451 which is within 10% of the Arizona state median level for 2004 estimated at $43,035.

Unemployment rates vary depending upon location within the County. Coconino County is very rural in nature, however, Flagstaff is the largest city in the county, with approximately 62,000 people and attracting outdoor enthusiasts, tourists and professional people. Flagstaff has an average unemployment rate of 3.3%. Population demographics indicate approximately: White 70%, Hispanic 14%, Native American 14%, Black 2% and Asian 2%. Williams has approximately 3,170 people with an average unemployment rate of 3.7% (2006 data). Ethnic minority populations in the Williams area are: White is 71%, Hispanic 21%, Native American 3%, Black 3% and Asian 2%.

After considering the environmental, economic, and social impacts of this project, it has been determined that none of the alternatives considered in this analysis would have a disproportionate impact on any minority or low income population in the immediate area, within surrounding counties, or in the central and northern Arizona region. Either not authorizing or authorizing livestock grazing would not prevent access to the Hackberry and Pivot Rock Range Allotment, nor would it prevent minority or low income individuals from recreating within the allotment, collecting firewood or other special forest products within the area. The No Graze/No Action Alternative would negatively affect the permittee and other providers of goods and services used for the ranching business. However, this would only affect a few individuals and would not likely disproportionately affect the greater population within the county or the local community.

Chapter 4 – Monitoring and Adaptive Management

This chapter describes monitoring components and adaptive management actions. Project design features for the range resource and other resource monitoring is described in Chapter 2.

Range Monitoring and Adaptive Management

Under both of the grazing action alternatives, two types of monitoring will be used for upland vegetation: ***implementation monitoring and effectiveness monitoring.*** Under the No Graze/No Action Alternative, monitoring of upland vegetation would not continue. Both qualitative and quantitative monitoring methods will be used in accordance with the Interagency Technical References, Region 3 Rangeland Analysis and Management Training Guide, (USDA – Forest Service 1997) and the Region 3 Allotment Analysis Handbook. Monitoring frequency varies by each activity and will be accomplished collaboratively by Forest Service personnel, permittee, and cooperating agencies.

Implementation Monitoring

Implementation monitoring will be conducted on an annual basis and will include: *permit compliance, livestock actual use data, grazing intensity, utilization, assessments of forage production and ground cover, precipitation, and allotment inspections.*

Permit Compliance: Throughout each grazing season, Forest Service personnel will monitor activities on the allotments to ensure compliance with Permit terms and conditions, the Allotment Management Plan (AMP), and the Annual Operating Instructions (AOI).

Livestock Actual Use: Permittee will keep accurate records regarding actual livestock numbers and pasture use dates on the form supplied as part of the AOI. This form will be submitted to the Forest Service at the end on the grazing season.

Grazing Intensity: Grazing intensity monitoring will occur within each of the main grazing pastures during, or immediately after, the period when livestock are grazing the pasture. Each

pasture would be visited two times every year. Grazing intensity is defined as the amount of herbage removed through grazing or trampling during the grazing period. Grazing intensity will be used by the Forest Service and the permittee to control actual pasture moves. Livestock may need to be moved out of a pasture sooner if the grazing intensity guideline is reached before the planned move date. Likewise, livestock may stay longer in a pasture if grazing intensity is below the established guideline when the planned move date arrives.

Grazing intensity measurements will be taken in key areas which reflect grazing effects within an entire pasture. A minimum of one key area will be established within each main grazing pasture, at existing long-term monitoring sites if possible, to represent the overall grazing intensity within the pasture.

Utilization: Utilization monitoring will 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). 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 measurements will 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 climate and condition/trend data, to determine stocking levels and pasture rotations for future years.

Forage Production and Ground Cover: Forage production assessments will be made to determine stocking levels for the grazing season and will also be used during the grazing season to determine if adjustments in the stocking level should be made. Qualitative assessments of ground cover will also be made and used as an indicator of condition and trend.

Precipitation: Precipitation is currently recorded at 3 sites that approximate the precipitation for the allotment. Additional precipitation gauges may be placed on the allotment for more localized information.

Allotment Inspection: A written summary will be completed each year by Forest Service personnel to document the overall history of that year's grazing. This document will include a monitoring summary, livestock actual use, weather history, and a discussion of the year's accomplishments and problems.

Effectiveness Monitoring

Effectiveness monitoring will be used to evaluate the success of management in achieving the desired objectives. Effectiveness monitoring will 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 (annual monitoring) indicate a need. Effectiveness monitoring will include forage production and vegetation condition and trend.

Forage Production: Forage production surveys will be conducted using the best available methods at that time. Forage production data will be used as a tool to manage this allotment, but will not be the sole measurement to establish carrying capacity. The most recent forage production survey was completed on the Hackberry Allotment in 2006. The next survey is scheduled to occur after 2015. A forage production survey will be completed on the Pivot Rock Allotment prior to 2010.

Condition and Trend: Eleven Parker Three-Step clusters were established on the Hackberry Allotment in 1958 and 1961. Fourteen Parker Three-Step clusters were established on the Pivot Rock Allotment in 1956 and 1957; eight of these permanent transects still exist. These transects are one of best historic records of range condition and trend. The photo points and vegetative ground cover data show how the site has changed over time. On the Hackberry Allotment, canopy cover and frequency plots will be placed with the Parker Three-Step transects in 2007 to add to this historic data. Canopy cover and frequency plots have already been added to the Parker Three-Step transects on the Pivot Rock Allotment.

Ocular plant canopy cover 0.10-acre plots will be used to compare existing conditions with potential and desired vegetative community conditions. Over time, these plots will document canopy cover changes.

Frequency and ground cover data will be collected using the widely accepted plant frequency method (University of Arizona, Extension Report 9043, 1997). These plots will monitor trends in plant species abundance, plant species distribution and ground cover. This will provide information on plant composition and additional information on regeneration.

Initially, two to three years of baseline data will be collected from the canopy cover and frequency plots. After the baseline data has been collected, these transects will be read at least every 10 years by Forest Service personnel.

Soil and Riparian Water Condition Monitoring

The intergovernmental agreement between the Forest Service and State of Arizona that controls water quality and the Clean Water Act requires implementation and effectiveness monitoring. The objectives of monitoring are to: (1) collect data sufficient to evaluate effects of management activities on soil and water resources; and (2) support changes in management activities to protect soil and water quality. Monitoring will help determine how successfully managers are implementing guidance practices and how effectively those practices are protecting soil and water quality. The current and proposed livestock grazing system incorporates best management practices (BMPs) specific to grazing practices and constitutes compliance with Arizona State and Federal Water Quality Standards. Arizona Department of Water Quality (ADEQ) will continue to monitor water quality in the area.

Watershed condition can be assessed using information from the monitoring schemes described above. Monitoring of plant abundance, ground cover, species diversity, and estimates of overall soil condition (using the methods described throughout this monitoring section) will indicate whether or not management practices are effectively meeting management goals. Trends toward improvements in species abundance and diversity as well as ground cover would indicate that management practices are effectively improving soil condition and, by inference, maintaining or improving downstream water quality and complying with water quality standards. Conversely, decreases in plant abundance and species diversity may indicate that management practices are not effective and need to be changed. Environmental factors, especially precipitation, will be considered when evaluating monitoring results.

As stated in Chapter 2, Monitoring, Soil, Watershed and Fisheries Resources, soil condition assessments will be conducted. An increased monitoring protocol for the unsatisfactory soils within pastures listed below will be implemented. This will consist of soil condition assessments that will be conducted in the three map units that are unsatisfactory, namely Map Units 401, 402 and 420, respectively.

For Map Unit 401, the soil condition assessments will be done in the Teepee pasture as a baseline for no grazing and on pastures that have unsatisfactory soils that are still in the current grazing rotation at either Mesquite Springs or Pipeline pastures.

For Map Unit 402, the soil condition assessments will be done in the Hackberry Basin pasture; and for Map Unit 420 in Buckhead, Doren or Lower Towel pastures. Within each Map Unit, baseline soil condition data will be collected along established transects prior to implementing the first years authorized grazing. After the baseline data has been collected, soil condition will be monitored every 2 years to determine extent of soil improvement, if any. If monitoring indicates soil conditions are not improving towards satisfactory, current livestock grazing utilization and intensity will be immediately adjusted and may include pasture deferral or reduced grazing utilization and intensity. In all other pastures, transects will be read at least every 10 years by Forest Service personnel to assess the affects of grazing.

Wild and Scenic Rivers Monitoring

Monitor and maintain fences along Verde River to minimize impacts to Wild and Scenic Outstanding, Remarkable Values, (ORVs). There is only one authorized emergency watering access point along the Verde where livestock have access to the river and that is at Gospel Hollow on the Hackberry Allotment.

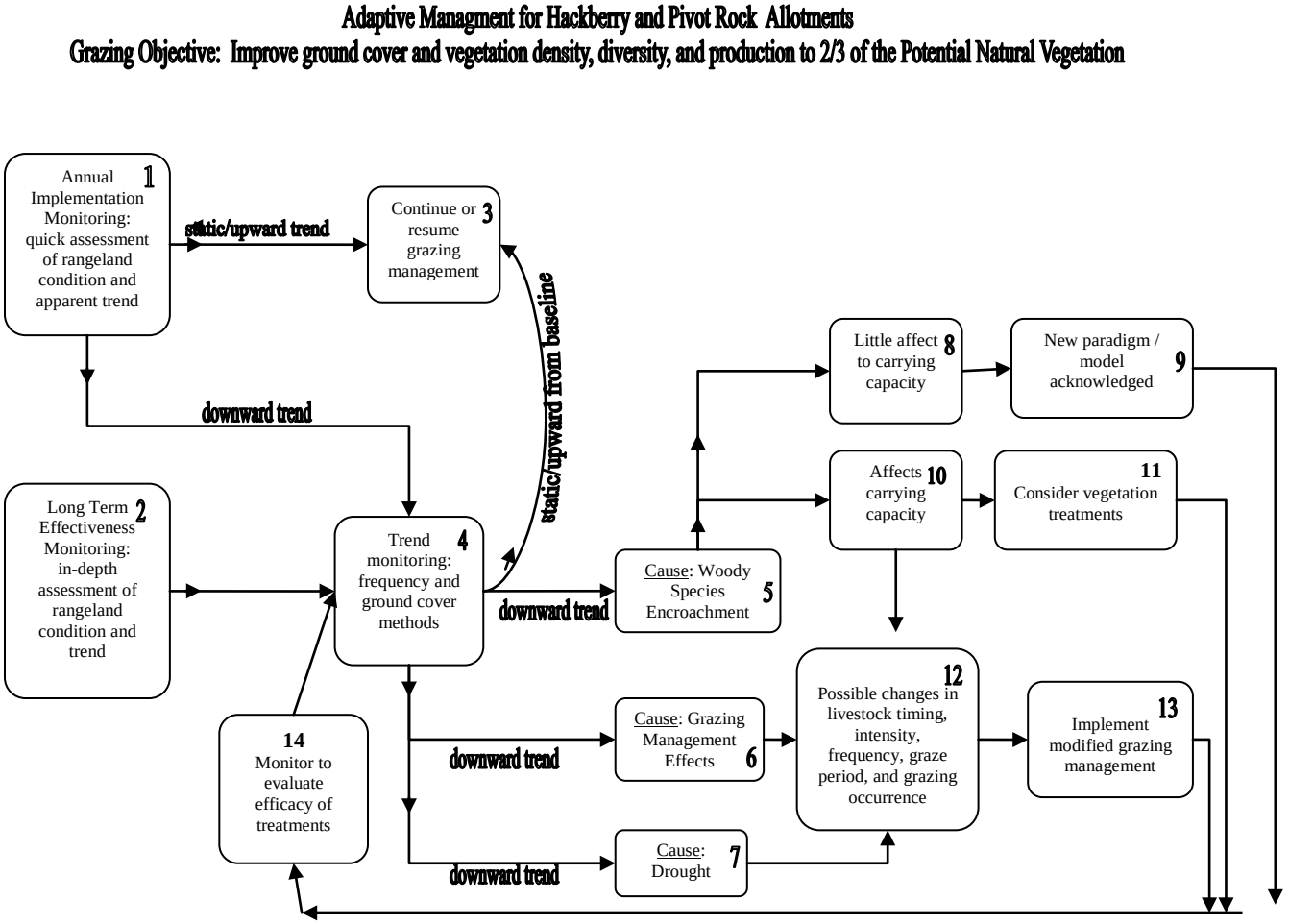
Heritage Resources Monitoring

The District will periodically monitor known archaeological sites to ensure they have been avoided.

Adaptive Management

Both of the grazing alternatives, the Proposed Action Alternative and the No Trailing Action Alternative will implement adaptive management. Adaptive management 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 will be modified in cooperation with the permittee. Figure 6 represents, in schematic form, the role of monitoring in adaptive management and possible management outcomes.

Figure 6. Adaptive Management for Hackberry and Pivot Rock Allotments



Adaptive management will allow the Forest Service to adjust: the timing, intensity, frequency and duration of grazing; the grazing management system; and livestock numbers. Modifications to these factors will be limited to the parameters identified in the proposed action. If adjustments are needed, they will be implemented through the Annual Operating Instructions. The following

are examples of adaptive management actions that could be taken in response to monitoring results:

- If monitoring shows that the utilization and/or grazing intensity guidelines were exceeded in a pasture, the duration of grazing, timing of grazing and/or livestock numbers could be adjusted for the following year. If the utilization and/or grazing intensity guidelines were exceeded after these adjustments are made, then changes could be made to the grazing management system.

- If monitoring indicates that the trend towards desired conditions is not occurring under a deferred rotation management system, livestock management could be changed to a deferred, rest-rotation management system.

- If monitoring indicates that forage production is below average due to drought or other climatic factors, the duration of grazing, timing of grazing, intensity of grazing and/or livestock numbers could be adjusted.

Adaptive management will also allow for the construction of structural range improvements if through monitoring, it shows that they are necessary for moving the allotment towards desired conditions. The following structural range improvements may be constructed as a result of monitoring and adaptive management.

- **Hackberry Allotment –** Lower authorized livestock numbers combined with improved management is expected to reduce livestock grazing in sensitive areas and allow riparian conditions to improve. However, livestock exclosure fencing may be constructed at additional spring/seep riparian areas if desired conditions are not achieved through the control of livestock grazing. The additional exclosure fences will be designed and constructed to protect the important riparian areas while still providing for livestock watering. These livestock exclosure fences may be located in: Basin, Bull Run, Doren, Hackberry Springs, Pambo, Phroney, and Lower, Middle and Upper Towel Pastures.

- **Pivot Rock Allotment –** If monitoring indicates a need, a new 3-strand barbwire fence, approximately 3.5 miles in length may be constructed in Toms Creek Pasture bisecting the pasture thus facilitating the overall movement of livestock. The actual location and alignment will be determined if and when the need arises.

- **Pivot Rock Allotment –** If necessary to improve management and facilitate livestock pasture movement, construct a small (5-10 acre) holding and gathering pasture in the West Bed Bug pasture. This holding and gathering pasture may be constructed either in the northeast corner of the West Bed Bug pasture or near Cart Cabin Tank in the center portion of the West Bed Bug pasture.

In the case that changing circumstances require additional physical improvements or management actions not disclosed or analyzed herein, further interdisciplinary review would occur. The review would consider the changed circumstances and site-specific environmental effects of the improvements in the context of the overall project. Based on the results of the

interdisciplinary review, the District Ranger would determine whether correction, supplementation or revision of the EA is necessary in accordance with Forest Service Handbook direction at FSH 1909.15(18) and FSH 2209.13(96.1).

Chapter 5 - 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:

Interdisciplinary Team Members:

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Arizona Game and Fish Department - Rick Miller
Arizona Game and Fish Department - Susan MacVean

Permittees:

Barry Brashears – Fossil Creek/13 Mile Allotment
Clifford Finch – Hackberry and Pivot Rock Allotment
Herbert Ward – Ward Ranch
Vida Ward – Ward Ranch

Tribes

The Navajo Nation, Hualapai Tribe, Havasupai Tribe, Pueblo Zuni, Yavapai Prescott, Fort McDowell Yavapai Nation,, The Hope Tribe, White Mountain Apache Tribe, The San Carlos Apache Tribe, Tonto Apache Tribe, The Yavapai-Apache Tribe, The San Juan Southern Paiute Tribe

Those Who Responded During the Initial Public Scoping

Willard S. Hunter – Private Citizen
Gary D. & S.L.C. Lentz – Private Citizen
C. B. Lane – Executive Vice President, Arizona Cattle Grower's Association
Roy Bell – Private Citizen
Frances Perkins, Arizona Department of Transportation, Winslow
Richard Miller – Habitat Specialist, Arizona Game and Fish Department
Peggy Ingham – Buckhorn Range Allotment Permittee
Colton Finch – Hackberry and Pivot Rock Allotment Permittee
Joseph Feller & Thomas Lustig – Attorney(s) for National Wildlife Federation
Erik B. Ryberg – Attorney at Law, Western Watersheds Project, Inc.
Clifford Finch – Hackberry and Pivot Rock Allotment Permittee
Diana Marsh – Watershed Scientist, Arizona Department of Environmental Quality
Bob and Joyce Orr – Private Citizen
Cindy Jutter – Private Citizen

Those Who Responded During the 30-Day Official Notice and Comment Period

Clifford Finch – Hackberry and Pivot Rock Allotment Permittee
Walter C. Richburg – Representing the Fossil Creek Allotment and Thirteen Mile Rock Allotment
Diana Marsh – Watershed Scientist, Arizona Department of Environmental Quality
Erik B. Ryberg – Attorney at Law, Western Watersheds Project, Inc.
Richard Miller – Habitat Specialist, Arizona Game and Fish Department

Glossary and Acronyms

A

ADEQ: Arizona Department of Environmental Quality

Adaptive Management: Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change and improving management. It involves synthesizing existing knowledge, exploring alternative actions and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. The alternatives are designed to provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicates 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, but such change will 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.

Animal Unit (AU): Considered to be one mature cow (approximately 1,000 pounds), either dry or with a calf up to six months of age, or their equivalent, consuming about 26 pounds of fjorage on an oven-dry basis per day.

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. Not synonymous with head month.

Apparent Condition and Trend: An interpretation of condition and trend based on observation and professional judgment at a single point in time. It includes, but is not limited to, consideration of such factors as plant species composition, plant species density, plant vigor, abundance of seedlings and young plants, accumulation or lack of plant residues on the soil surface, and soil surface characteristics (i.e. crusting, gravel pavement, pedestalled plants, and sheet or rill erosion).

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.

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

Carrying 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 a function of management goals and management intensity. Capacity classifications are described as follows:

Full Capacity - Lands which can be used by grazing animals under proper management without long term damage to the soil resource or plant communities. The land is stable and vegetative ground cover is maintaining site productivity and producing a minimum of 100 pounds of forage per acre on slopes less than 40%.

Potential Capacity - Areas that 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. Grazing capacity may be assigned to these areas, but conservative allowable use assignments must be made.

No Capacity - Areas that cannot be used by grazing animals without long-term damage to the soil resource or plant community, or are barren or unproductive naturally. In addition, it includes areas that produce less than 100 pounds per acre of forage and/or are on slopes greater than 40 percent. Grazing capacity is not assigned to sites with a "no capacity" classification.

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, pipe, or wire 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 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 management system that provides for a systematic rotation of the deferment among pastures.

Deferred, Rest-Rotation Management: A grazing management system which incorporates both deferment and rest in a systematic rotation among pastures.

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

Ecological Units: Map units designed to identify land and water areas at different levels of resolution based on similar capabilities and potentials for response to management and natural disturbance. These capabilities and potentials derive from multiple elements: climate, geomorphology, geology, soils and potential natural vegetation. Ecological units should, by design, be rather stable. They may, however, be refined or updated as better information becomes available.

Effects: The results expected to be achieved from implementation of actions relative to physical, biological, and social (cultural and economic) factors resulting from the achievement of outputs. Examples of effects are tons of sediment, pounds of forage, person-years or employment, and income. There are direct effects, indirect effects, and cumulative effects.

Emergent Vegetation: Plants rooted underwater that grow above the surface of the water.

Endangered Species: Any species that is in danger of extinction throughout all or a significant portion of its range.

Environmental Assessment (EA): A "concise public document [that] briefly provides sufficient evidence and analysis for determining whether to prepare an EIS or a finding of no significant impact…and shall include brief discussions of the need for the proposal…alternatives…the environmental impacts of the proposed action and alternatives…[and] a listing of agencies and persons consulted." (40 CFR 1508.9).

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 that is produced within a designated period of time or a given area. Production may be expressed as green, air dry, or oven dry weight. The term may also be modified as to time of production such as annual, current year, or seasonal forage production.

G

Game Species: Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen under State or Federal laws, codes, and regulations.

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: This is defined as the amount of herbage removed through grazing or trampling during the grazing period. 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. This 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).

Light to non-use	0-30 percent
Conservative	31-40 percent

Moderate	41-50 percent
Heavy	51-60 percent
Severe	61+ percent

Grazing Period: Period of time that a defined area of rangeland has been grazed by livestock.

H

Head Month (HM): One month's use and occupancy of rangeland by one weaned or adult cow, bull, steer, heifer, horse, burro, mule or five sheep or five goats.

Herding: A strategy for managing livestock that maintains the animals in a "herd", and moves them from area to area.

Hydrophytic Plant: A perennial vascular aquatic plant having its over-wintering buds underwater.

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 irreversible degradation. An impaired category should signal land managers that there is a need to investigate the ecosystem further to determine the cause and degree of decline in soil functions. Changes in management practices or other preventative actions 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).

Interdisciplinary Team (IDT): A group of individuals with skills from different disciplines. An interdisciplinary team is assembled because no single scientific discipline is sufficient to adequately identify, analyze, and resolve issues or problems.

Issue: A subject, question, or conflict of widespread public discussion or interest regarding management of National Forest System lands.

K

Key Area: A relatively small portion of a management unit selected because of its location, use, grazing or browsing value 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 whole unit. A key area guides the genereal management of the entire area of which it is a part.

L

Lane: A fenced pathway that allows livestock access, typically to a water source.

M

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: 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).

Microphytic Soil Crust: Formed when all or some of a diverse array of photosynthetic blue-green algae, fungi, bacteria, lichens, and mosses bind together with inorganic particles in the first few millimeters of a soil (also called cryptogamic crust).

Mitigation Measures: Actions that are taken to lessen the severity of effects of other actions.

N

Nongame Species: Animal species that are not usually hunted.

Nonpoint source (NPS) pollution is water pollution affecting a water body from diffuse sources, rather than a point source which discharges to a water body at a single location.

O

Old-Growth: Stand of timber that is past full maturity and well into old age and is the last stage in forest succession.

Overstory: That portion of trees, in a stand of trees of more than one story, forming the upper or canopy layer.

P

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 dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, and change successional stages to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives.

Present Net Benefit: Future benefits "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable dollars in the future.

Present Net Cost: Future costs "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable dollars in the future.

Present Net Value: "The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area." (36 CFR 219.3)

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.

Proposed Action (PA): In terms of the National Environmental Policy Act, the proposed action is the project, activity, or action that a Federal agency proposes to implement or undertake. The PA is sent to the public and interested agencies for their review and comment.

Protected Activity Center (PAC): An area established around a Mexican spotted owl nest or roost site for the purpose of protecting the area. Management of these areas is largely restricted to managing for forest health objectives.

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.

Raptor: Any predatory bird such as a falcon, hawk, eagle, or owl.

Reservoir Wetland: Human-made deep perennial water pool most years, no significant hydrophytic vegetation (except for submergents) because of deep pool and/or fluctuations of pool level.

Rest: To leave an area of grazing land ungrazed or unharvested 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 rotated annually to provide all pastures on an allotment with a rest period.

Revegetation: Re-establishing and developing plant cover. This may take place naturally through the reproductive processes of existing flora 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 (aquatic) and land (phreatic) 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 nonmotorized, semi-primitive motorized, roaded natural, rural, and urban (see individual definitions).

Roaded Natural ROS Class (RN): Characterized by a predominantly natural environment with evidence of moderate permanent resource use. Evidence of sights and sounds of people is moderated but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from sights and sounds of people.

S

Satisfactory Soil Condition: Indicators signify that soil quality is being sustained and the soil is functioning properly and normally. Ability of the soil to maintain resource values, sustain outputs and recover from impacts is high.

Seasonal Utilization: The percentage of the forage produced in the current season, to date of measurement, removed by grazing. This percentage is different from utilization because it does not account for subsequent growth of either the ungrazed or grazed plants.

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.

Semi-Primitive Motorized ROS Class (SPM): –Characterized by moderately dominant alterations by people, with strong evidence of primitive roads and/or trails.

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: One stage in a series of steps in the process of ecological succession.

Snag: Standing dead tree from which the leaves or needles have fallen.

Stand: A plant community sufficiently uniform in cover type, age class, risk class, vigor, size class, and stocking class to be distinguishable from adjacent communities thus forming an individual management or silviculture unit. This term is most commonly used when referring to forested areas.

Stock Tank: An earthen tank for providing water for livestock and wildlife.

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.

Succession: An orderly process of biotic community development that involves changes in species, structure, and community processes with time.

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

Terrestrial Ecosystem Survey Terrestrial Ecosystem Unit Inventory: (TES/TEUI): is the systematic examination, description, classification, mapping and interpretation of terrestrial ecosystems. A terrestrial ecosystem is an integrated representation of soil, climate and vegetation as modified by geology, geomorphology, landform and disturbance processes.

Threatened and Endangered Species (TES): 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.

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).

Transition Zone: As used for forest planning purposes, is the area of transition between ponderosa pine and pinyon-juniper. Includes the area where alligator juniper commonly occurs.

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.

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: Indicators signify that degradation of soil quality has occurred. Impairment of vital soil functions results in inability of the soil to maintain resource values, sustain outputs and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions.

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.

Utilization Level: Descriptors for utilization levels as determined at the end of the growing season (FSH, R3-2209.13-2007-1).

Light to non-use	0-30 percent
Conservative	31-40 percent
Moderate	41-50 percent
Heavy	51-60 percent
Severe	61+ percent

V

Viable Populations: A wildlife or fish population of sufficient size to maintain its existence overtime in spite of normal fluctuations in population levels.

Visual Quality Objectives (VQOs): A desired level of visual quality based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

- Retention (R). In general, management activities are not evident to the casual Forest visitor.
- Partial Retention (PR). In general, management activities may be evident but must remain subordinate to the characteristic landscape.
- Modification (M). Management activity may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.

W

Waterlot: A range improvement usually constructed of fencing materials that enclose a watering structure that is used to hold livestock or to close the water off to livestock.

Watershed: An entire area that contributes water to a drainage or stream.

Wetlands: Areas with shallow standing water or seasonal to yearlong saturated soils including bogs, marshes, and wet meadows. Wetlands must have the following three attributes to be considered wetlands: (1) hydric soils, (2) hydrophytic vegetation, and (3) evidence of frequent inundation.

Wild and Scenic Rivers (WSR): Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted (Wild and Scenic Rivers Act usage).

Wildfire: Any wildland fire that requires a suppression action. This includes all fires not meeting the requirements of a prescribed fire.

Woodland: Plant communities with a variety of stocking comprised of various species of pinyon pine and juniper, typically growing on drier sites

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