



United States
Department of
Agriculture

Forest
Service

Southwestern
Region

September 2013



Kane Ranch Allotment Management Plan Final Environmental Assessment

North Kaibab Ranger District, Kaibab National Forest
Coconino County, Arizona



Prepared by:

*USDA Forest Service
Kaibab National Forest
North Kaibab Ranger District
430 South Main Street / PO Box 248
Fredonia, Arizona 86022
Ph: (928) 643-7395
Fax: (928) 643-8105*

It is the mission of the USDA Forest Service to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication for program information (e.g. Braille, large print, audiotape, etc.) please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD)

To file a complaint of discrimination, write to USDA, Director of Civil Rights, 1400 Independence Avenue SW, Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TTY). USDA is an equal opportunity provider and employer.

Table of Contents

Introduction	1
Chapter 1: Purpose and Need for Action	2
Project Background.....	2
Management Direction.....	5
Purpose and Need for Action	5
Proposed Action.....	5
Applicable Laws, Regulations, and Policy	6
Decision Framework.....	9
Public Involvement	10
Issues.....	11
Chapter 2: Proposed Action and Alternatives	12
Alternatives	12
Alternative 2 – Current Action.....	21
Alternative 3 – No Grazing.....	21
Design Features.....	23
Mitigation Measures	24
Alternatives Considered but Eliminated from Detailed Study	25
Climate Change Consideration	28
Soils, Watershed, Water Quality, and Air Resources	30
Range Management	51
Vegetation.....	65
Non-Native Invasive Plant Species.....	80
Wildlife	89
Economy	100
Recreation, Scenery, and Social Environment	103
Heritage Resources	108
Other Required Disclosures	115
Chapter 4: Monitoring	118
Chapter 5: Consultation and Coordination.....	121
Preparers and Contributors	121
Consultation and Coordination	121
Glossary	124
References	130
Appendix A-1: Consideration of Public Comments.....	138
Appendix A-2: Public Comments Received.....	179

List of Figures

Figure 1. Vicinity map of Kane Ranch Allotments.....	2
Figure 2. Current Allotment Management Plan map of Kane Ranch Allotments.	4
Figure 3. Alternative 1 Map for Central Summer and Kane Allotment.....	15

List of Tables

Table 1. Season of use, AUM's, maximum AUM's, and available forage for Center Summer	16
Table 2. Summary of Alternatives	22
Table 3. Alternative comparison by purpose and need.....	22
Table 4. Terrestrial Ecosystem Units located within the Kane Ranch Allotments.....	31
Table 5. Predicted Soil Erosion Hazard by TEU within the Kane Ranch Allotments.....	34
Table 6. Subwatershed (HUC12) names, hydrologic unit codes, condition ratings, total watershed acreages, and watershed acreages occupied by Kane Ranch Allotments.....	38
Table 7. Watershed condition indicator summary for watersheds that occur in the Kane Ranch Allotments analysis area.....	39
Table 8. Central Winter Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.	68
Table 9. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.	69
Table 10. Central Summer Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.	71
Table 11. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.....	71
Table 12. Kane Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.....	72
Table 13. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.	73
Table 14. Kane Ranch Allotments livestock numbers, anticipated AUM's, maximum AUM's, available forage, and utilization for Alternative 1.....	73
Table 15. Central Winter Allotment range of numbers, initial dates, and adaptive dates for Alternative 1.....	74
Table 16. Noxious weeds species of concern on the North Kaibab Ranger District.	81
Table 17. Economic effects expected to Coconino County for jobs and federal payments.....	101
Table 18. Investment Analysis.....	102
Table 19. ROS classes, acres and general setting description for the Kane Ranch Allotment. ...	104
Table 20. Visual quality objectives and characteristics.	104
Table 21. Allotment and Geographic Areas.....	104
Table A-1 Summary of Comments Received on the Preliminary EA for Kane Ranch Allotment Management Plan.....	138

Introduction

The Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from implementing the Proposed Action or an alternative. The document is organized into five chapters and includes a glossary, references, and appendices. The EA is organized as follows:

Chapter 1. Purpose and Need for Action - This chapter includes information on the history of the project proposal, the purpose 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. Proposed Action and Alternatives - This chapter provides a more detailed description of the Agency's Proposed Action. It also includes alternative methods (alternatives hereafter) for achieving the stated purpose and a comparison of those alternatives including their environmental effects. The alternatives were developed based on issues raised during scoping. This chapter also includes mitigation measures.

Chapter 3. Affected Environment and Environmental Consequences - This chapter describes the environmental effects of implementing the Proposed Action and the Alternatives. This analysis is organized by resource area.

Chapter 4. Monitoring - This chapter describes the type of monitoring that would occur under all action alternatives during the life of the decision.

Chapter 5. Consultation and Coordination - This chapter provides a list of preparers and agencies consulted during development of the EA.

Additional documentation, including specialist reports, correspondence, and public comments and responses, may be found in the Project Record Document located at the North Kaibab Ranger District in Fredonia, Arizona. These records are available for public review pursuant to the Freedom of Information Act (5 U.S.C. 552).

Chapter 1: Purpose and Need for Action

Project Background

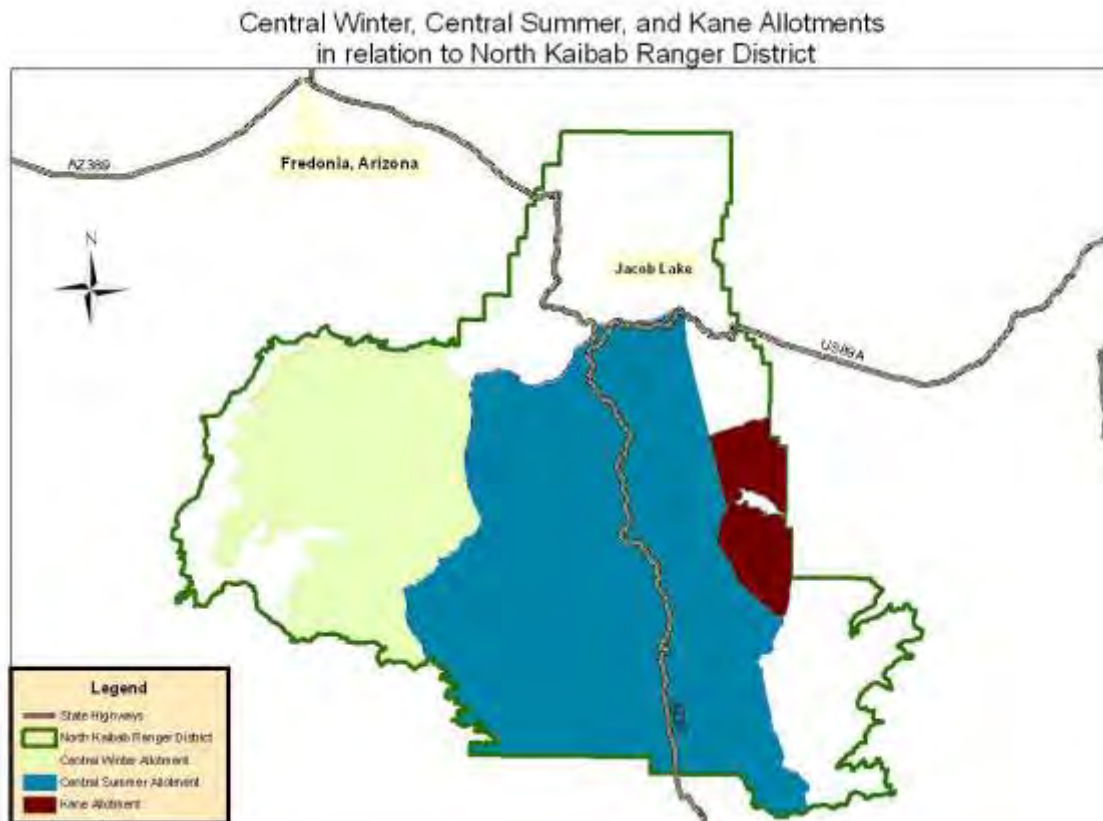
The North Kaibab Ranger District (NKRD) of the Kaibab National Forest (KNF), US Forest Service, is proposing to re-authorize cattle grazing on the Central Winter, Central Summer, and Kane Allotments. These three allotments are commonly referred to as the Kane Ranch Allotments. The Kanab Creek allotment will continue to be closed to livestock grazing.

Location and Description

The Central Summer, Central Winter, and Kane Allotments cover approximately 435,000 Forest Service acres, all of which is located in Coconino County, Arizona (Figure 1). The legal description of the allotments includes all or the majority of the sections within the following townships of the Gila and Salt River Baseline and Meridian:

- Township 34 North, Range 1 East to 4 East
- Township 35 North, Range 2 West to 3 East
- Township 36 North, Range 3 West to 4 East
- Township 37 North, Range 3 West to 4 East
- Township 38 North, Range 3 West to 3 East
- Township 39 North, Range 2 East to 3 East

Figure 1. Vicinity map of Kane Ranch Allotments.



Central Winter Allotment

The Central Winter Allotment consists of four active pastures and one pasture that is closed to grazing which include approximately 129,000 Forest Service acres on the west side of the North Kaibab Ranger District (Figure 2). The current allotment management plan authorizes 400 to 800 head of cattle (the latter number to be utilized when all available water sources are functioning) for a season of use from May 1 to June 30 in a rest rotation grazing system. One pasture is to be grazed for one month, and then livestock are to be moved to the next pasture for one month. The following year, the two different pastures are utilized in the same manner.

The elevations of the allotment vary from 6,000 feet to 7,400 feet. Primary vegetation types include pinion-juniper woodlands, great basin grassland, shrubland, and ponderosa pine. The 1996 Bridger Knoll Complex fire burned 54,000 acres of this allotment, resulting in increases in oak and New Mexico locust, as well as cheatgrass (*Bromus tectorum*) that has heavily infested parts of the allotment. There are no perennial streams on this allotment. An ephemeral lake containing riparian vegetation is located on the eastern edge of the Allotment. There are over 10 springs that occur on this allotment, but are all in locations along the western edge that are inaccessible to livestock due to terrain.

Fickeisen pincushion cactus (*Pediocactus peeblesianus fickeisenae*), a sensitive plant that is a candidate for endangered species listing, has potential habitat along the northern and western edges of the allotment. Grand Canyon rose (*Rosa stellata abyssa*) is a sensitive species that may occur along the western edge of the allotment. The allotment contains habitat for several sensitive and management indicator wildlife species including the northern goshawk (*Accipiter gentiles*) and Kaibab mule deer (*Odocoileus hemionus*).

Central Summer Allotment

The Central Summer Allotment consists of two very large pastures for a total of 281,000 acres (Figure 2). This allotment spans the top of the North Kaibab plateau from the Jacob Lake vicinity to the National Park Service boundary. The current allotment management plan authorizes 400 head of cattle from June 1 to June 30 and then 800 head of cattle from July 1 to October 15 in a rest rotation grazing system where one pasture is grazed each year while the other is rested, and then alternates the following year.

The elevations of the allotment range from 6,200 to 8,800 feet. Primary vegetation types include ponderosa pine, mixed conifer, subalpine meadows, pinion-juniper, and shrubland communities. There are no listed (threatened or endangered) animal or plant species known to occur on the allotment, but there is suitable habitat for the Mexican spotted owl. Two sensitive plant species occur in subalpine meadows near State Highway 67 and the Paradine plains cactus (*Pediocactus paradinei*) occurs on the eastern edge of the allotment. Several sensitive wildlife species occur on the allotment including the northern goshawk, the Kaibab squirrel, and the Kaibab least chipmunk.

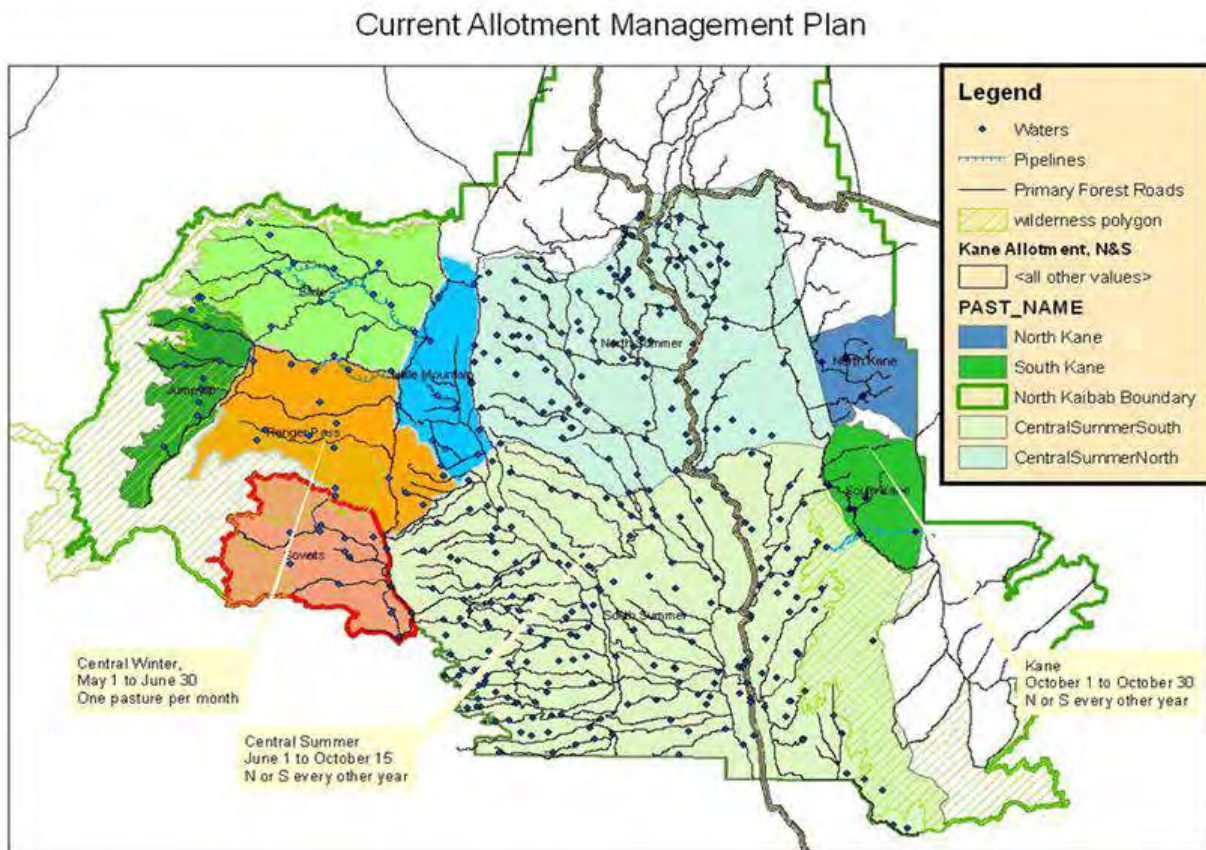
One of the two perennial streams on the KNF occurs in the allotment, but the stream is located in an area within the Saddle Mountain Wilderness where livestock use is prohibited. Riparian vegetation and limestone sink natural lakes occur in several subalpine meadows across the allotment. Most of these locations have been fenced off to exclude livestock access. The remaining locations where ephemeral lakes are known to occur are in Pleasant Valley, Demotte Park, and locations near the southern end of the allotment where only incidental livestock use is allowed.

There are over thirty natural springs or seeps known to occur on the allotment. Over fifteen of the springs are inaccessible to livestock due to terrain. Approximately ten locations where livestock could access the springs and adjacent riparian vegetation have been fenced off to exclude livestock access. At least ten of these inaccessible or excluded springs have developed pipeline systems that provide water for public use, livestock, and/or wildlife use. Additional known and unknown seeps and springs are likely to occur across the allotment that may have no to minimal livestock access.

Kane Allotment

The Kane Allotment consists of two pastures for a total of 25,000 acres (Figure 2). The allotment is located on the eastern bench of the North Kaibab Ranger District with the Bureau of Land Management boundary as the eastern border. The current management plan authorizes 800 head of livestock from October 15 to October 31 in a rotation grazing system where one pasture is grazed each year while the other is rested. The elevations of the allotment range from 5,500 to 7,200 feet. Primary vegetation types include shrubland and piñon-juniper communities. No known listed species occur on the allotment. The only known sensitive species is Paradine plains cactus (*Pediocactus paradinei*). There are no perennial streams, springs, or riparian areas known to occur on the allotment.

Figure 2. Current Allotment Management Plan map of Kane Ranch Allotments.



Kanab Creek Allotment

There is a fourth Forest Service allotment that was associated with the Kane Ranch Allotments, the Kanab Creek Allotment. It is located within the Kanab Creek Wilderness, west side of Figure 2. The 2001 NEPA decision called for no grazing in the Kanab Creek Allotment. The Kanab Creek Allotment will remain closed to livestock grazing and no permit will be issued for this area. The continued closure of this allotment to livestock grazing is primary due to poor rangeland conditions and archeological site protection. Other reasons for continued closure include: riparian resource protection, remote wilderness values, lack of functioning range improvements needed for proper livestock management, noxious weed expansion, and difficulty of managing livestock in this rough remote desert area.

Management Direction

Kaibab Forest Plan Consistency: The Kaibab National Forest Land Management Plan (i.e., the “Forest Plan”) (USDA Forest Service, April 1988, as amended) provides direction for all resource management programs, practices, uses, and protection measures on the Kaibab National Forest. This action responds to the goals and objectives outlined in the Forest Plan (USDA Forest Service, 1988) and all subsequent amendments, and helps maintain and/or move the project area towards desired conditions described in that plan. This project is consistent with the direction listed in the Forest-wide standards and guidelines, and in the standards and guidelines for Land Management Planning Areas GAs 11, 12, 13, 16 and 19, otherwise referred to as Geographic Areas (GAs) (Forest Plan – pp. 38-48, pp. 62-87, and pp. 97-104), which encompasses the Kane Ranch Allotments.

This project is also consistent with the following:

- Congressional intent to allow grazing on suitable lands (Multiple Use-Sustained Yield Act of 1960, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976).
- 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 (AMP) would be prepared consistent with land management plans, and the Clean Water Act of 1948, the Endangered Species Act of 1973, and 13186 (Conservation of Migratory Birds), National Historic Preservation Act 1966, and the Clean Air Act of 1970, as amended.
- 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). The only exception to this requirement is unless there is pending disposal, or it would be devoted to other uses prior until the end of 10 years, or it would be in best interest of sound land management to specify a shorter term.

Purpose and Need for Action

The Kane Ranch Allotments were analyzed as part of 2001 Kane Ranch EA, meeting the requirement of the Rescission Act (Rescissions Act Section 507 of Public Law 104-19). Since the implementation of the allotment management plan that was based on this EA, the grazing rotations have been logistically challenging to successfully operate. The 1996 Bridger Knoll Fire and the 2006 Warm Fire have led to changes in vegetative conditions across large portions of these allotments.

The purpose of this project is to re-authorize cattle grazing on the Kane Ranch Allotments in a manner that is consistent with the goals, objectives, standards and guidelines of the Forest Plan (1988), as amended, as well as provide logical, flexible, and adaptive grazing rotations. The analysis presented is necessary, and it should indicate whether or not the maintenance and/or improvement of vegetation and soil conditions can provide for ecosystem stability (i.e., is it sustainable) while allowing livestock grazing to continue to occur on the allotments.

Proposed Action

A Proposed Action has been developed to meet the project’s purpose and need. The Proposed Action would reauthorize grazing on the Central Summer, Central Winter, and Kane Allotments by issuing a new grazing permit and continuing adaptive management and monitoring. The Kanab Creek Allotment would remain closed to livestock grazing and no permit would be issued for this area. Specific details for each Alternative are listed in Chapter 2.

In summary, a term grazing permit would authorize cattle grazing on the Central Summer and Kane Allotments for a range of up to 600 to 1,000 head of livestock from May 15 to November 30. A 30-40

percent conservative utilization rate would be used throughout these allotments. The current North and South Summer pastures may be split along State Highway 67. Livestock would be authorized to utilize the South Kane Trail using a developed Paradine plains cactus monitoring and livestock trailing protocol. Three strategically located, small “holding pastures” would be constructed to increase the efficiency of pasture moves. Twelve natural lakes would be protected or fence modifications would be done to protect riparian species where they exist. Up to 20 spring improvement projects would be completed within the project area to restore full or partial natural flow and riparian vegetation. Up to thirty enclosures and/or enclosures monitoring/research sites would be constructed across the allotments for the purposes of research as well as long term monitoring. The Central Winter Allotment Management Plan would become independent of the Central Summer and Kane Allotments and would be managed in a way that balances livestock grazing with a series of well-defined research projects focused on the best grazing strategy for a variety of natural resource objectives.

Applicable Laws, Regulations, and Policy

The planning and decision-making process for this project was conducted in accordance with applicable laws, regulations, policies, and plans. Listed below are many of the Federal laws and executive orders pertaining to this project-specific planning and environmental analysis. This project is consistent with the following:

Clean Water Act of 1948, (Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. 1251 - 1376; Chapter 758; P.L. 845, June 30, 1948; 62 Stat. 1155) **as amended**: This act set the basic structure for regulating discharges of pollutants to waters of the United States. This project complies with Arizona State laws regarding natural resource protection, including but not limited to water quality.

Multiple Use-Sustained Yield Act of 1960: This act established the policy and purpose of national Forests to provide for multiple-use and sustained yield of products and services. This project is consistent with applicable Kaibab National Forest Land Management Plan (Forest Plan) standards and guidelines.

National Historic Preservation Act (NHPA) of 1966, as amended: This act secured the protection of archeological resources and site on public and Indian lands. A Heritage Resources compliance report is being finalized for the permit renewal and new reports will be developed as the evaluation for allotment improvement activities are conducted over the next few years. The Forest Service has initiated consultation with the Arizona State Historic Preservation Office (SHPO) and Native American Tribes for the permit renewal and will continue to consult over proposed allotment improvements. Section 106 requirements for survey and evaluation have been met for all undertakings listed under this proposed action.

National Environmental Policy Act (NEPA) of 1969, (enacted on January 1, 1970) **as amended**: This act directs all federal agencies to consider and report the potential environmental impacts of proposed federal actions, and established the Council on Environmental Quality. The effects of the Proposed Action and alternatives have been analyzed and are disclosed in this EA.

Clean Air Act of 1970 (public law 91-604): "An Act to amend the Clean Air Act to provide for a more effective program to improve the quality of the Nation's air." The amendments in 1970 were an entirely rewritten version of the original Clean Air Act (i.e., the Air Pollution Control Act of 1955 and the Clean Air Act of 1963). It set National Ambient Air Quality Standards (NAAQS), to protect public health and welfare, and air standards, that strictly regulated emissions of a new source entering an area. Most agricultural activities like cattle grazing and farming are exempt from air quality standards. Cattle grazing is not anticipated to cause disproportionate adverse human health or environmental effects to air quality (see “Air Quality” analysis in Chapter 3).

Endangered Species Act (ESA) of 1973, as amended: This act protects animal and plant species currently in danger of extinction (endangered) and those that may become endangered in the foreseeable future (threatened). The Endangered Species Act (ESA, PL 93-205), Forest Service Manual (FSM) 2670.11, 2670.21 and 2670.31 direction, and the Forest Plan standards and guidelines all require that National Forest System lands not only be managed for endangered, threatened and proposed (TEP) species, but also to recover TEP species. The ESA states that all Federal departments and agencies shall seek to conserve ecosystems of TEP species. FSM 2670 directs forests to manage National Forest System habitats to achieve recovery of TEP species and to avoid the need to implement special protection measures under the ESA.

The analysis and disclosure of effects to endangered, threatened, and proposed species is complete. Section 7(a)(2) of the Endangered Species Act requires that Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to ensure that our actions do not jeopardize the continued existence of species listed as threatened or endangered under the ESA, or destroy or adversely modify designated critical habitat. There would be no effects to species listed under the Endangered Species Act because none of these species occurs in the project area.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, (P.L. 93-378) as amended: This act is a United States federal law which authorizes long-range planning by the United States Forest Service to ensure the future supply of forest resources while maintaining a quality environment. RPA requires that a renewable resource assessment and a Forest Service Plan be prepared every ten and five years, respectively, to plan and prepare for the future of natural resources. It is found in the United States Code at Title 16, Chapter 36. This project is consistent with applicable Forest Plan standards and guidelines.

National Forest Management Act (NFMA) of 1976, as amended: NFMA reorganized, expanded and otherwise amended the RPA of 1974. NFMA required the Secretary of Agriculture to assess forest lands and develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System (i.e., the KNF Forest Plan). This project complies with NFMA, the Forest Plan and associated amendments. This project addresses all applicable Forest Plan forest-wide standards and guidelines and geographic/management area direction as they apply to the project area. This project is also in compliance with Forest Plan goals and objectives. All required interagency review and coordination has been accomplished.

American Indian Religious Freedom Act of 1978: This project would not deny American Indians access to land within the project area for traditional and cultural purposes nor would it infringe upon the rights of Native Americans to worship through ceremonies or traditional rights within the project area. The tribes have been consulted on this project.

Grand Canyon Game Preserve: (Jan. 24, 1905, ch. 137, § 1, 33 Stat. 614; June 29, 1906, ch. 3593, § 1, 34 Stat. 607.): Most of the Kaibab Plateau was withdrawn from the public domain in 1893 as part of the Grand Canyon Forest Reserve. The Grand Canyon National Game Preserve (GCNGP), which was established by proclamation by President Theodore Roosevelt on November 28, 1906 to protect game species and their habitat on the Kaibab Plateau (USDA Forest Service 2009). The Kaibab Forest Plan states “Cooperate with the Arizona Game and Fish Department to achieve management goals and objectives specified in the Arizona Wildlife and Fisheries Comprehensive Plan, and in carrying out the cooperative agreement for the management of the Grand Canyon National Game Preserve.” The Forest Service and Arizona Game and Fish Department agreed to allow hunting on lands managed by the District; the Proposed Action will have no lasting impact on the population or habitat of huntable species on the NKR D within the Grand Canyon Game Preserve.

Kaibab Squirrel National Natural Landmark (Designated NNL in 1965): In 1965, 278,459 acres of ponderosa pine forest within the Kaibab National Forest and Grand Canyon National Park were designated as the Kaibab Squirrel National Natural Landmark. National Natural Landmarks (NNLs) are designated by the Secretary of Interior and represent unique examples of ecological and geological features that comprise our nation's natural history. The Kaibab Squirrel NNL was designated for the Kaibab squirrel and for its largely intact example of the western climax community of ponderosa pine. The Proposed Action will have no lasting impact on the habitat of Kaibab squirrels on the NKR D within the Kaibab Squirrel NNL.

Executive Order 13007 (Indian sacred sites): Access to and ceremonial use of sacred sites by Indian religious practitioners would be accommodated with this project, and activities associated with this project would avoid adversely affecting the physical integrity of such places.

Executive Order 12898 (environmental justice): Implementation of this project is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations (see “Environmental Justice” analysis in Chapter 3).

Executive Order 13186 (migratory birds): On January 10, 2001, President Clinton signed Executive Order 13186 for the “Responsibilities of Federal Agencies to Protect Migratory Birds” which directed Federal agencies to develop a memorandum of understanding with the U.S. Fish and Wildlife Service to promote conservation of migratory birds. Agencies shall identify potential impacts to migratory birds and their habitats, avoid or minimize adverse impacts, restore and enhance habitats, and evaluate the effects of actions on migratory birds. Where they exist, other analyses should be used, such as the Arizona Partners in Flight Conservation Plan.

This project is consistent with the Migratory Bird Treaty Act of 1918, as well as Agency guidelines for conformance with the act.

Regulations: Regulations governing the management of the National Forest are found primarily at 36 CFR part 222. Secretary’s Administrative Order of August 1963. Departmental Regulations, Number 9500-5, dated December 15, 1983; Subject: Policy on Range.

36 CFR part 218 “*Project-Level Predecisional Administrative Review Process*” In 2011, President Obama signed into law the Consolidated Appropriations Act. Section 428 of the Act directed the Secretary to establish a pre-decisional objection process for projects and activities implementing land management plans, and documented with a Decision Notice or Record of Decision, in lieu of the postdecisional appeal process (36 CFR 215). The agency met the direction of Section 428 by revising the regulations found at 36 CFR 218 and published in the Federal Register on March 27, 2013.

Policies: Policies are the Forest Service Rules defining rangeland management. Forest Service Rangeland Management Directives – the Forest Service’s Rangeland Management Manuals and Handbooks.

USDA Forest Service - Kaibab National Forest Land Management Plan (Forest Plan), April 1988 - as amended.

Forest Service Sensitive Species: Forest Service Manual 2621.2 directs managers to display findings under the various management alternatives considered for individual projects. This assessment is based on the current geographic range of sensitive species on the KNF and the area affected by the project. This assessment considers, as appropriate for the species and area, factors that may affect the current trend for the species’ population.

Sensitive species are defined as “those plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by significant current or predicted

downward trends in population numbers or density, or significant current or predicted downward trends in habitat capacity that would reduce a species' existing distribution (FSM 2670.5(19)).”

It is the policy of the Forest Service regarding sensitive species to:

- Assist states in achieving their goals for conservation of endemic species;
- Review programs and activities through a biological evaluation to determine their potential effect on sensitive species;
- Avoid or minimize impacts to species whose viability has been identified as a concern;
- Analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the line officer, with project approval authority, makes the decision to allow or disallow impacts, but the decision must not result in loss of species viability or create significant trends toward Federal listing); and
- Establish management objectives in cooperation with the State when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions.

Effects to Forest Service sensitive species were considered and a biological assessment and biological evaluation have been completed for the sensitive plant and wildlife species found within the Kane Ranch Allotments.

Management Indicator Species (MIS): The Forest Service is required to address MIS in compliance with various regulations and Agency policy (36 CFR 219, Forest Service Manual (FSM) 2621 and 1920), which are, themselves, tiered to the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the NFMA. The Forest Plan was prepared under planning regulations issued in 1982. Effects to MIS were considered for this project and are summarized in this EA.

The Forest planning regulations were amended on January 5, 2005 (70 Fed. Reg. 1023). The Department of Agriculture issued a final rule to remove the 2000 planning regulations at 36 CFR 219 (a) in their entirety. Regulation 36 CFR 219.14(f) provides clarification and the forests' MIS obligations. For forests, like the Kaibab, that developed their forest plan under the 1982 NFMA regulations, the responsible official may comply with any obligations relating to MIS by considering data and analysis relating to habitat unless the plan specifically requires population monitoring or population surveys. The appropriate scale for MIS monitoring is the area covered by the Forest Plan, 36 CFR 219.14(f). The new planning regulations provide flexibility for MIS monitoring, which would allow for monitoring of habitat conditions as a surrogate for population trend data.

Decision Framework

This EA documents the environmental analysis of the Proposed Action (i.e., re-authorization of a cattle grazing permit for another ten years) and alternatives thereto. The District Ranger of the North Kaibab Ranger District is the Responsible Official for this project and will decide:

1. Whether to re-authorize cattle grazing and in what manner (i.e., as described in the Proposed Action or other alternatives thereto);
2. Whether to implement any alternative to the proposed action, or current cattle management;
3. What mitigation measures are needed; and
4. What monitoring is required?

The final environmental assessment (EA) is not a decision document, rather, it discloses the environmental consequences which may occur if the Proposed Action or alternatives to that action are implemented. A decision notice (DN) and finding of no significant impact (FONSI), signed by the North

Kaibab District Ranger, will document the decisions made as a result of this analysis. Should the decision authorize cattle 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 AMP and grazing permit.

The North Kaibab District Ranger expects a Final EA and Notice of Intent to sign a decision to be issued in September 2013. Implementation of the Allotment Management Plan would follow the decision and close of the appeal period as applicable. Reauthorization of livestock grazing would exist for a minimum of ten years. However, future NEPA analysis for additional projects within the allotments, changing rangeland conditions, or violations of the Term Grazing Permit could change the timing of this decision.

Items in this decision include: number of cattle, utilization level, season(s) of use, grazing management system, and structural range improvements, trailing, lake restoration, spring restoration, and enclosure/exclosure monitoring/research. 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.

Public Involvement

This project was first listed in the Kaibab National Forest Schedule of Proposed Actions (SOPA) in October 2011. Seven Native American tribes have been consulted on this project (please refer to Tribal Consultation Summary in Chapter 5 of this document). The Grand Canyon Trust, the grazing permittee, has been involved early on in the development of this project. Meetings also occurred with the Arizona Game and Fish (AGFD), the Town of Fredonia, Arizona, and at the Fredonia Natural Resource Conservation District office.

The "Scoping of Proposed Action" for the Kane Ranch Allotment Management Plan was initiated on July 8, 2012, with a legal notice published in the Arizona Daily Sun, Flagstaff, Arizona newspaper. On July 10, 2012, a description of the Proposed Action was 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). Fifteen different groups or individuals commented on the proposed action.

Changes in Public Participation and the NEPA Review Process:

The original July 2012 scoping legal notice stated that the project is subject to the appeal procedures set out at 36 CFR part 215. However, on March 27, 2013, the USDA Forest Service published the Final Rule for 36 CFR part 218 "Project-Level Predecisional Administrative Review Process" in the Federal Register, which was effective at said time of publication. The Kane Ranch Allotment Management Plan is an activity implementing a land management plan and not authorized under the Health Forest Restoration Act of 2003, and is subject to 36 CFR 218 Subparts A and B; therefore the project will be subject to the new rule / objection process (i.e., Final Rule for 36 CFR part 218).

The 30-day public comment period on the Preliminary (Draft) EA for the Kane Ranch Allotment Management Plan took place in June – July of 2013, following the publication of the legal notice on June 9, 2013, in the Arizona Daily Sun, Flagstaff, Arizona newspaper. Specific written comments (§218.2) on the proposed project were accepted for 30 calendar days following publication of the legal notice. Seven comment letters were received (See Appendix A-2 for copies of public comments received). The Forest Service's team of resource specialists reviewed/considered the comments received, and responses were recorded as part of this Final EA; see Appendix A-1, "Consideration of Public Comments."

Who May File an Objection?

Objections will only be accepted from those who have previously submitted specific written comments regarding the proposed project during scoping or other designated opportunity for public comment in accordance with §218.5(a). Indian Tribes are eligible to object if specific written comments are provided during Federal-Tribal consultation occurring prior to an opportunity for public comment for this project. Issues raised in objections must be based on previously submitted timely, specific written comments regarding the proposed project unless based on new information arising after the designated comment opportunities.

Objections must be submitted within 45 calendar days following the publication of this notice in the Flagstaff – *Arizona Daily Sun*. The publication date in the newspaper of record is the exclusive means for calculating the time to file an objection. Those wishing to object should not rely upon dates or timeframe information provided by any other source. The regulations prohibit extending the time to file an objection.

At a minimum, an objection must include the following (36 CFR 218.8(d)): (1) The objector's name and address, with a telephone number, if available; (2) A signature or other verification of authorship upon request (a scanned signature for email may be filed with the objection); (3) When multiple names are listed on an objection, identification of the lead objector (verification of the identity of the lead objector shall be provided upon request); (4) The name of the proposed project, the name and title of the Responsible Official, and the name(s) of the National Forest(s) and/or Ranger District(s) on which the proposed project will be implemented; (5) A description of those aspects of the proposed project addressed by the objection, including specific issues related to the proposed project if applicable, how the objector believes the environmental analysis or draft decision specifically violates law, regulation, or policy; suggested remedies that would resolve the objection; supporting reasons for the reviewing officer to consider; and (6) A statement that demonstrates connection between prior specific written comments on the particular proposed project or activity and the content of the objection. Incorporation of documents by reference is permitted only as provided in §218.8(b). It is the objector's responsibility to ensure timely filing of a written objection with the reviewing officer pursuant to §218.9. All objections are available for public inspection during and after the objection process.

Issues

The Council on Environmental Quality (CEQ) NEPA regulations direct agencies to "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review" (Sec. 1506.3).

The scoping comments we received on the Proposed Action were considered and analyzed during the development of this EA, however there were no unresolved issues identified. Unresolved issues can be defined as those directly or indirectly caused by implementing the Proposed Action. Issues are considered unresolved because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict. Some reasons for considering comments or issues as resolved include: (1) outside the scope of the project's purpose and need; (2) already decided by law, Forest Plan, or other higher level decision; (3) irrelevant to the decision; (4) conjectural or not supported by scientific or factual evidence; or (5) a general comment, opinion, or position statement. The 15 groups or individual commenters mentioned above were used to slightly modify, and improve the language within the proposed action and to create another alternative.

See "*Alternatives Considered but Eliminated from Detailed Study*" section of the EA (pp. 24-25) for discussion and further details of scoping issues.

Chapter 2: Proposed Action and Alternatives

This chapter describes and compares the alternatives considered for grazing management on the Kane Ranch Allotments. It includes a description of each alternative considered in this analysis. 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. The information used to compare the alternatives is based on the design of the alternative (e.g., installing additional water sources), as well as the environmental, social, and economic effects of implementing each alternative (e.g., authorizing or not authorizing cattle grazing).

Alternatives

The Forest Service developed and analyzed three alternatives to meet the requirements of Forest Service Handbook (FSH) 1909.15 and Forest Service Manual (FSM) 2209.13. A comparison and summary of the alternatives analyzed is presented in this section.

Alternative 1 – The Proposed Action

Alternative 1 was developed by the KNF and the grazing permittee to meet the purpose and need of this project. The alternative was then further refined by meeting informally with stakeholders. The following goals were established as part of developing the proposed action:

- re-authorize cattle grazing on the Kane Ranch Allotments in a manner that is consistent with the goals, objectives, standards and guidelines of the 1988 Forest Land Management Plan/Forest Plan, as amended;
- ensure the maintenance and/or improvement of vegetation and soil conditions that provide for ecosystem stability while allowing livestock grazing to occur on the allotments;
- meet goals and objectives as expressed in the Kane and Two Mile Research and Stewardship Partnership.

The Proposed Action would continue grazing on the Central Winter Allotment, Central Summer, and Kane Allotments. There is a fourth Forest Service allotment that is associated with the Kane Ranch Allotments, called Kanab Creek. The 2001 NEPA decision called for no grazing in the Kanab Creek Allotment. The Kanab Creek Allotment will remain closed to livestock grazing and no permit will be issued for this area.

A term grazing permit would authorize cattle grazing on the Central Summer and Kane Allotments for a range of up to 600 to 1,000 head of livestock from May 15 to November 30. Upon implementation of the new Allotment Management Plan, the initial stocking would be 600 head of livestock. Once post-implementation monitoring has occurred and indicated static or increasing vegetative conditions (over a 2-5 year period), the permittee would have the option to increase livestock numbers to the upper limit of 1,000 head. In terms of the amount of vegetation, the average cow could consume for this season of use, the proposed range of numbers would reflect up to 3,900 to 6,500 Animal Unit Months (AUM's).

While the proposed range of 600 to 1,000 head of livestock represents the lower and upper limits of permitted grazing, numbers can drop to as low as zero head and/or a reduced season of use if conditions require such an action. Possible rationale for dropping below 600 includes prolonged drought, large wildfires, or declining vegetative conditions.

A 30-40 percent conservative utilization rate would be used throughout these allotments. This amount of use follows the guidance of the Forest Plan, as amended. This percent utilization rate reflects the proportion of current year's herbaceous vegetation that is consumed or destroyed by all animals (including wildlife species and insects) compared to the amount produced during the year.

The grazing system would be a rest rotation system where each pasture would typically receive rest every other year. The majority of livestock use would occur on the two western Central Summer Allotment pastures with the eastern Central Summer and Kane Allotment pastures serving as spring and fall transitional use. The current North and South Summer pastures may be split along State Highway 67. Little Mountain and Burnt Corral pastures may also be used to add additional flexibility to the grazing management system.

State Highway 67 Right-of-Way Fence

A fence may be constructed on the western side of State Highway 67 and only on the western side of the highway. This potential fence consists of two sections, the north and the south. The fence design would follow AGFD guidelines to reduce potential wildlife crossing and entrapment concerns. The Northern section of the fence would start near Jacob Lake and would be located 60 to 120 feet from the highway for seventeen miles, ending where the meadows in the South Summer Pasture begin. The primary purpose for the fence would be public safety to respond to the number of car/cow collisions in the North Summer Pasture. Six cows were hit in 2010 and five were hit in 2012 while grazing in the North Summer Pasture. This fence would keep the livestock contained into the Northwest Pasture during the peak May 15 to September 15 Grand Canyon National Park-North Rim visitation season. Prior to construction of the north fence, we would test the effectiveness of large flashing signs warning the public of the livestock hazard. If collisions do not decrease from their current rate, then the fence would be built as soon as funding is granted.

The southern section of fence would not be planned for immediate construction, but would be considered adaptive management. This 14-mile section occurs entirely in the South Summer Pasture and spans from Pleasant Valley meadow to the GCNP boundary. The goals of splitting the South Summer Pasture into the Southwest Summer and South East Summer Pastures differ from the management of the North Pastures. The meadows along the highway and the area east of the highway would become the Southeast pasture and would be for limited spring and fall transitional use only. The reasons for this include public safety along the highway, sensitive plant species and natural lakes in Pleasant Valley and DeMotte Park Meadows, mitigating livestock/public interface around the Kaibab Lodge/north Rim Country Store/DeMotte Campground area, and reducing livestock impacts in the Saddle Mountain Wilderness and related recreational areas. To keep livestock from the Southeast pasture a series of management strategies would be utilized in the following order:

- 1) Livestock permittee would be required to monitor the meadows and area of the Southeast Summer Pasture periodically throughout the grazing season. Any livestock found during the June 1 to October 15 timeframe would be returned to the Southwest Summer Pasture. Random small bunches of less than 20 head that are found and removed a few times a season would be acceptable.
- 2) If large groups of livestock in excess of 20 head continue to return after continuous removals, the permittee would post a rider to inspect for and remove livestock on a weekly basis. This action would primarily be based on livestock impacts to meadow and riparian areas, greater than 10% use.
- 3) If livestock can regularly be found in the Southeast Summer pasture in spite of the efforts above, a fence would be constructed. The fence would be built along the western edge of the meadows and follow the tree line. This action would primarily be based on livestock impacts to meadow and riparian areas, greater than 20% use and/or trailing evidence. The permittee would be responsible to maintain this fence away from the highway.

Trailing

Using a developed Paradine plains cactus monitoring and livestock trailing protocol that specifies criteria for how livestock can be herded through the *Pediocactus Paradinei* Conservation Area, livestock would be authorized to utilize the South Kane Trail that is located in the South Kane and Central Summer Southeast Pastures. Livestock would be herded up the South Kane Trail in late May to access the summer pasture(s) to be utilized that year. The trailing would be optional to the permittee to improve the efficiency of getting livestock to the summer pastures, but would not be a required annual action. Trucking livestock would be the viable alternative any year.

The complete trailing protocol that provides guidance for livestock trailing across the entire *Pediocactus paradinei* Conservation Area can be found in the project record. Additional discussion of species will be discussed in the Botany Report. Specific details from that document that relate to the Kane Trail are as follows:

- The route was confirmed as being inside a *Pediocactus Paradinei* Conservation Unit but not inside a subunit;
- A survey for Paradine plains cactus was conducted;
- Limited suitable habitat was found and cacti were found in one location that would be easy to identify and avoid when trailing the livestock.

For use of the trail to occur, surveys would need to occur every other year. The locations where surveys locate additional cacti would be identified for avoidance by either flagging the locations or constructing temporary fences or small rock structures. The livestock permittee would be provided the locations and would be responsible for ensuring livestock were herded around the cacti.

Use of the trail would cease on any given year if any of the following events were to occur:

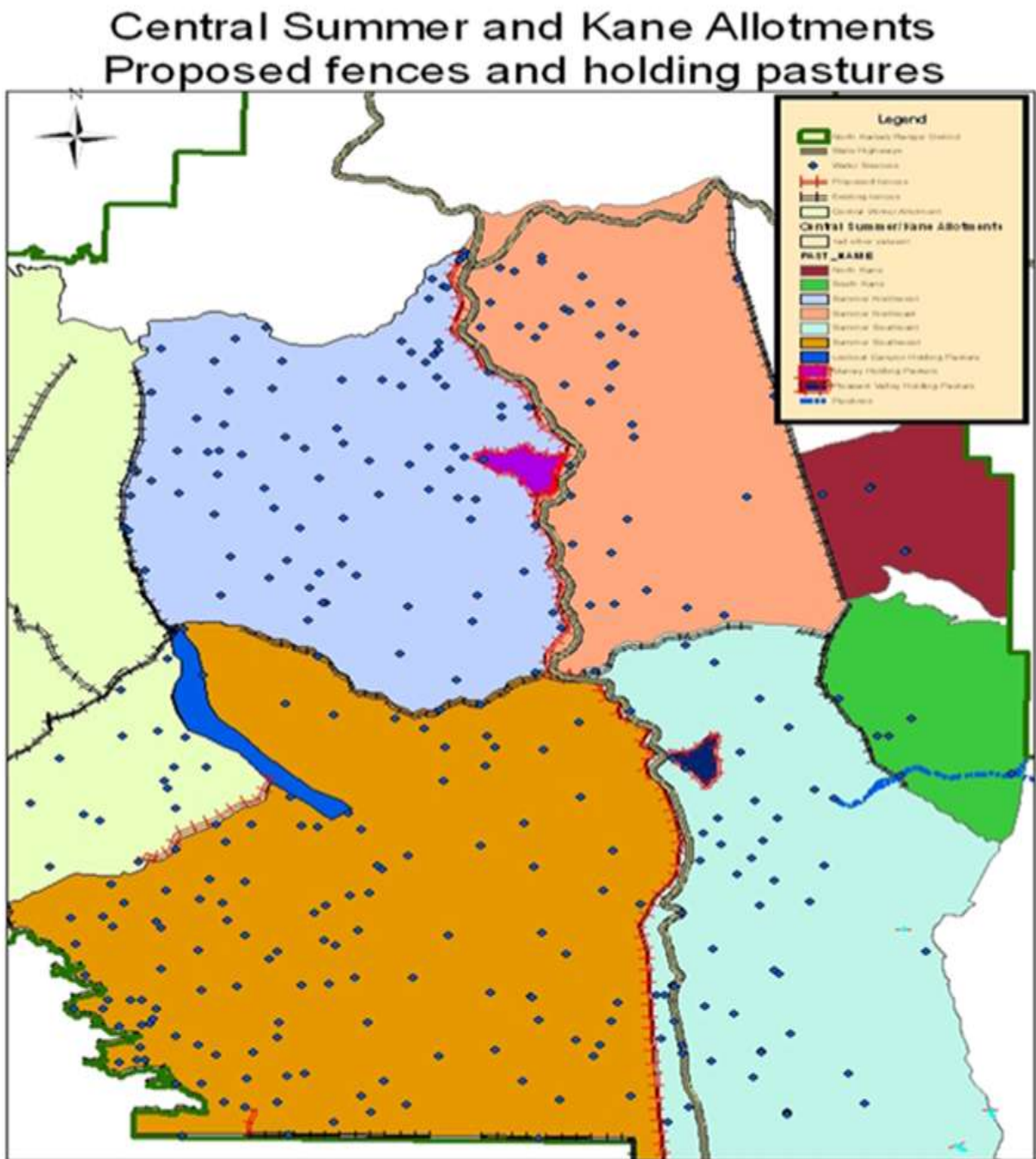
- The permittee elected to truck their livestock to the summer range instead of utilizing the trail.
- Monitoring of the trail did not occur with the last two years.
- Mitigation measures for avoiding cacti were not effective (mortality of greater than five plants trampled by cattle).
- New information becomes available that indicates trailing needs to cease.

Holding Pastures

Three strategically located, small “holding pastures” would be constructed to increase the efficiency of pasture moves (Figure 3). These pastures would not be utilized during most of the regular grazing season and would mostly be utilized during pasture moves. The basic idea behind a holding pasture would be a place to collect a series of small bunches of livestock from surrounding area of the large summer pastures and herd them into smaller, more manageable pasture. The combined group of livestock could then be moved all at the same time and be more efficient. Proposed locations and details include:

- Murray Holding Pasture: 1,196 acre pasture to be developed by constructing six miles of fence in the Murray Lake area.
- Lookout Canyon Holding Pasture: 2,241 acre pasture to be developed in Lookout Canyon by primarily utilizing natural topography and constructing three short 200-300 foot fence segments.
- Little Pleasant Valley Holding Pasture: 528 acres on the edge of Little Pleasant Valley to be developed by constructing five miles of fence.

Figure 3. Alternative 1 Map for Central Summer and Kane Allotment



Standard pasture rotations to be implemented under Alternative 1.

The following is an example of the expected and typical two-year rest rotation system including overlap in pasture timing to account for pasture moves. The Northeast and Southeast pastures would only be built after signs and/or herding does not work. Use of the Northeast pasture would depend on water availability and there are no current plans to add additional water sources.

Year 1:

- May 15 to May 31: Livestock may be herded up the Kane Trail that crosses through the South Kane and Summer Southeast Pastures to the Summer Northwest Pasture. Livestock may also be transported by semi-truck during this timeframe instead of utilizing the trail.
- May 15 to October 15: Livestock may graze the Summer Northwest Pasture, with the livestock numbers scaling down in mid-September as the pasture move begins. The Murray holding pasture would be utilized to facilitate the pasture move.
- October 15 to November 30: Livestock would transition through the North Kane pasture to winter range. Exact timing of transition would be dependent on fall snow storms.

Year 2:

- May 15 to May 31: Livestock may be herded up the Kane Trail that crosses through the South Kane and Summer Southeast Pastures to the Summer Southwest Pasture. Livestock may also be transported by semi-truck during this timeframe instead of utilizing the trail.
- May 15 to November 1: Livestock would graze the Summer Southwest Pasture, with the livestock numbers scaling down as the pasture move begins.
- October 1 to November 30: Livestock would transition through the Summer Southeast and South Kane pastures to winter range. The Little Pleasant Valley and Lookout Canyon holding pastures would be utilized to facilitate the pasture moves.

Adaptive Management in Grazing Rotations

In the event that there is need to rest one of these pastures for multiple years or modify the standard grazing rotations to improve vegetative conditions, the sequence of the remaining pastures may be modified and could also involve a grazing the pastures in a deferment system. The Southwest, Northwest, and Northeast pastures would retain the flexibility to be utilized up to their AUM limits or a season of use from May 15 to November 1, as needed for a temporary basis and dependent on the number of cattle stocked (Table 1). Little Mountain and Burnt Corral pastures may also be used to add additional flexibility to the grazing management system. Examples of how the deferment system could be utilized will be described in the livestock management section. Additional monitoring would occur to ensure that utilization rates were not exceeded and that conditions do not decline during this period.

Table 1. Season of use, AUM's, maximum AUM's, and available forage for Center Summer.

Pasture Name	Maximum Season of Use	Anticipated AUM's ¹	Maximum AUM's Authorized	Average Available Forage AUM's
Northwest Summer	5/15 to 11/1	2,400	4,000	5,000
Northeast Summer	5/15 to 11/1	200-600 ²	2,000	2,800
Southwest Summer	5/15 to 11/1	2,700	5,000	7,900
Southeast Summer	5/15 to 6/1, 10/1 to 11/1	150	1,000	2,000
North Kane	10/15 to 11/30	300	500	640
South Kane	5/15 to 6/1, 10/15 to 11/30	300	500	1,200
Little Mountain	5/15 to 11/1	1,000	1,200	6,400
Burnt Corral	5/15 to 11/1	1,000	1,200	8,400
Murray Holding	9/1 to 11/1	200	500	900
Lookout Canyon Holding Pasture	9/1 to 11/1	200	500	1,100
Little Pleasant Valley Holding	9/1 to 11/1	200	400	800

¹ Anticipated AUM's under initial stocking rate & standard rest rotations

² Anticipated higher AUM's if the fence is constructed and water is available.

Utilizing adaptive management to alter the grazing rotations would not apply to Summer Southeast, North or South Kane and the three holding pastures. These pastures are for transitional use for spring trailing and/or fall transition. Their season of use, duration, and intensity would not change with the potential exception being multiple years of rest in which trucking livestock and/or not utilizing the pasture is the change in management.

Table 1 indicates the anticipated AUM's utilized under the basic rest-rotation system with the initial 600 head stocking rate. It also includes the maximum allowable duration and Animal Unit Month's (AUM's) that could be utilized with the 1,000 head upper limits, as well the available forage (excluding production for browse that will also be utilized by livestock) in AUM's for each of the six pastures and three holding pastures. The allowable utilization rate is factored into all three columns. Details of how the AUM's were determined will be described in detail under the Vegetation Report.

Additional Items:

Natural Lake Fencing

Partial to full livestock access would resume at Dry Park, West, Murray and Snipe Lakes and fully excluding four new natural lakes. The lakes that would be resuming some level of livestock access have been modified by equipment and contain limited to no riparian vegetation.

- Dry Park Lakes does not contain wetland habitat or riparian vegetation. Livestock access would resume on one of the two lakes. The second lake would continue to be excluded from livestock by an existing fence line that divides the two lakes.
- Murray Lakes consists of two lakes that are currently divided by a fence. The lake that contains riparian vegetation would continue to be excluded to livestock while the second lake would have limited livestock access during the period that the Murray holding pasture is utilized.
- West Lakes contain three stock tanks. An enclosure would be built with a livestock lane to a stock tank(s) in a design to protect riparian and heritage resources while providing livestock water.
- Snipe Lake has limited riparian vegetation. It would have partial access to livestock by constructing a partial fence to allow livestock access to approximately a third of the lake. Livestock access to the Lake would only be authorized for limited windows to facilitate rounding up livestock.
- Bear, Cougar, Indian, and Wall Lakes would be fully excluded from livestock access.
- Cougar Lake has a fence that would be converted to an exclusion fence.
- Indian Lake could be excluded by the construction of the Highway 67 right-of-way fence and plans to exclude the area from livestock. If the Southern section of the highway right-of-way is not constructed, an exclusion fence would be constructed around the lake and adjoining riparian area.
- Bear and Wall Lakes would be excluded by a potential combination of terrain, tree felling, and small fence segments that would encompass the riparian area.
- Fourteen lakes that were in the 2001 EA would continue to be excluded from livestock use.

Spring Restoration

Up to 20 spring improvement projects would be completed within the project area to restore full or partial natural flow and riparian vegetation. Existing spring improvements would be removed where human and livestock improvements are no longer necessary. Fences would be built, removed, or modified to best protect the spring while still providing water to livestock and wildlife where necessary. The following are specific spring restoration and improvements:

- Acer Unnamed Spring – (Kanab Creek Wilderness). Remove old spring box to restore more natural spring flow and to enhance riparian vegetation.
- Big Spring – (Forest Service Big Springs Administrative Site). Construct a small stepping stone trail to the spring source area to reduce erosion. Increase the area of riparian habitat at the base of the slope by increasing channel width and sinuosity.
- Castle Spring – (one mile south of Big Spring in cattle enclosure area). Adjust and remove current fencing to better protect site. Alter or remove existing pipeline system to allow more natural spring flow and to enhance riparian vegetation.

- Locust Spring – (South Summer Pasture). If possible, alter or remove existing pipeline system to allow more natural spring flow and to enhance riparian vegetation.
- Mangum Spring – (North Summer Pasture). If possible, alter or remove existing pipeline system to allow more natural spring flow and to enhance riparian vegetation.
- Mangum Springs 1 – (North Summer Pasture). If possible, alter or remove existing pipeline system to allow for more natural spring flow and to enhance riparian vegetation. Construct a trail of stepping-stones to the source to reduce site erosion.
- Mangum Springs 7 – (North Summer Pasture). If possible, alter or remove existing pipeline system to allow more natural spring flow and to enhance riparian vegetation.
- Oquer Spring – (South Summer Pasture). Remove spring box and old fencing to restore the site to a wet meadow. Add fencing around spring source if needed.
- Pasture Spring – (Southwest Summer Pasture). If possible, alter or remove, pipe and drinker system or to maximize riparian vegetation while maintaining drinker water. Fence the spring source to enhance riparian vegetation.
- Pigeon Spring – (Snake Gulch, Kanab Creek Wilderness) Remove all piping, troughs, and fencing to improve open water riparian habitat.
- Table Rock Spring – (Snake Gulch, Kanab Creek Wilderness). No changes would be done to current management because it would take a massive effort to undo a higher impacted historic livestock/human use water source. It also makes sense to leave this watering site for packhorses and human consumption in this dry gulch.
- Watts Spring – (South Summer Pasture). Fence the hill slope spring source to enhance the native riparian vegetation.

The spring work would be largely completed with grant funding and volunteer labor with oversight by the Forest Service. Great care would be taken to protect archeological resources and maintain the integrity of the spring source and existing riparian vegetation.

Additional Allotment Improvements

Ten earthen tanks or wildlife guzzlers would be modified across the Central Summer Allotment for the purposes of increasing water availability in drier years. Earthen tanks that currently do not hold water due to erosion or sedimentation, would be repaired and potentially lined. Wildlife specific (livestock excluded) guzzlers that are currently not functioning would be repaired or replaced on the same location.

Approximately 17,346 acres of the Northwestern corner of the Central Summer South Pasture would be separated from the rest of the pasture by utilizing existing topography and constructing two sections of fence for a total of 3.8 miles. This new pasture would be called Burnt Corral and would add to the rotation flexibility of the overall operation.

Up to fifteen exclosures (to keep livestock out) and/or enclosures (to keep livestock confined for a short duration) monitoring/research sites would be constructed across the Central Summer Allotment for the purposes of research as well as long term monitoring. The exclosures and enclosures could be up to forty acres each and encompass up to 80 acres on each monitoring site. The exact size would be determined by site conditions and research needs. Within 1-2 of the exclosures an approximate five acre common gardens with be constructed. The gardens would include planting of native plants species from Northern Arizona. It would also include watering facilities for the plants and a weather station. Additional research work within these monitoring sites would likely include drill seeding, watering, and other plant and grazing research.

As many as two fence segments may be constructed on the National Forest to extend from the GCNP boundary fence. Each of these fence segments would be less than one mile long and extend from the existing boundary fence to natural topography with the purpose to reduce the amount of current boundary fence needed to prevent livestock from entering National Park Service lands.

Authorize a new grazing strategy and research program on the Central Winter Allotment

The Central Winter Allotment Management Plan would become independent of the Central Summer and Kane Allotments. The allotment would be managed in a way that balances livestock grazing with a series of well-defined research projects focused on the best grazing strategy for a variety of natural resource objectives.

A new 17,346 acre pasture to be called Burnt Corral Pasture would be added to the Central Winter Allotment from the Central Summer Southwest Pasture. This pasture would be developed by constructing two fence segments of an approximate total of four miles of fence and utilizing natural topography and existing fence lines for remaining pasture boundaries.

The key component to the allotment management plan would be specifying the range of limits and possible range of dates for each pasture. The general limitations applied to all Central Winter Pastures would be a range of 200-400 head of livestock. Upon implementation of the new Allotment Management Plan, the initial stocking would be up to 200 head of livestock. Once post implementation monitoring and/or associated research activities have occurred and indicated increasing vegetative conditions, the permittee would have the option to increase livestock numbers to the upper limit of 400 head. A 30-40 percent conservative utilization rate would be used throughout this allotment.

While the proposed range of 200 to 400 head of livestock represents the lower and upper limits of permitted grazing, numbers can drop to as low as zero head and/or a reduced season of use if conditions require such an action. Possible rationale for dropping below 200 includes pro-longed drought, large wildfires, declining vegetative conditions, or a specific research project that needs to run a lower number of livestock.

- Up to four months of use per pasture.
- Livestock utilization would not exceed 1,200 AUM's per pasture.
- One pasture can be utilized two consecutive years in a row as long as the second year of use has deferred grazing during the cool and warm grass growing seasons.

Each pasture would have timing constraints specified for permitted livestock activities with exceptions that can be made for research activities. Those details are as follows:

- Little Mountain (up to 6,400 AUM's available) and Burnt Corral (up to 8,400 AUM's available): May 15 to November 1.
- Slide (up to 21,000 AUM's available) and Ranger Pass (up to 13,000 AUM's available): August 1 to November 1.
- Sowats: This pasture would not have a typical, planned rotation. It would be available for research needs and have the ability to be utilized as a forage reserve tied to these allotments.
- JumpUp would remain closed to permitted grazing and research grazing as per the 2001 Kane Ranch EA Decision Notice.

The exception to the above timing constraints would be if there was a research project developed that needed to occur outside of this window. Examples include studying livestock and mule deer interactions on winter range and flash grazing spring or fall cheatgrass growth/seed spread concerns. In the event that research findings indicate that livestock impacts are minimal if grazed in a certain way at a certain time, the allotment management plan can be adapted to incorporate the timing and/or stocking rate.

From these basic pasture limitations, a series of potential rest and deferment rotation systems can be developed with enough flexibility to accommodate all research project requirements and the ability to rest multiple pastures for multiple years. The results of future research projects would direct further refinement of the pasture limitations, whether that means more flexibility in how and when livestock are grazed or more limitations and constraints.

Again, Burnt Corral and Little Mountain pastures may be used in conjunction with the Central Summer pastures when there is a need of additional flexibility in grazing management, primarily for fire recovery and drought.

Additional measures incorporated into the Central Winter proposed action include:

- Up to fifteen exclosures (to keep livestock out) and/or enclosures (to keep livestock confined for short durations) monitoring/research sites would be constructed across the Central Winter Allotment for the purposes of research as well as long term monitoring. The exclosures and enclosures could be up to 50 acres each and encompass up to 100 acres per monitoring site. The exact size would be determined by site conditions and research needs. Within two of the exclosures an approximate five acre common garden will be constructed. The garden would include planting of native plants species from Northern Arizona/Western United States. It would also include watering facilities (from an existing developed spring/pipeline system) for the plants and a weather station. Additional research work within these monitoring sites would likely include drill seeding, watering, and other plant and grazing research.
- Up to 10 existing dirt tanks would be modified to improve the water holding capability for livestock and wildlife on their existing location.
- Up to thirty miles of the existing Little Mountain pipeline system would be repaired or replaced. The Little Mountain storage tank that is part of the system would also be replaced.
- Reconstruction of three miles of fence near Sowats Canyon that was damaged in the 1996 Bridger Knoll fire.

Kanab Creek Allotment

There is a fourth Forest Service allotment that was associated with the Kane Ranch Allotments, it is called Kanab Creek. The 2001 NEPA decision called for no grazing in the Kanab Creek Allotment. The Kanab Creek Allotment will remain closed to livestock grazing and no permit will be issued for this area. The continued closure of this allotment to livestock grazing is primary due to poor rangeland conditions and archeological site protection. Other reasons for continued closure include: riparian resource protection, remote wilderness values, lack of functioning range improvements needed for proper livestock management, noxious weed expansion, and difficulty of managing livestock in this rough remote desert area.

Universal management actions associated with Alternative 1

Salt and mineral supplement would be authorized as “distribution aids” to help improve livestock distribution. These supplements would be placed in locations away from water or meadows to encourage livestock not concentrate in one location.

Monitoring

The Proposed Action includes the continued use of adaptive management, which provides flexibility for managing livestock and rangeland resources. Adaptive management is based on both implementation monitoring and effectiveness monitoring (see Chapter 4), and is designed to provide sufficient flexibility to adapt management to changing circumstances. If monitoring indicates that desired conditions are not being achieved, management would 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 grazing area rotations. Recommended changes would not exceed the limits for grazing intensity, livestock numbers, or the occurrence and frequency of livestock grazing defined in this Proposed Action.

Rangeland conditions would be monitored to assess plant population stability and soil stability. Managers would adjust timing, duration, and frequency of livestock grazing in areas with declining conditions via

the Annual Operating Instructions. Visual observations would be conducted annually to assess permit compliance, range readiness, and forage production.

Forage utilization would be monitored to ensure the “conservative” grazing intensity is not exceeded. Utilization is measured before the end of the growing season and is used to determine when livestock shall move to the next pasture in the rotation. Other factors that aid in rotation decisions include weather patterns, the likelihood of plant regrowth, and previous years’ utilization levels. Livestock would move to the next pasture when grazing intensity approaches a conservative level (30-40% utilization).

Long-term trend monitoring would be conducted at the historic Parker Three-Step plot locations on the allotment every 5 to 10 years, or as funding becomes available. Monitoring data at the Parker Three-Step plots currently includes frequency, canopy cover, dry-weight rank, comparative yield, repeat photography, and ground cover to estimate trend. Plant frequency, ground cover, canopy cover, and repeat photography is used to assess rangeland trend; dry-weight rank is used to estimate relative species composition by weight; and comparative yield is used to estimate forage production.

Alternative 2 – Current Action

This alternative would continue the current allotment management plan as developed from alternative six of the 2001 Kane Ranch EA and Decision Notice.

The Central Winter Allotment would be authorized for a season of use from May 1 to a July 14 for 800 head. As per the decision notice livestock numbers are to be limited to 400 until specified work is completed on water developments, fences, and corrals. The four pastures (Slide, Ranger Pass, Little Mountain, and Sowats) would be utilized in a rest rotation system where each pasture is to be grazed for one month, followed by a second pasture to be utilized for the next month. The remaining pastures would be utilized the following year in the same fashion. Up to three pastures can be utilized in one year if monitoring determines that the one month duration in any pasture needs to be shortened. Repairing and/or replacing structures on the allotment that were identified in the 2001 Kane Ranch EA Decision Notice including the Little Mountain Pipeline system would be ongoing.

The Central Summer Allotment would be authorized for 400 head from June 1 until June 30 and then 800 head from July 1 to October 29. Central Summer consists of the North (108,000 acres) and South (179,000) Pastures and would be grazed in a rest system where one pasture is grazed one year and then rested the following year. With the exception of North Canyon, livestock are able to access the remaining areas of the pasture all season long.

The Kane Allotment would be authorized from October 16 to November 12 for 800 head. Like the Central Summer Allotment the North and South Kane pastures alternate each year.

The utilization rate across the allotments would be set at twenty percent, but up to fifteen of the key areas may exceed the twenty percent. The high elevation meadows within Central Summer may be utilized up to 30 percent as long as the average for each pasture is no more than twenty percent.

Alternative 3 – No Grazing

This alternative would discontinue livestock grazing on Central Winter, Central Summer, and Kane Allotments. This alternative will be fully analyzed.

The Forest Service requires that a “No Action” (i.e. “no grazing”) alternative be analyzed in detail (FSM 2209.13, 92.31).

Alternative 3 would not authorize livestock grazing on the Allotments. This alternative does not preclude livestock grazing on this allotment in the future following a separate analysis and a decision made by the Responsible Official to resume livestock grazing. Under this alternative, existing range improvements

(e.g., earthen water tanks and pipelines) would require a separate analysis and coordination with other agencies to determine whether or not to maintain or remove these structures.

Alternative Summaries

Table 2. Summary of Alternatives

Proposed Activity	Alternative 1 (Proposed Action)	Alternative 2 (Current Action)	Alternative 3 (No Grazing)
Livestock #'s Central Summer Allotment	600-1000 head	800 head	0
Livestock #'s Central Winter Allotment	200-400 head	400-800 head	0
Utilization Percentage	30-40%	20%, up to 30% in upland meadows	0
Highway 67 Fence	Yes, if needed	No	No
South Kane Trail Use	Yes, using a developed Pediocactus monitoring and livestock trailing protocol	No	No
Building Holding Pastures	Yes, three holding pasture built to improve fall gathering	No, continue to have issues with fall gathering in two large pastures	No
Natural lake protection and fence modifications	Twelve would be protected or fence modifications would be done to protect riparian species where they exist.	No	No
Spring Improvement Projects	Up to 20 spring improvement projects would be completed within the project area to restore full or partial natural flow and riparian vegetation.	No	No
Research monitoring / research enclosures and enclosures	Up to thirty would be constructed across the Central Winter and Summer Allotments for the purposes of research as well as long term monitoring. Emphasis on livestock research with cheatgrass and mule deer.	No	No
Central Winter Allotment Management	Managed in a way that balances livestock grazing with a series of well-defined research projects focused on the best grazing strategy for a variety of natural resource objectives.	Used from May 1 to July 14.	None
Direct and Indirect Jobs (number)	9	9	0

Table 3. Alternative comparison by purpose and need.

Purpose and Need	Alt. 1	Alt. 2	Alt. 3
Authorize livestock grazing (purpose of project)	Yes	Yes	No
Allotment is managed in a manner that maintains and/or moves the area towards Forest Plan objectives and desired conditions	Yes	Yes	Yes

Design Features

The following is a list of items that are common to both action alternatives:

Annual Operating Instructions: Annual operating instructions (AOI) make adjustments to livestock numbers and time and duration of pasture use based on current and anticipated range conditions. Annual operating instructions may be adjusted throughout the grazing season as conditions change. Livestock numbers may vary annually, but would not exceed the maximum number set in this decision. The annual minimum livestock number is zero.

The AOIs may be changed to reflect new information based on applicable studies and/or field observations. If changes are suggested that fall outside the parameters of the decision resulting from this EA, they would be subject to NEPA analysis and a decision by the responsible official. The Forest Service would make the determination whether or not to undertake a new NEPA analysis at the time the recommendation is brought forward.

Monitoring: Permittee and permit compliance; allotment inspections; range readiness; forage production; rangeland utilization; condition and trend; precipitation; noxious weeds; threatened and endangered species; and soil condition would be monitored for all action alternatives. Long-term condition and trend monitoring would be the standard for monitoring the effects of livestock use.

Utilization: The definitions of utilization and seasonal utilization are adopted from protocols developed by the Society of Rangeland Management and the Region 3 Regional Forester (Smith et al. 2005).

If monitoring shows maximum utilization rates are exceeded the grazing schedule and/or permitted numbers would be adjusted the following year to better match forage conditions. If utilization rates continue to exceed the established guideline the grazing management system would be altered to ensure that utilization is within the desired limit.

Fencing: Newly constructed and reconstructed fencing would have a smooth bottom wire 18-inches above the soil surface and a top wire no higher than 42-inches to facilitate wildlife passage. Elk jumps and goat bars (PVC pipes placed on the bottom two strands of fence wire and on the top strand at a crossing point) would be installed along new fences or along existing fences on game trails and known migration corridors as volunteers and funding are available. As fence inventories are completed, those fences that are complete barriers to wildlife would be modified. Fences deemed unnecessary by both the grazing permittee and the Forest Service would be removed as opportunities (e.g., funding) become available.

Best Management Practices for Livestock Grazing: The following grazing practices were selected for the Allotments through the integrated resource management process and would also apply to each action alternative:

- *Pastures are alternately rested and grazed in a planned sequence.* Livestock rotate in a planned grazing system that alternates rest and grazed periods throughout a given year and from year to year. A deferred rest rotation grazing system meets this practice.
- *Grazing at a level that would maintain enough cover to protect soils and maintain or improve the quantity and quality of desired vegetation.* This practice would be applied through the utilization guidelines for all action alternatives.

Mitigation Measures

The Forest Service would apply the following mitigation measures to any action alternative to minimize and reduce potential impacts from proposed activities.

Noxious and Invasive Exotic Weeds

A noxious and invasive weed assessment/inventory was completed for this analysis. Noxious and invasive weeds located within the allotment would be treated as necessary. The grazing permittee and Forest Service would coordinate weed inventory and treatment activities with responsibilities identified through the AOI. The design features, best management practices, and mitigation measures in Appendix B of the Three Forest Integrated Treatment of Noxious or Invasive Weeds Environmental Impact Statement would be implemented (USDA 2005).

- Minimizing soil disturbance to the extent practical.
- Removing mud, dirt, and plant parts from equipment before moving it into the area. This practice does not apply to vehicles traveling frequently in and out of the project area that would remain on a clean roadway.
- Prohibiting work in areas that have large infestations of weeds until the weeds are controlled.
- Controlling the weeds means at least removing all above ground plant parts and seeds that could be spread by project activities. Clean all equipment before leaving the infested project site. Seeds and plant parts need to be collected when practical and incinerated (or bagged and solarized before sending to a landfill).

Including weed prevention practices in the allotment management plan and the annual operating instructions.

Soils and Microphytic Soil Crusts

Work on all projects (stock tanks, pipelines, trick tanks, fences, power line, roads, etc. may only be conducted when soils are dry enough to support heavy equipment without creating compaction, ruts, or erosion.

Microphytic (cryptogamic) soil crusts may exist on the Kane Ranch Allotments primarily on soils that contain a high proportion of sand. Livestock can trample microphytic crusts when they trail through the area. To mitigate the potential negative affect to microphytic soils from livestock, salting would not be allowed on soil types within TES Units that contain a high proportion of sand and are readily accessible to livestock grazing.

Sensitive Plant Species

Sensitive plant surveys would be completed in suitable habitat before constructing of new range improvements. Surveys would not be necessary if the construction would occur in an area that is already disturbed, such as existing roads and ditches or existing earthen tanks. If sensitive plant species are located, coordination with a wildlife biologist or botanist would occur to mitigate impacts as needed (i.e. flagging specific plants and adjusting the location of the improvement).

Recreation and Scenery Resources

Newly constructed features would be designed to meet the scenic integrity level requirements. Materials, colors, and textures would be selected so that the structure is not evident to the casual observer (i.e. materials for corrals and trick tanks would be matte finish and blend with the vegetation, if possible made of wood or other natural material; the design of roadside tanks would implement a low-profile design).

When performing maintenance on existing range and wildlife improvements, take measures to reduce or minimize negative or unnatural appearing features whenever possible. Consult with Scenery and Recreation Managers prior to maintenance.

Heritage Resources

Proposed activities associated with allotment improvements would be evaluated and managed to avoid adversely effecting cultural resource in accordance to Appendix H Standard Consultation Protocol for Range Land Management, of the Region 3 First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities among New Mexico, Arizona, Texas, Oklahoma and the Advisory Council on Historic Preservation. Prior to the implementation of structural improvements project managers must contact the North Kaibab archaeologist. The North Kaibab archaeologists would evaluate the improvements and develop appropriate protective measures pursuant Appendix H of the Region 3, First Amended Programmatic Agreement (USDA 2007). The Kaibab would also continue to consultation with the AZSHPO and appropriate tribes to ensure that the activities would have a minimal effect on heritage resources.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action can provide suggestions for alternative methods of achieving the purpose and need.

Reduction in Cattle Number and Utilization Alternative

During scoping for the EA for Kane Ranch Allotments, an alternative was considered by members of the Interdisciplinary Team that would have reduced cattle and utilization guidelines from 600-1000 to 400 head (Central Summer Allotment) and from 30-40 to 20 percent utilization.

A recent literature review by Milchunas (2006) showed that several grazing intensity guidelines have been proposed for pinyon-juniper communities. Based on this literature review and recommendations from Holechek (1988) it has been determined that reducing cattle numbers and/or the utilization guideline would result in little difference to the areas that are being affected by cattle. Adaptive management would be the tool by which livestock numbers would be reduced based on future allotment conditions if it appears that areas are experiencing a downward trend.

Recent case law has established that consideration of alternatives which lead to similar results is not sufficient to meet the intent of NEPA [Citizens for Environmental Quality v. United States, 731 F. Supp. 970, 989, (D. Colo. 1989); State of California v. Block, 690 F.2d 753 (9th Cir. 1982)]. Because a reduced cattle number/utilization alternative would result in similar environmental effects as that of the Proposed Action, it was eliminated from further analysis.

Other Items Brought Up in Scoping

An alternative was developed in response to scoping comments on the proposed action. This alternative was later dropped from further consideration as each item that differs from the proposed action can be met within the adaptive management of the proposed action. The details of the considered Alternative 4 are as follows:

- The seventeen-mile northern section of the Highway 67 right-of-way fence would be implemented as discussed in alternative one. The southern section of the fence would not be implemented as an adaptive management option. Livestock would be kept away from the highway and the meadows/wilderness/recreation areas of the South Summer Pasture by herding management.
- The Burnt Corral Pasture would not be developed.
- The three Central Summer Pastures would be authorized for a season of use from May 15 to November 1 with an upper limit of 600 head.

- The holding pastures and enclosures/exclosures would be included in this alternative as described in the proposed action.
- The existing natural lakes excluded from livestock would continue to be fully excluded. Cougar, Wall, Bear, and Indian Lakes would also be excluded from livestock.
- Spring trailing would not be authorized through Paradine plains cactus habitat. The two pastures of the Kane Allotment would be utilized only for a fall transition period of October 15 to November 30. The AUM limit for each pasture would be 300.
- The current utilization rate across the allotments would be set at twenty percent, but up to fifteen of the key areas may exceed the twenty percent. The high elevation meadows within Central Summer may be utilized up to 30 percent as long as the average for each pasture is no more than twenty percent.

This alternative was dropped as the majority of differences basic differences between the proposed action and this alternative can be achieved with the adaptive management of Alternative 1. The ability for the differences to be achieved through alternative is as follows:

- The southern section of the Highway 67 Right-of-way fence is adaptive management with options that would be implemented first that could eliminate the need for the fence.
- The lower limit of livestock numbers on the Central Summer Allotment is 600 head. Annual livestock numbers can be as low as zero if there is a resource related reason to do so.
- If there is new information that provides rationale to not authorize full, partial, or limited utilization to Murray, Dry Park, Snipe, or West Lakes, they would remain excluded to livestock access.
- Spring trailing through the Pediocactus Paradinei Conservation Area is an optional way to transport livestock. Use of this trail can be discontinued at any time.
- The livestock numbers on the Central Winter Allotment would also be adaptable from the 200 to 400 head stocking with the ability to drop all the way to zero head if there is a resource related reason to do so. Given the low stocking rate for the allotments and the low utilization rates recorded when the stocking rate was 1,200 head, it is unlikely that utilization rates in key areas would exceed 20-30 percent in the proposed action.

Chapter 3: Affected Environment and Environmental Consequences

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 proposed action and alternatives on those resources. Note: Acreages may vary within this EA due to the variability associated with GPS and GIS.

Direct effects are those caused by the action and that 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.

Past, present and reasonably foreseeable activities and natural events, and adjacent grazing allotments that were considered in the cumulative effects analysis. Activities and/or natural events were carried forward into each resources cumulative effects analysis based on that resource's spatial and temporal parameters. Not all of these activities or events are applicable to each resource cumulative effects analysis. It is also important to note that historic activities have likely altered natural conditions in some areas beyond a particular biotic threshold.

Since European settlement of the project area heavy tree harvest, fire exclusion, overgrazing, and climate change has altered the trajectory of stand development, ecosystem function, and spatial pattern of ponderosa pine stands in northern Arizona (Moore et al 2004). Many others have documented this as well (Pearson 1910, Arnold 1950, Cooper 1960, Stein 1988, Savage and Swetnam 1990, Savage 1991, Covington and Moore 1994, Swetnam and Baisan 1996, Heinlein 1996). The following is a more detailed summary of these changes related to current conditions:

- Livestock grazing has occurred in the analysis area for 100+ years. In the late 1800s, ranchers began grazing cattle with the numbers of cattle peaking in 1891. Cattle numbers have been greatly reduced since the turn of the century as better management strategies have been developed and implemented. Vegetation utilization by livestock has declined over this time period.
- Tree stand structure has changed dramatically from pre-settlement conditions to present day. Trees are dominantly even-aged, where they used to be more uneven aged. Trees are more mid-sized with less large or small trees, where they used to be more various sizes. Trees are more spaced throughout the forest, where they used to be more groupie and clumpy with more forest openings. An increase in tree density has increased the probability for increase in tree mortality from insects, disease, and fire. An increase in trees has reduced understory vegetation amount, species and composition.
- Fire suppression has been the norm in the project area since European settlement, until recent years. Pre-settlement natural wildfires burned on an average of 3-7 years in the project areas ponderosa pine forest. These fires reduced the number of pine trees, provided abundant nutrient cycling, and reduced pine litter build-up on the forest floor. The reduction in fire frequency reduced these processes.

Climate Change Consideration

First, in order to understand or consider climate change, one must understand the definition of climate. According to the Forest Service's "Southwestern Region Climate Change Trends and Forest Planning" document, May – 2010, Climate is defined as follows:

"Climate may be defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the statistical description of the state or condition of the climate system. In contrast, weather describes the daily conditions (individual storms) or conditions over several days (a week of record-breaking temperatures), to those lasting less than two weeks. Natural climate variability refers to variations due to natural internal processes in the climate system or natural external forcing, in the mean state and other statistics of the climate on all spatial and temporal scales beyond that of individual weather events. Climate and climate variability are determined by the amount of incoming solar radiation, the chemical composition and dynamics of the atmosphere, and the surface characteristics of the Earth."

The project area occurs within the North central climatological division of Arizona and is generally classified as low sun cold climate class. Precipitation on the average varies from 18 to 30 inches annually and is bimodal (i.e., having two peak seasons). The majority of the precipitation falls from October 1 to March 31, mainly in the form of snow as a result of large frontal storm systems. Thus the winters are cold and soil temperatures are generally classified as frigid throughout much of the allotment and subject to freezing and thawing. Summer precipitation is irregular, but usually takes place in the form of high-intensity, short-duration thunderstorms of limited areal extent during the monsoon season (July through September).

Average annual temperatures range from 55° Fahrenheit (F) at lower elevations to 34° F at higher elevations. For the month of January, mean minimum temperatures range from 10° to 20° F; mean maximum temperatures range from 32° to 50° F. For the month of July, mean minimum temperatures range from 45° to 52° F; mean maximum temperatures range from 70° to 105° F.

The NOAA U.S. Seasonal Drought Outlook released April 18, 2013 indicates that drought will persist or intensify in the vicinity of the North Kaibab Ranger District. Currently, the NOAA U.S. Drought Monitor (dated April 16, 2013) indicates that the area is under moderate to severe drought conditions (Soil and Watershed Specialist Report 2013).

The U.S. Seasonal Drought Outlook for April 18 – July 31, 2013 is based primarily on short-, medium-, and long-range forecasts, initial conditions, and climatology. Drought persistence is expected for western Colorado, most of New Mexico, Utah, Nevada, and Arizona due to below average snow-water equivalent values (generally at or below 75 percent of normal) and below average stream flows forecast for spring and summer. Enhanced odds for below median precipitation and above normal temperatures during May, June and July also indicate drought will persist (NOAA Climate Prediction Center 2013).

Two drought models that are available for this area include the Standardized Precipitation Index (SPI) and the Palmer Drought Severity Index (PDSI). The latest 12-month SPI through the end of March 2013 shows all of the regions mapped near the Kane Ranch Allotments to be in near normal conditions. The PDSI long term meteorological conditions dated April 20, 2013 show the area surrounding the Kane Ranch Allotments to be in a severe drought. Drought monitoring data and forecasts are always changing and are useful tools for assessing short term and long-term forecasts.

Temperature and precipitation data/records are available for the Kaibab Plateau and adjacent areas are available through the Western Regional Climate Center (WRCC). Climate data sets that are available through the WRCC vary in location and time-duration, and include such locations as Jump Up Springs (1906), Big Springs (1931-1948), , House Rock (1948-1958), **Jacob Lake** (1948-current), the Ryan Station (1952-1955) located at the bottom of Warm Springs Canyon, Buffalo Ranch (1959-1962), Grand Canyon National Park (1957-current) for north rim area, and **Fredonia, Arizona** (1948-current). The objective of the WRCC is to provide the best quality climate data and information possible. Information presented on the WRCC web site is derived from data received from the National Climatic Data Center, the National Weather Service, the Natural Resources Conservation Service, the Bureau of Land Management, the U.S. Forest Service, and other federal, state and local agencies. The presentation of this data does not prequalify its accuracy or the fact there may be certain data gaps, however, it is the best available data reflecting changes in climatic conditions for approximately the last 60 years or so. Consideration to changing climate conditions are also discussed on pages 49-50, and 78-79 of this EA. Annual temperature and precipitation summaries for the stations near Fredonia and Jacob Lake, Arizona are included in the Soil and Watershed Specialist Report (2013).

Climate conditions are a major contributing factor affecting range condition and trend in the southwestern United States. Large year-to-year differences in rainfall and forage production are characteristic of southwestern ranges (Martin and Cable 1974). Climate model projections for the southwest United States predict average temperatures will continue to rise as will the potential for an increase in the frequency of extreme heat events (Crimmins et al. 2007). Increased temperatures combined with decreased precipitation would lead to lower plant productivity and cover, which in turn would decrease litter cover. The reduction in plant and litter cover would make the soils more susceptible to erosion by both wind and water. Timing of moisture can lead to shifts in dominance from warm to cool season plant species or vice-versa. Currently we are observing a shift to warm season species dominance in many areas of northern Arizona as a result of reduced winter moisture and increased summer moisture. The dominant warm season plant in northern Arizona is blue grama (*Bouteloua gracilis*). Despite the frequent dry years, many areas exhibit an increase in perennial plant cover due to the sod-forming habit of blue grama.

Climate change may be the cause of this unusual weather, but scientists cannot be certain. Large shifts in precipitation and temperature have occurred in the past and will occur in the future. All action alternatives include adaptive management strategies. Adaptive management uses monitoring to adjust timing, duration and occurrence of livestock grazing, movement of livestock within the allotment, and livestock numbers. If adjustments are necessary, they are implemented through the Annual Operating Instructions, whereby livestock numbers can be adjusted so use is consistent with current productivity.

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

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

Some ranchers rely on well water for livestock watering, but often ranchers use earthen tanks to capture summer monsoon rainfall runoff from snow melt (USDA 2010). During the recent droughts, earthen

tanks have dried prematurely, making many pastures problematic for livestock management, even though forage was still available (Conley et al. 1999).

It is difficult to conclude whether recently observed trends or changes in ecological phenomena are the result of human influences, natural climatic variability, or other factors (USDA 2012). As documented in the U.S Climate Change Science Program Synthesis and Assessment Product 4.3 (Backlund et al. 2008), climate change is occurring and we are observing many effects on forests. A growing body of science has demonstrated that the Earth's climate warmed rapidly during the 20th century (USDA 2010).

Regardless of the causes of climate change, our responsibility is to determine effective ways to respond to changes and manage the land effectively. One of our identified goals is maintaining and improving watershed health. Healthy, resilient watersheds are more likely to support desired ecological services in the face of climate change (Furniss 2010).

Soils, Watershed, Water Quality, and Air Resources

Methodology and Analysis Process

Analyses for environmental consequences to soils and watershed resources that may result from implementation of each alternative were conducted using information contained in the Terrestrial Ecosystem Survey (TES) of the Kaibab National Forest (Brewer et al. 1991), the Watershed Condition Framework, the Kaibab National Forest Land Management Plan, as amended (1988), information obtained from other KNF resource specialists, other agency reports, available literature, and input from KNF collaborators and cooperators. Geospatial analysis was used to quantitatively and qualitatively assess soils and watershed conditions using Geographic Information Systems (GIS) data obtained from a variety of sources.

Soils of the KNF were mapped as part of the TES of the Kaibab National Forest. The TES is the result of the systematic analysis, mapping, classification and interpretation of terrestrial ecosystems, also known as terrestrial ecological units (TEU) that are delineated and numbered. A TES represents the combined influences of climate, soil and vegetation, and correlates these factors with soil temperature and moisture along an environmental gradient. It is an integrated survey and hierarchical with respect to classification levels and mapping intensities. It is the only seamless mapping of vegetation and soils available across the KNF that includes field visited, validated and correlated sites with a stringent Regional and National protocol stemming from decades of work. Field surveys for the Kaibab TES were completed from 1979 through 1986. Map units are identified by numbers ranging from 3 to 683. One hundred and thirty-two major soil types have been mapped and described and management interpretations developed on the KNF.

It is important to understand that differences in ecosystem properties including soil and vegetation can occur within short distances. The TES was mapped at a scale of 1:24,000 across the landscape. Generally, small vegetative communities (i.e., smaller than about 40 acres) were not differentiable and are therefore inclusions within larger TES map units.

The TES follows National Cooperative Soil Survey Standards similar to Soil Surveys conducted by the Natural Resource Conservation Service (NRCS). There has therefore been strict quality assurance, including Project Leader field reviews, Regional Office reviews, and annual progressive and final field reviews to approve map unit design and mapping.

The TES is used to evaluate and adjust land uses to the limitations and potentials of natural resources and the environment. It presents important properties pertaining to the natural, physical, and behavioral characteristics of the terrestrial ecosystems and provides the background for making interpretations. Interpretations based upon TES incorporate 1) soil physical and chemical properties, 2) climatic considerations, 3) topographic position and slope, 4) vegetation and anthropogenic influences as well as animal impacts, 5) productive and successional potentials, and 6) geologic influences.

Soil condition is based on the primary soil functions of soil hydrology, soil stability, and nutrient cycling.

Affected Environment

Soils

The soils analysis is largely based on information gathered from the TES of the Kaibab National Forest, in conjunction with range monitoring data, photographs, and field observations. The TES was consulted for information on soil and watershed characteristics including: erosion hazard ratings, plant and litter cover, and revegetation potential.

Topography within the allotment varies from flat to steep. Elevations across the Kane Ranch Allotments range from 4,465 feet in Slide Canyon to 9,176 feet near Johns Tank southwest of the Saddle Mountain Wilderness. Slopes range from one degree (flat) to as much as 90 degrees (vertical) with steeper slopes occurring along canyons and escarpments and on hillsides of less prominent knolls. There are a many differences in soil ecosystem properties across the Kane Ranch Allotments. Some soils are too shallow or rocky for certain uses, other soils may be too unstable. Some soils are well-suited for reforestation or revegetation while others are not. Table 4 provides a summary of the taxonomic classifications of TES map units in the project area and their associated soil phases and acreages.

Table 4. Terrestrial Ecosystem Units located within the Kane Ranch Allotments.

MAP UNIT SYMBOL	SOIL TAXONOMIC CLASSIFICATION	SOIL PHASE	ACRES
005	Pachic Udic Argiudolls	Deep loam	3,007.1
009	Cumulic Haploborolls	Deep loam	1,282.9
015	Typic Torrifluvents	Deep loamy fine sand	3.3
017	Cumulic Haplustolls	Deep loam	17,63.6
023	Fluventic Ustochrepts	Deep very fine sandy loam	787.1
032	Fluventic Ustochrepts	Deep fine sandy loam	1,219.1
035	Argic Cryaquolls	Deep loam	607.6
154	Typic Ustorthents	Fine sandy loam	258.4
156	Udic Haploborolls	Moderately deep loam	3,721.0
250	Lithic Ustochrepts	Fine sandy loam	12,772.5
251	Lithic Ustochrepts	Fine sandy loam	25,465.2
252	Lithic Ustochrepts	Fine sandy loam	32,341.2
263	Lithic Ustochrepts	Loam	16,501.4
264	Lithic Ustochrepts	Loam	10,158.7
271	Lithic Ustochrepts	Loam	6,861.4
272	Typic Haplustalfs	Loam	9,150.2
273	Typic Haplustalfs	Loam	18,964.0
274	Typic Ustochrepts	Moderately deep fine sandy	5,948.4
281	Typic Ustochrepts	Moderately deep fine sandy	250.2
293	Mollic Eutroboralfs	Loam	48,343.7
294	Mollic Eutroboralfs	Loam	35,395.4
297	Mollic Eutroboralfs	Loam	5,957.0
298	Mollic Eutroboralfs	Loam	7,232.2
299	Typic Haploborolls	Moderately deep loam	1,915.3
603	Eutric Glossoboralfs	Fine sandy loam	2,128.8
604	Eutric Glossoboralfs	Fine sandy loam	1,171.7
605	Lithic Glossoboralfs	Sandy loam	1,407.1
606	Lithic Haploborolls	Sandy loam	615.9
612	Lithic Haploborolls	Fine sandy loam	542.0
613	Eutric Glossoboralfs	Fine sandy loam	2,035.0
614	Eutric Glossoboralfs	Fine sandy loam	2,966.5
615	Udic Haplustalfs	Fine sandy loam	128.8
618	Typic Eutroboralfs	Fine sandy loam	227.3
619	Udic Haplustalfs	Fine sandy loam	8,684.5
620	Lithic Haploborolls	Loam	4,701.5
621	Mollic Eutroboralfs	Loam	6,493.7
622	Lithic Haploborolls	Fine sandy loam	2,682.0
623	Typic Paleboralfs	Sandy loam	33,082.6

MAP UNIT SYMBOL	SOIL TAXONOMIC CLASSIFICATION	SOIL PHASE	ACRES
624	Eutric Glossoboralfs	Sandy loam	46,451.1
625	Eutric Glossoboralfs	Moderately deep loam	10,910.3
626	Typic Haplocryalfs	Sandy loam	15,956.3
627	Typic Haplocryalfs	Moderately deep very	2,001.3
628	Typic Haplocryalfs	Fine sandy loam	1,439.6
629	Lithic Dystrudepts	Sandy loam	775.5
631	Lithic Eutroboralfs	Loam	2,384.3
633	Lithic Eutroboralfs	Fine sandy loam	1,632.7
634	Typic Ustochrepts	Moderately deep loam	6,261.3
636	Aridic Ustochrepts	Fine sandy loam	1,719.2
637	Lithic Ustochrepts	Loam	1,279.0
641	Typic Paleboralfs	Moderately deep loam	8,547.1
642	Typic Eutrochrepts	Moderately deep loam	669.7
643	Lithic Eutrochrepts	Loam	137.7
644	Typic Haplustalfs	Moderately deep loam	4,903.2
645	Typic Eutrochrepts	Moderately deep loam	89.2
655	Argic Cryoborolls	Loam	826.4
672	Typic Haplustalfs	Loam	7,868.5
673	Typic Haplustalfs	Loam	4,263.9
681	Udic Haplustalfs	Moderately deep fine sandy	912.3
Total			435,802.7

The TES includes an evaluation of soil condition, including erosion rates (current, tolerance, and potential), litter cover, and vegetative ground cover, allowing the user to classify all soils into one of four condition classes based on soil condition ratings: satisfactory, impaired, unsatisfactory or satisfactory but inherently unstable. The soil condition ratings are based on interpretations of the three primary soil functions: soil hydrologic function, soil stability and nutrient cycling.

Hydrologic function of the soil is based on indications of infiltration. Hydrologic function decreases with a loss of soil aggregate stability as evidenced by platy structure, ponding and puddling. Other indicators of soil hydrologic condition include bulk density, presence of crusting, and pore space. Soil stability is generally assessed through visual inspection of the soil surface for evidence of erosion including rills, pedestaling (i.e., plants or rock fragments elevated above surrounding soil), soil displacement, and changes to surface horizon thickness. Nutrient cycling is generally assessed by visual observation of surface litter (distribution and depth), composition and distribution of perennial vegetation, presence of coarse woody material, and root distribution within the upper mineral soil horizons.

Soil condition may vary within the same map unit across the landscape due to differences in disturbance and soil characteristics.

There are approximately 193,731 acres of soils in satisfactory condition. Most satisfactory soils have high amounts of effective ground cover that protect the soil from accelerated erosion. Effective vegetative ground cover consists of litter greater than 1.25 cm in depth plus plant basal area. Satisfactory soils occur where all three soil functions (the ability of the soil to resist erosion, infiltrate water, and recycle nutrients) are properly functioning. These soils are fully capable of supporting livestock grazing while allowing for maintenance of soil productivity when utilization guidelines are not exceeded.

Approximately 105,249 acres of soils within the Kane Ranch Allotments are currently in impaired condition. Impaired soils generally occur in pinyon-juniper woodlands, juniper-semidesert grassland transitional areas, semidesert grassland/shrublands, and in some areas affected by high severity wildfires.

Areas encroached by pinyon and juniper have reduced nutrient cycling, impaired soil hydrologic function, reduced effective vegetative ground cover, and decreased vegetative diversity. In some cases, these soils are at risk of trending toward unsatisfactory conditions due to loss of the herbaceous understory that protects soil surfaces from raindrop impact, soil particle detachment, and transport in surface runoff. As a

result, some soils in the pinyon-juniper vegetation type exhibit erosion rates and bare soil that are approaching tolerance thresholds.

Map units subjected to recent (i.e., within the last 20 years) high severity wildfire show signs of accelerated erosion. Soils in wildfire scars that are over 20 years old generally have adequate vegetative cover to protect soil surfaces from accelerated erosion and loss of soil productivity. However, more recent, large fire scars of the Warm and Bridger Knoll fires continue to exhibit impaired soil conditions through inadequate vegetative cover, and indications of minor, discontinuous sheet, rill, and gully erosion. Impaired soils are potentially capable of supporting livestock grazing under conservative allowable use while still allowing maintenance of soil productivity, which is dependent on utilization guidelines being met.

There are approximately 39,615 acres of unsatisfactory soils within the Kane Ranch Allotments. Unsatisfactory soils are assigned potential capability to support grazing, but no grazing capacity is assigned to these TES map units. Hydrologic function, soil stability, and the ability of these soils to cycle nutrients are currently unsatisfactory. Similar to impaired soils, most unsatisfactory soils are located within recent wildfire scars (i.e., wildfires that have occurred within the last 20 years), in pinyon and juniper woodlands, in grasslands encroached by pinyon and juniper, and in grasslands dominated by non-native cheatgrass (*Bromus tectorum*). Some soils within wildfire perimeters have lost portions of A horizons through sheet erosion. Rill and gully formation has also occurred in some areas, with erosion extending to the regolith in some locations. Many of these soils are trending toward an improved condition as vegetative ground cover and the associated litter has increased, thus restoring many soil ecosystem processes that are critical to healthy, stable soils. Unsatisfactory soils in pinyon and juniper woodlands and encroached grasslands are continuing to trend downward due to loss of ground cover contribution to higher soil erosion rates.

There are approximately 96,405 acres of satisfactory, but inherently unstable soils in the analysis area. Areas of satisfactory, but inherently unstable soils (portions above 40 percent slope) currently do not have the capacity to support grazing without risking loss of long-term soil productivity. Though incidental use may occur, by assigning no capacity to these soils, overall grazing capacity is reduced and adverse impacts are minimized to ensure soil conditions are maintained or improved. These soils are primarily found along escarpments, canyon walls, and side slopes of hills and knolls. Natural erosion rates of these soils often exceed the rates at which soils form.

Soil Erosion Hazard

The TES defines erosion hazard based on bare ground (complete removal of vegetation and litter). Estimates of sheet and rill erosion hazard were developed using the Universal Soil Loss Equation (USLE). The USLE predicts the long term average annual rate of soil loss from a given area based on rainfall pattern, soil type, topography, crop system and management practices. The USLE only predicts the amount of soil loss resulting from sheet and rill erosion on a single slope and does not account for additional soil loss resulting from gully, wind, or tillage erosion. While created for use in selected cropping systems, the USLE is also applicable to non-agricultural conditions such as forests and construction sites. The USLE can be used to compare soil losses from a particular area under a specific management system to "tolerable soil loss" rates. Alternative management systems and practices may also be evaluated to determine the adequacy of conservation measures in land management planning. In the Kaibab National Forest TES, a slight rating indicates that all vegetative ground cover could be removed from the site and the resulting soil loss will not exceed "tolerance" soil loss rates. A moderate rating indicates that predicted rates of soil loss will result in a reduction of site productivity if left unchecked. Conditions in moderate erosion hazard sites are such that reasonable and economically feasible mitigation measures can be applied to reduce or eliminate soil loss. A severe rating indicates that predicted rates of soil loss have a high probability of reducing site productivity before mitigation measures can be applied.

Within the project area, there are approximately 78,609 acres of soils having slight erosion hazard, 185,536 acres of soils having moderate erosion hazard, and about 171,431 acres of soils having severe erosion hazard (Table 5). Acres presented in Table 5 are for each map unit as a whole. There can be, and often are inclusions of different soil types within each TES map unit. Soils having single taxonomic classifications rarely, if ever, are mapped without including some areas of soils having other taxonomic classifications. As a result, most soils map units are comprised of the primary soil for which the unit is categorized and some soils that belong to other taxa. These latter soils are called inclusions or included soils.

Typically inclusions have properties and behavioral characteristics that are similar to those of the dominant soil or soils in the map unit, and therefore do not affect use and management. These are referred to as noncontrasting inclusions. They may or may not be noted in the map unit descriptions. Other inclusions may have properties and behavioral characteristics that deviate enough to influence use or management. These are referred to as contrasting inclusions. They generally occupy small areas and are inseparable on the soil maps due to the scale at which soils are mapped. The inclusions of contrasting soils are typically discussed in map unit descriptions. Sometimes inclusions are not mapped as they were not observed in the field. This typically occurs where soil patterns are so complex as to preclude a sufficient number of observations to identify all of the soils that occur within a given landscape.

Table 5. Predicted Soil Erosion Hazard by TEU within the Kane Ranch Allotments.

MAP UNIT	SOIL CONDITION	EROSION HAZARD	CURRENT EROSION RATE TONS/AC/YR	TOLERANCE EROSION RATE TONS/AC/YR	POTENTIAL EROSION RATE TONS/AC/YR	SLOPE (%)	ACRES
005	Satisfactory	Slight	1.2	2.7	5.7	0-15	3,007.1
009	Satisfactory	Slight	0.6	2.7	4.6	0-15	1,282.9
015	Satisfactory	Moderate	1.1	0.9	2.3	0-15	3.3
017	Impaired	Slight	1.7	2.7	3.8	0-5	17,63.6
023	Impaired	Slight	2.6	2.7	4.8	0-5	787.1
032	Impaired	Moderate	2.1	2.7	3.1	0-15	1,219.1
035	Satisfactory	Slight	0.3	2.7	3.6	0-15	607.6
154	Inherently	Severe	5.5	2.7	15.7	40-120	258.4
156	Satisfactory	Severe	2.3	2.7	43.5	40-80	3,721.0
250	Impaired	Moderate	1.1	1.8	2.0	0-15	12,772.5
251	Unsatisfactory	Severe	7.1	1.8	12.1	15-40	25,465.2
252	Inherently	Severe	9.4	2.7	15.8	40-80	32,341.2
263	Impaired	Moderate	1.4	1.8	2.0	0-15	16,501.4
264	Unsatisfactory	Moderate	5.2	1.8	12.1	15-40	10,158.7
271	Unsatisfactory	Severe	4.7	1.8	34.2	40-80	6,861.4
272	Impaired	Slight	2.0	2.7	3.8	0-15	9,150.2
273	Impaired	Moderate	2.7	2.7	9.9	15-40	18,964.0
274	Unsatisfactory	Severe	3.0	2.7	4.9	40-120	5,948.4
281	Satisfactory	Slight	1.3	2.7	2.9	0-15	250.2
293	Satisfactory	Slight	0.4	2.7	3.4	0-15	48,343.7
294	Satisfactory	Moderate	1.8	2.7	20.3	15-40	35,395.4
297	Impaired	Slight	0.4	2.7	3.4	0-15	5,957.0
298	Impaired	Moderate	1.8	2.7	20.3	15-40	7,232.2
299	Inherently	Severe	3.3	2.7	37.1	40-80	1,915.3
603	Impaired	Moderate	0.3	1.8	2.7	0-15	2,128.8
604	Impaired	Severe	0.9	1.8	16.8	15-40	1,171.7
605	Satisfactory	Slight	0.1	0.9	0.9	0-15	1,407.1
606	Satisfactory	Severe	0.7	0.9	5.6	15-40	615.9
612	Impaired	Severe	0.8	1.8	27.3	15-40	542.0
613	Satisfactory	Moderate	0.3	1.8	3.3	0-15	2,035.0
614	Satisfactory	Severe	0.9	1.8	20.9	15-40	2,966.5
615	Satisfactory	Moderate	0.3	1.8	3.3	0-15	128.8
618	Satisfactory	Not modeled	-----	-----	-----	15-40	227.3
619	Satisfactory	Moderate	0.4	2.7	4.3	0-15	8,684.5
620	Satisfactory	Moderate	2.0	1.8	14.4	15-40	4,701.5
621	Inherently	Severe	3.7	1.8	12.3	40-80	6,493.7
622	Satisfactory	Moderate	0.2	1.8	4.3		2,682.0

MAP UNIT	SOIL CONDITION	EROSION HAZARD	CURRENT EROSION RATE TONS/AC/YR	TOLERANCE EROSION RATE TONS/AC/YR	POTENTIAL EROSION RATE TONS/AC/YR	SLOPE (%)	ACRES
623	Satisfactory	Moderate	0.4	2.7	4.3	0-15	33,082.6
624	Satisfactory	Severe	1.9	2.7	34.4		46,451.1
625	Impaired	Severe	1.5	2.7	65.8		10,910.3
626	Satisfactory	Severe	1.7	2.7	19.4		15,956.3
627	Impaired	Severe	0.6	2.7	25.1		2,001.3
628	Satisfactory	Not modeled	-----	-----	-----		1,439.6
629	Satisfactory	Not modeled	-----	-----	-----		775.5
631	Impaired	Slight	0.3	1.8	0.9		2,384.3
633	Satisfactory	Severe	3.0	1.8	8.5		1,632.7
634	Impaired	Moderate	2.4	2.7	4.6		6,261.3
636	Impaired	Slight	1.2	2.7	2.1		1,719.2
637	Impaired	Slight	0.7	1.8	1.4		1,279.0
641	Satisfactory	Moderate	0.3	2.7	3.5		8,547.1
642	Impaired	Slight	0.5	2.7	2.3		669.7
643	Impaired	Severe	2.7	1.8	29.3		137.7
644	Impaired	Moderate	0.8	2.7	3.8		4,903.2
645	Unsatisfactory	Severe	9.5	1.8	29.7		89.2
655	Satisfactory	Moderate	1.1	2.7	3.5		826.4
672	Impaired	Moderate	0.9	2.7	2.9		7,868.5
673	Impaired	Not modeled	-----	-----	-----		4,263.9
681	Impaired	Severe	1.1	2.7	35.0		912.3

Hydrologic Soil Groups

Soils are classified into hydrologic soil groups (HSGs) to indicate the minimum rate of infiltration and runoff potential obtained for bare soil after prolonged wetting. This information is important to project and watershed planning since runoff determines, to a large extent, the flood hazard, the character and amount of stream flow, and the hazard of erosion from rainwater and snowmelt. The HSG designations are A, B, C and D, and are defined by Natural Resources Conservation Service (NRCS) as follows: Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 0.30 in/hr). Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr). Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05-0.15 in/hr). Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0-0.05 in/hr). The Soil and Water Specialist Report (2013) lists the HSGs for soils that occur within the project area and their associated acreages. This report also displays the location and extent of soils by their associated HSGs. For the analysis area, approximately 1% (114 acres) of the soils are in hydrologic soils group A; 26% (4,618 acres) are in hydrologic soils group B; 61% (10,811 acres) are in hydrologic soils group C; and 12% (2,119 acres) are in hydrologic soils group D.

Soil Organisms

Knowledge of specific fungal, bacterial, and arthropod populations is not available for analysis in this project. Biological soil crusts, commonly found in arid or semi-arid environments (USDA NRCS 1997) are known to exist in the Kane Ranch Allotment. Cryptogamic crusts have been identified in the same ecosystems as those found in the analysis area, including mixed conifer forests and pinyon-juniper woodlands (Beymer and Klopatek 1992). Biological soil crusts are common on arid, sandy soils with high gravel content.

In arid and semi-arid native vegetation communities, plants often exhibit patchy distributions that result in discontinuous fuel conditions and mosaics of fire intensities (Whisenant 1990). Biological soil crusts do not provide adequate fuel to carry a fire through interspaces, thereby serving as “refugia” to decrease the spread of fire and its intensity (Rosentreter 1986). The remaining unburned islands of vascular vegetation and biological soil crust provide propagules for reestablishment in burned areas. Johansen (1993) observed that the structural matrix of soil biological crusts remained intact following low-intensity fire, indicating that lightly burned crusts still function to provide stability against erosive forces.

Populations of other soil organisms include mycorrhizal fungi, soil-dwelling arthropods, gastropods, nematodes and bacteria. All of these types of organisms are expected to occur in soils throughout the Kane Ranch Allotments.

Revegetation Potential

Revegetation potential refers to the probable success and ease in the establishment of native grasses. This potential rating is influenced by climate, soil characteristics, and slope. The rating system is based on use of a rangeland drill, broadcast seeder (hand held), and aerial seeding with no consideration for site preparation (removal of trees, etc.).

A low or moderate rating alerts the land manager to potential limitations for successful artificial revegetation of an area. Soils associated with a "high" rating offer the best opportunity for success. The udic/frigid combination offers the optimum soil climate for establishment of vegetation. Conversely, the aridic/thermic combination offers the most limiting soil climate for the establishment of vegetation. It is important to note that soil potentials correspond to no site preparation or removal of trees. It is very likely that natural revegetation potentials would be higher than these values following vegetation treatments since soil moisture and light penetration to the forest floor would be increased. Practices that minimize soil disturbance such as churning of soil profiles would preserve native seed banks, thus improving natural revegetation. A table of revegetation potential for the analysis area is given in the Soil and Water Specialist Report (2013).

Roads

Currently, National Forest System roads within the analysis area occupy approximately 2,895 miles or 4,210 acres based on an average road width of 12 feet. In addition to National Forest System, non-system roads occur within the analysis area. Most of these roads are the result of indiscriminate, unauthorized route proliferation caused by dispersed camping, hunting, fuelwood gathering, and similar activities. The North Kaibab Ranger District recently issued a Decision Notice (DN) and Finding of No Significant Impact (FONSI) for the North Kaibab Ranger District Travel Management Project, which was upheld by the regional office following an appeal. If implemented, The selected alternative would result in a designated road system on the North Kaibab Ranger District of approximately 1,476 miles of roads open to motor vehicle use by the public, including the 16 miles of short road segments to be added. Thirty-nine miles of road (not included in the total miles mentioned above) will be restricted to administrative use only and closed to the public except by permit, allowing limited use for administrative purposes such as continued administration of range permits and timber sale contracts. Approximately 337 miles of existing Forest Service road will be closed.

System roads convert productive soils to an essentially non-productive condition in the long-term (i.e., greater than fifty years). Most of the precipitation that falls on the compacted surfaces becomes surface runoff. Implementation of effective Best Management Practices (BMPs) and Soil and Water Conservation Practices (SWCPs) as outlined in Forest Service Handbook 2509.22 during road construction and maintenance activities facilitates road drying, redirects surface runoff onto undisturbed areas of the forest floor, and prevents runoff from entering watercourses.

Watershed

The Kane Ranch Allotments occupy portions of 38 sixth-level (HUC12) hydrologic units or subwatersheds as shown in Table 10. A watershed condition assessment was conducted in 2010 for all subwatersheds in the project area as part of a Forest-level assessment of watershed condition. This assessment is used to: 1) prioritize watersheds for restoration, 2) identify specific on-the-ground activities and the associated costs to maintain or improve watershed condition, and 3) manage the data appropriately. Watershed conditions for the subwatersheds in the Kane Ranch Allotments analysis area were classified using a core set of national watershed condition indicators that were updated with local data and interpreted by Forest interdisciplinary (ID) teams. These indicators were grouped according to four major ecosystem process categories: (1) aquatic physical; (2) aquatic biological; (3) terrestrial physical; and (4) terrestrial biological. These categories represent terrestrial, riparian, and riverine ecosystem processes or mechanisms by which management actions can affect the condition of watersheds and associated resources. Each indicator was evaluated using a defined set of attributes whereby each attribute was scored by the Forest interdisciplinary team as GOOD (1), FAIR (2), or POOR (3) using written criteria and rule sets and the best available data and professional judgment. Attribute scores for each indicator were summed and averaged to produce an overall indicator score. The indicator scores for each ecosystem process category were then averaged to arrive at a process category score. The overall watershed condition score is computed as a weighted average of the four process category scores based on the relative contribution that each process category provides toward watershed condition. The watershed condition scores are tracked to one decimal point and reported as Watershed Condition Classes 1, 2, or 3. Class 1 scores are from 1 to 1.6 and represent good, or properly functioning condition; class 2 scores are from 1.7-2.2 and represent fair or functioning at risk condition, and class 3 scores are from 2.3-3.0 and represent poor or impaired function condition (Potyondy and Geier 2011).

Twelve core watershed condition indicators were evaluated for the watersheds in the project area. Aquatic physical indicators included: 1) water quality condition, 2) water quantity (flow regime) condition, and 3) stream and habitat condition. Aquatic biological indicators included: 4) aquatic biota condition and 5) riparian vegetation condition. Terrestrial physical indicators included: 6) road and trail condition, and 7) soil condition. Terrestrial biological indicators included: 8) fire effect and regime condition, 9) forest cover condition, 10) rangeland, grassland and open area condition, 11) terrestrial non-native invasive species condition, and 12) forest health condition. A summary of watershed conditions for the all watersheds in the Kane Ranch Allotments analysis area is included in Table 6 and 7.

Water Resources

Streamcourses

The Kane Ranch Allotments analysis area has a dendritic drainage pattern dominated by ephemeral and intermittent drainages. The majority of drainages have medium to low gradient channel characteristics, although some high gradient channels exist as canyon headwaters or initiating from the upper slopes of steep hills and knolls. Approximately 1,658 miles of streamcourses occur within the analysis area, with only North Canyon Wash and headwater canyons of Kanab Creek having riparian reaches. The only perennial stream reach within the Kane Ranch Allotments is located in the Upper North Canyon Wash subwatershed (HUC12) of the North Canyon Wash watershed (HUC10) of the Lower Colorado-Marble Canyon sub-basin (HUC8). The historic flow ranged from one to six miles, depending on precipitation, before becoming subsurface flow. Current riparian conditions are thought to be near historic conditions with a wide variety of riparian species present.

The Forest Service, in cooperation with the AGFD completed repair and replacement of log drop and other fish habitat structures in North Canyon Creek in 2010. This project has helped protect a genetically pure population of Apache trout (*Oncorhynchus apache*) by rehabilitating pools that provide winter habitat and refugia in times of stream dewatering from limited precipitation. The project was completed in the lower to mid portion of North Canyon Creek below North Canyon Spring in the Saddle Mountain

Wilderness. This stream channel is currently classified in good condition and is not diverted for other uses.

A list of stream reaches with associated reach codes and lengths are included in the project record.

Livestock Waters, Wetlands, and Springs

There are 246 livestock ponds, reservoirs, and natural waters within the Kane Ranch Allotments analysis area that impound water for a sufficient duration to support livestock and wildlife needs. Some waterbodies impound water for sufficient duration to exhibit wetland characteristics or support hydrophytic vegetation. It should be understood that the majority of water resources within the Kane Ranch Allotments analysis area are excavated, diked, or otherwise impounded bodies of water that were initially developed for the purpose of providing water for domestic livestock and wildlife. They were not intended to serve as functioning wetland habitats, and most do not. A list of natural and developed waters in the Kane Ranch Allotments analysis area and available condition information are included in the Soil and Watershed Specialist Report (2013).

Table 6. Subwatershed (HUC12) names, hydrologic unit codes, condition ratings, total watershed acreages, and watershed acreages occupied by Kane Ranch Allotments.

WATERSHED NAME	HYDROLOGIC UNIT CODE (HUC12)	CONDITION RATING	WATERSHED ACRES	PROJECT AREA ACRES
Bright Angel Creek	150100010608	1.0	24,226.0	6.2
Buck Farm Canyon-Colorado River	150100010504	2.0	21,279.6	1,262.3
Cane Canyon	150100010106	2.0	33,873.2	19,460.4
Castle Canyon	150100010106	2.0	11,184.6	11,170.5
Chamberlain Canyon-Kanab Creek	150100031004	2.0	38,346.2	1,744.7
Deer Creek	150100020206	1.0	10,797.4	1,674.7
Fence Canyon	150100010405	1.0	18,327.0	8,829.3
Flint Creek	150100020106	1.0	16,621.5	1,122.9
House Rock Canyon-House Rock Wash	150100010103	2.0	33,047.9	663.6
Hundred and Forty Mile Canyon-Colo.	150100020207	1.0	25,004.7	5.7
Indian Hollow	150100031002	2.0	32,706.5	27,245.6
Jacob Canyon	150100030406	2.0	32,448.3	408.1
Jumpup Canyon	150100031003	2.0	36,919.8	29,817.0
Little Spring Canyon-Kanab Creek	150100030906	2.0	20,748.3	11,269.2
Lookout Lakes	150100030702	2.0	38,761.2	38,716.3
Lower North Canyon Wash	150100010205	1.0	28,614.4	417.5
Middle North Canyon Wash	150100010204	1.0	17,124.4	8,458.7
Moquitch Canyon	150100010204	2.0	16,296.4	16,275.2
Nail Canyon	150100030705	2.0	17,625.5	17,132.4
Nankoweap Creek	150100010505	1.0	20,936.6	16.8
Pasture Canyon	150100010102	1.0	23,319.9	11,875.0
Pigeon Canyon-Snake Gulch	150100030707	2.0	40,164.1	18,312.5
Pleasant Valley Outlet	150100010203	2.0	16,235.1	14,038.6
Rock Canyon	150100010104	2.0	24,761.8	20,432.7
Rock Canyon	150100030205	2.0	66,690.8	9565.7
Saddle Canyon	150100020203	2.0	25,637.4	14,966.5
Saddle Canyon-Colorado River	150100010506	1.0	20,977.5	219.0
Seegmiller Canyon-House Rock Wash	150100010107	1.0	24,313.3	3,702.4
Shinumo Creek (Local Drainage)	150100020108	2.0	29,028.9	4,017.1
Slide Canyon	150100030706	2.0	25,906.4	25,036.5
South Canyon	150100010406	2.0	28,878.7	5,124.9
Sowats Canyon	150100031001	2.0	39,609.0	33,220.5
Tapeats Creek	150100020204	2.0	27,839.1	15,060.7
Tater Canyon	150100010201	2.0	23,222.7	22,649.3
The Transept	150100010606	1.0	19,338.9	230.9
Trail Canyon	150100010101	2.0	11,619.6	3,560.0
Upper North Canyon Wash	150100010202	2.0	15,679.0	14,013.6
Warm Springs Canyon	150100030704	2.0	29,435.1	24,138.2
Total			962,785.1	435,861.2

Table 7 below provides a summary by watershed of indicator ratings that resulted in the corresponding watershed condition rating found in Table 6.

Table 7. Watershed condition indicator summary for watersheds that occur in the Kane Ranch Allotments analysis area.

Subwatershed Name	Watershed Condition Summary
Bright Angel Wash	Fire regime departed from reference condition; low road maintenance; many roads near water courses; high risk of insect and disease.
Buck Farm Canyon-Colorado River	Moderate to high burn severity - Outlet Fire 2000; fire regime departed from reference condition; high road density; low road maintenance; many roads near water courses.
Cane Canyon	Reduced flows to springs and riparian areas (3 springs; 109 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance.
Castle Canyon	Fire regime departed from reference condition; high road density; low road maintenance; many tanks present; high insect and disease risk.
Chamberlain Canyon-Kanab Creek	Unsatisfactory soils in watershed; reduced flows to springs and riparian areas (2 springs and 308 acres of riparian habitat); fire regime departed from reference condition; low road maintenance.
Deer Creek	Fire regime departed from reference condition; low road maintenance.
Fence Canyon	Low road maintenance.
Flint Creek	Fire regime departed from reference condition; low road maintenance; high insect and disease risk.
Gann Tank	Low road maintenance; many roads near water courses.
Garden Tank-Partrid	Unsatisfactory soils in watershed; low road maintenance; cinder pits and quarries.
Garland Prairie	Reduced flows to springs (5 springs); high road density; low road maintenance; septic systems present; many tanks; 8 wells present.
Government Prairie	Reduced flows to springs (2 springs); high road density; low road maintenance; septic systems present; many tanks and 1 well present; high insect and disease risk.
Hancock Spring-House Rock Wash	Unsatisfactory soils in watershed; low road maintenance.
Heather Wash	Low road maintenance; many roads near water courses.
Hidden Lake	Moderate to high burn severity - Hidden Fire 2001; low road maintenance.
House Rock C. Wash	Unsatisfactory soils in watershed; fire regime departed from reference condition; low road maintenance.
Indian Hollow	Reduced flows to springs and riparian areas (4 springs; 4 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance; many tanks present.
Jacob Canyon	Fire regime departed from reference condition; high road density; low road maintenance; many tanks and 1 well.
Jumpup Canyon	Moderate to high burn severity - Bridger Knoll Fire 1996; reduced flows to springs and riparian areas (4 springs; 73 acres of riparian habitat); fire regime departed from reference condition; low road maintenance; many tanks present; high noxious weeds infestation (Scotch thistle)
Little Spring Canyon-Kanab Creek	Unsatisfactory soils in watershed; reduced flows to springs and riparian areas (3 springs; 509 acres of riparian habitat); fire regime departed from reference condition; low road maintenance; many roads near water courses.
Lookout Lakes	Reduced flows to springs and riparian areas (3 springs and 30 acres of riparian habitat); high road density; low road maintenance; many tanks present; high insect and disease risk.
Lower North Canyon	Fire regime departed from reference condition; low road maintenance; many roads near water courses.
Middle North Wash	Low road maintenance.
Moquitch Canyon	Moderate to high burn severity - Warm Fire 2006; Reduced flows to springs and riparian areas (1 spring and 8 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance; many tanks present.
Nail Canyon	Moderate to high burn severity - Warm Fire 2006; reduced flows to springs and riparian areas (10 springs; 24 acres of riparian habitat); high road density; low road maintenance; many tanks present; high noxious weed infestation (cheatgrass).
Pasture Canyon	Unsatisfactory soils in watershed; fire regime departed; low road maintenance; high insect and disease risk.
Pigeon Canyon-Snake Gulch	Reduced flows to springs and riparian areas (7 springs; 183 ac. of riparian habitat); fire regime departed from reference condition; low road maintenance.
Pleasant Valley Outlet	High road density.
Rock Canyon	Moderate to high burn severity - Warm Fire 2006; reduced flows to springs and riparian areas (2 springs and 35 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance; many tanks present.
Rock Canyon	Fire regime departed from reference condition; low road maintenance; many tanks present; high insect and disease.
Saddle Canyon	Reduced flows to springs and riparian areas (5 springs); fire regime departed from reference condition.; high road density; low road maintenance; many tanks present.
Saddle Canyon-Colo.	Moderate to high burn severity - Outlet Fire 2000; low road maintenance; septic systems present.
Seegmiller-House Rock Wash	Unsatisfactory soils in watershed; fire regime departed from reference condition; low road maintenance.
Shinumo Creek	Fire regime departed from reference condition; low road maintenance.
Slide Canyon	Moderate to high burn severity - Bridger Knoll Fire 1996; Slide Fire 2007; reduced flows to springs and riparian areas (4 springs; 84 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance; high noxious weeds infestation.
South Canyon	Fire regime departed from reference condition; low road maintenance.

Subwatershed Name	Watershed Condition Summary
Sowats Canyon	Moderate to high burn severity - Bridger Knoll Fire 1996; reduced flows to springs and riparian areas (15 springs; 129 acres of riparian habitat); fire regime departed from reference condition; high road density; low road maintenance; many tanks present;
Tapeats Creek	Reduced flows to springs (7 springs); fire regime departed from reference condition; high road density; low road maintenance; many tanks present.
Tater Canyon	Moderate to high burn severity - Point Fire 1993; reduced flows to springs and riparian areas (3 springs; 15 acres of riparian habitat); high road density; low road maintenance; many tanks; 1 well.
Trail Canyon	Moderate to high burn severity - Warm Fire 2006; fire regime departed from reference condition; high road density; low road maintenance; many tanks present.
Upper North Canyon Wash	Reduced flows to springs and riparian areas (3 springs; 34 acres of riparian habitat); fire regime departed from reference condition; low road maintenance.
Warm Springs Canyon	Reduced flows to springs and riparian areas (2 springs; 17 acres of riparian habitat); fire regime departed from reference condition; many tanks present.

There are at least one hundred eighteen natural springs or seeps known to occur on the allotments. At least forty of these springs are in pristine condition, with no evidence of livestock use. This is generally due to steep terrain or dense forest vegetation that precludes access by livestock. Forty-seven springs occur in the Kanab Creek Allotment, of which twenty-seven are in pristine condition due to inaccessibility to livestock. There are at least 22 additional springs throughout the allotments that are inaccessible to livestock due to enclosure fencing, steep terrain, or dense forest vegetation, but have been developed to provide water for livestock and human use (i.e., spring flow has been captured and diverted to troughs, tanks, or other offsite locations). Approximately 12 springs have been adversely affected by livestock and wildlife grazing, browsing, and trampling due to enclosure fences that are in disrepair or lack of enclosure fencing altogether. Additional known and unknown seeps and springs are likely to occur across the allotments that may have no to minimal livestock access.

Flood Zones

Flood zones are geographic areas defined by the Federal Emergency Management Agency (FEMA) according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. Since there are no large communities within the Kane Ranch Allotments analysis area, there are no designated FEMA flood zones. However, flash flood hazard areas exist within the Allotments. These are generally restricted to stream channels and associated floodplains.

Water Quality

Section 305(b) of the Clean Water Act requires states to assess and report on the water quality status of waters within the states. Section 303(d) requires states to list waters that are not attaining water quality standards. This is also known as the list of impaired waters. This information is reported to Congress on a nationwide basis. Arizona Department of Environmental Quality is responsible for conducting monitoring, assessment, reporting under CWA Sections 303(d) and 305(b), and TMDL development for the State of Arizona.

Water quality data are available for many of the perennial and intermittent flowing springs in the Kane Ranch Allotments. These data were collected by the SSI during recent spring assessments. Surface water quality data for springs that were inventoried and assessed using the SEAP protocol are included in the project record.

As previously noted, North Canyon Wash is one of two perennial streams on the North Kaibab, and it provides habitat for the threatened Apache trout. Water quality monitoring in North Canyon Wash includes an aquatic ecosystem inventory and analysis of North Canyon Creek, completed in 1990, and water quality data for three springs (Upper, Middle, and Lower) in North Canyon Wash. The aquatic ecosystem inventory included sampling macroinvertebrates, measuring physical stream characteristics and collecting water quality parameters. The results of the inventory and analysis indicate that North Canyon Creek is in good condition with regard to water quality, although sampling indicated that the

macroinvertebrate community had low diversity, which could be an indicator of instability in the ecological system. A copy of the Aquatic Ecosystem Survey macroinvertebrate report is included in the Soil and Watershed Specialist Report (2013). Springs assessment reports, including water quality data for springs in North Canyon Wash are also found in this report (2013). The findings of the springs assessment indicate that water quality was very good and habitat conditions were very good to excellent with few indications of human influence. Since cattle are excluded from the Saddle Mountain Wilderness and the nearest fence is approximately four miles from Upper North Canyon Spring, it is very unlikely that livestock grazing in the Central Summer Allotment would adversely affect water quality in the Saddle Mountain Wilderness. The springs that issue in North Canyon Wash are approximately 0.25 miles from the Wilderness boundary.

No water bodies are listed as impaired within the Kane Ranch Allotments or the North Kaibab Ranger District on the Arizona 2006/2008 Impaired Waters List.

Air Quality

The Kane Ranch Allotments are not located within an air quality Non-Attainment Area designated by the Arizona Department of Environmental Quality (ADEQ 2004). The closest Non-Attainment Areas are the Bullhead City Area for PM10 (particulate matter), Payson for PM10, and the Phoenix Area for PM10 and ozone.

The Regional Haze Rule (40 CFR 51.309(d)(7)) requires states to assess and reduce pollutants that cause haze in order to improve visibility in Class I Airsheds, including GCNP. The Regional Haze State Implementation Plan for the State of Arizona from December 23, 2003 states that “road dust is not a measurable contributor on a regional level to visibility impairment in the 16 Class I areas. Due to this finding, no additional road dust control strategies are needed...” The Plan also states that the State of Arizona will “perform further assessments of road dust impacts on visibility. Based on these assessments, if road dust emissions are determined to be a significant contributor to visibility impairment, the State of Arizona commits to implement emissions management strategies...”

The Arizona Department of Environmental Quality does not require the KNF to minimize fugitive dust from road use, range improvement construction and maintenance, or grazing allotment management.

ADEQ's Air Quality Division implements a Smoke Management Plan that works toward a reduction in smoke impacts due to prescribed/controlled burning of nonagricultural fuels with particular regard to heavy forest fuels. All state lands, parks and forests, as well as any federally managed lands in Arizona, are under the jurisdiction of ADEQ in matters relating to air pollution from prescribed burning.

Effects Analysis (Direct and Indirect)

Soil Erosion rates were modeled using the Rangeland Hydrology and Erosion Model (RHEM) web tool. Individual TES map units were modeled to determine the soil loss and sediment yield response under the Proposed Action, Current Management, and No Grazing Alternatives. Input parameters included climate station data from CLIGEN, the soil texture class of the upper 4 cm of soil, slope characteristics (i.e., length, shape, and steepness), and cover characteristics (i.e., percent canopy cover, basal area, rock cover, and litter cover).

Two soil and water effects tables are presented in the Soil and Water Specialist Report (2013) that 1) provides a comparative summary of direct and indirect effects to soils and watershed resources by alternative for the Kane Ranch Grazing Allotments Renewal EA, and 2) provides the RHEM modeled erosion and sediment delivery rates for each TES unit under each alternative.

Alternative 1

Potential direct effects of livestock grazing to soils and water resources include: 1) reduction of vegetative canopy cover that protects soil surfaces from raindrop impact and soil particle detachment; 2) reduction of

vegetative ground cover that provides soil stability and prevents entrainment of soil particles in surface runoff; 3) reduction in the surface litter component that otherwise protects soil surfaces from raindrop impact, contributes to nutrient cycling, improves soil moisture retention, and provides habitat/refugia for soil organisms; 4) increased bare mineral soil that is subject to raindrop impact; soil compaction and displacement; 5) degradation of surface water quality in livestock and wildlife waters; and 6) destabilization of ephemeral and intermittent streambanks.

Potential indirect effects of livestock grazing to soils and water resources include: 1) loss of long term soil productivity, and 2) degradation of downstream surface water quality through increased sediment delivery to streamcourses and water bodies and increased nutrient concentrations in surface waters.

Under the Proposed Action, conservative utilization (i.e., 30-40 percent) would be implemented across the three Kane Ranch Allotments. While this represents an increase in utilization of each pasture in the Allotments, it would continue to be a conservative level of use and is based on utilization of grasses and forbs, and not browse species. This alternative incorporates adaptive management through AUM utilization limits, pasture duration of use limits, limits to the number of livestock in a given pasture, and research to inform future management actions. Although utilization above conservative use would be allowed for restoration research purposes, the stocking rate has been established to ensure conservative use during years of below-average moisture. This alternative also provides improved flexibility in adaptive management of grazing resources to changes in resource conditions beyond those caused by livestock grazing. As a result, adverse impacts to soils and watershed resources would be minimized under the Proposed Action.

Since the Proposed Action provides flexibility that limits livestock as a vector for introduction or relocation of invasive or noxious weeds, particularly cheatgrass (*Bromus tectorum*), it provides better protection of native plant communities that are important for maintaining soil productivity. Native plant communities contribute to improved soil ecological function through perennial rooted vegetation that improve soil stability, provide habitat/refugia for native soil organisms, and improve nutrient cycling. Soil stability has a direct relationship with sediment delivery to streamcourses and waterbodies.

The Proposed Action would improve rest and deferment options for the Central Summer and Kane Allotments through installation of a fence along Highway 67 that would divide the North Summer pasture into the Northwest and Northeast pastures. This action would prevent cattle from congregating in the northwest portion of the North Pasture as they currently do. Soil disturbance and compaction caused by livestock trampling would be reduced. Also, reduction of vegetative cover through intensive grazing would be minimized. As a result, soil conditions would likely improve in the North Pasture.

Since livestock already congregate throughout the grazing season in areas where holding pastures are proposed, improvement in soils and watershed resources are expected since holding pasture fences would serve as enclosures for most of the year, except during pasture moves.

Dividing the North Pasture and installing holding pastures would improve the permittee's ability to implement pasture moves in a timely manner, thereby minimizing the actual AUM's utilized in each pasture. By minimizing AUMs used on a per-pasture basis, vegetative ground cover is expected to improve over time.

Prior to 1998, the stocking level of the Central Summer Allotment was approximately 1,100 head of cattle with a static vegetation trend. The proposed stocking rate under this alternative is initially 600 head, with an option to increase livestock numbers to 1,000 if vegetation conditions improve. If vegetation trends remain static, then the stocking rate would remain at 600. Livestock numbers may be reduced if a declining trend is observed. This adaptive management approach would ensure that soils and watershed resources are not subject to degradation as a result of livestock grazing.

Further improvement of soils and watershed resources would be realized as a result of the additional pasture in the Central Summer Allotment. Currently, with only two pastures, a multi-year rest for one

pasture means the other must be grazed for multiple seasons. The Proposed Action would allow a pasture to be grazed while the remaining two pastures are either rested or placed in deferment system. There would therefore be no long term reduction of soil vegetative cover in the Central Summer Allotment under this alternative. The Proposed Action further ensures that stocking and utilization levels in the Central Summer Allotment are based on rangeland ecological trends and conditions.

The only notable change from Current Management in the Kane Allotment would be the added option of using the Kane Trail for moving livestock. The Kane Trail would be used for a few days in late spring for moving livestock to their summer range. The Trail is currently in a somewhat compacted condition with sparse vegetative cover, so adverse effects to the trail would be minimal. Monitoring and coordination with the permittee would ensure that any observed increase in soil displacement, erosion, or sediment delivery to ephemeral drainages could be addressed in a timely manner through implementation of BMPs and SWCPs to protect soil resources and surface water quality.

Excluding livestock from Bear, Cougar, Indian, and Wall Lakes would improve water quality and increase riparian vegetation in transition zones around these lakes.

Restoring and protecting springs would improve water quality and ecosystem function of the springs proposed for protection and restoration.

The Proposed Action provides an opportunity to improve soils and watershed resources within the Kane Ranch Allotments in a manner that is compatible with grazing use. It also meets the purpose and need of maintaining and/or improving vegetation, soil, and water resources conditions within the Kane Ranch Allotments. Improved soil conditions lead to improved watershed conditions, and thus this alternative would move towards the Forest Plan guidance of improving watershed condition by 2020 at a faster rate than the other alternatives, although, if drought conditions persist or increase, such improvement may not be fully attained by 2020.

Alternative 2

Potential direct and indirect effects to soils and watershed resources would be the same as those outlined for the Proposed Action. The Current Management alternative would continue the same management strategy implemented in 2001. Soils and watershed conditions would therefore be expected to remain static under this alternative. Under Current Management, there would be no research to guide future management decisions toward improving rangeland ecological conditions. Management practices intended to improve rangeland conditions through multi-year pasture rests that improve vegetative cover, controlling invasive cheatgrass that damages soils and watershed resources through increased fire frequency, and improved understanding of the most appropriate timing, frequency, and distribution of livestock grazing necessary to improve vegetation, soils and watershed resources would not occur under Current Management.

Water quality and riparian habitats would remain static or improve only slightly under Current Management. Proposed livestock exclosures for Bear, Cougar, Indian, and Wall Lakes would not be constructed under Current Management.

In the absence of active herding, livestock would likely continue to congregate in preferred areas of the Central Summer Allotment, causing continued minor soil disturbance, displacement, and erosion.

Under Current Management, there would be less opportunity to implement adaptive management strategies to protect soils and watershed resources when large scale disturbances such as wildfire or prolonged drought occur since there would be fewer pastures in the system.

Alternative 2 would continue to include implementation of adaptive management strategies, which allows the KNF to adjust the timing, duration and frequency of livestock grazing, as well as livestock numbers. If adjustments are warranted, they are implemented through the Annual Operating Instructions (AOI) to ensure that livestock use is consistent with current soil productivity and rangeland conditions. Adaptive

management is the mechanism which ensures the maintenance and/or improvement of vegetation, soils and watershed conditions that provide for ecosystem stability and resilience while allowing livestock grazing to occur on Forest Service lands.

Alternative 2 meets the purpose and need of maintaining and/or improving vegetation and soil conditions because it ensures the monitoring of livestock grazing impacts on vegetation, soils, and water resources therefore providing information to invoke adaptive management when warranted.

Alternative 3

As previously noted, the No Action Alternative would mean livestock grazing on the Kane Ranch Allotments would no longer be authorized. This alternative would not preclude livestock grazing on this allotment in the future following a separate analysis of the environmental effects and a decision made by the Responsible Official to resume livestock grazing.

Under the No Action Alternative, direct and indirect effects of cattle grazing would be eliminated. Range conditions may improve in some areas, although some portions the Central Winter Allotment (i.e., Slide, Ranger Pass, and Sowats) have received limited grazing impact, yet soils and watershed conditions are less than satisfactory as a result of wildfires and spread of invasive and noxious weeds. The amount and probability of increased effective ground cover would depend on precipitation patterns and wildlife utilization. This statement would only be true in areas of the allotment where soil and watershed conditions are being impacted by livestock use and would not apply to areas where impaired soils are the result of encroachment by pinyon, and juniper trees, which inhibit development of understory herbaceous vegetative communities, where wildfires damage soils and watershed resources, and where invasive and noxious weeds threaten native plant communities.

Eliminating grazing on the Kane Ranch Allotment would also eliminate use of existing livestock waters by cattle. A direct effect would be decreased soil disturbance around existing stock tanks. Livestock have been shown to degrade water quality in stock tanks when access is not controlled (Davis 2011, Pfof and Fulhage 2001). Wildlife use would continue as a source of shoreline disturbance of natural and manmade waters. Overall, shoreline stability and surface water quality in existing livestock waters would be expected to improve in the short term. However, the No Action Alternative does not provide for ongoing maintenance of livestock and wildlife waters. Therefore, a long term indirect effect would be reduced water availability for wildlife consumption as earthen tanks, which are currently maintained, fill with sediments.

Alternative 3 meets the purpose and need of maintaining and/or improving soil and watershed conditions through elimination of adverse direct and indirect effects of livestock grazing on vegetation, soils, and water quality. However, the No Action Alternative does not address the need to control cheatgrass in the Kane Ranch Allotments as well as the other two action alternatives (i.e., the Proposed Action or the current action) as it does not include research on grazing as it relates to control of cheatgrass. Thus, there is a potential for the cheatgrass infestation to increase in size under this alternative, further impairing soil function on affected TES map units.

Cumulative Effects

Cumulative effects include the impacts on the environment which result 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 action (40 CFR § 1508.7). The geographic setting for the cumulative effects analysis for soils and watersheds includes all of the 6th-level (HUC12) hydrologic unit subwatersheds where the Kane Ranch Allotments occurs, which comprises approximately 108,600 acres. The timeframe for past actions is 20 years, based on soil productivity, watershed condition, and vegetative response. Surface disturbing activities that are older than 20 years are assumed to be contributing negligible or no measurable cumulative effect within the analysis area.

Following is a partial listing of actions considered in the cumulative effects analysis for this project: 1) activities such as vegetation management, fuels management, noxious weeds treatments, and recreational activities have occurred in the past, are occurring, and are reasonably foreseeable actions on the North Kaibab Ranger District. These activities could occur on private lands as well; 2) firewood cutting has occurred in the past and would likely continue in the foreseeable future on the District and private lands within watersheds that include the Kane Ranch Allotments; and 3) road construction, maintenance and right-of-way clearing can be expected to continue on non-National Forest System land. Road use and maintenance would continue on National Forest System lands. Travel Management Rule will be implemented.

Vegetation Treatments and Timber Harvesting

Vegetation management projects such as forest thinning and fuelwood gathering reduce overstory cover in the short-term but typically result in an increase in understory vegetation within three to five years following treatment. These projects would also cause an initial increase in soil organic matter in the form of residual woody debris from tree harvesting activities that prevents soil erosion by improving surface roughness and ground cover and improves nutrient cycling. As native grasses and forbs increase in numbers, fine root material would contribute to soil organic matter accumulation, improve soil aggregate stability and soil porosity, protect soil surfaces from erosion by wind and rain, and sequester organic carbon. Reduction of tree canopy and fuel loads would reduce the threat of high severity wildfire that could remove plant and litter cover, consume soil seed bank, sterilize soils, create erosion and flooding hazards, and degrade soil productivity.

Project objectives are typically designed to improve forest health by thinning overstocked stands and reducing the potential for high severity wildfire. These activities may require the use of logging machinery with potential to disturb soils. Overall, forest thinning improves tree vigor, increases the diversity, distribution, and amount of herbaceous understory vegetation (including effective vegetative ground cover), and reduces the risk of uncharacteristic wildfire. Effects on soil productivity and stability are common to all tree harvest/removal activities, but vary by silvicultural treatments, fuel treatments, and acres treated. Effects are generally related to roads, skid trails, log landings and burn piles resulting in varying degrees of soil displacement, compaction, and soil loss due to short-term reduction or complete removal of vegetative ground cover. Adequate vegetative ground cover is the primary component that protects the soil from accelerated erosion.

It is assumed that between harvest and fuel reduction treatment activities, every acre in each proposed treatment unit would be affected. Therefore, the total acreage is assumed to be at risk for some level of soil disturbance. The risk of accelerated erosion from soil disturbance is expected to last until vegetative ground cover is sufficient to protect soil surfaces, which typically occurs within 3 to 5 years after fuel reduction treatments are completed. It is important that the reader understand that not all soil disturbance is detrimental. For example, a low severity prescribed fire disturbs soils by partially consuming and redistributing the surface organic fraction. This changes short term carbon-nitrogen ratios and increases available short term nutrient supplies, resulting in increased understory response which in turn provides improved protection of soils from erosion by wind and rain.

By identifying and implementing site-specific BMPs and SWCPs prior to and during project implementation, adverse effects to soils and watershed resources are minimized and are generally short term (3 to 5 years). Best Management Practices are designed to maintain soil productivity and surface water quality by minimizing soil loss and associated sediment delivery to waterbodies.

When combined with vegetation treatments and timber harvests, all alternatives, including the No Action Alternative would result in improved soils and watershed conditions over the long term by increasing protective vegetative ground cover in treated areas.

Recreational Activities

Recreational activities common to the North Kaibab Ranger District and likely to occur within the Kane Ranch Allotments include: hiking, viewing wildlife, hunting, dispersed car-camping, backpack camping, orienteering, horseback riding, photography, picnicking, taking scenic drives, ORV/ATV use, bicycling, shooting, and gathering in family or social groups. The project area is part of the AGFD's Game Management Units 12AE and 12AW, and is popular for hunting turkey, mule deer, blue grouse, Kaibab squirrel, and mountain lion. dispersed camping, ORV/ATV use, firewood collection and Christmas tree cutting have the greatest potential to result in adverse cumulative effects to soils through compaction, puddling, erosion, and displacement. These conditions would be limited to areas where such activities take place. Since the Proposed Action provides the most effective means of improving vegetative ground cover, it would also provide the least adverse cumulative effects to soils and watershed conditions when combined with recreational activities. The No Grazing Alternative would also improve vegetative ground cover in some areas while cheatgrass infested areas would likely persist, increasing the risk of wildfire in infested areas. Current Management would likely result in cumulative effects to soils and watershed conditions that are static to slowly improving.

Invasive and Noxious Weeds

The cumulative effect of the increased risk of spread on noxious weeds on soil productivity can only be described in general terms because of the large number of unknown factors. Areas where soil disturbance includes compaction, displacement, erosion, and excessive heating are at the greatest risk of invasion by noxious weeds. These include livestock watering areas, corrals, infrequently used roads, and areas where invasive or noxious weeds currently exist. Monitoring of these areas for the presence of invasive and noxious weeds and treating observed populations in a timely manner would mitigate these adverse effects. To minimize cumulative adverse effects if invasive and noxious weeds, observed infestations would be managed in accordance with the "*Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona*" (USDA Forest Service. 2005). The Proposed Action includes research activities designed to better understand cheatgrass as it relates to livestock grazing and improve control of this invasive species. Cheatgrass control would likely continue under Current Management and the No Grazing alternatives, although control methods would be limited to herbicide use until other control methods are developed and approved for use on the Forest.

Fire Effects

In low burn severity areas, effects are mainly light ground char where the litter is scorched, charred, or partially consumed. The litter layer, or duff, is largely intact, although it may be charred on the surface. Woody debris accumulations are partially scorched, charred, or consumed. Mineral soil properties are not adversely affected. In fact, low severity fire releases nutrients stored in surface organic matter and live vegetation. These nutrients facilitate rapid reestablishment of vegetative ground cover since root to shoot ratios are improved for grasses and forbs that survive fire, resulting in protection of soils from accelerated soil erosion soon after fire has occurred. Evidence of sheet and rill erosion as a result of low severity fire is minor. In forested areas, much of the tree overstory is green with some scorch at the base of the trees and in the lower branches following low severity fire. Most trees survive; however, pockets of seedlings, saplings, and mature trees can be killed or consumed where moderate to high severity fires occur. While most of the shrubs, forbs and grasses are affected under low severity fire conditions, in most cases, much of this vegetation survives. Areas identified as low burn severity may also contain large unburned areas, resulting in a mosaic of burned and unburned sites across the landscape.

Moderate severity fire results in consumption of most fine litter and increased bare mineral soil. Some standing trees may be killed under moderate fire intensity through damage to tree cambium and crown scorch. The risk of accelerated soil erosion increases following moderate severity fire. Runoff is also

expected to increase in areas subjected to moderate severity fire since vegetative cover is reduced or non-existent.

High severity fire typically results nearly complete consumption of all litter, leaving only ash and bare soil. Soil aggregate stability is reduced or destroyed and soils become loose, or single-grained. These soils are highly susceptible to erosion due to increased hydrophobicity (water repellency) that prevents water infiltration, thereby increasing overland flow. Sheet and rill erosion are common on soils that burn at high severity.

Although several high severity wildfires have occurred on the North Kaibab over the last 20 years as a result of historic fire suppression and exclusion, efforts to return low and moderate severity fire to fire adapted ecosystems has been underway for several years on the North Kaibab Ranger District. When a wildfire occurs, it typically results in the burned area being rested until the herbaceous understory has recovered sufficiently to support livestock grazing and protect soil surfaces from accelerated erosion. Through improved management of the timing, frequency, intensity, and duration of livestock grazing, the Proposed Action, when combined with fire effects, provides the best opportunity to prevent adverse cumulative effects of fire and livestock grazing.

Soil Stability and Erosion Processes

Gullies and headcuts are a primary source of sedimentation. They channelize and accelerate sediment-laden water, resulting in soil movement to downslope locations or into drainages. Areas which are sensitive to gully erosion are long, narrow alluvial plains, alluvial fans, and low lying areas with moderate slopes and deep, fine-textured soils. Gullies are partly the result of historical management practices and partly the result of high severity wildfires and are now in varying degrees of recovery. Gullies have been observed in the Warm Fire and Bridger Knoll Fire perimeters. As management practices have improved and watershed conditions have changed, some gullies are reaching more stable conditions through aggradation and widening, creating more favorable floodplains and gentle gradients. This adjustment process involves erosion of banks and headcuts in order to reach a point of equilibrium. Once this point is reached, erosion decreases, vegetation begins to grow where gully sidewalls have a more gentle angle of repose, and gullies stabilize. The effect of gully stabilization is reduced loss of soil productivity and downstream sedimentation. Through anticipated improvements in vegetative ground cover, the Proposed Action would provide the best opportunity to ensure soil stability and mitigate soil erosion processes. Soil stability and erosion processes would likely remain static or improve slightly over the long term under Current Management. The No Grazing Alternative would provide for soil stability and erosion mitigation through elimination of livestock grazing on the Kane Allotments. However, areas infested with cheatgrass would likely continue to trend downward as a result of cheatgrass-induced wildfires that increase erosion and sediment delivery rates substantially.

Nutrient Cycling

The Proposed Action, in combination with vegetation treatments (i.e., forest thinning and prescribed fire use), and control of invasive and noxious weeds would improve soil nutrient cycling over time due to the addition of small and large woody material from thinning, reintroduction of fire to fire adapted ecosystems, and control of invasive and noxious weeds that displace native plant communities. Vegetation management projects would leave at least 5-7 tons per acre of CWD in treatment areas. In addition, up to 1-3 tons per acre of fine fuels would be left as needles, twigs, small limbs, and other small woody material. The addition of CWD and other fine fuels would have a beneficial effect to long-term soil productivity by providing microsites and refugia for soil organisms, microsites that aid in reestablishment of herbaceous vegetative cover, increasing soil organic matter which improves soil moisture retention, and sequestering organic carbon. The effectiveness of woody debris retention has been proven to reduce and control adverse impacts to soil resources and water quality (Graham et al. 1994, Ice 2004, Seyedbagheri 1996). Controlling cheatgrass and other invasive and noxious weeds would reduce wildfire risk in cheatgrass infested areas and protect or restore native plant communities, thus restoring

soil nutrient cycles. Current Management and the No Grazing Alternative would also improve soil nutrient cycles in some areas in combination with vegetation and noxious weeds treatments. However, areas where cheatgrass and noxious weeds have displaced native plant communities would continue to function in an impaired condition with regard to nutrient cycling.

Soil Hydrology

Since the Proposed Action would increase flexibility in managing livestock distribution, timing, intensity and duration of grazing through pasture divides and new holding pastures, stocking rates would be relatively low, and research would be implemented to investigate cheatgrass control, it is reasonable to expect that vegetative ground cover and overall range conditions would improve. With improved vegetation conditions, soil hydrologic processes would also improve. Increased infiltration and percolation would be expected. Compaction and sealing of soil surfaces caused by raindrop impact would be reduced. Overland flow would also be reduced as soil porosity improves, increasing water infiltration rates. Current Management would likely result in static to slightly improving trends in soil hydrologic function. However, with reduced flexibility in grazing management under this alternative, improvements would likely occur at a much slower rate. The No Action Alternative would also improve soil hydrologic function through reduced soil compaction caused by cattle trampling, trailing, and grazing. Removal of cattle would allow soils to improve over time. However, areas where cheatgrass infestations have caused frequent wildfires would continue to exhibit a downward trend through increased soil hydrophobicity following wildfires resulting in impermeable soil surfaces and increased runoff and erosion.

Watershed Response

The magnitude of change in water yield resulting from the combination of grazing management, vegetation treatments and prescribed burning is most strongly related to the amount of precipitation and intensity of the treatments.

The hydrologic response of watersheds to which the Kane Ranch Allotments belongs would depend on the summed effect of the changes in evaporation, transpiration, soil moisture storage, and snowpack accumulation and melt processes. This includes the degree to which grazing and vegetation treatments influence precipitation that reaches soil surfaces and infiltrates or runs off as a result of reduced tree canopy interception, changes to soil moisture evaporation rates, and changes to the amount of transpiration and soil water depletion. Changes to streamflow would depend on whether precipitation or snowmelt exceeds evapotranspirational demand of vegetation, soil moisture holding capacity, and groundwater recharge rates.

Changes in evapotranspiration following vegetation treatments would be the result of reduced soil moisture depletion during the growing season and decreased winter snowfall interception. Precipitation accumulates over the winter as snowpack, with melting and sublimation occurring during warm phases throughout the winter. Much of the winter precipitation in forested areas of the Kane Ranch Allotments is intercepted by tree canopies. Some of this moisture evaporates or sublimates without contributing to increased soil moisture, while some is blown off of intercepting vegetation or simply falls off, thus reaching soil surfaces. When the remaining snowpack begins to melt in spring, melt water first recharges the soil by replacing the water that was depleted during the previous growing season. Once soil moisture storage capacity is at its maximum, remaining melt water is available to become stream flow. On north facing slopes, some of the snowpack remains almost continuously from December to April. While the evaporation rate is lower than south facing slopes, the relatively large surface area of snow permits a substantial amount of evaporative loss to occur. In contrast, on south facing slopes, intercepted snow quickly leaves the less dense forest canopies, thus allowing less interception loss. When combined with other past, present and reasonably foreseeable future actions, the Proposed Actions would result in improved watershed conditions throughout the Kane Ranch Allotments. As vegetative and soil conditions improve in watersheds of the Kane Ranch Allotments, it follows that watershed response would improve. Groundwater storage would be expected to increase slightly under the Proposed Action as infiltration

rates increase and evapotranspiration are reduced through vegetation treatments and prescribed burning. Current management would also result in improved watershed condition as projects are implemented to reduce the threat of high severity wildfire, re-introduce low severity fire to fire adapted ecosystems, control invasive and noxious weeds and improve watershed conditions. The No Grazing Alternative would also improve watershed conditions by eliminating livestock impacts to soils and watersheds such as soil compaction and removal of vegetative cover that increases surface runoff and decreases infiltration.

Cumulative watershed effects from grazing of the Kane Ranch Allotments under the Proposed Action would include improved overall soils and watershed condition and restoration of the ecological interrelationships of soils, vegetation, and watersheds throughout the analysis area. Continued grazing under Current Management would result in many areas that exhibit static to downward trends due to the lack of flexibility in controlling the timing, distribution, intensity and frequency of grazing since the existing challenges related to the limited number of pastures make rest rotation and deferment systems difficult to implement and there would be limited opportunity to control cheatgrass infestations as compared to the Proposed Action. The No Grazing Alternative would result in cumulative improvement in watershed condition in most areas, although cheatgrass infested areas would likely continue to exhibit a static to downward trend.

Climate Change

While it is currently not possible to discern climate change effects of the Proposed Action or other Action Alternatives, given the lack of effects that can be meaningfully evaluated under current science and modeling, one would expect no detectable change in climate specifically related to livestock grazing under any of the alternatives in this analysis, including the No Action alternative.

The U.S. Environmental Protection Agency (EPA) has asserted that scientists know with virtual certainty that human activities are changing the composition of the Earth's atmosphere. It is also documented that "greenhouse" gases, including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and hydrofluorocarbons have been increasing (EPA 2010). The atmospheric increase of these gases is largely the result of human activities such as the burning of fossil fuels. Greenhouse gases absorb infrared energy that would otherwise be reflected from the earth. As this infrared energy is absorbed, the air surrounding the earth is heated (CARB 2007).

The Southwestern Region of the Forest Service recently released "Southwestern Region Climate Change – Trends and Forest Planning: A guide for addressing climate change in forest planning on southwestern National Forests and Grasslands". The following information is summarized from excerpts of this publication: In the Southwest, climate modelers agree there is a drying trend that will continue well into the latter part of 21st century (IPCC 2007; Seager et al. 2008). Climate modelers predict increased precipitation, but believe that the overall balance between precipitation and evaporation would still likely result in an overall decrease in available moisture. Regional drying and warming trends have occurred twice during the 20th century (1930s Dust Bowl, and the 1950s Southwest Drought). Current drought conditions "may very well become the new climatology of the American Southwest within a time frame of years to decades". According to recent model results, the slight warming trend observed during the last 100 years in the Southwest may continue into the next century, with the greatest warming to occur during winter. Climate models predict temperatures to rise approximately 5 to 8 degrees Fahrenheit by the end of the century (IPCC 2007). This trend would likely increase demand on the region's already limited water supplies, as well as increase energy demand, alter fire regimes and ecosystems, create risks for human health, and affect agriculture.

Average ambient air temperatures are rising, and it is possible that continued warming will increase the temperature difference between the Southwest and the tropical Pacific Ocean, enhancing the strength of westerly winds that carry moist air from the tropics into the Southwest region during the monsoon season. This scenario may increase the monsoon's intensity, or its duration, or both, in which case floods would

occur with greater frequency (Guido 2008). While the region is generally expected to dry, it is possible that extreme weather patterns leading to more frequent destructive flooding would occur. Along with monsoons of higher intensity, hurricanes and other tropical depressions are projected to become more intense overall. Arizona typically receives 10 percent or more of the annual precipitation from storms that begin as tropical depressions in the Pacific Ocean. In fact, some of the largest floods in the Southwest have occurred when remnant tropical storms intersect frontal storms from the north or northwest (Guido 2008). Most global climate models are not yet accurate enough to apply to land management at the ecoregional or National Forest scale. This limits regional and forest-specific analysis of the potential effects of climate change.

Due to the spatial and temporal limitations of climate models, as stated above, site-specific analysis of climate change at the Forest level with regard to implementing fuels reduction treatments remains impractical. Several unknown factors further limit discussion and analysis of climate change at the Forest level. These include: lack of data on emissions from prescribed fire and wildfires, lack of data on emissions from logging machinery and traffic increases due to transportation of logs to processing facilities, limited data on emissions from machinery used to construct, maintain, or obliterate roads, and limited knowledge of the contributions of surrounding areas to current and future climate impacts at the Forest level necessary to analyze cumulative effects. Impacts to climate change from implementation of the proposed project are therefore discussed in a qualitative manner.

Projected future climate change could affect Arizona in a variety of ways. Public health and safety could be compromised due to an increase in extreme temperatures and severe weather events. Agriculture would be vulnerable to altered temperature and rainfall patterns, increasing plant stress and susceptibility to insects and diseases. Forest ecosystems could face increased occurrences of high severity wildfires and may also be more susceptible to insects and diseases. Snowpack could decrease and snowmelt may occur earlier.

While the future of climate change and its effects across the Southwest remains uncertain, it is certain that climate variability will continue to occur throughout the region. Forest management activities should strive to promote ecosystem resilience and resistance to impacts of climate change. Forest management activities should focus on maintenance and restoration of native ecosystems, thereby reducing the vulnerability of these ecosystems to variations in climate patterns. Ecological diversity remains an integral component in native ecosystems. Projects should promote connected landscapes and endeavor to restore significantly altered biological communities, thus restoring their resilience to changes in climate.

Irreversible and Irretrievable Commitments of Resources

This section describes the irreversible and irretrievable commitments of resources associated with livestock grazing on the Kane Ranch Allotments. An “irreversible commitment of resources” occurs when, once committed to an Action, the resource would continue to be committed throughout the life of the Proposed Action. An “irretrievable commitment of resources” refers to those resources that, once used, consumed, destroyed or degraded during a Proposed Action, would cause the resource to be unavailable for use by future generations. There would be no irretrievable or irreversible losses of Forest Service resources under any of the alternatives, including the No Action Alternative.

[This Space Intentionally Left Blank]

Range Management

Methodology and Analysis Process

Data from historic range clusters sites scattered throughout the project area were used to show understory conditions and trends from the 1950's to current time. All this information is found within the project record and summarized in this report.

GIS was used for this analysis to determine capability and capacity. The scale of this analysis was primarily based on an individual range allotment. This scale was used because each allotment is unique in size, season of use, number of pastures, vegetation, waters, utilization patterns, and grazing system.

The vegetation, sensitive plants, noxious weeds, fire, watershed, recreation, archeology and wildlife specialist reports were used in this report. Individual reports are located in the project record.

Many of studies referenced used in this analysis were conducted within or near the project boundary or within similar vegetation types and similar rangeland management systems.

Affected Environment

Rangeland Conditions on the Kane Ranches

Since the late 1800's, these allotments consisted of livestock from multiple ranchers grazing in common on the area currently known as the Central Summer Allotment during the summer time. The large operation wintered to the east (Kane Ranch) while multiple smaller operators wintered to the west side of the North Kaibab Ranger District on the Central Winter and Kanab Creek Allotments. By the 1990's, this entire area would become tied to Kane Ranch with one herd in the summer and two herds in the winter, one on the Central winter Allotment and one to the east on Bureau of Land Management (BLM) administered lands. Trails were utilized to herd the livestock from the winter ranges to the higher elevation summer range.

The fall roundup would typically start in October. Once the colder weather would set in the fall or an early snowstorm would occur, many of the older "lead" cows would drift down to winter range on their own. By one account of a former Kane Ranch manager, up to 60 percent of the herd would return to the winter range(s) on their own (Dustin Burger personal communication 2013). The Ranch would then proceed to round-up the remaining cows that did not drift off and remove them from the Central Summer Allotment until all of the cows were off or the winter snows set in. While there are not detailed records on cattle numbers that remained on the allotment after the grazing season prior to 2001, it was noted as often being in the single digits and rarely over 20 head (Central Summer Allotment file). The basics of this allotment management were relatively consistent from the 1880's until 2001.

Livestock numbers across the area that is known today as the Central Summer Allotment have varied over the years. By some accounts over 20,000 head of cattle and an unconfirmed number of sheep grazed this area in the early 1900's. Since the 1940's livestock numbers have averaged in 900 to 1,200 head range. In 2000, livestock numbers for the allotment were permitted to 1,100 head of cattle (Central Summer Allotment file).

Existing Conditions

The affected environment for the range analysis is the project area. Of the 476,433 acres of this project area, 419,239 are within grazed and 57,194 acres that are not grazed by livestock (Kanab Allotment and JumpUp pasture). The majority of the understory vegetation within the grazing area is dominated by fescue, mountain muhly, blue grama and squirreltail.

The 2001 Kane Ranch EA thoroughly analyzed six alternatives, which included different grazing rotations and different stocking rates from 800 to 1,200 head across the allotment. The Decision Notice selected was “Alternative 6 low”, which included the following provisions:

- Eight-hundred head across the Central Winter, Central Summer, and Kane Allotments.
- The four pasture Central Winter Allotment was authorized from May 1 to July 14 where one pasture is utilized for one month, every other year in a rest rotation. One pasture can be utilized two consecutive years, if needed, as long as it receives a full year rest on year three. The livestock numbers would remain at 400 until all water sources were functioning.
- The Central Summer was authorized for 400 head from June 1 to July 1 with 400 head and then 800 head for remainder of the season which ends October 29 in a rest rotation system where one of the two pastures would be utilized one year and the other pasture would be utilized the next. One pasture can be utilized consecutive years at a reduced stocking rate, if needed.
- The Kane Allotment was authorized from October 16 to November 12 with 800 head, but not to exceed 587 AUM’s in a rest rotation grazing system where one pasture is utilized one year and the second pasture is utilized the next year.
- Livestock would spend the remainder of the year on BLM lands. The season of use of these BLM allotments is October 15 to May 28, which overlaps the dates of the Central Winter Allotment in the spring and the Kane Allotment in the fall to provide a transition period for moving livestock.

The primary rationale for this change in management was to avoid potential conflict with mule deer winter range on the Central Winter Allotment and reduce impacts to Paradine plains cactus on the Kane Allotment while keeping one herd that had the livestock numbers appropriate for the individual pastures.

Actual use numbers for the allotments since 2001 is found in the Range Specialist Report (2013). The permitted across the allotments has been 800 head. The Central Winter Allotment is the exception and has been held at 400 head due to several of the water sources not functioning.

Since 2001, there were many unplanned events that occurred that affected the consistency of management on the allotments. These include the following:

- The 2001 to 2003 drought cycle occurred the first year of implementing the new allotment management plan. While sufficient forage was still available, water became a limited resource across the allotments leading to destocking in 2003.
- The ranch permit rights were sold and transferred in 2004 and 2005. During this time the allotments were destocked for the personal convenience of the permittee.
- In 2006 a new permittee validated the permits with 90% of permitted numbers. As this was a new permittee with new livestock across a large series of allotments, it was expected to take a few years to sufficiently get structures functional and complete all pasture rotations.
- Also in 2006, the Warm Fire burned 59,000 acres, primarily within the North Summer Pasture. This pasture was rested from 2006 to 2009. As a result, the South Summer Pasture was grazed for these three years at a reduced stocking rate.
- In 2007 the 5,800 acre Slide Fire occurred primarily within the Slide Pasture of the Central Winter Allotment. The fire also burned about 1000 acres of the Ranger Pass Pasture.
- 2007 was also the first year that a series of vegetative habitat projects on the Ranger Pass and Slide Pastures commenced to improve vegetation for mule deer winter range. Due to the Slide Fire and the habitat projects, the areas affected were rested either by resting the entire pasture or utilizing water and herding management to keep cattle away from these areas.
- Starting in 2008, critical sections of the Little Mountain pipeline began to fail that rendered the entire pipeline system non-functional, leaving the Slide Pasture without a reliable water source.
- In 2009 and 2010 two natural ignition management fires were authorized in the Little Mountain Pasture, resulting in resting this pasture.

All of these events created challenges in the ability to follow the allotment management plan as each situation required a strategy to continue maintaining a place for cattle to graze. The allotment management plan is functional and can work most years when most pastures are available for use. However, the limited flexibility of the allotment management plan has led to some additional challenges including the following:

Central Winter Allotment

- Trucking from Houserock Valley (BLM) to the Central Winter Allotment in May is over 80 miles one way and with about 20-30 cow-calf pairs a semi load. This can also become expensive for the permittee when needing to haul 400, and potentially 800 head, in this manner.
- During an average to above average winter, semi accessible routes to Central Winter can still have small snow drifts by May 1. Typically livestock could be delivered to Oak Corral at the North East edge of Central Winter and then herded to a pasture. However, calves are still pretty weak at this point, so trailing more than five miles (which would necessary for the southern CW pastures) is problematic.
- Time in each pasture for Central Winter is not long enough for the amount of effort needed. There is considerable maintenance needed with the pipeline system and some for the trick tanks. The first pasture would just be getting the last load of cows when it's time to move to the next pasture.
- Given that the off-date for the BLM allotments are May 28 and the on-date for the Central Summer is June 1, it is shorter and easier to haul cattle straight to the Central Summer Allotment from the BLM allotments.
- Dirt tanks on the Central Winter Allotment are typically dry by late May so only the trick tanks and pipeline system can provide reliable water sources. This can lead to reduced distribution, but not to the extent of being problematic during an average moisture year.

Central Summer Allotment

- The Central Summer pastures are too large. The idea is that the cows would spread out into small bunches. This has proven true each year. However, there are locations that would always be the most desirable and receive the highest use (Joe's Mudhole and recent burn areas). Utilization has yet to exceed the authorized use rates.
- The biggest problem is trying to successfully gather these very large pastures (North Summer 102,000 acres and South Summer 179,000 acres). Because the cows are now trucked on as part of the 2001 Allotment Management Plan, there is no memory of how to access the lower elevation winter range on BLM lands. Some return to the western side of the pasture but others bunch up in valleys in the high elevation parts of the pastures when colder weather hits. Early snow storms further compound the success of the round-ups. The few successful fall round-ups in the last 12 years have taken over 1.5 months to complete. Success based on the ability to find each small group of cows and load them into a trailer before winter snows make the allotment inaccessible.
- No holding pastures to ease the fall roundup. Existing and portable corrals or canyons are used to gather small bunches that then have to be trucked off the next day for forage and water needs, depending on the corral used.
- Kane Allotment is not used at all as cows never go far enough East over the summer or fall. It would take additional effort above and beyond the challenges of the current fall round-up on Central Summer to successfully move cattle into this allotment.
- As many as six cows were hit on Highway 67 in 2010 and seven in 2012 in North Pasture.
- For the most part, many of these logistic challenges could be overcome and some of them have been manageable. With any new allotment management plan with multiple pastures or a new permittee with new livestock, it takes a few years to develop ways to improve the efficiency of consistent management. Since 2001 the permit changed to a new permittee with new cows, along with a large variety of unplanned events.

- Over the course of the last three years, the permittee and the Forest Service have found ways to improve the ability to work around the unplanned events and manage a herd between the Central Summer Allotment and BLM lands. However, a continued concern is the amount of effort necessary to be successful with the fall round-up, the variable unplanned events that can impede successful pastures moves, and that utilizing the Central Winter and Kane Allotments are more of an effort than a value for the annual rotations.

For the most part, many of these logistic challenges could be overcome and some of them have been manageable. With any new allotment management plan with multiple pastures or a new permittee with new livestock, it takes a few years to develop ways to improve the efficiency of consistent management. Since 2001 the permit changed to a new permittee with new cows, along with a large variety of unplanned events.

Over the course of the last three years, the permittee and the Forest Service have found ways to improve the ability to work around the unplanned events and manage a herd between the Central Summer Allotment and BLM lands. However, a continued concern is the amount of effort necessary to be successful with the fall round-up, the variable unplanned events that can impede successful pastures moves, and that utilizing the Central Winter and Kane Allotments are more of an effort than a value for the annual rotations.

General Overview of Potential and Existing Livestock Grazing Effects to Fire, Understory Species, Riparian, Aspen, Soils, and Hydrologic Function

Livestock grazing can affect vegetation by reducing plant height, plant canopy cover, ground cover, and can have the effect of compacting soils. Current grazing management systems on allotments within the project area are designed to mitigate these effects by rotating grazing so individual forage plants are not grazed at the same time each year. They are also designed so forage species can reach maturity and seed most years. Current allotment management plans throughout the KNF have utilization guidelines of 30-40% by ungulates which leave 60-70% for ground cover, soils, fire spread, hiding cover, and forage for other animals and insects. Adaptive management for all allotment grazing management systems in the planning area is also mitigation to grazing. It is primarily used match livestock numbers with annual available forage. Restrictions in grazing of livestock after fires are also a mitigation to reduce impact to forage species. These mitigations have shown to maintain static understory conditions in grazed areas.

Managed livestock grazing can affect the spread of natural fire by the removal of fine herbaceous fuel until the plants regrow. Historic unregulated livestock management from the 1860's to the 1920's removed a significant amount of forage plants and did not allow for much regrowth. As range management practices were improved through the years more forage plants became available to carry a fire. A likely factor to the increase in the amount of forest acres burned in recent history is a result of this improvement in range management practices.

Current grazing management systems effects to fire within the project area is short lived and limited in size. The effect is normally limited to one pasture in an allotment, until that pasture can regrow, depending on climate conditions. The effect is short lived because the plants are regrowing throughout the year. It is also limited in scope because of conservative 30-40% utilization levels used in these grazing management systems in the project area, leaving 60-70% of the plants available for fire spread or mulch. These utilization guidelines have been followed for these allotments throughout the KNF over the last 20 years with few exceptions (USDA Forest Service, 2200 Range Files Kaibab Ranger District inspections and utilization data). Many fuels reduction and restoration projects have occurred within the project area have been successful with livestock grazing. The Warm Fire Salvage, Bridger Knoll Salvage, Fracas, Willis Blowdown Salvage, and Dry Park, to name just a few, have been completed with current livestock grazing in place.

Livestock grazing can affect riparian and aspen areas similarly to upland areas. However, livestock can be more attracted to riparian and aspen areas because of the increased water and/or forage. Riparian plants and aspen can be reduced by grazing these species. Special livestock management techniques have been employed within the project area to reduce the impacts including livestock exclosures, deferred grazing, herding, and alternative water sources with adjustments in Allotment Management Plans over the years. These practices have limited the amount of livestock grazing on riparian vegetation and aspen. Additional adjustments in management may be necessary to reduce impacts to these areas, especially if riparian and aspen regeneration areas would be expanded with new management practices.

Domestic cattle grazing has the potential to affect soil and hydrologic functions that are important in the maintenance of long-term productivity and favorable conditions of water flow. Specifically, changes in the soil's surface structure and its ability to accept hold, and release water may be affected by compaction caused by trampling. The nutrient recycling function of the soil may be interrupted by removal of vegetation that impacts above ground nutrient inputs into the system. Finally, the soil's resistance to erosion is affected by changes in plant density, composition, and protective vegetative ground cover that are part of the organic components in the soil.

The effect of livestock grazing to soil and hydrologic function is limited within the project area because of the current management in place that limits utilization, maintains forage plants, and limits compaction with deferred and rest rotational grazing systems.

Grazing Effects from late 1800's to Present

Since the late 1800's, the Kane Ranch Allotments consisted of livestock from multiple ranchers grazing in common on the area currently known as the Central Summer Allotment during the summer time. The large operation wintered to the east (Kane Ranch) while multiple smaller operators wintered to the west side of the North Kaibab Ranger District on the Central Winter and Kanab Creek Allotments. By the 1990's, this entire area would become tied to Kane Ranch with one herd in the summer and two herds in the winter, one on the Central winter Allotment and one to the east on BLM lands. Trails were utilized to herd the livestock from the winter ranges to the higher elevation summer range.

The fall roundup would typically start in October. Once the colder weather would set in the fall or an early snowstorm would occur, many of the older "lead" cows would drift down to winter range on their own. By one account of a former Kane Ranch manager, up to 60 percent of the herd would return to the winter range(s) on their own (Dustin Burger personal communication). The Ranch would then proceed to round-up the remaining cows that did not drift off and remove them from the Central Summer Allotment until all of the cows were off or the winter snows set in. While there are not detailed records on cattle numbers that remained on the allotment after the grazing season prior to 2001, it was noted as often being in the single digits and rarely over 20 head. The basics of this allotment management were relatively consistent from the 1880's until 2001.

Livestock numbers across the area that is known today as the Central Summer Allotment have varied over the years. By some accounts over 20,000 head of cattle and an unconfirmed number of sheep grazed this area in the early 1900's. Since the 1940's livestock numbers have averaged in 900 to 1,200 head range. In 2000, livestock numbers for the allotment were permitted to 1,100 head of cattle.

Overgrazing by livestock and the changes to understory vegetation in the late 1880's and early 1890's is well documented (Farish 1889, Hughs 1893). Arnold (1955) described the following grazing effect of early livestock grazing. "Under heavy grazing the original tall bunchgrasses have been largely replaced by plants more resistant to grazing, except where dense tree cover discourages livestock use. In addition, grass cover decreases as pine reproduction becomes established; the greater the density of pine saplings, the less the total herbaceous cover. Decline in total forage production as a result of competition from young pine stands is accompanied by no great botanical change in the herbaceous vegetation, but heavy grazing induces a major change in species composition. In openings within the forest, ranges in good to

excellent condition near Flagstaff support a high proportion of midgrasses, dominated by Arizona fescue, mountain muhly, muttongrass, and June grass. Under heavy grazing pressure, the midgrasses are replaced by a shortgrass cover composed largely of blue grama and squirreltail. Under still more severe use, even these resistant grasses are largely replaced by less desirable perennial and annual forbs.” Cooper (1960) also describes similar effects.

In summary, historic livestock effects to understory vegetation follow the history of livestock management within the project area. Unregulated grazing from the 1860’s to the 1920’s led to declines in grass, forb, and shrubs and an increase in trees. Since then, grazing management practices have evolved through time to limit overgrazing by livestock and to match conservative livestock utilization with forage production. With the improvement in grazing management, trends in understory vegetation have generally improved in areas where tree density does not limit recovery. Tree density limits the amount of understory vegetation; as tree densities increase, the understory vegetation declines. The direct relationship between tree basal area and understory production has been widely studied (Moore et al 2004, Arnold 1950, Cooper 1960, Pearson and Jameson 1967). In these studies, the direct relationship between tree density and understory vegetation was observed regardless of whether the study area was grazed by livestock, or whether the study area was excluded from livestock grazing.

Range trends within the project area follow the history of grazing. Unregulated grazing from the 1860’s to the 1920’s led to declines in grass, forb, and shrubs and an increase in trees. Since then, grazing management practices have evolved through time to limit overgrazing by livestock and to match conservative livestock utilization with forage production. With the improvement in grazing management, trends in understory vegetation have generally improved in areas where tree density does not limit recovery. Tree density limits the amount of understory vegetation; as tree densities increase, the understory vegetation declines. The direct relationship between tree basal area and understory production has been widely studied (Moore et al 2004, Arnold 1950, Cooper 1960, Pearson and Jameson 1967). In these studies, the direct relationship between tree density and understory vegetation was observed regardless of whether the study area was grazed by livestock, or whether the study area was excluded from livestock grazing.

Historic changes in Trees, Fire, Climate, and Noxious Weeds

Changes in trees, fires, and climate has also had an effect on existing range conditions. Trees have become more dense and reduced understory vegetation (Cooper 1960, White 1985, Covington 1993, Moore et al 2004, Arnold 1950).

Fire suppression has been the norm in the project area since European settlement, until recent years. Pre-settlement natural wildfires burned on an average of 3-7 years in the project areas ponderosa pine forest. These fires reduced the number of pine trees, provided abundant nutrient cycling, and reduced pine litter build-up on the forest floor. The reduction in fire frequency reduced these processes (Laughlin et al 2005, Gundale et al 2005).

Precipitation and temperature influence what plants can grow and where. Variations of climate through time have greatly influenced plant conditions in the project area. In a review of the range data within the project area, changes in species composition have changed throughout this time period in a direct response to the amount and timing of moisture. From the 1950’s to the early 1990’s cool season grasses replaced warm season species with the increase in winter and spring moisture. Since the 1990’s, warm season species have increased with a decrease in winter moisture and increase in summer moisture. Another example of climate influences on vegetation in the project area has been shown to be the dominate factor in several rangeland studies comparing grazing management and restoration practices (Loeser et al 2006, Abella 2004, Laughlin and Moore 2009, Laughlin et al 2006, Breshears et al. 2005, Moore et al 2006).

The Noxious Weed Specialist Report (2013) documents the locations and effects on noxious weeds within the analysis area. The main issue within the allotments is cheatgrass. Cheatgrass has come into the area primarily after fires (primarily after the 1996 Bridger Knoll Fire) and reduced the native vegetation. After the cheatgrass has become established in large areas these regions become more susceptible to even more fires. For example, the Slide Fire (2007), East Fire (2012), JumpUp Fire (2012), and Tank Fire (2012) all occurred within the Bridger Knoll Fire cheatgrass areas. Several herbicide and seeding treatments have occurred within these cheatgrass areas with varying degree of success bring back the native vegetation.

More specific details on the research can be found in the Range Specialist Report (2013).

Effects Analysis (Direct and Indirect)

Common to all Action Alternatives (1-2)

Livestock grazing and climate change

In all the alternatives, climate change may have an effect on livestock grazing management. Increased temperatures combined with decreased precipitation could lead to lower plant productivity and cover, which in turn could decrease litter cover. The reduction in plant and litter cover could make the soils more vulnerable to wind and water erosion. Timing of moisture could also lead to a shift from warm to cool plant species or vice-versa.

Currently the range has seen a shift to warm season species dominance in many areas of northern Arizona as a result of relative lower winter moisture and to higher summer moisture. The warm season plant that has benefited most from this shift is blue grama. Because blue grama is a dense mat forming species, many areas have seen an increase in perennial plant cover and ground cover. The trends of forage production during this time period have been static. Long term trends would likely stay the same except during severe long term drought and high temperature periods, when understory plants would decline.

To address climate change, all the allotments within the project area use adaptive management in response to seasonal and annual changes in forage production. The adaptive management used in allotment management planning allows for adjustments in the number of livestock and season of pasture use so that livestock use matches forage production for every grazing season regardless of weather conditions. Direction for the use of rangelands prior to and after drought to ensure continued health of the forage resource has been provide by the agency at both the Regional and National Forest level. For example, during the drought of 2002 livestock numbers and season of use were reduced throughout the project area.

The effects of utilizing fire as a natural process within the project area and within currently authorized livestock grazing activities.

Livestock grazing effect to fire as a natural process are the same for all the alternatives with current livestock grazing management in place. The effects of livestock grazing for all the alternatives would continue with existing management systems in place within the project area.

Livestock grazing predominantly affect fire by reducing the amount of fine ground fuel available for burning. Current grazing management systems effects to fire within the project area are short lived and limited in size. The effect is normally limited to one pasture in an allotment, until that pasture can regrow, depending on climate conditions. The effect is short lived because the plants are regrowing throughout the year. It is also limited in scope because of conservative 30-40% utilization levels used in these grazing management systems in the project area. This conservative use leaves 60-70% of the plants available for fire spread or mulch. These utilization guidelines have been followed for these allotments over the last 20 years (USDA Forest Service, 2200 Kaibab District Range inspections and utilization data, Burger personnel observations) and a 20-30% standard has been in place since 2001. The exceptions were always

corrected the following year by resting the pasture, deferring use, reducing grazed periods, and/or reducing livestock numbers. The Peaks and Slate Allotments located on the north side of the San Francisco Peaks are good examples of how utilization guidelines have been followed while allowing fires to burn through them. The 1996 Horseshoe Fire and Hochderffer Fire burned within these allotments in pasture that were grazed the previous year.

Seasonal and annual adjustments in livestock number and season of use to match forage production through adaptive management is another way that current grazing management systems allow fire to play its natural role in the environment. By making these adjustments fine fuels are available for burning.

General livestock grazing effects

Livestock grazing in Alternatives 1 and 2 can affect vegetation by reducing plant height, plant canopy cover, ground cover, and can have the effect of compacting soils. Current grazing management systems on allotments within the project area are designed to mitigate these effects by rotating grazing so individual forage plants are not grazed at the same time each year. They are also designed so forage species can reach maturity and seed most years. Current allotment management plans throughout the KNF have utilization guidelines of 30-40% by ungulates which leave 60-70% for ground cover, soils, fire spread, hiding cover, and forage for other animals and insects. Adaptive management for all allotment grazing management systems in the planning area is also mitigation to grazing. It is primarily used match livestock numbers with annual available forage. Restrictions in grazing of livestock after fires are also a mitigation to reduce impact to forage species. These mitigations have shown to maintain static understory conditions in grazed areas.

Other livestock grazing effects

Effects on aspen trees by livestock grazing have been documented throughout the Western United States and northern Arizona. Aspen trees occur throughout the allotments above 6500'. Aspen impacts by Kane Ranch livestock have not been documented (Dustin Burger personnel communications). Aspen are not affected in this allotment because of vast number of aspen found within the allotment, high amount of available forage, and low stock densities. Livestock numbers for these alternatives fall within historic values, so no additional effects to aspen are anticipated.

Mule deer winter range effects by livestock in the Central Winter Allotment were mitigated within the 2001 NEPA decision by livestock number and season of use. Alternative 2 would improve upon this strategy with additional monitoring and research to insure a continued minimal impact on mule deer.

Alternative 1

Livestock management

The proposed action was developed to address the current management concerns as well as be more adaptable for potential unforeseen management or resource concerns that may occur in the future. A solution to each of the cited issues in the existing condition was developed in a manner that would also continue to maintain or improve the natural resource conditions of the allotments.

Central Summer and Kane Allotments

The South Kane Trail would be reauthorized for trailing livestock up to the Central Summer Pastures. The use of this trail reduces the amount of time and expense needed to get livestock from winter pastures on BLM to the Central Summer Allotment pastures. There is added effort needed in the form of monitoring by Forest Service personal and commitment to performing Pediocactus mitigation measures by the permittee. It would also take additional effort for the permittee to ensure there are enough riders to get livestock up the trail and perform avoidance mitigation. The trailing is considered an optional part of the allotment management plan. Trucking is the fall back option whether there is a lack of monitoring, a resource concern, or trailing proves not be to a cost effective option. Based on 120 years of experience

with how the livestock management occurred prior to 2001, it is predicted that trailing would provide a more cost effective way to get livestock to the Central Summer Allotment.

Besides being a cost effective way of getting cows to the Summer Range, trailing also gives livestock a memory of how to get back to winter range through the Kane Allotment. It does not mean that every last cow would leave the summer range on its own, but it does have a high likelihood to improve livestock movements based on the level of success this methodology once had. It is anticipated that it could take one to three years trailing cattle down the mountain to help train the herd.

This then also helps promote sustained and low levels of utilization on the Kane Allotment. Currently the Kane allotment is not getting utilized because it is very challenging to get cattle to the pastures and involves more effort than benefit. Livestock would now have the ability to briefly utilize the Kane Allotment pastures as they drift down in the fall through the rotation system.

The three proposed holding pastures are strategically located in places livestock are drawn to and for facilitating pastures moves. The permittee would now have the ability to gather small bunches of cattle and place them in the holding pasture until there is enough livestock gathered to drive them to the next pasture or load them into semi-trucks. These holding pastures also work strategically with the fall drift off.

The next piece of the proposed action would be the option of building a fence along Highway 67. This fence may be constructed on the western side of State Highway 67 and only on the western side of the highway. This potential fence consists of two sections, the north and the south. The fence design would follow AGFD guidelines to reduce potential wildlife crossing and entrapment concerns. The Northern section of the fence would start near Jacob Lake and would be located 60 to 120 feet from the highway for seventeen miles, ending where the meadows in the South Summer Pasture begin. The primary purpose for the fence would be public safety to respond to the number of car/cow collisions in the North Summer Pasture. Six cows were hit in 2010 and five were hit in 2012 while grazing in the North Summer Pasture. This fence would keep the livestock contained into the Northwest Pasture during the peak May 15 to September 15 Grand Canyon National Park-North Rim visitation season. Prior to construction of the north fence we would test the effectiveness of large flashing signs warning the public of the livestock hazard. If collisions do not decrease from their current rate, then the fence would be built as soon as funding is granted.

The southern section of fence would not be planned for immediate construction, but would be considered adaptive management. This 14 mile section occurs entirely in the South Summer Pasture and spans from Pleasant Valley meadow to the GCNP. The goals of splitting the South Summer Pasture into the Southwest Summer and South East Summer Pastures differ from the management of the North Pastures. The meadows along the highway and the area east of the highway would become the Southeast pasture and would be for limited spring and fall transitional use only. The reasons for this include public safety along the highway, sensitive plant species and natural lakes in Pleasant Valley and DeMotte Park Meadows, mitigating livestock/public interface around the Kaibab Lodge/north Rim Country Store/DeMotte Campground area, and reducing livestock impacts in the Saddle Mountain Wilderness and related recreational areas. To keep livestock from the Southeast pasture a series of management strategies would be utilized in the following order: (1) livestock permittee would be required to monitor the meadows and area of the Southeast Summer Pasture periodically throughout the grazing season; (2) any livestock found during the June 1 to October 15 timeframe would be returned to the Southwest Summer Pasture; and (3) random small bunches of less than 20 head that are found and removed a few times a season would be acceptable.

If large groups of livestock in excess of 20 head continue to return after continuous removals, the permittee would post a rider to inspect for and remove livestock on a weekly basis. This action would primarily be based on livestock impacts to meadow and riparian areas, greater than 10% use.

If livestock can regularly be found in the Southeast Summer pasture in spite of the efforts above, a fence would be constructed. The fence would be built along the western edge of the meadows and follow the tree line. This action would primarily be based on livestock impacts to meadow and riparian areas, greater than 20% use and/or trailing evidence. The permittee would be responsible to maintain this fence away from the highway.

Additional waters would improve the distribution of livestock and wildlife. The ten water sources identified for improvement would be selected for locations where distribution would likely improve. This would especially help in the Summer Northwest Pasture where many of the existing dirt tanks go dry in drier years. Returning half of Dry Park, Murray, and Snipe Lakes (locations that were modified with equipment) would also help considerably with livestock distribution and pasture moves, particularly in drier years.

Livestock numbers would initially be 600 head, which reflects a drop in permitted numbers from the current action's rate of 800. Once monitoring of the vegetative condition and trend plots occurs three to five years post implementation and assuming the vegetative trends are upward to static, the option to increase livestock numbers up to 1,000 head would be authorized. Whether managing 600 head or 1,000, the permittee would be responsible for the same levels of structure maintenance and perform all of the same activities. Extra time would be needed to perform pasture moves, but the level of extra effort is not proportional to the increase in cattle numbers. What the extra livestock numbers do provide is added gross revenue that can then be applied to additional workers to assist with pastures move and maintenance that roughly balances out the added effort needed.

Since the North Kane, South Kane, and Southeast Summer Pastures are considered more transitional use than true grazing season pastures, adaptive management changes to the grazing rotations are not applicable. If there becomes need to rest any of these pastures, trucking cows to or from Central Summer is the adaptive management option.

With each of these adaptive management scenarios, there could be the possibility of added AUM's utilized in each pasture beyond the regular use of the standard rotations. AUM's would not exceed the maximum amount authorized or utilization rates. Additional vegetative monitoring would be a part of any of these adaptive management scenarios.

Central Winter Allotment

The Central Winter Allotment would be utilized in a series of dates that are better suited to the ecosystem with a more efficient and flexible rotation system. Another key component would be improved maintenance to structures. Currently maintaining pipeline systems, trick tanks, and fences that are utilized for one month every other year is almost not worth the effort, especially as the dates of use for BLM winter range overlaps with the Central Summer Allotment. By having the ability to utilize a pasture for up to four months every other year, there is a value to the permittee to graze longer and the need to ensure that the structures would be maintained so that water is available for appropriate livestock distribution, as well as wildlife.

The initial timing for the allotment would be from May 15 to November 1. Once the fence line is completed to enclose the Burnt Corral Pasture, it would complement the Little Mountain pasture as the summer range with Slide and Ranger Pass serving as fall pastures.

The adaptive management part of the Central Winter Allotment would be extensive and is primarily based on researching potential conflicts between cattle and mule deer and the potential spread and/or reduction of cheatgrass livestock in different grazing strategies. To properly conduct each individual research study the dates of cattle use on the Slide, Ranger Pass, and possibly Sowats pastures would be available all year long. Research studies could be at the pasture scale as part of a modified timing for the pasture use that year or with the use of grazing enclosures to ensure cattle remain at the selected study sites to achieve the desired utilization rates. Based on answers learned from these grazing studies, the future of grazing the

Slide, Ranger Pass, and Sowats pastures would be modified to reflect increased or decreased timing windows of the grazing season. Essentially if research finds minimal conflicts with grazing livestock and cheatgrass spread or wintering mule deer, options of grazing in the winter and spring could occur as part of the modified Allotment Management Plan. However, if it turns out that there is not an appropriate timing, grazing intensity, or strategy that could mitigate the potential effects of cheatgrass spread or mule habitat, then grazing timing and intensity would be decreased.

To help balance grazing rotations around potential needs to rest pastures due to fire, habitat projects, or research projects designs, there are a series of adaptive management options. One pasture could be utilized two consecutive years in a row as long as it is not utilized during the same time of the year as the previous year. This would be a deferment system. An example of this would be if there was a need to rest the both the Slide and Ranger Pass Pastures for multiple years. The Little Mountain and Burnt Corral Pastures could be utilized during the May 15 to November 1 season of use in a deferment system where one pasture is utilized for the first half of the grazing season and the second pasture would be utilized for the second half. The next year the order of the pasture use would switch.

If there was a need to rest the entire allotment, additional livestock could be shifted to the Central Summer Allotment as long as the maximum of 1,000 head limit for that allotment is not exceeded. This could also only occur if the monitoring of the Central Summer Allotment has occurred and indicated that the numbers can be increased above 600 head.

The initial stocking on the Central Winter Allotment would be up to 200 head. The grazing research projects may require lower levels of livestock numbers depending on the research design. If monitoring of the vegetative condition and trend plots indicate upward trend or static trend with no evidence of livestock use affecting vegetative conditions and research activities are indicating positive outcomes, the adaptive management option of increasing livestock numbers up to 400 head could be authorized. Monitoring would occur again three to five years after the increase in numbers to track vegetative conditions and trend with adjusts to numbers or duration made as needed.

Getting livestock to and from the Central Winter Allotment would be comparable or slightly better than current conditions. Trucking would probably be the logical choice and would require the same efforts as current conditions, however there would be more flexibility for when livestock could be transported in the spring. The value would be that less livestock would be trucked when comparing the current AMP's rate of 400-800 to the proposed action's 200-400. Another option would be trailing livestock that would be going to Central Winter along with livestock that would be staying on Central Summer. A larger herd would go up the Kane Trail, most of which would be left in Central Summer, while the rest would be herded down Forest roads an additional 10-15 miles to the Central Winter Allotment.

There are several key structures that would need to be implemented to correctly complete the rotations. The Little Mountain Pipeline is critical to providing water to livestock in the Slide Pasture along with improving distribution in the Little Mountain and Ranger Pass Pastures. Utilizing the Burnt Corral Pasture would not occur until it is broken off from the Central Summer Allotment by constructing the two sections of fence. The repairs to the pasture boundary fence between the Sowats and Ranger Pass Pastures that was identified in the 2001 Kane Ranch EA needs to occur. This means that there would need to be some phasing occurring before a grazing rotation system could occur on the Allotment. Depending on funding and grant sources, the goal would be to complete these projects within five years of implementation of the new Allotment Management Plan.

In summary the proposed action addresses many of the concerns that are facing the logistical viability of grazing cattle on these allotments. The proposed action would improve the efficiency and timing of getting livestock on and off the Central Summer and Kane Allotments. It would provide added flexibility to when there is need to provide rest to a pasture. It would also be easier to manage.

The Central Winter Allotment would become more usable for grazing and more cost effective to manage. There would always be unplanned events that management would need to respond to, but with additional flexibility, the proposed action gives a lot more opportunities to react in a way that provides for both the vegetative resources and the ranching operation.

Riparian (Natural Lakes and Springs)

Alternative 1 includes 12 natural lake projects that include protections or fence modifications designed to protect riparian species from livestock grazing where they exist. This alternative also includes up to 20 spring improvement projects to restore full or partial natural flow and riparian vegetation.

Unavoidable Adverse Effects, Irreversible and Irrecoverable Commitment of Resources, Compliance with the forest plan(s).

There are no unavoidable adverse effects in Alternative 1 related to livestock grazing. There are also no irreversible and irretrievable commitments of resources.

Alternative 1 is in compliance the Forest Plan for livestock grazing.

Alternative 2

Under current management, the Allotment Management Plan would remain the same. Under existing condition, unplanned events were described along with how management responded. Events including drought cycles and fires would continue. To date there have been solutions to manage multi-season pasture rest while continuing to graze a herd. Over time finding any additional ways to reduce time and effort needed to improve the fall round-up on the Central Winter Allotment could occur. The ability to improve round-ups and maintenance could occur by continuing to increase the stocking rate up to the full permitted 800 head. The added numbers would relate to a higher calf crop and higher gross revenue, which in turn would provide the opportunity to hire additional ranch help to assist with structure maintenance and pasture moves.

The planned structure replacements, improvements, and repairs identified in the 2001 Kane Ranch EA Decision Notice would occur in Alternative 2. There were several projects planned for implementation of that EA that have not occurred yet that would be implemented including: 1) repairing or replacing sections of the Little Mountain pipeline system; 2) replacing the Sowats/Ranger Pass Pasture boundary fence; and 3) constructing a five mile stretch of fence in the Ranger Pass Pasture along Forest Road 427 to create an additional holding pasture.

Additional efforts would need to be made by the permittee to utilize the Central Winter and Kane Allotment to intent of the Allotment Management Plan. This would involve trucking 400 head initially to the Central Winter Allotment in May once the semi accessible roads are free of snow. Livestock would then be moved to the next Central Winter pasture in the rotation for one month, following by moving cattle to the Central Summer Allotment. Once the Little Mountain pipeline system is repaired and fully functioning, livestock numbers on the Central Winter Allotment could be increased up to 800 head.

When fires and habitat projects occur that require resting a pasture or two, the Central Winter pasture rotations would be modified by grazing remaining pastures for the number of years necessary. The other option is to rest the entire Central Winter Allotment and cattle would be transferred from BLM winter range to Central Summer.

Grazing on the Central Summer Allotment would continue with the ability to graze 400 head from June 1 to July 1 and 800 head from July 1 to October 28, alternating between North and South Summer each year. From a vegetative standpoint, 800 head is very conservative grazing on either pasture. When there is a need to rest one of the two pastures for multiple years, the non-rested pasture would be grazed multiple years and potentially at a reduced stocking rate.

The Kane Allotment would need to be utilized. The season of use would range from October 16 to

November 12 with 800 head and would not exceed 587 AUM's. As the fall round-up occurs on the Central Summer Allotment, the small bunches of livestock that are gathered in corrals and canyons would be moved to either the North or South Kane Allotment one group at a time, alternating pastures each year. This would probably be a balance of herding some bunches of cattle that are close to the Kane Allotment and possibly hauling some in trailers close to the allotment and herding the rest of the way. Semi-truck access to the Kane is almost impossible due to the steep terrain and limited access roads, but a small trailer may be possible. Over the course of a few years, livestock could learn to drift down to these pastures on their own which would improve the efficiency of the operation. If there was a need to rest either or both of the Kane Allotment pastures, it would be managed by trucking cattle from Central Summer to BLM winter range.

Completing the full rotations of the allotment management plan in Alternative 2 is possible. Compared to the proposed action, it would require more effort from the permittee to move cattle from the Central Summer Allotment. The permittee would need to balance the structural maintenance of the Central Winter Allotment with the short timing of the pasture duration. The options listed for pasture rest would need to be balanced with the appropriate stocking rate for each situation.

To date there is no direct evidence to support that the known noxious and invasive weeds on the allotments were introduced by livestock or further spread following current management (Noxious Weeds Report). However, there has been the potential that livestock could have contributed to the spread. Given the vast size of the all of the pastures in the Kane Ranch Allotments, there is the continued ability to avoid infestations of concern by control of water access and supplement placement. Based on observations of the noxious and invasive species and the cattle rotations over the last ten years, it is reasonable to assume that the spread of these species by livestock in Alternative 2 is not likely to increase.

Riparian (Natural Lakes and Springs)

No additional riparian projects would be part of Alternative 1. However, it is likely that additional future NEPA work would protect or improve some of these areas. Livestock would continue to utilize some of these areas for forage and water that area not currently excluded from grazing.

Unavoidable Adverse Effects, Irreversible and Irrecoverable Commitment of Resources, Compliance with the forest plan(s).

There are no unavoidable adverse effects in Alternative 2 related to livestock grazing. There are also no irreversible and irretrievable commitments of resources.

Alternative 2 is in compliance the Forest Plan for livestock grazing.

Alternative 3

Under this alternative, there would be no authorized grazing on the allotments. There would be additional structures to the allotments. Existing structures including waters and fences would not be maintained. All structures that require a level of maintenance to remain functional would eventually become non-functional. There are no benefits to livestock management if there are no livestock.

The project area would have no affects from livestock grazing for any resource. The negative and positive effects from livestock to noxious weeds within the allotments would not exist in this alternative. Fires would not be affected by livestock grazing. Livestock would not have an effect on climate change.

Unavoidable Adverse Effects, Irreversible and Irrecoverable Commitment of Resources, Compliance with the forest plan(s).

There are no unavoidable adverse effects in Alternative 3 related to livestock grazing. There are also no irreversible and irretrievable commitments of resources. Future analysis could bring livestock back to the allotments.

Alternative 3 is in compliance the Forest Plan for livestock grazing.

Conclusions of Alternative's Effects

Livestock grazing management and livestock forage. Alternative 1 would provide for the best long-term improvements in grazing management, followed by Alternative 2. Alternative 3 removes livestock from the allotments. Alternative 1 also improves natural lakes and springs within the allotments compared to Alternative 2. It also provides grazing research for cheatgrass and mule deer. A good representation of these alternative differences is displayed in Table 1 in this report. It shows the improvements in livestock management. Under Alternative 3, the project area would have no affects from livestock grazing for any resource.

All alternatives are in compliance with the Forest Plan standards and guidelines for livestock management.

Cumulative Effects

The cumulative effects analysis area for the grazing management of the Kane Ranch EA is the entire area compasses the Central Winter, Central Summer, and Kane Allotments and the adjoining BLM allotments that are also part of the same ranch. The anticipated cumulated effects that could alter management of these allotments in the next ten years are climate change, fire, vegetation projects, the management of BLM lands portion of the ranch.

The time frame for these combined effects is 10 years, 10 years in the future because changes in condition and trend in the vegetation depend on the presence of favorable growing conditions after cattle leave the pasture. Vegetation recovery from the other activities and natural events depend on annual weather conditions particularly annual precipitation. If growing conditions are favorable, plant height and canopy cover would completely recover from the impacts of the proposed forest management activities within one year. If growing conditions are not favorable, plant recovery would occur more slowly (up to two to three years).

Past restoration projects (Cumulative List of Projects) within the project area have increased forage and understory vegetation. Forest Service policy has changed over time and the Forests are now allowed to be managed for un-evened age tree management and allow fire to return to its nature role in the ecosystem. Current grazing management conducted utilizing adaptive management procedures in order to meet objectives established in existing allotment management plans, is also part of the existing baseline. The baseline includes the vegetation and prescribed fire projects. The baseline also includes the use of up-to-date grazing systems and adaptive management on all the allotment acres of the cumulative effects.

Current studies on global climate change indicate a trend towards higher temperatures, lower precipitation, more frequent and severe droughts, and increased frequency of high intensity wildfires. In the event that drought cycles or higher temperatures lead to decline vegetative conditions, management of the allotments would need to be adaptable to not have an added cumulative effect. When comparing Alternatives 1 and 2, the proposed action is more flexible to be adapted around reduced vegetation by altering the pasture rotations. However, if a severe drought cycle occurs for multiple years, livestock numbers would need to be dropped in both alternatives. Climate change would not create added effects to Alternative 3, as there would not be livestock to have an impact.

Wildfires can be expected to occur to some level in the next years across the allotments. To best allow the native understory vegetation to respond, the fire area or even entire pastures would need to be rested for a period of time with the duration dependent on monitoring. The proposed action provides an increased ability to alter grazing rotations around resting pastures multiple years without a decrease in livestock numbers when compared to alternative 2. Alternative 3 would have no authorized livestock grazing and no concerns of resting pastures.

Predicted vegetation projects in foreseeable future across the allotments include the Burnt Corral vegetation project, Tipover fuels reduction project, and ongoing vegetation treatments on Central Winter

Allotment. With each project there would probably be a need to rest that portion of the pasture until the project is completed and the vegetation has responded. Alternative 1 provides the best opportunity to provide pasture rest and maintain livestock numbers in a logistically feasible rotation. Alternative 3 would have no authorized livestock grazing and no concerns for these projects.

The BLM portions of the ranch are Soap Creek and Sand Hills Allotments. When livestock from Kane Ranch are not on Forest Service lands, they are on BLM lands on one or both of these allotments. Changes in management on the Forest or the BLM could affect management on the other. In developing the proposed action, the stocking rate and pasture rotation timing was evaluated for potential effects to BLM lands.

The Soap Creek Allotment season of use is October 15 to May 28 which works well with the May 15 to November 30 range of dates on the Forest Service Allotments in alternative 1. In comparison with maintaining current Forest Service Allotment Management in Alternative 2, the range of dates is May 1 to November 12. Both alternatives overlap within the season of use on the Soap Creek Allotment. The difference of when livestock would be entering and leaving the Forest is two weeks earlier in the current action.

The use of the BLM Sand Hills Allotment is consistent across both Alternatives 1 and 2. The Sand Hills Allotment is a year round allotment. Some of livestock that graze on the Forest Service Allotments would spend the winter months on the Sand Hill Allotment. Between the season of use and the available stocking rates on the BLM Allotments, there is the ability to sustain the range of livestock numbers that would be permitted on the Forest in both Alternative 1 and 2. Alternative 3 would require the BLM grazed livestock to remain on these permits. This change would reduce the amount of rest these pastures receive each year by going on the Forest.

Vegetation

Methodology and Analysis Process

In assessing the existing condition of Central Winter, Central Summer, and Kane Allotments, the following methodology was utilized: 1) reading the existing transects across the three allotments and converting the transects to an updated protocol; 2) linking all transects to ecosystems and Terrestrial Ecosystem Soil Map Units (TEU) and lumping similar soil units into strata; 3) establishing new transects in strata where data was lacking; conducting forage and browse production surveys at each transect location; 4) assessing changes in vegetative condition by comparing the differences in vegetative frequency, production, and species diversity since the last reading; and 5) comparing changes in annual and seasonal moisture from North Kaibab rain gauges.

Parker 3 step transects were initially established across the allotments in the 1950's to determine vegetative condition and trend. These plots have been read intermittently since to determine changes in species composition, frequency, and diversity. To begin this analysis, these plots were all monitored in 2010-2012. The methodology for monitoring the transects was converting to a nested frequency and dry weight rank protocol to determine frequency but continues to utilize existing Parker 3 step locations to continue the link to 60 years of vegetative data.

Terrestrial Ecosystem Soil Map Units (TEU) were utilized to represent the vegetation occurring on these sites. Descriptions of each TEU come from the Kaibab National Forest Terrestrial Ecosystem Survey Handbook (1989). Units containing similar soil types, slopes, elevation, ecosystem, and vegetation were lumped into strata for each respective allotment. All read plots were then linked to a stratum. If there was only one or less plots in a strata that contained suitable grazing capability, additional plots were installed to establish a baseline and the opportunity to track vegetative changes for future analyses. In the tables below for each allotment, the following data would be described: 1) most common species found on the

plots; 2) change in vegetative trend since the last monitoring plot reading; and 3) individual TEU's that make up the strata.

At each of the monitoring plots, forage (primarily grasses and small forbs) and browse (shrubs/large forbs) production studies were conducted to establish a point in time vegetation quantity under a protocol called comparative yield. The results of each plot were then averaged to represent the actual results of the strata. It is important to note that forage and browse production are "point in time" measurements. The same study could be conducted on the same site at a different time of year or on the same day the following year with different results depending on the growth of the plants at the site and factors including precipitation.

Grazing capability was determined using updated soil condition and forage production data. Grazing capability classes were determined as follows: satisfactory soil condition - full capability; impaired soil condition - potential capability; unsatisfactory soil condition - potential capability; inherently unstable soil condition - no capability. Unsatisfactory soil conditions have potential capability because the ID team believes there a chance for recovery to impaired or satisfactory condition.

Allowable use would be assigned as follows: full capability for satisfactory soil condition - conservative allowable use (30-40%); potential capability for impaired soil condition - conservative allowable use (30-40%); potential capability for unsatisfactory soil condition - can have a conservative assignment of allowable use (10-20%); no capability - no allowable use.

Available livestock forage in each pasture was determined using the following protocol. The forage production and browse production numbers for each of the full capability stratum was assigned and the acres of each stratum totaled. Pounds of forage and browse were converted to Animal Unit Months (AUM's or the amount one cow/calf pair would consume in one month). The allowable use rate was calculated and the number of forage AUM's available for livestock on each pasture was determined. Even though shrub browse species are often utilized by livestock, with the degree of shrub utilization being dependent on the location and time of year, potential carrying capacity was calculated grass forage production alone. The final authorized livestock numbers were then set to be well within the potential forage production limits to account for any factors that could limit forage production like reduced moisture, canopy encroachment, or climate change. The stocking rate of livestock was then further refined in each pasture to account for providing more than sufficient forage for wildlife species that would utilize the same forage and browse species. Potential capability acres were not used in this analysis because the full capability acres were above stocking levels for all the alternatives.

The detailed results of each transect, plot, forage and browse production, the tables accumulating the data can be found in the project record. Descriptions of the protocol can also be found in the project record.

Precipitation data for each allotment comes from rain gauges that occur on or within a mile of each allotment. The data represents annual totals as well as amounts throughout the year. Arizona has a unique feature of two periods of precipitation: one season from December through March and the other during July, August, and September. Storms associated with the winter precipitation normally cover large areas in the State, which includes the project area. In contrast, the summers "monsoon rains" are brief, sometimes intense systems that move up the elevation gradient and approaches the Kaibab plateau. These systems are known to be spotty and rarely cover more than two miles. These monsoon storms will often provide moisture to the higher elevations of the North Kaibab with minimal smaller precipitation to the west and east sides of the plateau. A summary of the rain gauge data applicable to the project area can be found in the project record.

Affected Environment

Central Winter Allotment

The Central Winter Allotment consists of four active pastures and one pasture that is closed to grazing which include approximately 129,000 Forest Service acres on the west side of the North Kaibab Ranger District. The elevations of the allotment vary from 6,000 feet to 7,400 feet. Primary vegetation types include pinion-juniper woodlands, great basin grassland, shrubland, and ponderosa pine.

The climate is considered semi-arid with an average annual precipitation ranging from less than 12 inches near the shrubland western and northern edges of the allotment to over 17 inches towards the higher, ponderosa pine eastern edges of the allotment. These figures are an average spanning over forty years. There was a significant dip in precipitation from 2001 to 2003 drought followed by years closer to the annual averages.

The 1996 Bridger Knoll Complex fire burned 54,000 acres of this allotment, resulting in increases in oak and New Mexico locust. The fire has also promoted the establishment and spread of cheatgrass (*bromus tectorum*) that has heavily infested parts of the allotment. The fire occurred to some degree in all five pastures of the allotment. Burn intensities varied through-out the fire but the most dramatic changes in post fire vegetative condition occurred on shallow soil ridge tops in pinion-juniper woodlands that burned with high intensity and shrubland communities of the Sowats, JumpUp, Slide, and Ranger Pass Pastures.

Since the Bridger Knoll fire, several more wildfires have occurred on the Central Winter Allotment including the 2005 Ranger Fire, 2007 Slide Fire, and the 2012 West Side Complex Fires. This area is prone to fires because of high frequency of lightening, spotty precipitation, and the increasing abundance of cheatgrass that serves as dry fine fuels during the peak fire season.

Today many of these ridge tops have become heavily infested with cheatgrass, ranging from 30 to 90 percent of ground cover (D Burger, professional observations). Additional discussion of invasive species, including cheatgrass, will occur in the non-native invasive species section of this analysis.

There are areas on the allotment where fires have had positive benefits. These locations are typically sites with more productive soils in shrubland valleys and the ponderosa pine ecosystem where low to moderate intensity fires have occurred. More specific locations include valley bottoms affected by the Bridger Knoll Fire and natural ignition management fires and prescribed fires on the ponderosa pine ecosystems of the Little Mountain Pasture. In these sites, the native understory vegetation responded with increased frequency and vigor.

Prior to the 2010 reading and new protocol conversion, the last complete reading of the plots occurred in 1997, which was before to the original Kane Ranch EA and after the Bridger Knoll Fire. Some of the plots that were affected by the fire were reread in 2003. The analysis period for the vegetative changes on the Central Winter Allotment spans from the last full reading in 1997 but also compares the 2003 readings.

Based on the 2010 plot readings, just over half of the acres on the Central Winter Allotment have indicated a notable improvement since prior readings (Table 8). These improvements are often attributed to areas affected by the Bridger Knoll Fire. The lower intensity portions on more productive sites of the fire showed only modest improvements between the 1997 to 2003 readings primarily due to slow understory species response post fire during the 2001 to 2003 drought. Notable gains then occurred to these low intensity fire affected sites once precipitation patterns returned to average. These sites are represented mostly by some of strata 8, and then large portions of strata 9 and 10.

Table 8. Central Winter Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.

Strata	Acres	Range Type	Trend	Capability	Terrestrial Ecosystem Units
1	3,448	1/4 BOGR, POFE, SIHY, ARTR	Static	FC	17, 23
2	5,744	6 PIPO, PIED, QUGA, ARTR	None	NC	154, 271, 274, 299
3	238	4 ATCA, BOR, EULA	None	FC 80%	633, 636, 637
4	25,080	9 BOGR, POFE, STCO	Static	FC 75%	272, 273
5	10,935	6 POFE, BOGR, SIHY	Static	FC 60%	293, 294, 621
6	8,540	6 PIED, JUOS, ARTR, STCO	Static	FC	263, 264, 281, 644
7	6,610	6 PIPO, PIED, QUGA, ARTR	Static	FC 80%	297, 298
8	48,859	6 PIED, JUOS, ARTR, STCO	Up	FC 35%	250, 251, 252
9	4,119	1/4 BOGR, SIHY, ARTR	Up	FC	634
10	12,133	6/4 ARTR, AGCR, QUGA	Up	FC	672, 673

The acres that have remained in a static trend can be linked either shallow soil ridge top areas that burned with high intensity during the Bridger Knoll fire or areas not affected by the Bridger Knoll Fire at all. Stratum 4 and 6 are examples that contain both high intensity burn and no fire effects. For the areas of high intensity burn intensity, response by native species was slow and further impacted by drought. Cheatgrass was able to successfully fill in voids between the limited native vegetation that did respond post fire and lead to insignificant changes from the transect reading that occurred in 1997, one year after the Bridger Knoll Fire. Invasive species were recorded during the reading of the transects for the purposes of establishing vegetative trend but are not considered as part of the calculations of native understory frequency or forage production. Monitoring sites infested with cheatgrass found two results: 1) increasing cheatgrass frequency that would then indicate decreasing vegetative trend, and 2) increasing native species when compared to the 1997 post fire reading and the 2003 drought reading.

Cheatgrass was present on these sites during the 1997 reading and then very abundant in the 2003 readings and represented a highest percentage of the understory species frequency at the time. In 2010, the amount of cheatgrass had increased on the sites, but so did the native species. The percentage of native species to cheatgrass increased at all sites monitored. The end results were assessed as a static trend as the site has both improved native understory composition and ground cover and also declined due to increased invasives.

For the sites that were not affected by fires, there have been limited changes during the analysis period. Some of these sites that are represented by shrubland valley bottoms are in good vegetative condition. Many of the pinion-juniper woodland ridge tops where transects were read are not meeting desired condition due to overstory encroachment from Pinion and Juniper and/or poor soil quality. These sites experienced a similar response to cycles in precipitation and the 2010 plot monitoring was comparable the 1997 transect readings. While the areas experiencing overstory encroachment did remain in a static trend pattern, incremental decreases in understory vegetation can be expected over time. Gains in understory species cannot occur until measures can be taken to restore the balance of pinion-juniper overstory and understory species on the sites with the capability to increase understory production.

The remaining areas of the allotment fall under strata 2 and 3 in which the former represents areas with steep slopes or very rough terrain that livestock would be highly unlikely to graze on and the latter was too small of an area to find a logical place to establish a monitoring plot.

There have been multiple projects initiated across the Central Winter Allotment to improve vegetative conditions. The West Side Habitat EA (2006) has focused on improving habitat for wildlife species through a series of treatments to restore native understory vegetation. The majority of this work has occurred on the Slide and Ranger Pass Pastures. These projects include seeding native shrub and grass species on ridge tops and valley bottoms where these species are lacking; creating openings in dense pinion/juniper stands to stimulate the understory potential, and maintaining historic openings by treating pinion/juniper encroachment.

The Coconino, Kaibab, and Prescott National Forests Noxious and Invasive Species EIS (2005) authorize the use of different treatment options to control Noxious and Invasive Species. More detailed discussion of these treatments will be discussed in the non-native species section.

The 2007 Slide Fire and 2012 West Side Complex Fires had overlap with some of the areas identified for treatment in the West Side Habitat EA. A series of fire rehab activities occurred on these areas where sites that contained high frequency of cheatgrass that then burned, were sprayed with herbicide and then seeded with grasses and/or shrubs.

To date, each of these projects have had a variable level of success in improving the vegetative conditions, with factors including precipitation, seed mixes, soil productivity, and cheatgrass invasion/eradication each affecting treatment results. The most successful of the projects have been maintaining the historic openings and/or creating openings in pinion-juniper on sites with more productive soils and grass seeding efforts on productive sites.

Details of livestock use will be discussed in the Livestock Management section of the EA. Given issues with drought, the transfer of the grazing permit, non-functional water sources, semi access in May, and a series of fires/rehab projects, the pastures have not experienced the full intended rotational grazing system from the 2001 Kane EA. The Little Mountain Pasture has received the majority of the livestock use on the Allotment, being grazing four out of the possible 11 years since 2001.

Table 9 is a point in time measurement of forage and browse taken at all plots in 2010. The table displays pasture name, acres, available forage, and available browse for the Central Winter Allotment.

Table 9. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.

Pasture Name	Pasture acres	Available Forage in AUM's	Available browse in AUM's
Little Mountain	15,038	3,500	1,220
Ranger Pass	34,342	8,320	3,185
Slide	37,728	9,410	5,189
Sowats	23,582	7,535	2,587
JumpUp	15,744	1,922	1,713

The current utilization rate for the pastures of the Central Winter Allotment is 20 percent. Up to 15 percent of the key areas within a pasture may exceed 15 percent as long the combined utilization rates of all key areas average 20 percent or less. All use of the pastures has been within the allowable utilization since 2001.

Based on 2010 monitoring results, there is no evidence to indicate that livestock use has had an impact on the vegetative conditions of the pasture. Some of this could be attributed to the inconsistent use of the allotment. The primary influences to vegetative change on this allotment have been wildfires and the spread of cheatgrass. Areas that were not affected by wildfire and cheatgrass have remained the same. Now that the native species affected by the Bridger Knoll fire have recovered to a sustainable level, the key challenges that could affect vegetative conditions would be the continued expansion of cheatgrass and cheatgrass fueled fires.

Central Summer Allotment

The Central Summer Allotment consists of two very large pastures for a total of 281,000 acres. This allotment spans the top of the North Kaibab plateau from the Jacob Lake vicinity to the National Park Service boundary. The elevations of the allotment range from 6,200 to 8,800 feet. Primary vegetation types include ponderosa pine, mixed conifer, subalpine meadows, pinion-juniper, and shrubland communities.

The Central Summer Allotment also receives the highest precipitation ranging from the high teens to low 20 inch range across most of the allotment. The eastern edge of the allotment is in the pinion-juniper and also a “rain shadow” that averages about 10-13 inches per year. Intense summer “monsoon” rains are typical here and average winter snows will often accumulate into multiple feet. While also affected by the 2001 to 2003 drought, the more productive soils and typically higher precipitation levels facilitated adequate forage during the drought and then responded quickly once moisture patterns returned to average.

There have been numerous wildfires, prescribed burns, and natural ignition management fires across this allotment. The most notable was the 2006 Warm Fire that burned approximately 59,000 acres in the North Summer Pasture of this allotment. While burn intensities varied across the fire, the ponderosa pine ecosystem responded the quickest with large increases in understory growth. The rate of vegetative response in this ecosystem correlates with burn intensity where low intensity responded the quickest, followed by moderate intensity and high intensity being the slowest response. Currently, all areas within the ponderosa pine areas of Warm Fire indicated considerable improvement in native understory plant frequency compared to the last reading.

The mixed conifer ecosystems affected by the Warm Fire are also increasing understory growth, although given that the majority of these acres burned with the highest intensity experienced on the fire, the understory recovered at a slower rate, but have now recovered. The pinion-juniper portion of the fire is recovering at the slowest rate. Pre-fire this area was very dense with pinion-juniper with very little understory. Post fire flooding had a large impact here. Efforts to limit cheatgrass from out-competing the native understory in the pinion-juniper portion of the Warm Fire have been ongoing since 2007. Currently, the understory in these pinyon and juniper fire areas has increased since the fire primarily because of the removal of the trees and return to normal precipitation patterns.

The remaining fires that have occurred across the allotment, whether wildfire, natural ignition management fires, or prescribed burning have all had positive results across the allotment which includes reduced overstory competition and increased understory production.

Reading the Parker 3 step transects locations as nested frequency/dry weight rank plots occurred in 2011. The Parker 3 step transects was initially established in 1953, with additional plots added over the years. The last reading occurred in 1998, although not all transects were located and read at that time. The last complete reading where all transects was found and monitored was in 1983. When establishing trend, comparisons were made to all of the 1998 transect results and the rest are based on the 1983 numbers. In creating the strata, additional permanent plots were installed to represent ecosystem changes in the pinion-juniper (Strata 1 and 2) in locations where temporary transects were read in 2007 to track vegetative changes from Warm Fire. New plots were established on mixed conifer ridgetops (strata 12) and so there will not be a vegetative trend from the 2011 readings. Areas with steep slopes or terrain inaccessible to livestock are represented by strata 4 and 9 and did not contain monitoring plots. Specific areas where livestock use is to be discouraged include Demotte Park meadow (strata 7) and canyon bottoms in the Saddle Mountain Wilderness (strata 3). As these areas will not be authorized for grazing, they will not be part of the forage production capacities.

The numbering scheme for the strata on the Central Summer Allotment is the same as the Central Winter Allotment, however, the TEU based strata is different for each allotment (Table 10). Even though there are similar soil types that can be found across these allotments, there are differences in moisture, management activities, and vegetation that makes each of the three allotments slightly different. Due to these differences, each allotment is comprised of different strata to represent the soil types.

Table 10. Central Summer Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.

Strata	Acres	Range Type	Trend	Capability	Terrestrial Ecosystem Units
1	4,725	PIED, JUOS, ARTR, STCO, BOGR	Static	FC	17, 23, 25, 644
2	10,963	PIED, JUOS, ARTR, STCO, QUGA	Static	FC 50%	263, 264, 272, 273,
3	1,334	PIED, JUOS, ARTR, ATCA, BOGR, EULA,	Static	NC	32, 633, 634
4	31,550	QUGA, RONE, PIED, JUOS, ARTR, STCO,	Static	NC	156, 274, 252, 271,
5	84,969	PIPO, QUGA, PIED, ARTR	Up	FC 70%	293, 294, 297, 298,
6	1,062	POPR, AGSM, PIPO	Static	FC	9
7	1,434	CAREX, DECA5, POPR, FEOV, DAIN,	Static	NC	35, 655
8	3,814	POPR, FEOV, BRAN, MUMO	Static	FC	5, 642, 643
9	12,888	PSMEG, PIEN, ABLAA, ABCO,	Static	NC	627, 625, 645
10	113,061	ABCO, PSMEG, PIPO, QUGA, PIEN,	Static	FC 70%	623, 624, 626, 618,
11	5,672	ABCO, PIPO, POTR	Static	FC 60%	612, 613, 614, 615
12	10,221	ABCO, PICE	Static	FC 40%	603, 604, 605, 606,

In comparing the trend of the plots in 2011 to previous readings (excluding newly established plots of strata 12), areas that have not received treatment in the form of fire or mechanical treatment have remained the same for the vegetative frequency and composition. Plots located within strata 10, which represented approximately 40% of the allotment, indicated virtually little to no change in understory vegetation. Strata five represented approximately 28 percent of the allotment and the upward vegetative trend is based on the increases in understory vegetative frequency in the sections of Warm Fire. It is worth noting that the one plot that occurred in strata 5 that was not in Warm fire was static trend.

The trends of strata one and two are reflective of changes in the Pinion-Juniper portion of Warm Fire based on initial readings in 2007, one year after the fire. Other than visual observations of dense pinyon juniper cover with minimal understory before the Warm Fire, these plots only represent post fire vegetative response from the last five years. Table 11 displays pasture name, acres, available forage, and available browse for the Central Winter Allotment.

Table 11. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.

Allotment & Pastures	Pasture Acres	Available forage in AUM's	Available browse in AUM's
Central Summer North	102,337	19,860	18,590
Central Summer South	179,355	34,355	48,075

The two pastures of the Central Summer Allotment are very large and very productive from a vegetative standpoint. The current Allotment Management Plan authorizes a very conservative stocking rate. The 2001 Kane Ranch EA analyzed six alternatives, including alternatives that would authorize 1,200 head. Prior to the 2001 EA, the stocking rate was 1,100 head with static vegetative trends on the plots monitored in 1998. Based on the forage production estimates in the late 1990's, 1,200 head would be suitable for the available forage. The alternative selected that authorized 800 head was more a product of the pastures where livestock would spend the remainder of the year, not the Central Summer Allotment. The high levels of forage production are consistent with the results of the 2012 monitoring.

Due to circumstances including the Warm Fire, 2001-2003 drought, and the transfer of the grazing permit, the pastures have not experienced full permitted numbers since the implementation of the 2001 Allotment Management Plan. Greater detail of the actual use of the pastures will be in the livestock management section of the EA.

The allowable utilization rate on the Central Summer Allotment is an overall average of 20 percent. Key area monitoring sites may be utilized up to 30 percent as long as the combined utilization averages of all the key areas within the pasture average 20 percent. Annual utilization monitoring of the pasture has averaged less than five percent. Typically the summer monsoon rains leads to understory species growing

at a faster rate than utilization can occur. The majority of the use in both the North and South Pastures occur on the western halves of each pasture. Livestock spread out across the vast pastures into small bunches. While the stocking rate is very low on these pastures, the small bunches tend to spend stay in the same locations most of the grazing season. This small level of concentration has not indicated any changes in vegetation composition, frequency, or trend.

Based on the permanent plot monitoring, there was no indication that livestock was influencing change in the vegetative conditions. Fire has been the biggest influence on the understory vegetation of the Central Summer Allotment.

Kane Allotment

The Kane Allotment consists of two pastures for a total of 25,000 acres. The allotment is located on the eastern bench of the North Kaibab Ranger District with the Bureau of Land Management boundary as the eastern border. The elevations of the allotment range from 5,500 to 7,200 feet. Primary vegetation types include shrubland and pinion-juniper communities.

The allotment is in a “rain shadow” cast by the top of the Kaibab Plateau. Precipitation totals here average from nine to fourteen inches each year. The soil types are very similar to those found on the Central Winter Allotment, but the vegetative response is often slower and less productive on the Kane Allotment due to the lower average moisture.

There has been very little management activities on this allotment. Probably the biggest influences on the shrubland valley bottoms were “dozer pushes” and seeding that occurred in the 1960’s. Parades plains cactus occurs on this allotment. Strategy measures towards the preservation of this species will be discussed in the botany section.

The initial Parker 3 step plots were established in the 1950’s. Monitoring these plots and converting to Nested Frequency and Dry weight rank occurred in 2012. Comparisons to establish the trend of the vegetative conditions will be from the last reading on the North Kane pasture in 2002 and the South Kane Pasture in 1981.

The Kane Allotment was also given separate soil unit based strata to reflect that the understory vegetation is different on this allotment. Table 12 displays the acres, range type, trend, capability and TEU map units by soil strata.

Table 12. Kane Allotment strata, with range type, trend, capability, and terrestrial ecosystem units.

Strata	Acres	Range Type	Trend	Capability	TEU Map Units
1	3,751	Shrubland valley bottoms, Atrtr, Agcr, Atca, Bogr	Static	FC	17, 644, 634
2	14,191	Pinion-juniper woodlands, Artr, Bogr	Static	FC 50%	263, 264, 272, 273, 281, 251
3	2,851	Cold desert shrub, Bogr, Spcr, Boer, Atca	Up	FC	23, 633, 636
4	4,635	Steep slopes from cold desert shrub to ponderosa pine, Pied, Juos, Artr, Pipo	Static	NC	156, 274, 252, 271, 299, 621
5	246	Ponderosa pine, Quga, Pied, Artr	Static	FC 70%	293, 294, 297, 298, 620, 631

For the most part the vegetative conditions on this allotment have not experienced a notable change since the last respective readings. Strata 3 represents the only strata that have experienced a notable change in conditions. The increase in vegetative frequency in these zones could be attributed to average to above average monsoon rains that promoted the warm season species when compared to the 2003 reading in drought conditions and long term benefit from changes in the grazing rotations. Table 13 displays pasture name, acres, available forage, and available browse for the Kane Allotment.

Table 13. Central Winter pasture name, acres, available forage in AUM's and available browse in AUM's.

Kane	Pasture Acres	Available forage in AUM's	Available Browse in AUM's
North Kane	11,746	1,600	1,790
South Kane	13,903	3,000	3,484

The utilization rate for the pastures of the Kane Allotment is 20 percent. Up to 15 percent of the key areas within a pasture may exceed 15 percent as long the combined utilization rates of all key areas average 20 percent or less. There has been virtually no use on this allotment since 2001. Use by cattle has been incidental. This is due to logistical challenges that will be discussed in the livestock management section.

Kanab Creek

While the Kanab Creek Allotment will remain closed to grazing across all three alternatives, a few transects were visited in 2012 to study any changes from the last reading in 1998. There were no discernible changes at the plots visited. However, its worth mentioning that the plots of this closed to grazing allotment are on grassy benches that contain the best soils and support native vegetation. Species like tamarix, Russian olive, Russian thistle, and cheatgrass were visible in many places throughout the channel of Snake Gulch and Kanab Creek Canyon. While there is not currently monitoring plot data to track the trend of the areas infested, it does appear that vegetative conditions here are declining as a product of increased invasive species.

Disturbance in the allotment is limited to flash flooding and continued invasive species moving in from areas higher in the watershed. Until measures are taken to fully reduce the non-native species, the vegetative conditions are expected to continue declining.

Effects Analysis (Direct and Indirect)

Alternative 1

The Central Winter, Central Summer, and Kane Allotments would incorporate the allowable conservative forage utilization rate of 30-40%. This change is based on the Kaibab National Forest Plan, as amended, consistency for all the other allotments on the Forest, and the 1997 Forest Service Region 3 Range Monitoring and Training Guide. This would represent an increase the utilization allowed in each pasture of the allotment. This utilization rate would still represent conservative grazing levels. The upper limits of the proposed action's stocking rates for each pasture were calculated on forage production numbers alone. Livestock use of available browse species would be in addition to the calculated stocking rate on forage. The stocking rate was also set to be conservative for years with below average moisture, provide ample forage and browse for wildlife, and still not remain under a 40 percent allowable use rate. Utilization rates above this level for restoration research purposes would be allowed. If this research shows a positive effect using these higher utilization rates, a higher level may be established for specific restoration purposes. Table 14 displays the summary of range of livestock numbers, anticipated AUM's, maximum AUM's, available forage, and modeled utilization in key areas.

Table 14. Kane Ranch Allotments livestock numbers, anticipated AUM's, maximum AUM's, available forage, and utilization for Alternative 1.

Allotment (Bold) & Pastures	Range of Authorized Livestock Numbers	Anticipated AUM's	Maximum AUM's	Available forage in AUM's	Modeled utilization in key areas
Central Summer					
Central Summer Northwest	600-1,000	2,400	4,000	4,300	20% to 30%
Central Summer Northeast	600-1,000	600	2,000	2,976	8% to 27%
Central Summer Southwest	600-1,000	2,700	5,000	8,244	10% to 25%
Central Summer Southeast	600-1,000	150	1,000	5,500	1% to 7%
Lookout Canyon Holding Past.	600	200	500	960	8% to 20%
Murray Holding Pasture	600	200	500	800	10% to 24%
Pleasant Valley Holding Pasture	600	200	400	720	11% to 22%

Allotment (Bold) & Pastures	Range of Authorized Livestock Numbers	Anticipated AUM's	Maximum AUM's	Available forage in AUM's	Modeled utilization in key areas
Kane					
North Kane	600	300	500	640	18% to 30%
South Kane	600	300	500	1,200	10% to 17%
Central Winter					
Little Mountain	200-400	600	1,200	1,400	17% to 35%
Burnt Corral	200-400	600	1,200	1,368	20% to 35%
Ranger Pass	200-400	600	1,200	3,328	7% to 15%
Slide	200-400	600	1,200	3,764	6% to 13%
Sowats	100	100	100	3,014	5%
JumpUp	0	0	0	768	0

Central Winter Allotment

The Central Winter Allotment would become a separate allotment from the Central Summer and Kane Allotment compared to being part of the annual rotation of Alternative 2. The timing of when the pastures would be utilized would become more a product of the best management practices and not a set date every year as in Alternative 2. The AUM's of pastures would become more flexible with the ability to increase or decrease numbers easier than the current action. The limits set on pastures would be the following: 1) no pasture would be utilized more than 1,200 AUM's; 2) no pasture can be utilized for more than four months; 3) initially livestock numbers in a pasture cannot exceed 200 head; and 4) after monitoring occurs three to five years after implementation and assuming increasing vegetative trend, the livestock numbers would not exceed 400.

Initially, the stocking rate on these pastures would not exceed 200 head. Only after monitoring the nested frequency plots has occurred, and if the plots indicate static and/or increasing vegetative condition trend, the adaptive management option of increasing to up 400 head could be authorized. If monitoring plots indicate only static trend with no positive vegetative improvements, the numbers would remain at 200 head. If the monitoring plots indicate declining vegetative trends, the stocking rate would be reduced either by number of livestock or by duration of use all the way to zero use, if necessary.

Use of each pasture would initially be further refined by series of limits based on climatic or resource concerns. In order to best research management concerns with cheatgrass and mule deer habitat, each pasture would then a second range of use that could only occur initially in a specifically designed research project.

Table 15. Central Winter Allotment range of numbers, initial dates, and adaptive dates for Alternative 1.

Pasture	Range of Authorized Livestock Numbers	Initial and End Dates of Authorized Use	Dates of adaptive management and research designs
Slide	200-400	August 1 to November 1	January 1 to December 31
Ranger Pass	200-400	August 1 to November 1	January 1 to December 31
Little Mountain	200-400	May 15 to November 1	May 15 to November 1
Burnt Corral	200-400	May 15 to November 1	May 15 to November 1
Sowats	Up to 100	No initial authorized use	Jan 1 to Dec 31

What this provides a vegetative and resource minded approach that allows these pastures to be more adaptive to changes in resource conditions beyond just potential impacts from livestock. The Ponderosa pine ecosystems of the Little Mountain and Burnt Corral pastures would be available to use from May 15 to November 1 both initially and with any adaptive grazing management or research strategy. The range of dates were established to start after the cool season grasses have had the chance to develop past the "range ready stage" and end around the time that early snow storms could occur. Neither pasture would be utilized for the full potential range of dates because that would exceed the four month pasture limit.

However, rest rotation or deferment grazing systems could be utilized between the pastures within those dates.

The Slide and Ranger Pass Pastures would have the initial authorized dates of August 1 to November 1. These initial dates are based around avoiding the spring cheatgrass growth on the pastures. The typical spring cheatgrass growing season starts in March to April with seed dispersal in April to May. By August the cheatgrass seed has fallen off of the plant and is less likely to be distributed by livestock. Also, the majority of cool and warm season plants have fully matured and distributed their seed as well. The off date of November 1 is based on typical migration patterns of the Kaibab mule deer herd to winter range. To reduce potential interaction conflicts, the livestock would be leaving the pasture prior or around the same time as the mule deer enter the pastures for the winter.

With Alternative 1 comes a wide variety of adaptive grazing rotation strategies to accommodate multiple years of rest and research opportunities. Pastures could be grazed consecutive years under a deferment system where the timing of the pasture would be altered with the range of initially available dates to defer grazing. This creates the opportunity to rest one to two of the Central Winter Pastures multiple years. With the range of livestock numbers on the Central Summer Allotment, livestock from Central Winter can also be placed on the Central Summer Allotment to provide a rest to the entire Central Winter Allotment. These adaptive rest options create the ability to continue grazing permitted numbers while still providing potential pasture rest needed to maintain or improve vegetative conditions.

Anticipated research activities connected to the “research ranch” component of the Allotment Management Plan include interactions between livestock and wildlife as well as livestock and cheatgrass. To best study livestock and wildlife interactions and dietary needs/overlaps, cattle would be authorized to be on the Slide and Ranger Pass Pastures in the winter months, but only at a scale that facilitates the design of the research project. In regards to cheatgrass, a series of studies that would be outside of the initial authorized dates to determine the following questions: 1) whether or not livestock distribute cheatgrass seed; 2) if livestock do contribute to spreading cheatgrass seed, to what level; 3) what is the variability of grazing livestock at different times of the year for potential cheatgrass spread; and 4) what are the effects of utilizing livestock as a potential tool to “flash graze” cheatgrass in spring and in the fall?

While the studies listed above are the primary research activities expected over the next ten years, there may become opportunities to expand to other elements of grazing/ecosystem management that would be considered within the relatively broad categories of cheatgrass and mule deer interactions.

The Sowats pasture would be limited to research designs initially. It is expected to be utilized as a non-grazing control with the potential option for reduced level of controlled grazing if needed.

Once these applicable studies are completed, the results would drive potential changes to the timing of the allotment management plan. If completed studies indicate grazing strategies that facilitate positive results in regards to wildlife interactions and/or cheatgrass spread, the timing dates of Ranger Pass and Slide Pastures could be modified to authorize a traditional grazing rotation during the research approved timing window and stocking rate. In similar fashion, if research indicates that there is not a timing window or stocking rate that facilitates grazing these pastures, then the pastures would be not be grazed.

When evaluating the effects of the proposed action to the west side, the anticipated result is expected to improve or at least remain static when compared to Alternative 2, current action. Under the initial stocking rate and grazing strategy, 600 AUM's would be utilized on each pasture with the potential to be 800 AUM's if livestock remain in a pasture for the maximum four months. Instead of up to 400-800 head per month per pasture in the months of May and June in Alternative 2, the proposed action would a lower amount of livestock that would be spread out in a more reasonable range of dates better suited to the vegetation types. The Upper limit of the pastures with adaptive management strategies does provide the opportunity to exceed the AUM's in Alternative 1, but only if monitoring and/or research provide results that the vegetative conditions on the pastures would continue to improve.

Alternative 1 also provides the ability to conduct research activities that would best inform future management and the ability to modify timing, duration, and intensity to changing resource conditions that Alternative 2 does not. The product of Alternative 1 would be the ability to adapt the best grazing strategy to the vegetative resource conditions of the Central Winter Allotment, regardless of future vegetative trends.

Central Summer Allotments

The Central Summer and Kane Allotments would become more adaptive to changing vegetative conditions under Alternative 1. Under this alternative, the basic season of use of the allotments would be similar to Alternative 2 only extended by two weeks in the spring. The key to the improvements tied to alternative one would be that livestock would be better distributed and not have the opportunity to linger at the same locations for as long in the North Summer Pasture. A rest rotation system similar to the current action would continue where the North Pastures would be utilized one year and then the South pasture would be utilized the next. There would be more pasture rest and deferment options as well. These results are a product of the fence that would be constructed along highway 67 that would divide the North Summer Pasture into the Northwest and Northeast pastures.

Under current management, livestock tend to gather into the same locations all season long from early June until October. With the implementation of the fence that splits the North Pasture into two halves, livestock would be in the Summer Northwest Pasture for one less month than current action as they would be moved to Summer Northeast where cattle do not typically go.

The holding pastures proposed in Alternative 1 are in locations where livestock tend to congregate now all season long. Each of three pastures would be closed off to livestock for the duration of the grazing and growing season. The holding pastures would only be open to livestock use to help facilitate more efficient pasture moves in the fall, reducing the overall AUM's utilized in the area of the holding pasture.

The proposed action is also expected to improve the livestock permittee's ability to remove livestock from pastures in a timely manner, which then also reduces the overall AUM's actually utilized each grazing season compared to permitted use. This is a product of trailing, the holding pastures, and the division of the Central Summer Pastures.

The stocking rate would be a range from 600 head to 1,000 head. Six hundred head would be the initial stocking rate. Six hundred head would represent a drop in AUM's compared to current management and the adaptive management option of 1,000 would represent an increase. Once monitoring occurs three to five years after the implementation of Allotment Management Plan, and indicates static to increasing vegetative conditions, the option to increase livestock numbers up to 1,000 head would be available. If vegetative trends indicate only static conditions, the stocking rate would stay at 600 head. If monitoring determines declining vegetative conditions that might be a result of livestock, either directly or cumulatively, livestock numbers or the duration would be reduced.

Monitoring in 1998 indicated static trend following decades of livestock numbers averaging near 1,100 head and 2012 monitoring data indicated static trend across all acres not affected by low to moderate intensity fire when grazing 400 to 800 head. When looking at the factors of very low stocking rates for the available for 600 head, lack of change from past stockings, and vegetative trends on areas affected by fire effects, it is predicted that 600 head would not have a noticeable effect to vegetative conditions. If the adaptive management option to increase to 1,000 head is exercised, there is not expected to be a measureable change to the vegetative conditions. Additional monitoring would also be critical in determining that increasing the stocking rate continues the existing static to improving vegetative conditions.

Another benefit of the proposed action is the additional options of pasture rotations would be in the event that there was a need to rest a pasture for multiple seasons. Under the two-pasture current management of Alternative 2, multiple years of rest are managed by grazing the non-rested pasture for consecutive years.

Under the proposed action with three pastures, a pasture could be rested while the two remaining pastures could enter two pasture rest system or a deferment system that could reduce potential long term vegetative impacts. Additional livestock can be shifted to the separate rotation system on the Central Winter Allotment.

In summary, the effect of the proposed action on the Central Summer Allotment provides for a range of numbers that initially drops the stocking rate and ensures that potential increases in future stocking rates are vegetative monitoring and ecosystem managed based. The alternative also reduces the amount of time livestock spend in one location, makes it easier to remove livestock, and has more grazing rotation options when there is a need to rest a pasture multiple years. To the level that improved livestock management alone can improve vegetative conditions, the proposed action gives that potential.

Kane Allotment

The effects of the proposed action to vegetative resources are expected to be very similar to the intentions of the current action. A similar level of AUM's would be utilized in the pastures at the same time. The only key difference would be the optional ability to utilize the Kane Trail to drive livestock up the trail each May that is provided in the proposed action and not in the current action. The trail, which is primarily a road, would be utilized for one to three days each year to quickly transfer livestock through the allotment with minimal grazing expected. Any soil compaction or vegetation damage is anticipated to be minimal as the road that trail is on is already compacted.

Alternative 2

The Current Action alternative would continue the same management implemented in 2001. The disclosed effects are based on the anticipated effects described in Alternative 6 Low in the 2001 Kane Ranch EA as well as reflecting monitoring results of this management plan during this analysis.

Central Winter Allotment

The vegetative conditions of the Central Winter would likely stay the same if current management continued under alternative 2. If the rotations in the current Allotment Management Plan were occurring, it would likely be at the 400 head rate with potential for 800 head if all waters are working and vegetative conditions improve. With a rest rotation system that provides a full year rest to each pasture in the system, there is the opportunity to maintain existing vegetative conditions. The Little Mountain Pasture had experienced the basics of the current allotment management plan and continues to experience static to increasing vegetative trend.

The same operational challenges would continue including spring access, multiple year pasture rest options for fire rehabilitation and restoration efforts, and managing cheatgrass infestations around livestock management which would like lead to years of not grazing the planned pasture rotations.

There would still be limited opportunities to research livestock and potential May cheatgrass seed spread, but options for understanding the best way to graze around cheatgrass and mule deer interactions would not be possible. Determining the potential cheatgrass spread that could occur by livestock would probably not occur in this alternative.

There is not currently scientific research that can relate the potential amount of cheatgrass livestock could transport while grazing in or near an infestation. With the current pasture dates for Sowats, Ranger Pass, and Slide Pastures occurring in May and June, that is following cheatgrass seed dispersal, livestock would probably have the highest potential for spreading invasive species seed in this alternative.

Central Summer Allotment

The Central Summer Allotment would continue to maintain the existing conditions, which are static to improving. Even when stocking at full permitted numbers of 800 head, the pastures of the Central Summer Allotment would be very conservatively stocked and would not cause a negative impact on the

vegetative conditions. Changes in the vegetative conditions on this allotment are a product of moisture and responses to fire and vegetative treatments. To the level that conservative grazing numbers could provide positive influences on the understory, alternative 2 would continue the existing vegetative trends.

As events occur that may require resting the North or South Central Summer Pasture, the pasture would not be rested would continue to be grazed for continuous years. A reduction in livestock numbers from 800 may occur if needed.

Livestock would continue to have the ability to remain in same general areas of the pastures for the entire grazing season. However, herding management can be applied to move livestock away from concentrated areas as needed.

Kane Allotment

The Kane Allotment would be expected to maintain existing conditions, which are static to improving. Added efforts would be made to utilize the Kane Allotment as intended in the 2001 Kane Ranch EA. Even if utilized, the light use for a brief period in the fall is not expected to change or impact the frequency or health of the native understory species on the allotment.

Alternative 3

There would be no livestock on the allotment and no potential impacts from livestock. Given the monitoring results discussed in the existing condition and along with comparing sites that have not experienced grazing or intended grazing, Alternative 3 is not expected to generate positive or negative results on the vegetative conditions.

The pastures of the Central Winter Allotment have been utilized to a limited amount in the last ten years. Anticipated effects of removing grazing would be minimal to this allotment when compared to the conservative stocking rates discussed in Alternatives 1 and 2. The vegetative changes across the lower elevations of this allotment in the Slide, Ranger Pass, Sowats, and the closed JumpUp pastures have been a product of fire activity and invasive species spread. Those changes would continue at the existing rates if cattle were not grazed. Researching the potential to utilize livestock grazing as a cheatgrass treatment would not be an option.

There are no anticipated changes to vegetative conditions to the Central Summer Allotment as a product of removing grazing. The vast area of this allotment combined with the low stocking rates provided in the current action had led to no difference between sites grazed regularly in the rotation and places that livestock do not go. It is predicted that livestock removal would not have a measureable effect on the vegetative conditions monitored on all transects.

The Kane Allotment has essentially experienced ten years of no grazing due to logistical constraints. Conditions remained static or improved. Monitoring plot data correlated the increasing vegetative conditions closely with changes in moisture patterns from the 2003 plot monitoring during a drought cycle to the 2012 monitoring during an average monsoon season. This pattern would continue.

Cumulative Effects

The cumulative impacts that could also affect the understory conditions across the Central Winter, Central Summer, and Kane Allotments over the next ten years in the three alternatives include climate change, wildfires, invasives species, and travel management.

Climate Change

Current studies on global climate change indicate a trend towards higher temperatures, lower precipitation, more frequent and severe droughts, and increased frequency of high intensity wildfires. Past droughts led to temporary declines in vegetative production and frequency that responded back to normal conditions once the drought ended. Higher moisture areas with better soils responded more rapidly to

moisture while drier areas with shallow soils took longer. Changes in climate can reduce a species' ability to reproduce or even cause the plant to die when long term conditions are outside of its optimal range. A drought stressed plant would be more likely to be damaged if consumed at a high utilization rate by livestock and minimal effect if grazed with light intensity. When comparing the three alternatives to the ability to protect the understory species to climate change, Alternative 3 would provide the greatest protection. Alternative 1 and the increased adaptive rest rotation options would provide the second best protection. Alternative 2 would provide the lowest opportunities for changing grazing management to provide the best management to understory plant species.

Fire

Years of fire suppression combined with climate change has led to an increasing number of high intensity wildfires in recent years. While fire historically played a key role in maintaining healthy ecosystem function, high intensity wildfires can dramatically alter an ecosystem by damaging or destroying plants and any potential seed in the soil. The disturbance created by these events leave burned areas lacking of native seed in the soil and open the door for new species to become established. This includes non-native invasive species that can rapidly establish and dominate a site within a few years after a fire.

Restoring Forests to fire adapted ecosystems will be an ongoing effort for the foreseeable future. Managed fires in conjunction with mechanical treatment can reduce heavy fuels, preventing catastrophic fires from occurring. When a fire occurs, the area is rested until the understory species have responded to the point being able to sustain grazing pressure. By reducing the potential for negative impacts to understory plant species and providing added rest options for the allotments, the long term survival of many plant species can be increased. Alternative 3 provides the greatest rest ability with no grazing, followed by Alternative 1 and a high level of rest options, and Alternative 2 then has the least amount of options to provide rest post fire.

Non-Native Invasive species

Non-native invasive species are continuing to invade and establish on federal lands at an alarming rate. These species are adapted to outcompete native species for nutrients and can rapidly establish and dominant sites. Invasives species pose a high risk to sensitive plant species and can displace them if left untreated.

The implementation of noxious and invasive weed control efforts has reduced the number of exotic plant species within the North Kaibab Ranger District. The containment, control, and eradication of species like Scotch thistle, spotted knapweed, and cheatgrass is expected to continue for the foreseeable future. With these practices are guidelines for performing project activities that will reduce the risk of introduction of new invasive species and prevent the spread of undetected existing populations.

Livestock can in some cases serve as a vector to spread weed seed. This can be dependent on the type of invasive species, the timing that grazing occurs in relation to seed distribution, and the location of the invasive species. Alternative 3 eliminates the ability for livestock to be a potential vector. Alternative 1 provides the ability to study livestock interactions with cheatgrass and a more adaptive approach to grazing weed infested areas. Alternative 2 is not expected to increase invasive species, but provides the least amount of invasive species management.

Travel Management

The Travel Management EA was completed in 2012, with implementation expected to occur in 2013. Implementation of travel management will include the following provisions that pertain to reducing impacts to understory vegetation on the North Kaibab Ranger District: 1) forest visitors will only be allowed to travel designated roads; 2) designated spur roads to recreational opportunities in areas with sensitive resources; and 3) motorized big game retrieval for only elk and bison.

Each of these provisions has the opportunity to reduce potential impacts to the understory species across the allotments. Prior to the implementation of Travel Management, cross country motorized travel was authorized to occur. The reduction of cross country travel was assessed to be a positive benefit to reduce crushing, weed spread, and fugitive dust.

These measures towards livestock grazing management when combined with a road system and dispersed camping strategy that analyzes the effects to the species can contribute towards the promotion of understory plant species on the North Kaibab Ranger District.

BLM Lands Associated to the Kane Ranch Allotments

The livestock that would graze on the Central Winter, Central Summer, and Kane Allotments in Alternatives 1 and 2 would also likely graze on Bureau of Land Management Allotments permitted to the same ranch when during the winter months. This would then result in the potential for livestock grazing on the Forest to have a cumulative effect on the BLM's Soap Creek and Sand Hills Allotments. It is important to note that this EA is only discussing proposed management changes and actions on the North Kaibab, not BLM lands. Allotment Management Plans, grazing rotations, seasons of use, and stocking rates on BLM lands would not be altered if Alternatives 1 or 2 are selected due to the similar stocking rates and season of use. This would result in no changes to the effects vegetative conditions or the management of the adjoining BLM Allotments.

There could be a change in the effects to the BLM Allotments if Alternative 3 were to be selected. With no grazing on Forest Service lands, there could be modified grazing rotations to reflect a management strategy without the available use of the Forest Allotments. Given that analyzing management on BLM lands is not part of this EA, determining how management would change stocking rates or pasture rotations on the Soap Creek and Sand Hills Allotments would be difficult to predict.

Vegetation and Wildlife Habitat Management Projects

Several vegetation and wildlife habitat management projects have and will be completed within the analysis area (a complete list of projects are given in the project record). On-going projects include Jacob Ryan, Plateau Facilities Fire Protection, West Side, Tip-over, and Moquitch. After completion of these projects, these areas typically provide additional forage for livestock.

These projects work within the current grazing management system (as they would in the proposed action) to avoid conflicts with the restoration efforts and livestock use. Cattle can be attracted to new forage within a restoration project, compared to the rest of pasture, but normally only for a short time until the area recovers after favorable growing conditions and normally within one year. The rest-rotation grazing system of these allotments provides pasture rest to reduce these impacts. Alternative 3 would not have any effect on these projects.

Non-Native Invasive Plant Species

Affected Environment

Invasive species can displace native vegetation and aggressively dominant a site. If an infestation is left uncontrolled, the ecosystem function can be altered. There are many ways, or vectors, that invasive species seed can be distributed from one place to another including wind, water, gravity and elevation, motorized vehicles, recreational activities, wildlife, and livestock. In regards to livestock and wildlife, seed can attach itself to hair or in the mud of a hoof. Cattle have been found to strongly prefer native perennial to alien annual grasses, especially in the dry season (Van Dyne and Heady 1965). Livestock could however, still graze invasive species to some level or travel through an area infested. Some of the harder shell seeds can even be consumed and pass through the digestive track of an animal.

Under the guidance of the Coconino, Kaibab, and Prescott National Forests Integrated Treatment of Noxious or Invasive Weeds Environmental Impact Statement (2004), the North Kaibab Ranger District

has the ability to treat invasive species of concern. Identified invasive species are treated in the most efficient manner possible with the goal to contain and eradicate each population. The weeds treated include species that are defined by two categories: 1) noxious: listed by the Arizona department of Agriculture as a species that should be controlled, eradicated, and/or prohibited from the state; and 2) invasive: a non-native plant that is not on the state's noxious weed list but still possesses the ability to negatively alter ecosystem function.

Currently the annual program of work focuses on treating known infestations across the district, prioritizing the species and locations that pose the greatest threats. This is combined with surveying areas that have recently experienced disturbance, are expected to be disturbed, and/or see high visitor use. This methodology allows the district to control and eradicate new infestations before they have the opportunity to spread. To date, this methodology has proven successful in eradicating and/or reducing potentially serious noxious species threats. Table 16 displays the species of concern in relation to the North Kaibab Ranger District.

There are several species of invasive weeds that have been found within or adjacent to the Central Winter, Central Summer, and Kane Allotments. The table above describes the known populations of invasive species of concern. There may be more non-native species that occur that have not been discovered or are not currently considered to be a species of concern. Each species listed on the table has the ability to invade, establish, and dominant the project area. Of these species musk thistle, bull thistle, and spotted knapweed have been identified in the Jacob Lake area along the State Highways and a few adjacent Forest Roads in the Warm Fire area of the Central Summer Allotment. There is a population of leafy spurge near Big Springs Field Station. Populations of scotch thistle exist on the Central Winter Allotment.

Once these species become established, it takes years to eradicate the population. For example, a Musk thistle seed can survive and be viable for germination up to 15 years. One healthy musk thistle plant is capable of producing over 100,000 seeds in its life cycle. Once seeds from a species like musk thistle enter the soil, monitoring and treatment must occur annually for the potential span of the seed viability to effectively eradicate the threat of the species.

Being able to cite the exact source and vector that lead to the introduction of these infestations on the North Kaibab would be difficult to pinpoint. Given that most of these noxious infestations occur along roads or at water sources it could be assumed that motorized vehicle use, Forest activities, wildlife, and livestock could all be possible vectors.

Table 16. Noxious weeds species of concern on the North Kaibab Ranger District.

SPECIES	LOCATION OF KNOWN POPULATIONS	STATUS
Musk Thistle (<i>Carduus nutans</i>)	Several small populations around the Jacob Lake area and along State Highway 89A on the Northern edge of the Central Summer Allotment.	Treatments began in 2003. Population is controlled and in annual monitoring status.
Spotted Knapweed (<i>Centaurea masculosa</i>)	Small populations in numerous places along State Highways 67 and 89A and a few isolated occurrences along roads in the Warm Fire and inside the Central Summer Allotment.	Treatment began in 2008. Populations are reducing and getting closer to control status.
Scotch Thistle (<i>Onopordum acanthium</i>)	One large population and five small populations on Central Winter Allotment.	Treatment began in 2005. Overall frequency continues to drop. Future treatments planned.
Russian Thistle (<i>Salsola sp.</i>)	Multiple populations emerging along roads and disturbed areas in Central Winter Allotment.	Recent large increase from a few spots to over 300 acres. Treatment began in 2010. Future treatments planned.
Leafy Spurge (<i>Euphorbia esula</i>)	One small population near Big Springs Field Station.	Treatment began in 2004. Future treatments planned.
Cheatgrass (<i>Bromus tectorum</i>)	Numerous populations across NKRD. Large populations currently exist in the vicinity of 1996 Bridger Knoll Fire on Central Winter Allotment. Other spots occur in disturbed areas with p/j woodlands and shrubland communities.	Treatments began in 2007. Varying levels of treatment success dependent on the site. Total infestation continues to grow at a rate faster than current rate of treatment.
Oxeye Daisy (<i>Chrysanthemum leucanthemum</i>)	Small populations occurring in the Demotte Park area of the Central Summer Allotment.	Treatment began in 2010. Population decreased and in monitoring status.
Bull Thistle (<i>Cirsium vulgare</i>)	Several populations along State Highways 89A and 67 and in the Warm Fire adjacent and inside the Central Summer Allotment.	Treatments began in 2008. Populations decreasing.
Salt Cedar (<i>Tamarix ramosissima</i>)	Large populations in the Kanab Creek Wilderness.	Monitored annually. The salt cedar beetle migrated into the drainage in 2009 and is maintaining the population.

Russian Olive (<i>Elaeagnus angustifolia</i>)	Growing population in the Kanab Creek wilderness	Monitored annually.
Dalmatian Toadflax (<i>Linaria genistifolia</i>)	No known populations on NKR, but species can be found on federal lands in Northern Arizona.	Monitoring for potential introductions continue.
Yellow Starthistle (<i>Centaurea solstitialis</i>)	No known populations on NKR, but species can be found on federal lands in Northern Arizona.	Monitoring for potential introductions continue.

Treatment of the noxious thistle and knapweed species has been ongoing since 2003. Activities conducted by the Forest Service and several partners have been effective in reducing the number of species each year, with the level of success dependent on the size of the population, the amount seed already in the soil at the site, and the longevity of the seed viability. Small populations of one to 10 plants with seed that is viable for 1-3 years can be eradicated in less than five years. Large populations like the large scotch thistle infestation spanning over 500 acres and containing thousands of seeds with potential viability of up to seven years is projected to take over ten years to fully eradicate.

Cheatgrass is a winter annual grass species that germinates in the winter or spring. Cheatgrass plants produce many seeds, depending on the environment and the spacing and size of the plants. Individual plants growing in high densities may produce about 25 seeds each, while a large, open-grown plant can produce about 400 seeds. The design of the seed allows it to be easily transported via clothing, animals, and vehicles.

This species is very successful at maximizing available moisture and nutrients from the upper layer of soil, and it is capable of growing in years of drought and in poor soil conditions. Cheatgrass' ability to grow and produce seed before other species, high seed production, and the ability to grow in places other grass species cannot allows this species to rapidly take over a site. Cheatgrass can be found in many locations across the North Kaibab Ranger District. While most of the larger, denser populations are found in pinion-juniper woodlands that have experienced disturbance, numerous small populations have been found in ponderosa pine ecosystems. With its abundance across the entire Forest, this species poses the greatest risk of having a negative effect to the project area.

The large populations of cheatgrass expanded as a product of the 1996 Bridger Knoll Fire. There appears to be a correlation between high intensity fire on shallow soil pinion-juniper ridge tops and high frequency cheatgrass infestation. The native species understory on these ridge tops would naturally take longer to respond after fire and the soils would not normally support 100 percent native species ground cover. This created a perfect opportunity for cheatgrass to establish, expand, and then outcompete surrounding native species.

The deeper soils of the shrubland valley bottoms that burned with a low to moderate fire intensity during the Bridger Knoll fire experienced a different result. These areas that can support a higher density of native understory vegetation responded quickly with higher frequency of native species. Some of these valley bottoms were also seeded with non-native species including crested wheatgrass (*Agropyron cristatum*) in the 1960's and 1980's for the purposes of erosion control that also responded quickly to fire.

In relation to the level of cheatgrass infestation on the Central Winter Allotment today, the populations are expanding. Cheatgrass expansion is particularly more rapid in areas in or adjacent to the high intensity burn areas of the Bridger Knoll Fire with shallow soils and a natural low frequency of understory species. Mapping and treatments on cheat grass began in the pinion-juniper woodlands in 2007. Many of the infestations mapped vary in the percent frequency of cheatgrass, ranging to less than ten percent to over 90 percent. The Sowats Pasture contains a cheatgrass infestation that spans over 10,000 acres that is spotty in some places and continuous and dense in others. Within the JumpUp Pasture there is a 7,000 acre polygon that is mostly continuous across very shallow and low productive soils. The Slide Pasture contains two isolated locations of cheatgrass. One infestation in the Buckhorn area is about 1,000 acres and the other is in the East Slide/Slide Fire area that is around 3,000 acres across a series of ridge tops broken up by valley bottoms that are mostly not infested. The Ranger Pass Pasture contains a series of smaller infestations that are less than 200 acres each along Forest Road 427. There are also numerous small infestations ranging from a few plants to ten acres that can be found across all four pastures. While

the level of cheatgrass prior to the 1996 Bridger Knoll Fire is unknown, the estimate in 2012 is close to 25,000 acres of infestation across the 110,000 acres encompassed by these four pastures and growing.

Besides converting understory, the increasing cheatgrass infestations have also modified the fire regime in this area. As this winter annual species distributes its seed in late April to May and then dies, it cures out and becomes dry fine fuel by June. Cheatgrass is highly flammable and densely growing populations provide ample, fine-textured fuels that increase fire intensity and often decrease the intervals between fires. As summer monsoon storms approach in late June to August, the lightning strikes combined with a high density of the dead cheatgrass provide the opportunity for large fires.

Post fire monitoring indicated that cheatgrass is quicker at re-establishing than the majority of the native species. Often coming back at a higher frequency as more native vegetative is displaced. Fires that have occurred in the last ten years where an existing cheatgrass infestation represented a significant percentage of the area burned include the 2007 Slide Fire, and over five different fires that were part of the 2012 West Side Complex.

Treatment to cheatgrass began in 2007, starting with the Slide Fire that occurred the same year. Treatments are ongoing utilizing a combination of herbicide application and/or seeding of native and sterile annual species. The intent of this effort is to greatly reduce the large populations of cheatgrass and return the sites infested back to native vegetation species. The specific treatment involving herbicide, cultural, biological, and manual treatments to non-native invasive species would occur under the extensive guidance of the Coconino, Kaibab, and Prescott National Forests Noxious and Invasive Weed Environmental Impact Statement. The Kane Ranch EA is not proposing herbicide treatment as part of the any of the three alternatives.

These treatments have had a variety of success in restoring areas infested with cheatgrass from highly successful to minimal results with annual acreage of the treatments ranging to as high as 1,500 acres a year. Additional efforts to complement the existing treatments are currently being discussed including brown stripping and green stripping. At this point, creating green strips are just basic concepts that could be part of a future and separate NEPA document.

These four pastures infested with cheatgrass have seen very little livestock grazing since the Bridger Knoll fire. The entire allotment was rested post fire until 2001 for the purposes of fire recovery. The JumpUp pasture was officially closed to grazing in 2001. The Sowats pasture has not been grazed for a number of reasons. The Slide and Ranger Pass Pastures have both been grazed a few times each since 2001 with special provisions to graze only portions of these pastures in areas away from cheatgrass infestations, habitat enhancement treatments, and/or recent fire activity. Discussion of the pastures utilized from 2001 to 2012 is provided in detail in the Range Management Specialist Report (2013).

Other cheatgrass infestations within the Allotments include the far eastern side of the Central Summer North pasture in the pinion-juniper woodlands after the 2006 Warm Fire. Treatments in the form of herbicide application and seeding began in 2006 and were relatively effective here in suppressing cheatgrass infestations where treatment occurred. In 2012 cheatgrass can still be found here, however, most places that received treatment have a higher balance of native species when compared to the areas infested from the Bridger Knoll Fire.

Russian thistle has been found in small quantities in and around the lower elevations of these allotments for several years. The populations recently expanded in the last 2-3 years along several roads and areas of disturbance. There is now an estimated 300 acres in several different areas across the Central Winter and a location on the Central Summer Allotment. Treatment began on the species in 2011 and is expected to continue until the species is controlled. Given the shorter viability life span of the seed, reductions in the populations are expected to occur quicker than some of the noxious thistles.

Cheatgrass and Russian thistle are also abundant in the Kanab Creek Allotment which is inside the Kanab Creek Wilderness. Salt cedar and Russian olive are heavily infested along Kanab Creek Canyon. The

migration of the salt cedar beetle into the canyon in 2009 has resulted in several years of leaf defoliation of the salt cedar. Based on personal observations, there has yet to be any noticeable decline to individual salt cedar trees as a result of the annual defoliations.

The challenge with performing invasive species treatments in the Kanab Creek Allotment includes access and balancing wilderness principles and management. The other challenge that comes with managing invasive species here is the vast size of the watershed that drains into Kanab Creek Canyon. To be successful in eradicating any of these species, the efforts must start and be successful in all of the areas higher in watershed to stop the continual seed source that migrates down the watershed.

Effects Analysis (Direct and Indirect)

Common to All Alternatives

As the Kanab Creek Allotment and the JumpUp Pasture would remain closed to grazing in all three alternatives, the effects of no livestock to invasive species would be the same. Cheatgrass and Russian thistle would continue to increase at the same rate in the JumpUp Pasture, with the probability of actions taken by the Forest Service and partners to try to control the infestations.

The Kanab Creek Allotment would continue to experience the current increase in cheatgrass and Russian thistle. Monitoring will tell if the migration of the salt cedar beetle will result in reductions of salt cedar. Russian olive could also be expected to an invasive threat similar to salt cedar. Until large scale control measures can be taken across the entire watershed that drains into Kanab Creek, any potential weed treatments would be annual maintenance.

Vegetation and wildlife habitat improvement projects have the potential to bring noxious weeds into the area with vehicles, disturbance of the area, and potentially more open ground cover. These projects all have noxious weed mitigations to prevent the spread of these species.

Alternative 1

The effects to non-native invasive species by the proposed action are predicted to reduce of the potential for livestock to be vector in spreading weeds. Livestock can serve as one of the vectors that could spread species. The proposed action provides the ability to reduce livestock interaction with invasive species and also provides a research approach to better understanding livestock interactions with cheatgrass.

The fence line along Highway 67 proposed in Alternative 1 would keep livestock away from the highway during the summer months. It is along the Highway 67 corridor where there are and have been several noxious and invasive species that are being controlled including bull thistle, spotted knapweed, and oxeeye daisy. Given the high seasonal traffic along this highway and motorized vehicles represent another potential seed vector; there is continued potential for the introduction of other species as well. By keeping livestock off the highway during the growing and seed dispersal season for these species, there is less potential for livestock serve as a vector in transporting weed seed from along the highway to other places.

In regards to cheatgrass, the research side of the Central Winter Allotment would be focused on answering several questions tied to this topic. The following topics would be part of the research in relation to cattle and cheatgrass with many different elements to be tested through a series of replicable multi-year studies.

- When grazing a series of sites infested with a varying level of cheatgrass from 0 to over 90% frequency, what would be the changes to the site after grazing? This would also be measured by grazing at different times of the year and different grazing intensity levels from low use to moderate use in research exclosures located on sites with different levels of cheatgrass infestation.

- Can livestock be utilized as a tool to assist with reducing biomass of cheatgrass or even reducing cheatgrass regrowth on site? This would be focused studies by concentrating livestock on a heavily infested site and measuring the before and after results for multiple years. This would also likely compare differences between spring “flash” cheatgrass grazing during a short timing window and then fall cheatgrass grazing over a longer time period.
- A third proposed topic would be designing a study to determine to what level cattle could spread cheatgrass from one site to another. The details of this study have not been fully fleshed out yet.

These studies would assist in increasing the knowledge base of how livestock grazing can or cannot be performed in relation to the impact to cheatgrass infestations in pinion-juniper woodland ecosystems.

An unpublished study conducted between the University of Nevada at Reno and the BLM’s Northeastern Resource Advisory Council, demonstrated that cheatgrass can be significantly reduced with the use of fall grazing. The group conducted the experiment between 2006 and 2009 at the Gund Ranch near Eureka, Nevada. The results showed reductions in the amount of cheatgrass from 500 lbs. of cheatgrass biomass per acre to 90 lbs. of cheatgrass biomass per acre. Over the course of the study, production of perennial grasses increased from 45 lbs. per acre to 577 lbs. to the acre. This study also utilized a liquid protein supplement to promote the dietary needs of livestock as well as provide a reason for the cattle to stay on the desired site.

Several unpublished sources from State Cooperative Extension Services have also recommended spring flash grazing. Livestock would be put on a site infested with cheatgrass in the spring when it first emerges. Livestock would graze these sites due to cheatgrass actually being palatable when it is young and green. Providing supplement can also assist in promoting livestock use. The challenge in flash grazing is a very short timing window. Between one week to one month (depending on moisture and temperatures) cheatgrass can go from palatable for livestock to very course. The seed heads become sharp and can create soles on a cow’s mouth or hooves.

The enclosures/exlosures of the proposed action would perform the primary role for conducting livestock cheatgrass interaction studies. The enclosures would allow the ability to set the desired stocking rate and keep livestock on the desired site. A matching exclosure would be at the same site to compare the differences between grazed and ungrazed. Pasture scale studies would also be a part of this research as there is the reality that grazing behavior can be different in a confined area versus roaming across a 30,000 acre pasture.

The expectations of the series of studies conducted on the Central Winter Allotment would be to best understand how livestock plays a role in areas infested by cheatgrass through research studies on grazing timing and intensity. It would also answer the question whether or not livestock could also be a management tool to assist in combating the large cheatgrass invasion. If the studies result in positive or negative answers for ways to graze livestock on the cheatgrass infestations of the Central Winter Allotment, the Allotment management Plan provided in the proposed action has the flexibility to allow grazing to accommodate those results. Whether the Allotment Management Plan modifications allows more flexibility in the season of use or less flexibility, the resulting livestock management would respond to the necessary outcome that would provide for the best ecosystem management of the allotment.

In addition to the series of research studies on the Central Winter Allotment, there would also be an initial grazing rotation system with the Little Mountain, proposed Burnt Corral, Slide, and Ranger Pass Pastures. The grazing rotation would not occur until the necessary structures are in place to accommodate the rotation. This would primarily include the Burnt Corral fence line and repairing and/or replacing strategic sections of the Little Mountain Pipeline System. The initial grazing rotation system proposed is designed to accommodate the resource concerns on the west side, work in correlation with research activities, and then be adaptable to research results and/or changing conditions.

The grazing system is not anticipated to have an effect on spreading or introducing invasive species to the Little Mountain and proposed Burnt Corral Pastures due to lack of cheatgrass in these ponderosa pine transition landscapes which is a product of higher soil productivity and vegetative cover. The initial timing for use of the Slide and Ranger Pass Pastures was specifically selected to work around concerns of cheatgrass spread and also mule deer winter range. As cheatgrass is a winter annual species that distributes seed in late April and May, the seed would be in the soil prior to the August 1 on-date for the Slide and Ranger Pass Pastures due to wind, gravity, and summer rains. The polygons of large cheatgrass infestations would be avoided by control of water and supplement when the pastures are utilized in a traditional grazing capacity. All of the cattle accessible and reliable water sources on the Slide and Ranger Pass Pastures have the ability to be turned off or have a gate shut to prevent livestock access. The notable cheatgrass infestations on the Slide Pasture are in the south and western areas of the pasture with minimal infestations to the north and east. The Ranger Pass pasture infestations are primarily along a series of ridge tops along Forest Road 427 and areas to the east of this road and towards the center of the pasture have minimum infestation.

In a seven-year study conducted in Northern Arizona, livestock were utilized to experiment with vegetative response at different grazing intensity levels in an area with a small percent of cheatgrass frequency. The study utilized enclosures to compare no grazing to low-moderate grazing and high impact grazing. The results found increases in cheatgrass on the high impact grazing with little to no change between the low-moderate and no grazing plots. "Cattle removal demonstrated no consistent differences in cover from the moderate grazing control in any plant functional category" (Loeser et al. 2006).

With the initial livestock numbers to be up to 200 head and not to exceed four months of pasture use, the anticipated utilization rates would be around 10 percent or essentially low intensity grazing. This would be combined with a rest rotation system that utilizes either the Slide or the Ranger Pass Pastures every other year at a time that should accommodate minimum cheatgrass spread. By taking additional measures by only allowing access to water and supplement away from large cheatgrass infestations, cheatgrass spread by livestock in these two pastures should be minimum if even detectable.

By designing a grazing system that is balanced around resource issues like cheatgrass and the ability to be adapted to on the site research, the proposed action would provide the opportunity to minimize cheatgrass spread by livestock.

When comparing Alternatives 1 and 2, Alternative 1 is predicted to be less likely to cause the additional spread of Noxious and Invasive weeds. This is primarily due to the thought process and research in the proposed Central Winter Allotment Management Plan and keeping livestock away from the Highway 67 Right of Way during peak seed dispersal months.

Alternative 2

Alternative 2 would continue the current Allotment Management Plan. To date there is no direct evidence to support that the known noxious and invasive weeds on the allotments were introduced or further spread by livestock. However, there has been the potential that livestock could have contributed to the spread. Given the vast size of the all of the pastures in the Kane Ranch Allotments, there is the continued ability to avoid infestations of concern by control of water access and supplement placement. Based on observations of the noxious and invasive species and the cattle rotations over the last ten years, it is reasonable to assume that the spread of these species by livestock in Alternative 2 is not likely to increase.

When comparing Alternatives 1 and 2, there are areas where alternative 2 has the increased potential to spread invasive species. By continuing current management, livestock can cross highway 67 the entire Central Summer Allotment grazing season as the access to the highway would remain unfenced. Season long access to the highway corridor would be a higher potential for livestock to encounter and spread weed seed. This would be considered a low risk due to efforts taken by the Forest Service and the Arizona Department of Transportation to monitor and treat invasive species along the highway.

The potential to spread cheatgrass is higher in Alternative 2. The May-June season of use on the Central Winter Allotment would continue. One year, livestock would be in the Slide Pasture in May and then Little Mountain Pasture in June. The next year livestock would graze the Sowats Pasture in May and the Ranger Pass Pasture in June. Cheatgrass produces and disperses its seed in late April to early May with populations of cheatgrass that can be found in the Slide, Sowats, and Ranger Pass Pastures. There is no known scientific data that can estimate how much cheatgrass could be transported by a cow while passing through an infestation. To what level cheatgrass seed distribution by cattle could occur, the current pasture timing has the highest potential to contribute.

The concern of cheatgrass spread by cattle could be mitigated to some levels within Alternative 2. By May, cheatgrass is coarse and unpalatable. The seed heads can create sores in cattle mouths and hooves. So it is reasonable to assume that cattle would not purposely graze in cheatgrass infestations. Cattle movements across the pasture can be altered by only allowing water and supplement access in areas several miles from known cheatgrass infestations.

Alternative 2 would not provide for full intent of research on cheatgrass and livestock interactions. The flexibility in grazing timing, intensity, and duration along with the construction of the enclosures and exclosures would not occur in this alternative. There could still be limited opportunities to research these interactions at the pasture scale during the May to June season of use, but answers on finding the best timing, intensity, and duration would be lacking. The potential to research whether or not livestock could be utilized to reduce cheatgrass biomass in spring flash grazing or fall grazing would not be an option. While Alternative 2 is not expected to have a significant direct impact towards increasing the spread of invasive weeds, it is predicted to have a higher potential for livestock to spread weed seed than Alternative 1.

Alternative 3

There would not livestock authorized on the Kane Ranch Allotments in Alternative 3. There would be no potential for added weed seed spread by livestock. This would mean that Alternative 3 poses the least threat for additional invasive species spread of any alternative.

Since livestock would not be authorized on the allotment, the potential to research whether or not livestock could be utilized to reduce cheatgrass biomass in spring flash grazing or fall grazing would not be an option. If the research in Alternative 1 proves that livestock can be utilized as a management tool to reduce cheatgrass, then Alternative 3 would not have the ability to help reduce cheatgrass infestations.

Cumulative Effects

The geographical extent of the cumulative effects analysis is confined to the analysis area of the Kane Ranch 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.

Fire

Fire management plays a vital role in ecosystem management. Fire also can create a disturbance that can allow for invasive species to enter and become an infestation. The high intensity portions of 1996 Bridger Knoll Fire performed a direct role in dramatically increasing the cheatgrass infestations on the Central Winter Allotment. Fires that occurred after the Bridger Knoll Fire continued to increase the acreage infested and also the percent of cheatgrass frequency. As fires are expected to continue to occur and create disturbance, the ability for invasive species like cheatgrass to invade and spread increases. Cheatgrass fires are also a continued threat.

Restoring Forests to fire adapted ecosystems will be an ongoing effort for the foreseeable future. Managed fires in conjunction with mechanical treatment can reduce heavy fuels, preventing catastrophic fires from occurring. When a fire occurs, the area is rested until the understory species have responded to

the point being able to sustain grazing pressure. By reducing the potential for negative impacts to recovering understory plant species, reducing one more potential invasive seed vector, and providing added rest options for the allotments, native species have the best chance for reestablishment. Alternative 3 provides the greatest rest ability and eliminates livestock as a potential weed seed vector with no grazing, followed by Alternative 1 and a high level of rest options, and Alternative 2 then has the least amount of options to provide rest post fire.

Travel Management

The Travel Management EA was completed in 2012, with implementation expected to occur in 2013. Implementation of travel management will include the following provisions that pertain to reducing impacts to understory vegetation on the North Kaibab Ranger District: 1) forest visitors will only be allowed to travel designated roads; 2) designated spur roads to recreational opportunities in areas with sensitive resources; and 3) motorized big game retrieval for only elk and bison.

Each of these provisions has the opportunity to reduce potential impacts to the understory species across the allotments. Prior to the implementation of Travel Management, cross country motorized travel was authorized to occur. The reduction of cross country travel was assessed to be a positive benefit to reduce invasive species spread.

These measures towards livestock grazing management when combined with a road system and dispersed camping strategy that analyzes the effects to the species can contribute towards the promotion of understory plant species on the North Kaibab Ranger District.

BLM Lands Associated to the Kane Ranch Allotments

The livestock that would graze on the Central Winter, Central Summer, and Kane Allotments in Alternatives 1 and 2 would also likely graze on Bureau of Land Management Allotments permitted to the same ranch when during the winter months. This would then result in the potential for livestock grazing on the Forest to have a cumulative effect on the BLM's Soap Creek and Sand Hills allotments by potentially transporting invasive seed back and forth. It is important to note that this EA is only discussing proposed management changes and actions on the North Kaibab, not BLM lands.

Alternative 3 would not authorize grazing on Forest Service Lands. There would be no potential for livestock to be a vector for distributing invasive species seed on BLM lands. Any potential invasive species on BLM lands would not have the potential to be distributed to the Forest by livestock.

Vegetation and Wildlife Habitat Management Projects

Several vegetation and wildlife habitat management projects have and will be completed within the analysis area (a complete list of projects are given in the project record). On-going projects include Jacob Ryan, Plateau Facilities Fire Protection, West Side, Tip-over, and Moquitch. These projects have the potential to bring noxious weeds into the area with vehicles, disturbance of the area, and potentially more open ground cover. These projects all have noxious weed mitigations to prevent the spread of these species.

These projects work within the current grazing management system (as they would in the proposed action) to avoid conflicts with the restoration efforts and livestock use. Cattle can be attracted to new forage within a restoration project, compared to the rest of pasture, but normally only for a short time until the area recovers after favorable growing conditions and normally within one year. The cattle could help spread a weed species within these areas if it was established. The rest-rotation grazing system of these allotments provides pasture rest to reduce these impacts. Alternative 3 will not have any effect on these projects.

Other Vectors

Other potential vectors for introducing and spreading invasive species seed include wildlife, water, wind, and gravity/elevation. These vectors would continue to have the potential to spread weeds at the same rate in all three alternatives.

Wildlife

Affected Environment and Effects Analysis (Direct and Indirect)

Action Alternatives Effects of Livestock Grazing on Wildlife Habitat

Livestock grazing potentially affects plant and animal species in a number of specific ways. These effects include: direct competition for forage, removal and trampling of herbaceous and/or shrubby vegetation used for cover, change in plant composition favoring one foraging group over another, use and trampling of water sources and associated vegetation, utilization of riparian dependent species, and barrier effects of fences.

Direct competition for forage

Livestock grazing directly competes with foraging wildlife by selective removal of palatable vegetation. The primary wildlife competitor for the forage resource is deer. Other game and non-game animals (small mammals, non-game birds, turkey, pronghorn etc.) are also dependent on forage and seed availability. These effects are directly related to the number of livestock and other animals (stocking rate in Animal Unit Months, AUM's) utilizing a particular area. The level of proposed utilization (30-40%) should provide overall residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of prey species in the allotment as whole.

Although wildlife will forage at greater distances from water and utilize steeper slopes, both wildlife and livestock concentrate use around water sources, riparian areas and "soft" sites such as meadows and seeps. Current utilization monitoring shows that under current management use levels have been well below allowable use levels.

Utilization guidelines for the Proposed Action would maintain forage availability for grazing wildlife species. These rates incorporate wildlife use as well as livestock use. Allowable use guidelines are not, however, directly applied to wildlife species in that no effort is made to immediately remove wildlife from the allotment if use by wildlife alone is exceeding allowable use guidelines. The Forest Service coordinates with Arizona Game and Fish (AGFD) and makes periodic recommendations for population objectives and management of particular species.

Under the proposed action, forage available to allow expansion of deer herd would depend on the stocking rate of livestock. Utilization by other herbivores is considered to be minor compared to the deer herd. The discussion above includes current rates of use by other grazing herbivores as a part of the anticipated utilization rates. No sustained changes up or down in such herbivores is predicted under the Proposed Action.

Removal and Trampling of Herbaceous and/or Shrubby Vegetation used as Food or Cover

This affects species that reproduce or feed on the ground or in bushes. Livestock and other grazing/browsing herbivores remove material that provides cover for hiding, nesting, reproduction or prey species. Herbage removed and damaged is directly related to stocking rate. The higher the stocking rate, the more herbage would be removed. The proposed action contains allowable utilization guidelines. These guidelines would mitigate effects of livestock grazing by maintaining a set level of herbage for cover. This would maintain or improve watershed and range condition on the allotments, which is consistent with maintaining viable populations of herbaceous and bush cover dependent species.

Change of Plant Composition

Livestock selectively remove material from those plants most palatable to them. Over time this results in a change in the herbaceous and shrub composition. Generally, there would be a reduction in palatable grasses and forbs, cool season grasses (plants that grow in spring and fall) and palatable shrubs. There would be a concurrent increase in non-palatable shrubs, forbs (particularly composites), and grasses. This benefits some seed eating species since annual forbs produce more seed than perennial grasses. It is detrimental to deer and perennial grass/sedge dependent species as the palatable shrubs, grasses, and sedges tend to decline. Range condition scores include evaluation of plant composition, vigor, and diversity. The proposed action would maintain or improve existing range, watershed and riparian condition.

Use and Trampling of Water Sources and Associated Vegetation

Livestock grazing would affect water dependent species only if the grazing were conducted to the extent of causing unsatisfactory water quality. The allotment lies within watersheds that are currently considered to have satisfactory ground cover. The proposed action would maintain 100% satisfactory watershed condition. There are no perennial streams within the allotment. Development of water sources (pipelines, wells, and stocktanks) distributes livestock and wildlife use so that individual natural water sources are less severely impacted. Livestock consumption of water is minor compared to evaporation and seepage loss. Livestock use of natural water sources (seeps and springs) and stock tanks disturbs water margin vegetation and soils, causes turbidity, and adds organic material to the system. The proposed action would continue to eliminate livestock effects on springs, seeps and associated vegetation. Maintenance of existing water developments would serve to distribute some of the use by herbivores away from the natural waters. No measurable off site sedimentation or water yield would be produced from the levels of livestock grazing under the proposed action.

Fences Injure and Kill Wildlife and Create Barriers to Wildlife Movement

In addition to modifications in cattle numbers and rotation seasons, the Proposed Action includes various infrastructure changes to the existing plan (above). These developments include the following: Establishment of smaller holding pastures in the Central Summer allotment (Lookout Canyon, Murray's Lake, Pleasant Valley) and Central Winter (Burnt Corral) allotments. Pasture establishment includes fencing and construction of two cattleguards, construction of a fence along the west side of highway 67 and the construction of nine cattleguards, reconstruction of the KNF-Grand Canyon National Park (GCNP) boundary fence, reconstruct a three mile section of the Sowats Fence, and construction of up to 30 fenced enclosure/exclosures (40-80 acres in size, potential of up to 42 miles of fence) for research and monitoring. Total additional fencing from the Proposed Action could be up to 88 acres.

Fences can interfere with wildlife in two ways. They create a barrier to movement of big game and they serve as a source of injury or mortality to big game, bats and some birds (particularly low flying raptors). Fences can be especially be barriers to pronghorn movements depending on location, size of area fenced, design and snowfall depth (Neff 1986, Lee et al. 1998). "Pronghorn have not learned to go through most fences (as do bison) or vault them (as do deer). Instead, many have learned to negotiate certain fences by crawling underneath. But, if the bottom wires of fences are too low, by virtue of design or buildup of vegetation or snow, pronghorn mobility can be impeded" (O'Gara et al. 1986). Additionally, fences can impede pronghorn when constructed adjacent to highways or railroads, or fences constructed of woven wire or logs.

Proper location and construction of wire fences including smooth bottom wires and raised bottom wires would mitigate much of the big game conflicts. Well-maintained barbed wire fences that are properly constructed impede big game less than loose, poorly maintained fences. Mortality of big game in properly constructed and maintained fences is uncommon. Livestock fences can severely restrict pronghorn antelope movement and lower numbers (Bureau of Land Management 1980). Mortality of raptors on

fences has been documented. Such mortality is minor compared to expected normal annual losses to a population due to other factors such as predation and disease. Use of standard regional specification for fence construction, reconstruction and maintenance is required. These specifications incorporate wildlife design specifications to minimize the risk of injury or death to crossing wildlife.

Disease Transmission between Livestock and Wildlife

Transmission of diseases between domestic livestock and wild animal populations occurs in both directions. Diseases endemic in wild populations can spread to domestic livestock. Rabies and clear-eyed blindness in deer are examples of such diseases. Epidemic levels of rabies in the wild mammal populations occasionally spread to domestic livestock. This is uncommon and does not pose a serious threat to ranch economics.

Disease transmission between domestic livestock and wild animals is a risk. Permitting livestock grazing on National Forests may increase the level of contact between livestock and wild animals. The primary diseases of concern for transmission from cattle to wildlife are brucellosis and tuberculosis. Local pockets of these diseases in domestic cattle are controlled by state regulations that quarantine infected herds and restrict movement of potentially exposed animals. Livestock entering Arizona from other states or countries are required to be tested and certified as free from these diseases before entering the state. Within Arizona, only a few isolated herds are normally under quarantine for brucellosis and tuberculosis. There is no known infection in wild ungulate populations. These diseases are not considered to constitute a problem in Arizona. The Proposed Action would not affect the likelihood of disease transmission between domestic livestock and wild animals.

Alternative 1 Allotment Improvements that Benefit Wildlife

Four natural lakes (Dry Park, West, Murray and Snipe Lakes) with riparian vegetation would be partially removed from livestock access. An additional four natural lakes (Bear, Cougar, Indian, and Wall Lakes) would be completely excluded from livestock access. This is in addition to 14 natural lakes (Corral, Crane, Deer, Dog, East, Fracas, Franks, Indian, Glen, Lookout, Mile and a Half, Oquer, Three and VT) that are currently partially or fully excluded.

The Proposed Action would modify 10 dirt tanks or wildlife guzzlers across the Central Summer Allotment for the purposes of increasing water availability in drier moisture years. Existing dirt tanks that currently do not hold water due to erosion or sedimentation, would be repaired and potentially lined. Wildlife specific (livestock excluded) guzzlers that are currently not functioning would be repaired or replaced on the same location.

Alternative 2

The 2001 Kane Ranch EA thoroughly analyzed all resource issues that could have directly, indirectly, or cumulatively effected by livestock grazing. However as described in the Range Management Specialist Report (2013) many issues have arisen including leaving livestock on the landscape longer than permitted. It is possible that these issues have attributed to wildlife impacts that were not considered or analyzed in the 2001 Kane Ranch EA.

Utilization rates in the Proposed Action are the same as those that were expected in the 2001 Kane Ranch EA. Utilization rates have not dropped below threshold as a result of issues in implementing the 2001 Kane Ranch EA. Effects to wildlife from the Continued Action were analyzed in the 2001 Kane Ranch EA and Wildlife Specialist Reports (2013) and will be incorporated by reference as adequate analysis for the Continued Action, Alternative 2.

Alternative 3

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 al. 1989 all in Bock et al.

1990). A review by Jones (2000) found 11 of 16 response variables showed detrimental effects from cattle grazing. Soil related variables were most negatively impacted, followed by vegetative cover variables and biomass and rodent diversity and richness. Effects to soil include trampling, compaction, increased bulk density, erosion, infiltration, and damage to cryptogamic crusts (Jones 2000).

Fleischner (1994) summarized in his literature review that grazing could have negative effects such as: to reduce the density and diversity of small mammals at grazed sites; 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. One-third of riparian bird species showed significant differences in diversity between heavily and lightly grazed riparian sites; although the bark-foraging guild was unaffected, grazing affected four guilds of riparian birds. In Arizona, the abundance and diversity of lizards was higher on ungrazed sites in 4 of 5 vegetation types (chaparral, desert grassland, mixed riparian scrub, and cottonwood-willow deciduous forests, the fifth being Sonoran desertscrub); and wandering garter snakes were five times more abundant in ungrazed sites in New Mexico.

In their study, Bock and Bock (1993) showed that total grass canopy cover was greatest in the ungrazed portions of all eight monitored sites and that blue grama, the most common grass in the study area, showed immediate response to livestock exclusion. Bock and Bock (1993) summarize that “livestock grazing appears to be an exotic ecological force in these southwestern grasslands, and one destructive of certain components of the native flora and fauna”.

Based on the above literature, the no graze alternative, when compared to the proposed action alternative, can reasonably be expected to: 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, increase vegetative cover, increase vegetation biomass, increase seedling survival, increase cryptogamic crust, increase litter cover, increase litter biomass, decrease soil bulk density, and increase soil/water infiltration rate.

However potential benefits from grazing would also not occur. Grazing has the potential to be an ecologically and economically sustainable management tool for reduction of fuel loads. Existing data indicate there are two ways by which grazing impacts the fuel load: removal of vegetation, and hoof incorporation of fine fuels (Nader et al 2007). Fuel management studies have shown that spread rate and flame length decrease as dry grass fuel loads decrease (Scott and Burgan 2005).

Diamond, et al. (2009) showed that targeted grazing in Idaho reduced cheatgrass (*Bromus tectorum*) biomass and cover, which resulted in reductions in flame length and rate of spread. When the grazing treatments were repeated on the same plots in May 2006, cheatgrass biomass and cover were reduced to the point that fires did not carry in the grazed plots in October 2006.

Under the No Action alternative, actions described below would not occur. Both negative and potentially positive effects, as discussed above, would not occur. The effects of the No Action alternative as described above are equal for all species analyzed below and will not be repeated for each species.

Federally Listed Species

There are six wildlife species listed under the Endangered Species Act (ESA) identified by the U.S. Fish and Wildlife Service (<http://www.fws.gov/arizonaes/>) for Coconino County that occur on the Kaibab NF. The Forest has developed a list (USDA 2012) that breaks down the range of species by District. This section is a summary of the information provided in the Wildlife Specialist Report (2013), which details why species were not carried forward in this analysis.

This section is also a summary of the information provided in the Biological Evaluation (2013).

Mexican Spotted Owl

The NKRD is located in the Colorado Plateau (CP) Ecological Management Unit (EMU) as defined in the Recovery Plan (USDI 2012). Within this EMU, Mexican spotted owls (owls) are known to nest within the Grand Canyon of Arizona and the canyon country of Utah (USDI 2012). In southern Utah and Colorado, surveys have shown that breeding owls can be found in canyons, while in Northern Arizona and New Mexico, owls are found predominantly in montane forests (USDI 2012). All known breeding and roosting sites of owls in the Grand Canyon are in canyon habitat as described for southern Utah. Further, Bowden et al. (2008) found owls in rocky caves or on steep cliffs where canyon width at roost height averaged 46.2 meters (± 40.9 SD). Owls primarily use areas within the canyons, but do, on occasion, forage or define territory boundaries on the plateau. However, Bowden et al. (2008) found that most detections are within 0.5 miles of the rim.

Recovery owl habitat is all habitat that does not fall in the protected habitat definitions. For the Colorado Plateau EMU only mixed conifer and riparian habitat is considered recovery habitat. There are 69,661 of recovery mixed conifer stands in the Project area. This habitat is also designated Mexican spotted owl critical habitat.

Effects of cattle grazing on Mexican spotted owls and their habitat are described in the “Framework for Streamlining Informal Consultation for Cattle Grazing Activities” (USDA 2005) and relate to grazing effects on habitat structure and composition, as well as the availability and diversity of food for the owl.

NKRD does not have any PACs therefore criteria 1 and 2 of the “Framework for streamlining informal consultation for livestock grazing activities” do not apply. The third criteria would be met in the proposed action by the conservative level (30-40%) of grazing utilization in the 69,661 acres of recovery habitat that is within the Kane Ranch Allotments.

In conclusion, we have determined that the proposed *action may affect but will not adversely affect* Mexican spotted owls or their habitat. The proposed action *may affect but will not adversely affect* MSO designated critical habitat.

California Condor

The California condor was reintroduced as an experimental, nonessential population under Section 10(j) of the Endangered Species Act. This non-essential, experimental designation provides increased opportunities for assuring that the release and the management of the condors do not disrupt or conflict with other activities.

Depending on the time of year and food availability, the number of condors on the district at any one time may vary. Condors have been extensively radio-tracked and have been detected flying over and foraging throughout the project area. Researchers sponsored by the California Condor Working Group closely monitor all condors.

The FWS and BLM have developed a list of voluntary conservation measures that may be applied during activities within the 10(j) area. No operational restrictions are required solely due to the presence of condors, and no structural modifications have been made within the area solely for the protection of condors (USDI 2012).

The Kaibab NF has also worked with the FWS to develop measures to minimize the risk of harm to condors that could occur near project-related activities, and requires these measures be followed by employees, contractors, and partners (USDI 2012).

The Project *will not jeopardize the continued existence* of the California condor.

Rare Plants - Fickeisen pincushion cactus (*Pediocactus peeblesianus fickeisenae*)

Fickeisen is listed as a candidate species for addition to the Endangered and Threatened Wildlife and Plants List. The FWS has recently revised the Proposed Critical Habitat for Fickeisen plains cactus, removing the Snake Gulch Unit because this area is now considered to be unoccupied (FWS July 2013). The Fickeisen plains cactus is a small solitary or clustered globose cactus with corky spines. It emerges from the soil in early spring and then the species retracts into the soil during periods of drought.

Recent surveys efforts completed by the Kaibab NF in April of 2013 did not yield any known populations in the Snake Gulch (Willow Point) area where they were previously thought to exist. There are no known populations of Fickeisen plains cactus in the area at this time. There is no authorized livestock use within Kanab Creek wilderness. Outside of the wilderness boundary, the Central Winter Allotment does authorize grazing within the unoccupied habitat area. However, grazing does not occur within the potential habitat for the Fickeisen plains cactus. This is primarily due to the lack of available vegetation within its habitat, availability of a cattle accessible water source, and often challenging terrain around this habitat. The closest functioning water source available to cattle near potential Fickeisen plains cactus habitat occurs within the Slide pasture of the Central Winter Allotment. However, the water source is over five miles away from the habitat which is beyond the distance that livestock would normally travel from water. Potential habitat also occurs in the JumpUp Pasture which was closed after the 1996 Bridger Knoll Fire, was excluded from grazing in the 2001 EA, and will continue to be excluded.

The project is *not likely to jeopardize the continued existence* of Fickeisen plains cactus or *adversely modify* proposed critical habitat.

Forest Service Sensitive Species

There are 20 wildlife species on the USDA R3 Regional Forester's Sensitive Species 2007 list that occur on the Kaibab NF. The Forest has developed a list (USDA 2012) that breaks down the range of species by district. The species analyzed below are listed for the North Kaibab and have suitable habitat (including foraging habitat) in the Project Area. All other species on the Forest list do not occur on the district and would not be impacted by the proposed project. This section is a summary of the information provided in the Wildlife Specialist Report (2013).

Northern Goshawks

Northern goshawks use a wide variety of forest stages in ponderosa pine and mixed conifer habitat in the southwest. Nest stands are typically in later successional stages. Post-fledging areas (PFAs) have patches of dense trees, developed herbaceous or shrubby understories, snags, downed logs, and small openings, which provide cover and prey species. Goshawks prefer stands of intermediate canopy cover for nesting and more open areas for foraging. Foraging area, by virtue of its size, is a mosaic of various successional stages and cover types. Goshawk foraging use on the North Kaibab crosses all vegetation types: mixed conifer, ponderosa pine and pinyon juniper. The goshawk preys on large to medium sized birds and mammals.

All ponderosa pine and mixed conifer is considered goshawk nesting habitat. There are 109 known northern goshawk territories and 68,305 acres of habitat considered as PFA habitat within the Kane Ranch Allotments, the majority occurring in Central Summer. The entire habitat within the project area outside of PFA is considered Foraging Area (FA).

Cattle grazing has the potential to modify the understory vegetation by reducing its height, potentially affecting seed head production, and encouraging growth in years with good precipitation. Cattle grazing can modify food and cover for some prey species that nest or feed in these areas. Habitat for deer mice may be improved because they are associated with areas of little herbaceous cover. Several studies have shown that voles and ground nesting birds are more abundant where there is denser herbaceous cover, so are potentially impacted by cattle grazing, and more so by heavier grazing, than light. Other prey species,

such as squirrels, are less affected since their habitat requirements are more closely tied to the pine overstory, which would not be affected in any alternative.

Grazing can impact the density and abundance of a number of prey species that northern goshawks hunt, including ground nesting birds and most rodents. 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 is not expected to have direct effects on goshawk prey species or their habitat. In goshawk prey species' habitat that occurs in pastures that would be deferred or fenced to provide improved grazing regime options, small mammal and ground nesting bird habitats are expected to improve.

Merriam's and Dwarf Shrews

Merriam's and Dwarf shrews occupy cool grassy areas near conifer forest. These insectivorous animals may occur in the burrows of other animals while hunting.

Effects to this species from livestock grazing and management activities would include trampling and removal of grass needed for cover which may make them more susceptible to predation. The effect of livestock grazing on vegetation has been documented to affect insects, upon which shrews feed. Above ground 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).

Spotted, Allen's Lappet Browed and Pale Townsend's Big-Eared Bats

Spotted, Allen's lappet browed and Pale Townsend's big-eared bats have been mist-netted and captured over meadows and waters on the North Kaibab. Past telemetry work has tracked all of these bats to roosts in cracks and crevices along high cliff ledges, predominately in the Grand Canyon and Kanab Cree Wilderness. There are no known roosts for any of these three bats in the project area however, the area does provide foraging habitat.

Livestock grazing and the potential reduction in host plants adversely affect insects that insectivorous bats eat.

Kaibab Least Chipmunk

The Kaibab least chipmunk, a subspecies, occurs as a disjunct population on the Kaibab Plateau. These small diurnal chipmunks prefer spruce-fir forests but occur in many habitat types. They are found in rocky areas within moist or damp situations and usually in open places in the forest. Summer dens are typically in hollow logs or stumps, in rock piles, or under debris. Least chipmunks feed on and store a variety of small seeds that they can reach from the ground or by climbing bushes.

Effects to this species from livestock grazing and management activities would include trampling and removal of grass needed for cover which may make them more susceptible to predation.

Kaibab Northern Pocket Gopher

The Kaibab northern pocket gopher occurs only on the Kaibab Plateau of north central Arizona. This subspecies occurs in the soils of the high elevation meadows surrounded by spruce-fir or ponderosa pine. Grasses, weeds and shrubs that occur in those meadows provide most of the pocket gophers' food requirements.

Houserock Valley Chisel Toothed Kangaroo Rat

Overall abundance of Houserock Valley chisel toothed kangaroo rat is low. Its habitat covers approximately one-half of Houserock Valley. Overall low densities and the apparent negative response to livestock pressure suggest vulnerability.

Specifically, cattle grazing may be causing a decrease in the number, structure, density, and/or reproduction of certain shrubs, such as fourwing saltbush, which this kangaroo rat is dependent upon. Concentrations of livestock use, such as around water sources, have caused habitat degradation (O'Farrell 1995).

Long-Tailed Voles

Long-tailed voles inhabit grassy areas and meadows within or adjacent to various forest and woodland types including ponderosa pine, mixed conifer, spruce-fir, and aspen forest types and pinyon-juniper woodland.

Long-tailed voles, like other voles (*Microtus* spp.), need herbaceous vegetation for food (especially grasses) and cover. This is a small mammal dependent on the herbaceous vegetation layer for food resources and cover, so annual reductions in herbaceous vegetation and litter as a result of livestock grazing would result in reduced habitat quality.

Determination

The proposed action is not wholly beneficial to any of the Forest Service sensitive species that occur in the project area. A determination of *may impact individuals, but is not likely to result in a trend toward Federal listing or loss of viability* is made for all species.

Management Indicator Species (MIS)

A Forest-wide assessment entitled "Management Indicator Species (MIS) of the Kaibab National Forest: Population Status and Trends Version 3.0" (USDA 2010) summarizes current knowledge of population and habitat trends for species identified as MIS for the Kaibab National Forest. MIS species that have habitat within the Project are analyzed below. This section is a summary of the information provided in the Wildlife Specialist Report (2013).

Habitat types (cover types) present in the project area were quantified by conducting a GIS analysis of the Kaibab National Forest's existing vegetation layer. Habitat types in the project area are ponderosa pine forest, mixed-conifer forest, pinyon-juniper woodland, grassland, and aspen. Management Indicator Species that are indicators for at least one of these six habitat types are Mexican spotted owl, northern goshawk, wild turkey (*Meleagris gallopavo*), Cinnamon teal (*Anas cyanoptera*), hairy woodpecker (*Picoides villosus*), red-naped sapsucker (*Sphyrapicus ruber*), juniper titmouse (*Baeolophus ridgwayi*), pygmy nuthatch (*Sitta pygmaea*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), red squirrel, (*Tamiasciurus hudsonicus*), and Abert's squirrel (*Sciurus aberti*). Each of these species is known to occur within or adjacent to the project area.

The project area lacks late seral riparian habitats for aquatic macroinvertebrates (aquatic macroinvertebrates were selected to indicate stream health for North Canyon Creek on the North Kaibab District), low-elevation riparian habitat for Lucy's warbler and yellow-breasted chat.

Indicator habitats for Cinnamon teal and Lincoln's sparrow (late-seral wetlands), hairy woodpecker (snags in ponderosa pine, mixed conifer, and spruce-fir habitats), red-naped sapsucker (late-seral aspen and snags in aspen), juniper titmouse (late-seral pinyon-juniper and snags in pinyon-juniper woodland), pygmy nuthatch (late-seral ponderosa pine habitat), red squirrel (late-seral mixed-conifer and spruce-fir), and Abert's squirrel (early-seral ponderosa pine) occur within the project area. However, livestock grazing does not affect any of the key habitat components for these species (snags, trees, and arboreal insects for hairy woodpeckers and juniper titmice; aspen trees and snags and arboreal insects for red-naped sapsucker; ponderosa pine trees and arboreal insects for pygmy nuthatches; mixed-conifer and spruce-fir trees, seeds, cones, nuts, and fruits for red squirrel; ponderosa pine trees, mushrooms, and truffles for Abert's squirrels). Wetland habitat for Cinnamon teal and Lincoln's sparrow is fenced and is off limits to livestock. Therefore, there would be no measurable effects to habitat quantity or quality for each of these

species under the Proposed Action. Implementation of Alternative 1 would not affect the Forest-wide habitat or population trend of cinnamon teal, hairy woodpecker, red-naped sapsucker, juniper titmouse, pygmy nuthatch, red squirrel, or Abert's squirrel.

Indicator habitat for Mexican spotted owl on the KNF is mixed-conifer forest (Forest Service 2010: pages 56-62). The Proposed Action would not affect habitat quantity but would likely result in a decrease in foraging habitat quality (Biological Evaluation, 2013), in mixed conifer habitat within the project area. Under the Proposed Action 68,367 acres of mixed-conifer forest mapped is 63% of the total amount of mixed conifer mapped across the KNF. Implementation of the Proposed Action would not result in changes to Forest-wide habitat or population trends for Mexican spotted owl.

Indicator habitat for northern goshawk on the KNF is late-seral ponderosa pine forest (Forest Service 2010). The Proposed Action would not affect habitat quantity but would likely result in some decrease in goshawk foraging habitat quality (see discussion in Forest Service Sensitive Species section) within the ponderosa pine indicator habitat within the project area. Under the Proposed Action 213,921 acres of ponderosa pine forest mapped within the current allotment boundaries is 14% of the total ponderosa mapped across the KNF. Implementation of the Proposed Action would not result in changes to forest-wide habitat or population trends for northern goshawk.

Indicator habitat for wild turkey on the KNF is late-seral ponderosa pine forest (Forest Service 2010). Wild turkeys forage and nest on the ground. They eat a variety of plant parts (leaves, seeds, and fruits) as well as various arthropods found in the herbaceous vegetation layer. They are ground nesters and herbaceous and shrub-level vegetation provides potential cover to shield nests, as well as poults, from predators. Livestock grazing results in reduced levels of herbaceous and shrub cover and thus reduced food resources and cover for wild turkey. Trampling by livestock also may result in occasional destruction of eggs and nests. The Proposed Action would not affect habitat quantity but would result in continued decreases in wild turkey habitat quality due to continued decreases in food and cover resulting from livestock grazing. The area of ponderosa pine indicator habitat within the project area represents only a small percentage of the total area of ponderosa pine forest across the Kaibab NF. Although there could be localized decreases in wild turkey habitat quality that would result from the Proposed Action it is not expected to affect the Forest-wide habitat or population trend for wild turkey.

Indicator habitat for mule deer on the KNF is early-seral aspen and pinyon-juniper woodland (Forest Service 2010). The lower-elevation western portion of the Project Area that is dominated by pinyon-juniper woodland is an important winter range.

Livestock compete directly with mule deer for grass/forb forage and browse. Livestock also remove vegetation that is used for hiding cover for fawns. This effect was discussed under "removal and trampling of herbaceous and/or shrubby vegetation used as cover". There is some evidence of spatial competition between deer and cattle. The proposed Action would not increase competition with cattle over current levels.

Currently the aspen habitat trend on the forest is declining, while the pinyon-juniper habitat trend is considered to be stable (Forest Service 2010). Deer use a variety of habitat across their range. Since they are indicator of early-serial habitat that is what this analysis will focus on. Mule deer forest-wide are considered to be stable to increasing. The entire project is within game management unit 12. This unit appears to be in an increasing trend (Forest Service 2010). Forest-wide and local populations are managed primarily by the state through their permitted hunt structure.

The Proposed Action would not affect habitat quantity but would result in continued negative effects to mule deer habitat quality within the pinyon-juniper and aspen indicator habitat within the project area. Under the Proposed Action 233,654 acres of mapped pinyon-juniper is 19% and 14,796 acres of aspen is 32% of the total pinyon-juniper and aspen mapped forest-wide. Implementation of Proposed Action would not result in changes to Forest-wide habitat or population trends for mule deer.

Pronghorn antelope were selected as an MIS to represent species using the early and late seral grassland habitat within the forest. The pronghorn found within the Kane Ranch Allotments are found primarily in House Rock Valley on the east side of the Kaibab Plateau in the grassland/desert scrub. Pronghorn are also found along the edge of the plateau in the pinyon-juniper transition zone. AZGFD states that although the herd is only estimated to have around 90 animals, the herd appears to be fairly stable. Pronghorn in House Rock Valley generally tend to be located within 6 to 7 miles of the base of the Kaibab Plateau. Drier habitat conditions further to the east limit use of this area. North of Kane Ranch, there are a few groups of antelope scattered throughout the rolling hills. Pronghorn diet is generally higher in forbs and shrubs when compared to other ungulates. There is a higher diet overlap with mule deer. However, deer tend to choose more rugged areas compared to more open areas preferred by pronghorn so spatial segregation offsets this competition to some degree. Pronghorn diet also overlaps with deer and less so with cattle since both cattle and deer have relatively higher proportion of grasses in their diet. Ockenfels et al. (1996) found that plant species richness varies by month in many grassland and shrub steppe habitats in Arizona, with the greatest species richness expressed in spring. Low vegetative structure, averaging 10 to 15 inches in height is preferred. Vegetation greater than 30 inches in height is not used much (Lee et al. 1998).

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). Loeser et al. (2001) compared the effects of four grazing regimes on plant communities in semiarid grassland for 3 years. Their preliminary results suggested that interannual variability is high and that different grazing strategies did not have a dramatic short-term effect on the plant community in regards to native and exotic species richness and ground cover of grasses and forbs.

Though studies conducted by Loeser et al. (2004) did not show dramatic short-term effects in species richness as a result of grazing, pasture rest would increase forage resilience and vigor. The effects of grazing from this project would not change the habitat trend for grasslands, meadows, open pinyon-juniper, or the population trends for pronghorn on the forest.

Migratory Birds

We considered potential effects of the Plateau Facilities Fire Protection Project project on Arizona Partners in Flight Priority Species (Latta et al. 1999) and U.S. Fish and Wildlife Service Birds of Conservation Concern (USFWS 2008). There are no designated Important Bird Areas on the North Kaibab. The North Kaibab is within the Southern Rockies/Colorado Plateau (#16) bird conservation region. The forest developed a white paper to show which species are on the forest by vegetation type (USDA 2010). Not all species described below have been located on the district, but they have the potential of occurring there. The piñon-juniper, ponderosa pine, mixed-conifer are found within the analysis area.

Piñon-Juniper

The priority species for pinyon-juniper include gray flycatcher, gray vireo, piñon jay and juniper titmouse (Latta et al. 1999). The FWS list also included the Bendire's thrasher (USDI 2008).

Ponderosa Pine

The priority species in the ponderosa pine habitat type include northern goshawk, Cordilleran flycatcher, olive-sided flycatcher and purple martin (Latta et al. 1999). FWS list also included the flammulated owl, Grace's warbler, Cassin's finch and Lewis's woodpecker (USDI 2008). The goshawk is discussed in the Forest Service Sensitive Species section.

Mixed Conifer

Priority species in the mixed conifer habitat type include the northern goshawk, Mexican spotted owl and olive-sided flycatcher (Latta et al. 1999). The FWS list also includes Cassin's finch (USFWS 2008). Both goshawk and Mexican spotted owl are discussed above.

Numerous migratory bird species occur within the project area. Several species are evaluated in the Endangered Species Act section and the Forest Service Sensitive Species section (Mexican spotted owl, goshawk, bald eagle, peregrine falcon, burrowing owl) and Management Indicator Species section (juniper titmouse, red-naped sapsucker). Effects were also evaluated for bird species of conservation concern. Species of conservation concern were identified as Arizona Partners in Flight Priority Species (Latta et al. 1999) and U.S. Fish and Wildlife Service Birds of Conservation Concern (Fish and Wildlife Service 2008) that potentially occur in the project area. There are no designated Important Bird Areas on the North Kaibab Ranger District.

Species most likely directly affected by livestock grazing are species that nest or forage in ground and low-shrub vegetation layers (Saab et al. 1995). Potential effects are reduced herbaceous seed crops, reduced arthropod populations, reduced vegetative nest cover, and livestock trampling of ground nests. Livestock grazing unlikely to affect habitat quality for bird species that nest and forage in higher vegetation layers above the low-shrub layer.

The Proposed Action may result in limited unintentional take of individual migratory birds as a result of trampling the nests of certain ground-nesting bird species.

The Proposed Action would not result in measurable negative effects to migratory bird populations because 1) the 30-40% allowable use guideline should ensure that adequate residual vegetation is left to provide sufficient forage and cover resources for migratory birds, and 2) no new effects are likely because the project area has been grazed by livestock since the 1800's.

Cumulative Effects

Past, present, and reasonably foreseeable actions that are relevant to wildlife resources are described and included in the North Kaibab 5-Year Restoration Plan (project record). The cumulative effects analysis area for the action alternatives is defined by four of the major 5th code watersheds including Snake-Gulch, North Canyon, Houserock Wash and Jump-up Canyon-Kanab.

Reasonably foreseeable actions in the cumulative effects analysis area are livestock grazing, forest thinning, prescribed and natural fires, and recreation activities.

Cattle grazing has occurred in all or most of the cumulative effects analysis at some time or another since the 1800's. At that time cattle numbers were many times higher than at present. Livestock grazing currently occurs adjacent to the Kane Ranch Allotments including: Ryan, Willis, Houserock, Buffalo Ranch and Burro Allotments on the North Kaibab and Allotments on BLM.

Forest thinning and prescribed fires can affect wildlife habitat. Although these types of projects are mitigated to reduce negative effects, resulting habitat modification can affect foraging, nesting, hiding and thermal cover, and potentially daily movements on a short term basis. Although fires can cause a short-term disturbance to some wildlife, most species would benefit over the long term. Approximately 5,000 acres of prescribed and 10,000 acres of natural fires have occurred within the Kane Ranch Allotments in the past 5 years. Prescribed fires would continue over the district in the coming years to reduce accumulated fuels that can cause catastrophic wild fire.

The Jacob-Ryan Vegetation Management project is an approximately 26,000 acre thinning project. The objective of the project is to thin unnaturally dense forest and reduce fuels. The result would be decreased canopy cover and increased growth of herbaceous and shrub-level vegetation.

Juniper thinning treatments continue to occur on the west side of the North Kaibab. The result of these treatments would be open woodland with an increase in herbaceous and shrubby vegetation.

Human recreational activities can affect nesting, roosting, foraging, and general movement of wildlife. The KNF is in the process of analyzing road closures under the Travel Management Rule that would reduce recreational disturbance to wildlife.

Direct and indirect effects of the Proposed Action was identified for various species above, primarily as a result of annual reductions in forage and cover resources due to livestock grazing. These direct and indirect effects, however, even when added to the effects of past, present, and reasonably foreseeable future actions described above, would not cause adverse population-level effects (e.g., threats to population viability, trends toward federal listing, Forest-wide population decline) because 1) the 30-40% allowable use guideline should ensure that adequate residual vegetation is left to provide sufficient forage and cover resources for wildlife species analyzed above; 2) other protective design features and adaptive management and monitoring provisions of the Proposed Action should ensure that habitat degradation does not occur across the allotment; and 3) the project area has been grazed by livestock since the 1800's, and current livestock numbers are a fraction of historic numbers.

Economy

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

Cattle grazing contribute to the livelihood of the Kane Ranch permittee as well as to the economy of local communities. Individual allotments provide incremental contributions to local economies, so changes in several allotments could cumulatively impact the rural economy. The Kane Ranch Allotments are in Coconino County. These allotments are currently permitted for 800 head of cattle, so the economic effect is relatively low for the local communities and nearby counties. The presence of cattle grazing does not limit hunting or recreational activities on lands contained within the allotments.

Income associated with cattle grazing represents a small percentage of the Fredonia, Arizona and Kanab, Utah economy. The nearest community to the allotment is Fredonia where the economy is recessed and limited and grazing and associated revenues make up a very small portion of that economy. Permittees contribute a small percentage to county tax revenues. Livestock grazing permit revenues are a small percentage, but an important contributor, to the funds Coconino County receives from national forest grazing fees.

Livestock grazing operations make a larger contribution to the economy of rural landowners in the area.

The economy of Coconino County gains 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 livestock grazing, are an important part of county revenues, but provide only a fraction of available funds. Coconino County also receives fees from uses on the Coconino and Apache-Sitgreaves National Forests. Coconino County uses national forest fees for highway maintenance and schools. The Corva and Double A permittee directly contribute revenues to Coconino County through property taxes.

Effects Analysis (Direct and Indirect)

Estimates of direct and indirect jobs and payments to Coconino County from Federal receipts provide a relative comparison of economic effects that could occur due to changes in cattle grazing. Table 17 estimates the effects expected on these indicators in Coconino County from implementing the proposed action, current management, and no grazing on the Allotments.

Quantifiable factors such as economic costs and outputs, along with projected animal months (AM) or animal unit months (AUM) have been used to help describe the economic effects of grazing on the Kane Allotments. An economic analysis program called Quicksilver was used to calculate these factors.

Table 17. Economic effects expected to Coconino County for jobs and federal payments.

Economic Effects	Alternative 1	Alternative 2	Alternative 3
Direct and Indirect Jobs* (#)	9	9	0
Federal Payments to Counties**	\$1,711	\$1,602	0

*About 1.14 jobs per 100 cattle, based on current conditions maximum numbers

**The amount shown under current management is a projection of 25 percent of all grazing fees to Coconino County at the 2013 grazing fee rate of \$1.35. Not shown in this amount are the taxes that counties collect on range structural improvements. These taxes are based on a percentage of the assessed values of those improvements and the materials purchased for the construction of these improvements. Based on current conditions maximum numbers.

Although projections from the Quicksilver model are precise in measurement, they serve best as an indicator of change rather than a precise measurement. Additionally, identifying some of these effects is difficult, if not impossible, as economic effects tend to deal with personal issues.

The investment analysis anticipates the rate of return for the projected expenditures by the permittee and Forest Service on the Kane Ranch 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 18 displays the results of this investment analysis for the Allotment. These figures have been rounded to the nearest dollar. The partners, grants and agreements section was added to this project because this is how the pipeline system would be procured in the Proposed Action.

Effects to the Permittee for All Alternatives

Gross revenue estimates are created by estimating the amount of calves produced each year for each alternative. Alternative 1 would have two separate the herds on Central Winter (200) and Central Summer (600) that together have the initial lower limits of 800 (head and the potential upper limits of 1,400 head. Alternative 2 would continue current management at 800 head across the allotments.

For calves, the following figures are used in the calculations, although these figures may vary, depending on current market prices: 80 percent cow to calf ratio, 500 pounds per calf at \$0.80 per pound.

The initial stocking rate of alternative 1 and current stocking rate of alternative 2 would be 720 cows (80 bulls, due to the way cattle spread out into small bunches across the pastures). This would provide the estimated gross annual revenue of \$239,400.

If grazing the upper limits across the allotments as potential in the proposed action there would be 1,260 cows (140 bulls) and an estimated gross annual revenue would be \$403,200.

The estimated gross annual revenue for current management and the proposed action is \$82,800 per year. In no grazing alternative's estimated gross annual revenue is \$0.

In the no grazing alternative, 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 Allotments. Private land owned by the permittee could also be affected. When the public land permit associated with the ranch operation is lost, the permittee's economic ability to maintain a ranching operation may be greatly diminished or eliminated. Forest Service and BLM Allotments represent approximately 99 percent of the land base for this cattle operation. Without the public land permit, the base property controlled by the permittee would be greatly affected. No complete projections were made for the permittee's actual costs, the ability to cover costs, or any supplemental income that may be available.

Table 18. Investment Analysis

Investment Analysis	Proposed Action (Alternative 1)	Current Management (Alternative 2)	No Grazing (Alternative 3)
Forest Service			
Present Value of Benefits ¹	59,949	56,141	0
Present Value of Costs ²	-190,365	-30,749	-10,250
Present Net Value ³	-130,415	25,392	10,250
Benefit/Cost Ratio ⁴	0.31	1.83	0
Permittee			
Present Value of Benefits	504,906	472,833	0
Present Value of Costs	-153,952	-84,353	0
Present Net Value	350,954	388,480	0
Benefit/Cost Ratio	3.28	5.61	0
Partners/Grants, etc.			
Present Value of Benefits	0	0	0
Present Value of Costs	-1,210,577	0	0
Present Net Value	-1,210,577	0	0
Benefit/Cost Ratio	0	0	0
All Partners			
Present Value of Benefits	564,855	528,973	\$0
Present Value of Costs	-1,554,893	-115,102	-10,250
Present Net Value	-990,038	413,872	-10,250
Benefit/Cost Ratio	0.36	4.60	0

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

¹Present value of benefits represents the income generated from grazing on the Kane Ranch Allotments by the permittee, along with the present value of the grazing fees collected by the Forest Service.

²Present value of costs represents the cost of maintenance and range improvements (for the permittee), along with the costs of range inspections, permit administration, monitoring and materials for range improvements (for the Forest Service).

³Present net value represents present value of benefits minus present value of costs.

⁴Benefit/cost ratio represents the present value of benefits divided by the present value of costs.

Effects to Local and Federal Economy for All Alternatives

In Alternative 2, the loss of the Allotment permits would eliminate \$1,602 at the 2013 fee rate of \$1.35/AUM for the current permit from the treasuries of Coconino County. This loss, by itself, is not substantial. The county 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. Since cattle grazing is not limiting recreational uses, we do not expect the local economy to be enhanced once cattle are removed.

Under the grazing alternatives, ranching on the Allotments would help maintain current jobs (approximately 9 full-time jobs per table 17 above) within communities around this allotment and revenues for Coconino County and the state. If changes are made in the use of the Allotments in the future, contributions to state, county and local economies from fees, taxes and jobs associated with cattle grazing on this allotment would change accordingly.

The loss of direct and indirect jobs shown for the no grazing alternative is also shown in Tables 2 and 17 above. All jobs directly associated with the permit (as outside businesses) would be eliminated with this alternative. Some of the jobs indirectly associated with the permit (as outside businesses) would also be

eliminated, however, some would still exist because other ranches and portions of communities that use ranching supplies and services on the Allotments also support these businesses.

Recreation, Scenery, and Social Environment

Recreation Resources

Information on current recreation use levels and preferences is derived from public contacts, field observations, surveys of visitors, local tourism businesses, and residents. Although exact figures are not known, recreation use in the project area is estimated by District recreation managers to be low. The National Visitor Use Monitoring (NVUM 2001 and 2005) and visitor survey conducted in 2000-2002 by Northern Arizona University indicated visitors come from the local towns of Fredonia, AZ and Kanab, UT, and from across the U.S. and foreign countries. While local residents are consistent users of the project area and have immediate access to the national forest, the project area also receives many visitors from the cities of Las Vegas, St. George, Flagstaff, and Phoenix.

There are multiple Forest Service developed recreation facilities in the project area, which include DeMotte Campground, Jacob Lake Campground, Jacob Lake Group Area, East Rim Viewpoint, LeFevre Overlook, Kaibab Plateau Visitor Center, Indian Hollow Campground, as well as several trailheads and trails.

As recreation use increases, the types of activities visitors engage in are likewise increasing and diversifying. The types of recreation activities visitors pursue in the project area are varied and occur in developed and dispersed settings in all seasons. These activities include camping, picnicking, hiking, mountain biking, hunting, horseback riding, off-road vehicle use, driving, sightseeing, and viewing historic features. National Forest visitors are diverse in their preferences for recreational settings, experiences, and activities.

In order to provide a diversity of settings and opportunities, the Forest Service uses the Recreation Opportunity Spectrum (ROS) as a management tool to inventory and describe recreation setting objectives for National Forest System lands. Visitors choose specific settings for their recreation activities in order to enjoy desired experiences. These settings vary by geographic area and are further refined by the Recreation Opportunity Spectrum (ROS). ROS is a classification system that describes different outdoor recreation settings across the Forest using seven standard classes that range from primitive, undeveloped settings to urban, highly developed settings. Attributes typically considered in describing the settings are size, scenic quality, type and degree of access, remoteness, level of development, social encounters, and the amount of on-site management. By describing existing recreation opportunities in each class, ROS helps match visitors with their preferred recreation setting. Forest plan direction states that ROS classes are to be considered in the design of project activities and ROS classes maintained or enhanced.

Table 19 below describes the general settings and opportunities provided by ROS classes for the Kane Ranch Allotments. Note that the majority of the area is classified as roaded natural. Developed resorts such as Kaibab Lodge and Jacob Lake Inn have been classified as rural. Designated Wilderness has semi-primitive non-motorized, primitive and pristine classes.

Scenic Resources

Implementation of the Forest Service Visual Management System acknowledges the variation of forest landscape scenic quality, the visual sensitivity of different areas, and provides guidance for analyzing the ability of a landscape to undergo alteration.

Table 19. ROS classes, acres and general setting description within Kane Ranch Allotments.

ROS Class	Acres	General Setting Description (Desired Condition)
Rural	1,936	Landscapes may be highly modified and managed, and managed to maintain general scenic attractiveness. May contain highly developed recreation sites, and use may be high. Generally a natural appearing backdrop.
Roaded Natural Appearing	390,846	Landscapes are carefully managed to maintain or enhance recreation and scenic values, sites and features, to be natural-appearing, with changes designed to appear in harmony with natural setting. May contain highly developed recreation sites and travel routes.
Semi-primitive Motorized	156,641	Maintain predominantly undeveloped landscapes and scenic vistas as viewed from travel routes, with limited recreation developments.
Semi-primitive Non-Motor. Wilderness	44,551	Predominantly undeveloped landscapes and scenic vistas. Recreation uses are non-motorized and non-mechanized. Management according to Wilderness Act and Agency regulations. Use is low.
Primitive Wilderness	61,101	Management according to Wilderness Act and Agency regulations. Use is low. Wilderness-dependent uses are favored. Non-motorized and non-mechanized opportunities.

Visual quality objectives (VQO) combine the characteristics of natural features (vegetation, land form, and water) and the public's concern for scenic quality into five visual quality objectives. The five VQO's are named preservation, retention, partial retention, modification, and maximum modification. These represent a spectrum of change and the acceptable degrees of landscape alteration. See the characteristics of the VQO summarized in the Table 20.

Table 20. Visual quality objectives and characteristics.

Visual Quality Objectives	Characteristics
Preservation	Provides for ecological change only.
Retention	Human activities are generally not evident to the casual forest visitor. Must meet the VQO immediately after treatment.
Partial Retention	Human activities may be evident, but remain subordinate to the characteristic landscape. Must meet VQO after 1 year.
Modification	Human activities may dominate the landscape, but at the same time must utilize naturally established line, form, color, and texture. Must meet VQO within 2 years.
Maximum Modification	Human activities may dominate the landscape. Must meet the VQO within 3 years.

The Kaibab National Forest Management Plan does not include comprehensive visual quality objective mapping for the North Kaibab Ranger District. Only special features and corridors have been mapped. With the guidance provided, the three allotment areas where grazing activity has been proposed will be analyzed.

The Kane Ranch Allotment is located within Geographic Area (GA) 12, Western North Kaibab Woodland, GA 13, Kaibab Plateau Forestland, and part of GA 16, East North Kaibab Woodland. The project also includes Land Use Zones (LUZ) 20 and 21. Table 21 displays the allotments within a geographic area.

Table 21. Allotment and Geographic Areas.

Allotment	GA/LUZ
Central Winter Allotment	GA 12
Central Summer Allotment	GA 13, LUZ 20 & 21
Kane Allotment	GA 16

GA 12 includes the northern and eastern sides of the North Kaibab as well as the west half of the woodland zone. The area is dominated by woodland vegetation such as pinyon pine, Utah juniper, sage brush, and different grasses. The area is visually sensitive around Highway 89A and Forest Road 22. These two roads lead to vista points that overlook the Grand Canyon. Management activities in the area must be visually subordinate to the landscape. The visual quality objectives for GA 12 are retention and partial retention.

GA 13 is located in the middle of the North Kaibab and has predominantly ponderosa pine vegetation as well as mixed conifer and spruce-fir at higher elevations. The area starts at the north end of the district

and runs south to the Grand Canyon National Park North Rim boundary. The visual quality objectives for GA 13 are retention, partial retention, and modification.

GA 16 is located on the east side of the North Kaibab with the vegetation consisting predominantly of pinyon pine and Utah juniper. The area has been classified under the VQO's as retention and partial retention of landscape elements in the foreground along Highway 89A, the Arizona Trail, and Forest Road 249.

LUZ 20 and 21 include the Franks Lake Geologic-Botanical Area (20) which is located within the subalpine and montane conifer forest near Highway 67. This area includes developed recreation sites (21) such as campgrounds, lodges, and gas stations. Both LUZ's are characterized under the VQO as partial retention.

Effects Analysis (Direct and Indirect)

Alternative 1

Recreation Resources

It is expected that there will be some short-term direct and indirect effects to recreationists and very little effect to the recreation setting. Recreational drivers will need to continue to be vigilant while driving through the district in livestock grazing areas. Some recreationists may be temporarily displaced by the activity of the cattle or the associated ranching activities (support trucks, disturbance during fence construction, or other range improvements and repairs).

Scenic Resources

It is expected that there would be some short-term direct and indirect negative effects on visual quality in the project area from the proposed activities. Examples of these activities include the increase in the evidence of management activities, through the appearance of the disturbance associated with fence maintenance (State Highway 67, right-of-way fence), modification of stock tanks, and other activities associated with the maintenance of range improvements and the new Burnt Corral pasture. The mitigation measures in place for the range improvements in this alternative would meet the VQO requirements. Materials, colors, and textures would be selected so that the structures are not evident to the casual observer.

Alternative 2

Recreation Resources

Under Alternative 2, the current grazing management and range improvements would continue to occur. It is expected that there would be some short-term direct and indirect effects to recreationists and very little effect to the recreation setting. Recreational drivers would need to continue to be vigilant while driving through the district in livestock grazing areas. Some recreationists may be temporarily displaced by the activity of the cattle or the associated ranching activities (support trucks, disturbance during fence construction, or other range improvements and repairs).

Scenic Resources

Under this alternative, it is expected that there would be some short-term direct and indirect negative effects on visual quality of the project area from the proposed activities. The increase in the evidence of management activities, through the appearance of the disturbance associated with fence maintenance, water developments, and associated with the maintenance of range improvements. The mitigation measures in place for the range improvements would meet VQO requirements.

Alternative 3

Recreation Resources

There would be minimal direct or indirect effects on the existing recreational setting and facilities. Fewer visitors would be affected by livestock entering campsites and eroding roads and trails. Recreationists would not be temporarily displaced by the activity of the cattle or the associated ranching activities (support trucks, disturbance during fence construction, or other range improvements and repairs). There would also likely be a decrease in collisions between drivers and livestock.

Scenic Resources

Under the no grazing alternative it is expected that there would be some direct and indirect negative effects on visual quality. The absence of cattle could decrease the VQO of the North Kaibab in the project areas, in that, if not removed, existing range management facilities such as corrals, fences, and tanks would affect the VQO. The removal of old grazing infrastructure would require time and budget.

Effects Analysis (Cumulative)

The cumulative effects analysis for the recreation and visual resources is defined as the coniferous woodland and pinyon-juniper components of AGFD Hunting Units 12A and 12B over a 20 year time period, from 2013 to 2033. Potential cumulative actions include past, present, and future management activities that could include vegetation management, fuels management, livestock grazing, recreational activities, and noxious weed treatments.

Alternative 1

Recreation Resource

The cumulative effects of the proposed action when combined with past, present, and planned actions, would be to increase the amount of disturbance and displacement of recreationists. The number of recreationists affected by grazing activities in the project area has historically been and would most likely continue to be minimal. The greatest potential of displacement could occur during the large-game (deer and buffalo) hunting seasons in the fall. Past experience has shown that these effects are short in duration and localized. When combined with the direct and indirect effects of implementing this alternative, the cumulative effects on recreation resources are negligible given that activities do not occur at the same time and are spatially distributed across the allotment.

Scenic Resource

Past experience has shown that the implementation of best management practices and careful structure design has minimized the effect from past activities on visual quality. These effects have been and are anticipated to continue to be temporary and localized to the project area. The cumulative effect of the proposed action when combined with past, current, and planned actions would likely increase the negative effects on visual resources. For example, the implementation of a new Kaibab Plateau – North Rim Scenic Parkway Corridor Management Plan could affect the fencing along State Highway 67, but since it's also for safety and would follow line and form of the area, this should not affect the project. However, the cumulative effects are negligible because activities do not all occur at the same time and are spatially distributed across the allotment. The mitigation measures were selected so that the structures would not be evident to the casual observer.

Alternative 2

Recreation and Scenic Resources

Same as Alternative 1 (Proposed Action)

Alternative 3

Recreation Resource

There would be no cumulative effects on recreation under the no grazing alternative.

Scenic Resource

The primary cumulative effect on visual resources under the no grazing alternative would be that some visitors to the project area could notice the absence of livestock operations that they had previously encountered in the past.

Social Environment (Human Perceptions)

The current permittees of the Kane Ranch Allotments are a partnership between a Colorado Plateau environmental organization and a ranching family. The environmental organization lives and works in primarily in Northern Arizona. The ranch managers are native to the Arizona and ranching has been part of their lifestyle for a long time. Ranching makes up a substantial portion of their income. This entire partnership contributes to the social structures of communities around this allotment by providing some direct and indirect jobs for residents of those communities and revenues for county, city, and federal governments. They also contribute to the lifestyle associated with ranching for their community, their employees, and other people associated with ranching in the area.

The number of people involved in ranching today in the Northern Arizona is very low compared to the rest of the population. There are 24 different permittees on the KNF. Each of these permittees has a varying number of family members and ranch hands working with them.

Forest visitors vary widely in their reactions to seeing cattle on National Forests or other federal lands (Mitchell et al 1996). Reactions depend on viewers' personal values, opinions and whether they are accustomed to seeing cattle. The presence of cattle grazing may be viewed by some as a pleasant pastoral scene. Wilderness enthusiasts may associate cattle with the presence of humans, which disrupts their perception of National Forests as truly wild places.

Recreationists that visit the same places in which cattle may congregate may find that the presence of cattle waste detract from their experiences, or even cause them to move to different areas. This occurrence is rare on these allotments because there are a low number of people recreating in the area. Encountering fences while traveling across the area may be considered an inconvenience. However, fence crossings have not been an issue raised on this allotment to date. People traveling cross-country on foot generally climb over fences and those on horseback travel along fences until a gate is reached.

Effects Analysis (Direct and Indirect)

Some forest visitors prefer the exclusion of livestock grazing in areas they choose to recreate, while other visitors may enjoy seeing livestock on the range. The amount of time cattle spend on the allotment and cattle numbers would be very similar under Alternatives 1 and 2. Cattle grazing would not be permitted under Alternative 3.

Eliminating cattle grazing on the allotments may resolve direct conflicts between recreationists, and grazing permittees, and would satisfy the visual concerns of those who do not wish to see livestock on the KNF. However, for those who enjoy the pastoral scene and ambiance of the western lifestyle, eliminating cattle may detract from their experience and enjoyment of rural National Forest lands.

Those who believe cattle grazing is an appropriate use of public lands may not approve of removing cattle from this allotment. These people may not only express concerns about the impacts of not permitting cattle grazing on these allotment, but may also question the legitimacy of mutually beneficial land management goals. The uncertainty of short-term grazing permits may also be unacceptable to these people.

Alternative 3 would eliminate a source of income and possibly the current lifestyle of the permittee of the allotments and their employees. These changes may cause conflicts within the ranching community and potentially cause conflicts within the family of the permittee and their employees.

Alternatives 1 and 2 would maintain ranching operations, thereby maintaining the income of the permittees and their employees. Ranching operations would allow the permittee and their employees to continue their customs, traditions, and lifestyles that have long been associated with cattle grazing. This, in turn, would contribute to the rural sense of community in areas around this allotment.

These effects on the social environment are limited to the allotment and it is expected that any alternative would have little cumulative effect on adjacent allotments.

Heritage Resources

Affected Environment

The Kane Ranch allotments cover an estimated 475,100 acres. Elevations range from 3,200 feet in the bottom of Kanab Creek to 9,000 feet on the Kaibab Plateau. Vegetation includes riparian assemblages along the creek bottoms, sagebrush and grasslands transitioning into pinyon juniper along the flanks of the Kaibab Plateau, and ponderosa pine, aspen, mixed conifer forests and meadow systems at higher elevations. Physical evidence indicates that human use occurred throughout all environmental zones on the District. A diversity of landscapes and natural resources has allowed for a rich and varied assortment of cultural resource sites.

Cultural resources (heritage resources) include prehistoric and historic remains left by people of the past, as well as special locations important to the traditions of living cultures. Remains found on the District represent limited activity sites such as hunting and gathering camps, prehistoric agricultural areas, rock art, and historic resource extraction areas; habitation sites including pueblos, prehistoric residential camps, and historic cabins; linear features like roads, trails, and fences; and special use sites including traditional cultural properties of significance to area tribes. Kanab Creek and adjacent canyons are of special significance to the Kaibab Paiute and Hopi Tribes.

The Kanab Creek allotment was closed to grazing in 2001 to protect sensitive resources, including cultural resource sites. It will remain closed to livestock grazing and therefore the proposed action will not alter the existing condition. Grazing would continue on the Central Winter, Central Summer, and Kane allotments. The Central Summer, Central Winter, and Kane allotments comprise an estimated 435,833 acres. Approximately 151,678 or 35% of these acres have been intensively surveyed for cultural resource sites over the past several decades. To date, 1750 cultural resource sites have been recorded within these three allotments.

Kaibab Paiute, Hopi and Zuni tribes claim cultural affiliation with prehistoric sites located on the District. Navajo utilization of the North Kaibab occurred primarily in the twentieth century following the construction of the Marble Canyon Bridge that crosses the Colorado River gorge.

Laws, Regulations, and Policy

Federal land managers are responsible for the protection and enhancement of significant cultural resources under 36 CFR 800, as per Sections 106 and 110 of the National Historic Preservation Act (NHPA), as amended. These include both physical manifestations of past human activities and specific locations that are traditionally important to area tribes. Federal agencies are charged with avoiding or minimizing impacts to significant archeological and historical sites, as well as to traditional cultural properties. Therefore, locations and condition of existing cultural resources are identified and documented prior to implementing any Federal undertaking. Significant resources are protected primarily through site avoidance. Other protective measures include various design criteria established by the agency in consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic

Places (ACHP). The Arizona SHPO concurred that the proposed action would have no adverse effect on cultural resource sites.

The NHPA and the American Indian Religious Freedom Act (AIRFA), along with various other laws and regulations, require that agencies consult with culturally affiliated tribes to determine the effects of agency decisions and activities on sites and areas culturally significant to the tribes. The North Kaibab typically consults with the Kaibab Band of the Southern Paiute Indians, the Hopi Tribe, the Navajo Nation, and the Pueblo of Zuni to identify and address issues and concerns.

The Kane Ranch Allotment Management Plan (AMP) environmental analysis (EA) was added to the KNF Schedule of Proposed Actions (SOPA) during the First Quarter of Fiscal Year 2012. No specific concerns, questions, or comments about the project were received by the Forest. On November 9, 2011, the KNF initiated government-to-government consultation by sending a consultation letter and an updated copy of the SOPA to the Havasupai Tribe, the Hopi Tribe, the Hualapai Tribe, the Kaibab Band of Paiute Indians, the Navajo Nation, the Yavapai-Prescott Indian Tribe and the Pueblo of Zuni. On November 9, 2011, the Forest initiated public scoping of tribal communities by sending a copy of the SOPA to the Bodaway/Gap, Cameron, Coalmine, Coppermine, Lechee, Leupp and To'Nanees'Dizi Chapters of the Western Navajo Agency. The KNF has continued to send copies of the SOPA to these Tribes and Navajo Chapters on a quarterly basis.

The North Kaibab District Ranger and tribal liaison met with the Kaibab Paiute Tribe on September 6, 2012 and March 6, 2012, to review district projects including the Kane Ranch EA. No concerns or issues were raised. Additionally, the KNF Forest Supervisor provided a briefing on the project during a regularly scheduled government-to-government consultation meeting with the Hopi Tribe on September 19, 2012. The Hopi Tribe defers to the Kaibab Band of Paiute Indians on this project.

Methodology and Analysis Process

The analysis for this allotment utilizes standards found in the Region 3 First Amended Programmatic Agreement (USDA 2003), with specific guidance from Appendix H that identifies standard consultation protocol for rangeland management (USDA 2007). As per Appendix H, a complete survey of an allotment is not required. However, grazing history, proposed changes in the allotment management plan, known incidents of grazing impacts, presence of grazing-sensitive sites, locations where cattle congregate, amount of previous inventory, and local knowledge should be considered. Additionally, any new ground disturbing activities require complete survey. Cultural resource site location probability zones on the North Kaibab are identified in a Proposed Survey Strategy for the North Kaibab Ranger District (District Heritage Files 2006). The survey and site location methodologies presented in this strategy were accepted by the Arizona SHPO as the standardized approach for surveying and locating cultural resource properties on the North Kaibab.

The 2001 Kane AMP cultural resource clearance (District Heritage Files 2000) provided the initial foundation for the current analysis. In the original analysis, sites highly susceptible to grazing impacts within the allotments were identified using the KNF Geographic Information System (GIS) database. These sites were inspected and where needed, site protection measures were developed and implemented. Livestock were officially removed from the Kanab Creek Allotment which lies mostly in federally designated wilderness. The allotment is characterized by canyons and contains a high concentration of rock art and rock shelter habitation and storage sites. Monitoring of these sites revealed that many significant sites were being adversely affected by livestock. The forest decided to remove livestock entirely from this allotment. Rock shelter and rock art sites in other allotments were also inspected for cattle damage and if warranted, fencing was proposed given the manageable number of sites affected. Additionally, all infrastructure improvements and areas where cattle were expected to congregate were inspected for cultural resource sites. If needed, avoidance, fencing, or other appropriate mitigation measures were developed in consultation with the Arizona SHPO (Ibid).

A similar approach was taken for the revised Kane Ranch AMP taking into consideration changes in seasonal rotations and cattle numbers. Previous survey coverage within the proposed smaller pastures was assessed and found to be adequate. Sites susceptible to livestock damage were reviewed to assess any changed conditions or identify any newly recorded sites since the 2001 decision. Additionally, proposed infrastructure improvements were completely surveyed for cultural resources sites. During the 2012 field season, North Kaibab archaeologists surveyed a total of 761 acres for the newly proposed Kane Ranch improvement projects. The results of that inventory and site-specific information can be found in section 106 clearance report prepared for this project (Heritage Report 2013).

Exceptions to this are future maintenance, monitoring, or restoration projects including repair and maintenance of dirt tanks and guzzlers, installation of research monitoring plots, possible restoration of the non-functioning Little Mountain pipeline, and restoration of natural springs. All of these projects would be addressed on a case-by-case basis prior to implementation. Appendix H of the Region 3 First Amended Programmatic Agreement (2007) permits phased survey and consultation for these improvements.

Effects Analysis (Direct and Indirect Effects)

Alternative 1

The proposed action would continue grazing on the Central Winter, Central Summer, and Kane allotments. The Kanab Creek allotment will remain closed to livestock grazing. In addition to modifications in cattle numbers and rotation seasons, the proposed action includes various infrastructure changes to the existing plan.

Cattle can damage cultural resource sites by trampling or crushing artifacts and surface features. This typically occurs when cattle congregate, such as at a water source, along a cattle driveway or when confined to a corral or constricted canyon. Additionally, individual or smaller numbers of cattle can damage sites located in rock shelters by crushing features, causing erosion, and in some cases, damaging rock art by rubbing against images.

The proposed action would continue grazing on the Central Winter, Central Summer, and Kane allotments. The Kanab Creek allotment will remain closed. There will be no effects to sites in this allotment.

The proposed action would likely benefit cultural resource sites within the Central Summer allotment, by rotating cattle across the allotment, and limiting or restricting use of certain locations where cattle now congregate, including sensitive meadow areas where cultural resources commonly occur. Additionally, holding pastures would help wranglers gather cattle for transport off the allotment. Under the current plan, it is difficult to get all cows off the allotment each fall, which has led to year round use of the area by some cattle.

Grazing within the Central Winter allotment has been lower than authorized levels since the 2001 Kane AMP for various reasons. The newly proposed Burnt Corral pasture would be added to the allotment, incorporating a higher elevation component. Initial cattle stocking levels would be 200 head of cattle, with a minimum of zero head, depending on range conditions, and a maximum of 400. Stocking levels would be contingent upon ongoing monitoring results. The Central Winter allotment contains a high concentration of cultural resource sites in the lower elevations. Most are open campsites or habitation sites; rock shelters are limited. Given the level of proposed grazing across this allotment, anticipated impacts to sites from dispersed grazing are low. The greatest potential for damage to sites would be around water developments, or smaller holding corrals where trampling can occur.

Use of the Kane allotment would increase from the current plan. However, use would be transitional and short term, in the shoulder season to move cows from Forest Service allotments to Kane Ranch winter allotments located on Bureau of Land Management lands. Cattle would not be channeled into side

canyons within the allotment. It is possible (though not probable) that an errant cow may enter canyons on either side of the Kane Trail cattle driveway, which could impact sensitive archaeological sites.

It is unlikely that sites within these pastures would be adversely affected by generalized dispersed cattle grazing given the number of cattle present at any one time and the season of use. Existing and proposed Kane Ranch water sources and associated corrals, areas where cattle congregate, were inventoried during the original 2001 Kane AMP and current AMP. Efforts were made to protect locations containing sites from potential cattle damage. These water sources are regularly monitored and protection measures can be employed if a change in condition is observed.

Additionally, sensitive rock shelter and rock art sites were addressed in the original Kane AMP which contributed to the closing of the Kanab Creek allotment. In other locations, fencing was installed to keep cattle out of shelter sites. Monitoring of sensitive shelter sites would continue. Sites on the ridge and within canyons flanking the Kane Trail would also be monitored for errant cattle. Archaeologists would work with range conservationists to identify any potential disturbances that might occur. An adaptive management approach would be used. If impacts to cultural resource sites are identified, protection measures such as fencing or other suitable measures would be implemented.

Establishing Holding Pastures

As noted, cattle can damage cultural resource sites by trampling or crushing artifacts and surface features. This typically occurs when cattle congregate, such as at a water source or when confined to a corral. Additionally, individual or smaller numbers of cattle can damage sites located in rock shelters by crushing features, causing erosion, and in some cases, damaging rock art by rubbing against images.

Over 80% of the acreage in the smaller pastures (Murray's Lake and Little Pleasant Valley) has been intensively inventoried for cultural resources sites, and 1/3 or more of the pastures in the larger areas (Lookout Canyon and Burnt Corral) have been inventoried. Most of the unsurveyed area in Lookout Canyon contains steep slopes. Under the current plan, cattle have access to unfenced areas across the Central Summer allotment. Under the proposed action, there would be less cattle use of these pastures because they would now only be accessible during the fall, as wranglers round up cattle for transport to the Kane allotment and onto the winter allotments on Bureau of Land Management lands. Given the short duration and potential number of cattle grazing within each pasture, in relation to the size of each, it is unlikely creation of these pastures would adversely affect sites.

Archaeologists would work with range conservationists to identify any potential disturbances that might occur following implementation as mitigation measures for these projects. An adaptive management approach would be used. If impacts to cultural resource sites are identified, protection measures such as fencing or other suitable measures would be implemented.

Fence Construction

Fence construction activities have the potential to adversely affect archaeological sites. Excavation of post holes can damage sites with buried deposits by disturbing subsurface artifacts and features. Additionally, mechanical equipment, used to clear vegetation along the fence can also damage sites through ground disturbance or crushing of surface artifacts or features.

The majority of the proposed fencing projects (Lookout Canyon, Murray's Lake, Little Pleasant Valley, and Burnt Corral Pastures; Indian, Wall, Bear, and Cougar Lakes; Sowats Fence) would have no effect on unevaluated or eligible cultural resources sites. The entire length of fencing for each of these sub-projects was surveyed for cultural resources and fencing would be positioned to avoid crossing any cultural resource sites. Therefore there would be no direct or indirect effects to sites by these projects.

The original KNF/Grand Canyon National Park boundary fence (AR-04-07-03-775) is located properly along the boundary. However, this site was officially determined ineligible to the National Register of Historic Places (NRHP) on 6/27/1998 in consultation with the Arizona SHPO. Remains of this fence line

may be removed or restored during the boundary fence project. These proposed fence line was completely surveyed for cultural resources and no eligible or unevaluated properties were found. Consequently, there would be no direct or indirect effects to sites from fence construction.

Two fencing projects are associated with cultural resources sites. These include West Lake and the proposed fence along the west side of highway 67. The existing fence at West Lake would be redesigned to ensure that cattle would no longer congregate atop the lithic scatter adjacent to the lake. The proposed highway 67 fenceline follows meadow margins that contain multiple sites. Forty-two unevaluated or eligible sites are located along the proposed line. Standard mitigation measures would be implemented to minimize potential damage to these sites. If mitigation measures are followed, there would be no adverse effect to sites (direct or indirect) as a result of fence construction.

Given the absence of unevaluated or eligible cultural resource properties associated with new fencing for Lookout Canyon, Murray's Lake, Little Pleasant Valley, and Burnt Corral Pastures; Indian, Wall, Bear, and Cougar Lakes; KNF/GCNP Boundary Fence; Sowats Fence, no mitigation measures are required for these improvements.

However, sites at West Lake and along the highway 67 fenceline would require special mitigation measures to ensure that there are no adverse effects to these sites from fence construction. The fence associated with West Lake would be designed to protect the site. However, construction would be monitored by an archaeologist. The Highway 67 project would be designed to mitigate potential adverse effects to sites in several ways. Where the fence crosses a prehistoric site, the distance between the fence posts would be maximized to reduce ground disturbance or where visually suitable, the fence would be situated to avoid the site. All work would be done by hand. Dirt retrieved from the post holes within any site boundaries would be screened, artifacts collected and curated and results documented. An archaeologist would be present on site during fence installation to screen back fill and monitor fence construction. A report containing the results of this effort would be prepared and submitted to the Arizona SHPO upon completion of fence installation. This procedure was used during implementation of the Kane Ranch 2001 AMP, natural lakes fencing projects where cultural sites were present. The approach worked very well. Only a small amount of ground was excavated for the fence posts and none of the projects yielded any cultural material in the screen.

Cattle Trailing along Kane Trail

Direct effects of cattle trailing include trampling or crushing artifacts and surface features. This is most likely to occur in situations where cattle congregate such as the historic Kane Trail cattle driveway. Fourteen prehistoric sites (four of which include modern/historic Navajo brush shelters) are adjacent to or crossed by the Kane Trail. The trail is over 100 years old and was used at varying times between the 1880's – 2000 to drive as many as 10,000 cattle between Kane Ranch in Houserock Valley to the top of the Kaibab Plateau. The current proposal is to trail up to 600 cattle once a year in May. Stretches of the trail have been overlain with Forest Service system roads. Portions of the sites lying in the roadbed have been impacted by long term vehicle use and maintenance, and the trail itself has been "hardened" by over a century use of the trail as a cattle driveway. The trail and two track portions of the trail were inspected to determine if any features were exposed in the roadway. None were identified. Consequently continued use of the trail is unlikely to cause additional adverse effects to sites.

However, an indirect effect of the use of this driveway could occur if cattle are not confined to the trail corridor. Sites adjacent to the driveway could experience trampling of artifacts or features, adversely affecting the integrity of these sites. Therefore site avoidance and or protection measures must be implemented to contain livestock to the road/trail and prevent adverse effects to the sites. Additionally, if cattle are not confined to the trail, they could enter into adjacent canyons, where susceptible rock shelter sites occur. Therefore, mitigation measures are necessary to prevent direct or indirect effects to sites as a consequence of reutilizing the Kane Trail cattle driveway.

Kane Ranch wranglers would be required to keep cattle on the existing two-track road when herding through the portions of the Kane trail that contain cultural sites. This would confine trampling to the existing two-track, which was used historically for many decades. The trail also runs through pediocactus habitat, so, attention would be given to keeping the cows on the existing trail to protect both cultural sites and vegetation. Sites located within canyons flanking the Kane Trail would be monitored for possible impacts from errant cattle. The cattle drive would occur in May. Forest Service archaeologists and range staff would work with wranglers to effectively protect these sites prior to the drive. Archaeologists would initially monitor the route, after the drive, to see if there are noticeable impacts outside the trail/road prism. If impacts are found, the district would consider fencing or other suitable mitigation options to ensure that cattle stay on the trail, or use of the trail for cattle drives may be eliminated. The forest would share the results of its monitoring efforts with the Arizona SHPO and consult on suitable mitigation measures that might be needed. Adherence to these requirements should minimize the potential for adverse effects to archaeological sites crossed by the existing road.

Dirt Tank, Water Guzzler, and Little Mountain Pipeline Maintenance and Reconstruction

Future maintenance or replacement projects associated with existing dirt tanks and guzzlers and the Little Mountain Pipeline would be addressed in future clearance reports as the decision to implement these projects is made. Should they be necessary, the North Kaibab would develop appropriate mitigation measures for repairs or reconstruction of existing structures in consultation with the Arizona SHPO. Efforts would be made to minimize potential adverse effects to cultural resources sites by these projects.

Completion of all Section 106 requirements, including inventory and establishment of any necessary site avoidance or mitigation measures would be required prior to implementation of any of these projects.

Research Plot Enclosure/Exclosures

Research plots would be constructed in areas that have been completely inventoried for cultural resources sites and where adequate protection or avoidance measures would result in no adverse effects to cultural sites. Only locations that meet these criteria be selected for plot placement.

No mitigation measures are necessary. However, Completion of all Section 106 requirements would be required prior to installation.

Spring Restoration

The Proposed Action includes plans to complete up to 20 spring improvement projects to restore full or partial natural flow of spring water and riparian vegetation. Spring sites are often in close proximity to both historic and prehistoric cultural resource sites and are typically considered special places by many people. In particular, springs on the North Kaibab are held in special regard by local tribes. Tribal consultation with the Kaibab Paiute Tribe and Hopi Tribe addressing natural water sources has indicated that the tribes feel that restoration and protection of springs provides a beneficial effect and is in keeping with the traditional values held by the tribes.

Existing spring improvements would be removed where human and livestock improvements are no longer necessary. Fences would be built, removed, or modified to best protect the spring while still providing water to livestock and wildlife where necessary. Where feasible, pipelines, spring boxes or other infrastructure would be removed. Cultural resource sites potentially located at the springs could be directly impacted by restoration activities. Protection of the springs from cattle would provide a beneficial effect. However, ground disturbing activities or removal of significant historic components could create an adverse effect. An archaeologist must inspect each location on an individual basis as part of the restoration planning and design phase to identify any cultural issues or conflicts and assess suitable mitigation strategies to avoid adverse effects to cultural resources.

Spring restoration activities would be phased in as funding and resources are available. Each project would be assessed on an individual basis. If any eligible prehistoric or historic sites are found, the sites

would be completely documented and project activities would be designed to avoid adverse effects to the properties. The North Kaibab would consult with the Arizona SHPO regarding site eligibility and the suitability of proposed mitigation measures. Completion of all Section 106 requirements, including inventory and establishment of any necessary site avoidance or mitigation measures would be required prior to implementation of any of these projects (USDA 2007).

Alternative 2

The effects of the current management plan in regards to cultural resources were analyzed in the 2001 Kane Ranch AMP and in the cultural resources specialist report completed for the effort (District Heritage Files 2000). Implementation of approved infrastructure developments has not generated any new direct or indirect effects to cultural resource sites.

Monitoring of the allotments, however, has revealed cattle are more apt to congregate in smaller meadow systems within Central Summer pastures, such as Lookout Canyon and Dry Park. Meadow systems tend to have a high concentration of cultural resource sites. Consequently there is some potential that over time, sites in these areas may experience trampling effects in absence of a more comprehensive rotation system in the allotment.

The Central Winter allotment has not received as much use as the Central Summer allotment due to drought, fire and other factors. If fully stocked, this allotment would support up to 800 hundred cattle during the months of May and June. Monitoring in this allotment has not revealed obvious damage to sites from cattle following implementation of the 2001 AMP.

The Kane allotment includes a number of large canyon systems that contain rock shelter sites that are potentially susceptible to livestock generated impacts. However, use of the Kane allotment has been negligible under the current plan. Consequently, vulnerable rock shelter sites found in the canyon systems associated with the allotment have not been affected by cattle, and under the current operating plan it is highly unlikely that any impacts would occur in the future.

The removal of Forest Service authorized cattle in the Kanab Creek allotment has had an overall beneficial effect on sensitive sites in that allotment. Kanab Creek contains a large number of rock shelters with cultural features and rock art images that are particularly susceptible to livestock damage. The allotment has experience multiple incidents of trespass cattle from an Arizona Strip Bureau of Land Management allotment in recent years. However, the trespass incidences are not affiliated with Kane Ranch operations.

Existing Kane Ranch water sources and associated corrals were inventoried during the original 2001 Kane AMP. Mitigation requirements for infrastructure improvements developed at that time are still relevant today. These water sources are regularly monitored and protection measures can be employed if a change in condition is observed. Sites located within canyons associated with the Kane allotment would not be affected since cattle use of these locations is negligible under the current plan. Additional monitoring of meadow systems in Central Summer, where cattle are currently congregating, such as Lookout Canyon, would continue. Archaeologists would work with range conservationists to identify any potential disturbances that might occur following implementation. An adaptive management approach would be used. If impacts to cultural resource sites are identified, protection measures such as fencing or other suitable measures would be implemented.

Alternative 3

Cessation of livestock grazing on the North Kaibab District would eliminate the potential for direct or indirect effects to cultural sites. While measures are currently taken to protect cultural resource sites from livestock related impacts, previously unobserved impacts are occasionally discovered. The absence of cattle would eliminate that possibility.

No mitigation measures would be required under Alternative 3.

Cumulative Effects

Cultural resources are bound in time and space. The cumulative effects boundary for this analysis is the Kane Ranch allotment holdings boundary that would be actively utilized (Central Summer, Central Winter, and Kane Allotments). Temporal boundaries are for the life of the new AMP (10 years). In general, sites are protected from direct adverse effects by Forest Service actions through site avoidance or appropriate mitigation measures put in place by the agency. This limits cumulative damage and loss of sites over time. However, livestock can damage surface archaeological sites by trampling features and artifacts. This tends to occur in situations where livestock are concentrated, such as at a water source or in a corral. Livestock have also damaged sites found in rock shelters, where they are known to seek shade and protection from the elements. Cattle have crushed granaries and cliff structures, damaged rock art, and eroded or trampled features in these locations.

Sites can also suffer damaged from natural processes such as flood or wildfire events. Public land users can impact sites through vandalism and looting activities, as well as unintentional damages associated with recreational use of the forest such as dispersed camping or resource gathering activities. All of these actions and events can generate cumulative effects.

Cultural resource sites are non-renewable. Because they are bound in time, they are also limited in quantity. While each individual site possesses unique characteristics, when viewed together, these resources combine to provide a synthesis of human history, i.e., the sum is greater than its parts. Over time, the number of ancient sites decreases due to destructive processes, both natural and human caused. The cumulative impacts of human land use activities, including livestock grazing serve to accelerate this loss. When artifacts or features are damaged or destroyed within a site, less information can be retrieved from the site. Eventually a site can lose its physical and scientific integrity. As additional individual sites are lost, there is a cumulative adverse effect to the resource as a whole: the permanent loss of information that contributes to the understanding of the whole.

Cumulative effects to cultural resource sites over time can be lessened through attentive land management. All official undertakings on the North Kaibab District would continue to be inventoried for cultural resources. Sites at risk across this area would continue to be monitored. Appropriate management actions would be taken to avoid or mitigate adverse effects to sites. In regards to cattle grazing operations, archaeologists would work with range conservationists to identify any potential disturbances that might occur. An adaptive management approach would be used. If impacts to cultural resource sites are identified, protection measures such as fencing or other suitable measures would be implemented. These approaches would lessen adverse cumulative effects to sites generated by both managed and unmanaged events and activities.

Other Required Disclosures

NEPA at 40 CFR 1502.25(b) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with other environmental review laws and executive orders.”

- Fish and Wildlife Service, under the Endangered Species Act regulations, for projects with threatened or endangered species and habitat.
- State Historic Preservation Office under the National Historic Preservation Act of 1966 for evaluating the effects of ground-disturbing actions on heritage resources.
- The Forest Service does not need to consult with the National Marine Fisheries Service because there are no threatened or endangered marine mammals or anadromous fish species within the project area. The Forest Service does not need to consult the USFWS under the Fish and Wildlife Coordination Act because no water is proposed to be impounded or diverted.

See Chapter 1, “Applicable Laws and Regulations” for a list of other Federal laws and executive orders pertaining to this project-specific environmental analysis.

Environmental Justice

Executive Order No. 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” 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.

After considering the environmental, economic, and social impacts of this project, the Forest Service 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 northern Arizona region.

Authorizing cattle grazing would not prevent access into these allotments nor prevent minority or low-income individuals from collecting firewood or other special forest products within the area. Conversely, not authorizing cattle grazing would not alter this access. Alternative 3 (No Grazing) would negatively affect the permittee and family and providers of goods and services used for the ranching business. However, this would affect only a few individuals and would not disproportionately affect the greater population.

Unavoidable Adverse Effects

Implementing any alternative would result in some degree of environmental effects. The design features and mitigation measures (Chapter 2) are intended to lessen adverse effects. Adjusting the season of cattle grazing and cattle numbers are examples of mitigation measures incorporated into the design of the alternatives. However, mitigation cannot eliminate all negative effects and implementing any of the alternatives would still result in some unavoidable adverse effects.

Alternative 3 (No Grazing) would adversely affect the permittee’s ranching business, the permittee’s and Forest Service’s access to water claims, and direct jobs associated with the permit.

Alternatives 1 and 2 would result in the following adverse effects:

- Cattle grazing would temporarily reduce plant height and canopy cover of vegetation. This effect is short-term, as plants would resume growth once cattle move to different areas and/or following the grazing season;
- Cattle would trample microphytic soil crusts. These effects may be minimal because cattle are not typically attracted to areas associated with soil crusts (e.g., sandy soils with little available forage).

These adverse effects are considered to be short-term (less than one year) and would not result in impaired long-term productivity, as outlined in the next section.

The Forest Service has had ample experience implementing similar types of projects. Monitoring described for this project would add to our knowledge of possible effects and the level of these effects. Moreover, management of the allotments under any alternative does not set a precedent for adjacent allotments.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). Short-term use of the land includes the day-to-day and year-to-year activities that the permittee, Forest Service land managers, and visitors engage in on the Kane Ranch Allotments. This includes activities that remove resources from the land, such as cattle grazing or firewood gathering, as well as activities that do not, such as hiking and wildlife viewing. Short-term actions also include management activities such as vegetation management, structural improvements, and road maintenance. Long-term productivity refers to the land’s continuing ability to produce commodities, such as plant products, wildlife, or recreation opportunities, for future generations. This includes management practices and uses that do not impair soil productivity and water quality, provide habitat without altering the natural landscape to recover, or impair geologic features to the extent that they lose identity.

In summary, the action alternatives would result in the following short-term uses and effects to long-term productivity:

- Cattle grazing effects to upland plant height and cover is not expected to change the overall static to upward trend in rangeland condition;
- Unsatisfactory and impaired soil conditions are expected to remain static under all alternatives;
- The effects of grazing from this project would not change the habitat trend, or the population trends for wildlife species on the forest.

Although some environmental effects would occur as a result of implementing the action alternatives, the effects analysis provides evidence that these impacts are short-term in nature and would not result in adverse effects to long-term productivity.

Irreversible and Irrecoverable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irrecoverable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or road.

The interdisciplinary approach used to identify specific practices was designed to eliminate or lessen adverse consequences. The application of Forest Plan standards and guidelines, best management practices, project-specific mitigation measures, and monitoring are all intended to further limit the extent, severity, and duration of potential effects. The Kane Ranch Allotments, a renewable resource, are managed in such a way they would be available for future generations. There are no irreversible or irrecoverable commitments associated with this project.

Chapter 4: Monitoring

Monitoring would occur under all action alternatives during the permit term. Under Alternative 3 (No Grazing), condition and trend and wildlife utilization would continue to be monitored, if funding is available. Monitoring frequency varies by each activity and funding, and may be accomplished by either the permittee and/or Forest Service personnel, or third-party involvement in accordance with monitoring standards and protocols. Monitoring is adaptive, and as improved methods are developed these new methods would be considered.

Implementation Monitoring: Within key areas of these allotments, annual monitoring would be conducted, which may include, but is not limited to evaluating grazing intensity during the season, and utilization at the end of the growing season in order to practice adaptive management and make necessary management changes needed for plant development and plant recovery from the grazing event. Managing for plant development and recovery would provide for increased ground cover and potential changes in species composition. Example methods for implementation monitoring may include, but is not limited to, permit compliance, allotment inspections, range readiness, forage production, rangeland utilization, comparative yield, grazed plant count, paired plot clipping and weighing.

Effectiveness Monitoring: Long term condition and trend monitoring would be used to assess the effectiveness of management in achieving desired objectives. This monitoring may include, but is not limited to measurements to track upland vegetative conditions and soil condition towards achievement of the objectives. Example methods for effectiveness monitoring may include, but are not limited to, condition and trend, invasive species, soil and watershed conditions, dry weight rank, pace transects, pace quadrat frequency, ground cover, and repeat photography. Monitoring would occur on historic benchmarks, which correspond with key areas. Depending upon the method selected monitoring should occur at an interval of at least every 5-10 years in key areas.

Permit Compliance: Throughout each grazing season Forest Service personnel would monitor to determine accomplishments of the permit terms and conditions, the AMP, and the AOI.

Allotment Inspections: Allotment inspections are a written summary documenting compliance monitoring to provide an overall history of that year's grazing. This document may include weather history, the year's success, problems, improvement suggestions for the future, and a monitoring summary.

Range Readiness: Forest Service personnel and/or the grazing permittee would assess range readiness prior to cattle coming onto spring pastures to determine if vegetative conditions are ready for cattle grazing. The range is generally ready for grazing when cool season grasses are leafed out, forbs are in bloom, and brush and aspen are leafed out. These characteristics indicate the growing season has progressed far enough to replenish root reserves so that grazing would not seriously impact these forage plants.

Rangeland Utilization: Long-term condition and trend monitoring is the primary standard for monitoring of this grazing management system. Utilization is used as a tool to understand and achieve the goals of long-term management. Utilization guidelines are intended to indicate a level of use or desired stocking rates to be achieved over a period of years.

The definition of utilization and seasonal utilization is adapted from standard protocols established by the Society of Rangeland Management and the new guidelines established by Region 3 Regional Forester (Smith et al. 2005). The following definitions and procedures for utilization were taken and adapted to fit this project.

Utilization is 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 guidelines are intended to indicate a level of use or desired stocking rate to be achieved over a period of years.

Utilization measurements (ocular and/or actual measure) would be taken in key areas which would reflect grazing effects within the allotment. 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 set stocking levels and pasture rotations for future years.

Cattle would move when seasonal utilization in a pasture approaches a conservative level. For Alternative 1 uses a conservative seasonal utilization level of approximately 30-40 percent. Alternative 2 uses a conservative seasonal utilization level of approximately 20-30 percent. These values are approximate because it takes into account any additional growth that might occur later that year and considers season of use, wildlife use, weather conditions, availability of forage, and water in pastures. This utilization level leaves residual cover for wildlife and soils and provides for long term health of the grazed plants.

If monitoring shows utilization rates exceed the utilization guideline in a given year, the grazing schedule and/or permitted numbers would be adjusted the following year so utilization guidelines are not exceeded again. If utilization is exceeded after these adjustments are made, then the grazing management system would be changed to ensure this does not happen in the future.

Condition and Trend: Watershed and vegetative condition and trend monitoring would determine the effectiveness of the allotment management plan, and long-term range and watershed trends.

Parker Three-Step and paced transect monitoring points were established throughout the allotment in the 1953. Transect data from these monitoring points is the best historic records of range condition and trend available. The photo points and vegetative ground cover data show how the site has changed over time. Pace-frequency and ground cover transects were established on top of the Parker Three-Step transects in 2010-2012 to supplement this historic data.

Frequency and ground cover data were collected using the widely accepted plant frequency method (Ruyle 1997). These plots monitor trends in species abundance, composition, and ground cover. This would provide information on plant composition and additional information on plant community dynamics.

Precipitation: Precipitation is currently recorded at Fredonia and Jacob Lake. Precipitation data may be recorded within or near the allotment for more localized information. Precipitation data may be recorded throughout the year and summarized in the annual inspection. This data assists managers with forage utilization and production data collection.

Noxious Weeds: Noxious and invasive weeds located within the allotment would be treated as necessary. The grazing permittee and Forest Service would coordinate weed inventory and treatment activities with responsibilities identified through the AOI. The design features, best management practices, and mitigation measures in Appendix B of the Three Forest Integrated Treatment of Noxious or Invasive Weeds Environmental Impact Statement would be implemented (USDA 2005).

Soil and Watershed Condition: The current and proposed cattle grazing system incorporates best management practices (BMP) and grazing practices and constitutes compliance with Arizona State and Federal Water Quality Standards. Arizona Department of Water Quality (ADEQ) would continue to monitor water quality in the area.

Watershed condition can be assessed using information from the monitoring schemes above. Monitoring of plant abundance, ground cover, species diversity, and estimates of overall soil condition (using the methods described throughout this monitoring section) would indicate whether or not management practices are effectively meeting management goals. Trends toward improvements in species abundance and diversity should 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, would be considered when evaluating monitoring results. If plant cover, litter cover, and/or soil condition decline, changes would be made to the livestock numbers, grazing period, grazing time, or pasture rotation.

Monitoring would be conducted during and after the pipeline construction to insure little erosion and water channeling. If erosion or water channeling is discovered, more effective erosion control and drainage control/diversion structures would be installed.

Chapter 5: Consultation and Coordination

Preparers and Contributors

Forest Service Interdisciplinary Team of Resource Specialists and Consulting Members

- Angela Gatto, Wildlife Biologist, North Kaibab Ranger District
Contribution: Wildlife Specialist, Biological Evaluation and Wildlife Report
- Connie Reid, Archeologist, North Kaibab Ranger District
Contribution: Heritage Resources and Heritage Compliance Report
- David Vincelette, NEPA Specialist, North Kaibab Ranger District
Contribution: NEPA, IDT Guidance and NEPA Review of Draft EA, Final EA, and DN-FONSI
- Dustin Burger, Rangeland Management Specialist (former), North Kaibab Ranger District
Contribution: Rangeland Management Specialist, Botany, Noxious Weeds, Vegetation.
- Kit MacDonald, Soils Scientist, Kaibab NF
Contribution: Soils and Watershed, Climate, Air and Water Quality
- Mike Hannemann, Range and Watershed Staff Officer, Kaibab NF
Contribution: Rangeland Management Specialist, Botany, Noxious Weeds, Vegetation, Economics
- Wade Christy, Forester (Recreation), North Kaibab Ranger District
Contribution: Recreation and Scenery Resources

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes (See Heritage Resources section for results of tribal consultation) and non-Forest Service persons during development of this EA. The proposed action was mailed to this groups and individuals with expected interest in the project on July 10, 2012.

Local, State, and Federal Agencies

Arizona Department of Agriculture
Arizona Department of Environmental Quality
Arizona Department Office Transportation
Arizona Game and Fish Department
Arizona State Historic Preservation Office
Arizona State Government
Arizona State University, College of Law
Bureau of Land Management
Coconino County
Coconino County Board of Supervisors
Colorado City
City of Kanab

Five County Association of Governments
Garfield County Commission
Grand Canyon National Park
Kane County Commission
Kane County Resource Development
Mohave County Board of Supervisors
National Resource Conservation Service
Northern Arizona University, Tom Sisk
Rocky Mountain Research
Town of Fredonia
University of Arizona, Cooperative Extension
United States Fish and Wildlife Service

Organizations and Individuals

Aircell, LLC
Allen's Trail Rides
Alvy Johnson
Ben Ott
Bob Wallen
Brent Mackelprang
Bruce Bunting
C and F Properties, Brain Lamb
Candace Hughs
Canyon County Mill and Resources, Inc.
Canyoneers Inc.
Center for Biological Diversity
Cheryl Welckle
Chris Harbin
Cindy Mackelprang
Congressman Jim Matheson
Cooper Ridge Communications Site
David and Marcia Lamkin
David De Vooght
Dick Artley
Garkane Energy Cooperative
Grand Canyon Trust
Grand Canyon Wildlands Council
J. Earl Robinson
Jacob Lake Inn
Janet McIntyre
Jay Mackelprang
Jeffery Ingram
Jill Brown
Jim Koons
Jim Schreiner
John Kenson
K and D Forestry
Kaibab Lodge
Larry Reidhead and Sons
Maggie Sacher
Mark Habbeshaw
Matt Logan
Melissa Siders
Native Forest Network
North Rim County Store
Pacific Legal Foundation
Richard Jessop
Rick Erman
Roger Hovermann
Ron Kowalewsky
Schoppmann Land and Cattle Company
Scott Lerich
Senator Mike Lee
Senator Orrin Hatch
Sierra Club Grand Canyon Chapter
Sierra Club Plateau Chapter
Signature Rock Ranch, John P. Rich
Skyline Forest Resources, Inc
South Central Utah Telephone Association
Susan Erickson
Territorial Livestock, David Johnson
Verizon Wireless
Vermillion Services and Utah Forest Products
Wally and Sue Thomson
Western Watersheds
Wild Earth Guardians
Wild Watershed

Tribes

Havasupai Tribe

Hopi Tribe

Hualapai Tribe

Kaibab Band of Paiute

Navajo Nation

Pueblo of Zuni

Yavapai-Prescott Indian Tribe

Tribal Consultation Summary

The NHPA and the American Indian Religious Freedom Act (AIRFA), along with various other laws and regulations, require that agencies consult with culturally affiliated tribes to determine the effects of agency decisions and activities on sites and areas culturally significant to the tribes. The NKRDR typically consults with the Kaibab Band of the Southern Paiute Indians, the Hopi Tribe, the Navajo Nation, and the Zuni Tribe to identify and address issues and concerns.

The Kane Ranch Allotment Management Plan (AMP) environmental analysis (EA) was added to the Kaibab National Forest (KNF) Schedule of Proposed Actions (SOPA) during the First Quarter of Fiscal Year 2012. No specific concerns, questions, or comments about the project were received by the Forest. On November 9, 2011, the KNF initiated government-to-government consultation by sending a consultation letter and an updated copy of the SOPA to the Havasupai Tribe, the Hopi Tribe, the Hualapai Tribe, the Kaibab Band of Paiute Indians, the Navajo Nation, the Yavapai-Prescott Indian Tribe and the Pueblo of Zuni. On November 9, 2011, the Forest initiated public scoping of tribal communities by sending a copy of the SOPA to the Bodaway/Gap, Cameron, Coalmine, Coppermine, Lechee, Leupp and To’Nanees’Dizi Chapters of the Western Navajo Agency. The KNF has continued to send copies of the SOPA to these Tribes and Navajo Chapters on a quarterly basis.

The NKRDR District Ranger and tribal liaison met with the Kaibab Paiute Tribe on September 6, 2012 and March 6, 2012, to review district projects including the Kane Ranch EA. No concerns or issues were raised. Additionally, the KNF Forest Supervisor provided a briefing on the project during a regularly scheduled government-to-government consultation meeting with the Hopi Tribe on September 19, 2012. The Hopi Tribe defers to the Kaibab Band of Paiute Indians on this project. Regular updates have taken place over the course of the last year through quarterly correspondence, and the regularly scheduled consultation meetings which have taken place since September 2012.

Glossary

A

Adaptive Management: 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 cattle 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 plan cooperatively developed by the range permittee and Forest Service that lists management practices, cattle numbers, improvement needs, salting practices, and administrative policies.

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 Month (AUM): A calculation to get the amount of feed or forage required by an animal unit for 1 month. Not synonymous with head month.

B

Best Management Practices (BMP): 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: Twigs, leaves, and young shoots of trees and shrubs on which animals feed. The shrubs used by big game animals for food.

Bureau of Land Management (BLM): A federal agency associated with management and administration of federal or public lands under the Department of Interior's jurisdiction.

C

Carrying Capacity: The average number of cattle 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, on slopes under 40%, and vegetative ground cover is maintaining site productivity and producing a minimum of 100 pounds of forage per acre.

Potential Capacity - Lands not undergoing accelerated erosion but requiring access, water developments, or other improvements to bring them up to full capacity.

No Capacity - Lands that are incapable of being grazed by domestic cattle under reasonable management goals. Examples include areas where slopes are over 40 percent, where forage production is less than 100 pounds per acre, and in the wetlands. These no capacity areas mainly occur on the sides of the canyons and in dense juniper stands. Cattle do not usually graze the sides of canyons or dense juniper stands due to the slope and lack of vegetation. Wetland bottoms are grazed by cattle but this use is not included in capacity.

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 or boards and is used to hold, load, or unload cattle.

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 (DN): A decision document prepared for an environmental assessment that explains the rationale for the decision.

Direct Effects: The effects caused by the action and occur at the same time and place (40 CFR § 1508.8).

E

Ecosystem Management: The use of an ecological approach that blends social, physical, economic, and biological needs and values to assure productive, healthy ecosystems.

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.

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 cattle and wildlife for food. Only a portion of a plant is available for forage if the plant is to remain healthy.

Forage Production: The weight of forage produced within a designated period of time on a given area.

G

Geographic Area (GA): As defined in the "Kaibab National Forest Land Management Plan" (a.k.a. "Forest Plan"). GA's are a landscape that is a contiguous portion of one Geographic Area, or GA. GAs are similar to the larger Management Areas in the original (1988) Plan except for some minor boundary changes and logical combinations made as more complete information about physical resources has been acquired. There are also special areas or small areas now referred to as Land Use Zones (LUZs). LUZs consist of areas such as wilderness areas or designated campsites, which have special management designations. GA's are defined at the landscape level based on the predominate species of vegetation from a geographical

standpoint, or the type of designated use for the area. The entire forest is divided into GAs where common standards and guidelines apply.

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. Nonforest land is classified as grassland when herbaceous vegetation provides at least 80 percent of the canopy cover excluding trees.

H

Head Month (HM): One month's use and occupancy of range by one weaned or adult animal cow, bull, steer, heifer, horse, burro, mule or five cattle or goats.

Herdling: A strategy for managing cattle 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 under water.

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.

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 range selected because of its location, use or grazing value as a monitoring point for grazing use. It is assumed that key areas, if properly selected, will reflect the overall acceptability of current grazing management over the range.

M

Management Indicator Species (MIS): Any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (FSM 2605).

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.

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 uppermost canopy layer.

P

Permittee: An individual who has been granted a Federal permit to graze cattle 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 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: An area operated under one plan of management designated for the use of a prescribed number of cattle owned by one or more permittees.

Rangeland (Range): Land that supports vegetation useful for grazing; vegetation is routinely managed through manipulation of grazing rather than cultural practices.

Raptor: Any predatory bird such as a falcon, hawk, eagle, or owl.

Revegetation: Re-establishing and developing plant cover. This may take place naturally through the reproductive processes of existing flora or artificially by planting.

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.

Section 7 Consultation: A formal process for consultation on the potential effects on threatened, endangered, or proposed species that occurs between the agency proposing an action (U.S. Forest Service) and the regulating agency (U.S. Fish and Wildlife Service).

Sediment: Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth's surface either above or below sea level.

Sensitive Species: Plant and animal species identified by a regional forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capacity 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. Most commonly used when referring to forested areas.

Stock Tank: An earthen tank for providing water for cattle and wildlife.

Structural Improvement (Range and Wildlife): Any type of range or wildlife improvement that is human-made such as fences, water developments, or corrals.

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

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.

Endangered Species - Any species that is in danger of extinction throughout all or a significant portion of its range.

Proposed Species - Any species of fish, wildlife, or plant that is proposed in the Federal Register to be listed under Section 4 of the Endangered Species Act (50 CFR 402.02).

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: Expresses the direction of change (if any) in condition, in response to past and existing cattle management practices, or land use activities combined with other environmental factors.

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 Guidelines: Utilization is 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 guidelines are intended to indicate a level of use or desired stocking rate to be achieved over a period of years.

V

Viable Populations: A wildlife or fish population of sufficient size to maintain its existence over time in spite of normal fluctuations in population levels.

W

Waterlot: A range improvement usually constructed of fencing materials that enclose a watering structure that is used to hold cattle or to close the water off to cattle.

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.

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.

References

- Abella, S.R. 2004. Tree thinning and prescribed burning effects on ground flora in Arizona ponderosa pine forests: A review. *Journal of the Arizona-Nevada Academy Of Science* 36(2):68-76.
- Archer, S. and F.E. Smeins. 1991. Ecosystem-Level Processes. P. 109-134. In: *Grazing Management: An Ecological Perspective*. R.K. Heitschmidt and J.W. Stuth (eds.), Timber Press, Portland, OR.
- Arnold, J.F. 1950. Changes in Ponderosa Pine Bunchgrass Ranges in Northern Arizona Resulting from Pine Regeneration and Grazing. *J. For.* 118-126.
- Arnold, J.F. 1955. Plant Life-Form Classification and Its Use in Evaluating Range Conditions and Trend. *Journal of Range Management*, Vol. 8, No. 4 (July 1955), pp. 176-181.
- Arizona Department of Environmental Quality. 2003. Regional Haze State Implementation Plan for the State of Arizona; Air Quality Division; December 23, 2003; <http://www.azdeq.gov/environ/air/haze/download/2sip.pdf>.
- Arizona Department of Environmental Quality. 2004. Air Quality Annual Report (A.R.S. §49-424.10).
- Arizona Department of Environmental Quality. 2008. Intergovernmental agreement between the State of Arizona and US Department of Agriculture, Forest Service Southwestern Region. February 15, 2008.
- Arizona Game and Fish Department. 2013. Arizona Game and Fish Department, 2013-14 Arizona Hunting Regulations.
- Arizona Department of Transportation. 2013. Kaibab Plateau – North Rim Parkway Scenic Byway Corridor Management Plan; finalized on July 22, 2013
- Backlund, P., D. Schimel, A. Janetos, J. Hatfield, M. Ryan, S. Archer, and D. Lettenmaier. 2008. Introduction. In: *The effects of climate change on agriculture, land resources, water resources, and biodiversity. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research*. Washington, DC., USA, 362 pp.
- Beymer, Renee J., Jeffrey M. Klopatek. 1992. Effects of Grazing on Cryptogamic Crusts in Pinyon-Juniper Woodlands in Grand Canyon National Park. *American Midland Naturalist*, Vol. 127, No. 1, 139-148.
- Bureau of Land Management. 1980. Habitat management guides for the American pronghorn antelope. U.S. Dept. of Interior, Tech. Note 347, Filing Code 6611, Denver, Colorado. 18pp.
- Bock, C. E. Bock, J. H. Bock, W. R. Kenney and V. M. Hawthorne. 1984. Responses of Birds, Rodents, and Vegetation to Livestock Exlosure in a Semi-desert Grassland Site. *Journal of Range Management* 37(3):239-242
- Bock, C.E. and J.H.Bock. 1993. Cover of perennial grasses in southeastern Arizona in relation to livestock grazing. *Conservation Biology*. Volume 7, No. 2 pp 371 to 377.

- Bowden, T., M. Taper, and D. W. Willey. 2008. Home range and habitat ecology of Mexican spotted owls in Grand Canyon National Park. Final Report to National Park Service, Grand Canyon National Park. Cooperative Park Service Agreement No.: CA-1200-99-007.
- Bredy et al. 1989, in Bock, C.E., H.M.Smith, and J.H.Bock. 1990. The Effect of Livestock Grazing Upon Abundance of the Lizard, *Sceloporus scalaris*, in Southeastern Arizona. *Journal of Herpetology*, v. 24, (4) p. 445-446.
- Brewer, David G., Rodney K. Jorgensen, Lewis P. Munk, Wayne A. Robbie, and Janet L. Travis. 1991. Terrestrial Ecosystem Survey of the Kaibab National Forest, Coconino County and Part of Yavapai County. USDA Forest Service. 319 pp.
- Breshears, R.G, N.S. Cobb, P.M. Rich, K.P. Price, C.D. Allen, R.G. Balice, W.H. Romme, J. H. Kastens, M.L. Floyd, J. Belnap, J.J. Anderson, O.B. Myers, and C.W. Meyer. 2005. Regional vegetation die-off in response to global-change-type drought. *PNAS*, Vol. 102, no. 42. 15144-48.
- Buffington and Herbel, 1965, in Bock, C.E., H.M.Smith, and J.H.Bock. 1990. The Effect of Livestock Grazing Upon Abundance of the Lizard, *Sceloporus scalaris*, in Southeastern Arizona. *Journal of Herpetology*, v. 24, (4), p. 445-446.
- CARB, 2007. California Air Resources Board; <http://www.arb.ca.gov/cc/cc.htm>
- Chew 1982, in Bock, C.E., H.M.Smith, and J.H.Bock. 1990. The Effect of Livestock Grazing Upon Abundance of the Lizard, *Sceloporus scalaris*, in Southeastern Arizona. *Journal of Herpetology*, v. 24, (4), p. 445-446.
- Cooper, C.F. 1960. Changes in vegetation, structure and growth of southwestern pine forest since white settlement. *Ecological Monographs*. Vol. 30, No. 2, pp. 129-164.
- Conley, Janet, Hallie Eakin, Thomas E. Sheridan, and Diana Hadley. 1999. CLIMAS Ranching Case Study: Year 1. CLIMAS Report Series CL3-99. Institute for the Study of Planet Earth. The University of Arizona, Tucson, AZ. 29 pp.
- Covington, W.W. 1993. Sustainable ecological systems: implementing an ecological approach to land management. USDA. Forest Service. Rocky Mtn. Exp. Station. Gen Tech. Report. RM-247.
- Covington, Wally and Margaret Moore and. 1994. South western ponderosa pine forest. *Journal of Forestry*. Vol. 92, Number 1, pp. 39-47.
- Crimmins, Michael A., George Zaines, Niina Haas, Christopher K. Jones, Gregg Garfin, and Theresa M. Crimmins. 2007. Changes on the Range: Exploring Climate Change with Range Managers. *Journal of Natural Resources and Life Sciences Education*. Vol. 36. 2007.
- Diamond J.M., C.A. Call, and N. Devoe (2009) Effects of targeted cattle grazing on fire behavior of cheatgrass-dominated rangeland in the northern Great Basin, USA. *International*
- Environmental Protection Agency. 2010. <http://www.epa.gov/climatechange/>
- Farish, T.E. 1889. Northern Arizona, its forest, arable, and grazing lands. Phoenix, Ariz. Gazette Printers.

- Fleischner, T. L. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8:629-644.
- Furniss, Michael J., Sherry Hazelhurst, Caty F. Clifton, Ken B. Roby, Bonnie L. Ilhardt, Elizabeth B. Larry, Albert H. Todd, Leslie M. Reid, Sarah J. Hines, Charlie H. Luce, Pamela J. Edwards. 2010. *Water, Climate Change, and Forests. Watershed Stewardship for a Changing Climate. PNW-GTR-812. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 75 p.*
- Graham, R.T.; Harvey, A.E.; Jurgensen, M.F.; Jain, T.B.; Tonn, J.R; Page-Dumroese, D.S. 1994. Managing coarse woody debris in forests of the Rocky Mountains. Res. Pap. Int-477. Ogden, UT. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 13 p.
- Guido, Zack. (2008). Southwest Climate Change Network.
<http://www.southwestclimatechange.org/impacts/land/fire>
- Gundale, M.J., T.H. DeLuca, C.E. Fiedler, P.W. Ramsey, M.G. Harrington, J.E. Gannon. 2005. Restoration treatments in a Montana ponderosa pine forest: Effects on soil physical, chemical and biological properties. *Forest Ecology and Management* 213:25–38.
- Heinlein, T. A. 1996. Fire regimes and forest structure in lower mixed conifer forests: San Francisco Peaks, Arizona. M. S. Thesis. Northern Arizona Univ., Flagstaff, AZ. 99 p.
- Holechek, J. 1988. An approach for setting the stocking rate. *Rangelands* 10: 10-14.
- Hughs, L.C. 1893. Report of Governor of Arizona to Secretary of Interior. In: Ann. Report Dept. Interior, Misc. Reports, 1893.
- Ice, George. 2004. History of Innovative Best Management Practice Development and its Role in Addressing Water Quality Limited Waterbodies. *Journal of Environmental Engineering*, Volume: 2, Issue: 6, Pages: 684-689.
- Johansen, Jeffrey R. 1993. Cryptogamic Crusts of Semiarid and Arid Lands of North America. *Journal of Phycology* 29, 140-147.
- Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* S. Solomon, D. Quin, M. Manning et al. Cambridge, United Kingdom, Cambridge University Press: 996.
- Jones, A.L. and W.S. Longland. 1999. Effects of Cattle Grazing on Salt Desert Rodent Communities. *The American Midland Naturalist*, v. 141, p. 1-11.
- Latta, M. J., C. J. Beardmore, and T. E. Corman. 1999. Arizona Partners in Flight Bird Conservation Plan, Version 1.0. Nongame and Endangered Wildlife Program Technical Report 142. Arizona Game and Fish Department, Phoenix, AZ. 331 pp.
- Laughlin, D.C. and M.M. Moore. 2009. Climate-induced temporal variation in the productivity-diversity relationship. *Oikos* 118:897-902.

- Laughlin, D.C., M.M. Moore, J.D. Bakker, C.A. Casey, J.D. Springer, P.Z. Fule', and W.W. Covington. 2006. Assessing Targets for the Restoration of Herbaceous Vegetation in Ponderosa Pine Forests. *Restoration Ecology*: 548–560.
- Laughlin, D.C., J.D. Bakker, and P.Z. Fule. 2005. Understory plant community structure in lower montane and subalpine forests, Grand Canyon National Park, USA. *Journal of Biogeography* 32:2083–2102.
- Lavigne et al. 1972, in Milchunas, D.G., W.K. Lauenroth, and I.C. Burke. 1998. Livestock grazing: animal and plant biodiversity of shortgrass steppe and the relationship to ecosystem function. *OIKOS* 83: 65-74.
- Lee, R. M., J. D. Yoakum, B.W. O'Gara, T. M. Pojar and R. A. Ockenfels, eds. 1998. Pronghorn Management Guidelines. 18th Pronghorn Antelope Workshop, Prescott, Arizona.
- Loeser, M.R., T.D. Sisk and T.E. Crews. 2006. Impacts of grazing intensity during drought in an Arizona Grassland. *Conservation Biology*, Vol. 21, No. 1, pp. 87-97.
- Loeser, Matt R., T. D. Sisk, and T. E. Crews. 2004. Defoliation increased above-ground productivity in a semi-arid grassland. *Journal of Range Management*, 57(5):442-447.
- Loeser, M.R., T.D. Sisk, and T.E. Crews. 2001. Plant community response to livestock grazing: as assessment of alternative management practices in an semi-arid grassland. In: Vance, R.K., C.B. Edminster, B. Carleton, W.W. Covington, and J.A. Blake (comps). 2001. Ponderosa pine ecosystems restoration and conservation: steps toward stewardship; 2000 April 25-27; Flagstaff, AZ. Proceedings RMRS-P-22. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 80-87.
- Martin, S.C. and D.R. Cable. 1974. Managing semidesert grass-shrub ranges: vegetation responses to precipitation, grazing, soil texture, and mesquite control. U.S. Department of Agriculture Technical Bulletin No. 1480: 45 pp.
- Milchunas, D.G., W.K. Lauenroth, I.C. Burke. 1998. Livestock grazing: animal and plant biodiversity of shortgrass-steppe and the relationship to ecosystem function. *Oikos* 83: 65-74
- Milchunas, D. G. 2006. Responses of plant communities to grazing in the southwestern United States. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-169.
- Mitchell, J.E., G.N. Wallace and M.D. Wells. 1996. Visitor Perceptions about Cattle Grazing on National Forest Land. *Journal of Range Management*, Vol. 49, No. 1 (Jan., 1996), pp. 81-86.
- Moore, M.M., D.W. Huffman, J.D. Bakker, A.J. Sánchez Meador, D.M. Bell, P.Z. Fulé, P.F. Parysow, W.W. Covington. 2004. Quantifying forest reference conditions for ecological restoration: The Woolsey plots. Final report to the Ecological Restoration Institute for the Southwest fire initiative.
- Moore, M.M., C.A. Casey, J.D. Bakker, J.D. Springer, P.Z. Fule', W.W. Covington, and D.C. Laughlin. 2006. Herbaceous vegetation responses (1992–2004) to restoration treatments in a ponderosa pine forest. *Rangeland Ecol Manage* 59:135–144.

- Nader, G., Z. Henkin, E. Smith, R Ingram, and N. Narvaez. 2007. Planned Herbivory in the Management of Wildfire Fuels. *Rangelands* October 2007 18-24.
- Neff, D. J. Sept. 1986. Pronghorn Habitat Description and Evaluation. Federal Aid in Wildlife Restoration Project W-78-R. 17 pp.
- NOAA. 2011. U.S. Drought Monitor and El Nino/La Nina Forecasts. <http://drought.unl.edu/dm/monitor.html>
- Ockenfels, R. A., C. L. Ticer, A. Alexander, J. A. Wennerlund, P.A. Hurley, and J. L. Bright. 1996. Statewide evaluation of pronghorn habitat in Arizona. Arizona Game and Fish Dept. Fe. Aid Wildl. Restor. Proj. W-78-R Final Rep., Phoenix. 296 pp.
- O'Farrell, M. J. 1995. Distribution of the Houserock Valley Chisel-toothed Kangaroo Rat (*Dipodomys microps leucotis*) Goldman. pp. 1-22.
- O'Gara, B. W., M. E. McNay and W.A. Bodie. 1986. Effects of Fawn Activity and Bedding Cover on Susceptibility to Predation in Proceedings of the 12th Pronghorn Antelope Workshop, Reno, Nevada. March 11-13, 1986.
- Painter, M. 2009. Interpretation of the intent of the Grand Canyon Game Preserve, as supported by historical evidence. Kaibab National Forest
- Pearson, G.A. 1910. Reproduction of western yellow pine in the Southwest. U.S. Dept. Agr. Forest Service. Circ. 174.
- Pearson, H.A. and D.A. Jameson. 1967. The Wild Bill Range: The relationship between timber and cattle production on ponderosa pine range. Rocky Mtn. Forest and Range Experiment Station. Forest Service. USDA.
- Potyondy, John P. and Theodore W. Geier. 2011. Watershed Condition Classification Technical Guide. United States Department of Agriculture, Forest Service Technical Guide FS-978. 41 pp.
- Pfost, Donald L. and Charles D. Fulhage. 2001. Water Quality for Livestock Drinking. University of Missouri Extension Publication EQ381. 7 pp.
- Rosemtreter, Roger. 1986. Compositional patterns within a rabbitbrush community of the Idaho Snake River Plain. Proceedings – Symposium on the Biology of *Artemisia* and *Chrysothamnus*, July 1984.
- Ruyle, George (ed.). 1997. Some Methods for Monitoring Rangelands and Other Natural Area Vegetation. University of Arizona, College of Agriculture, Cooperative Extension Report 9043.
- Saab, V. A., C. E. Bock, T. D. Rich, and D. S. Dobkin. 1995. Livestock grazing effects in western North America. Pages 311-353 in T. E. Martin and D. M. Finch, editors, *Ecology and Management of Neotropical Migratory Birds: A Synthesis and Review of Critical Issues*. Oxford University Press, New York.
- Seager, R. et al. 2007. Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America. *Science* 316: 1181.

- Seager, R., R. Burgman, et al. 2008. "Tropical Pacific Forcing of North American Medieval Megadroughts: Testing the Concept with an Atmosphere Model Forced by Coral-Reconstructed SSTs." *Journal of Climate* 21: 6175-6190.
- Savage, M. 1991. Structural dynamics of a southwestern pine forest under chronic human disturbance. *Ann. Assoc. Am. Geog.* 81:271-289.
- Savage, M., and T. W. Swetnam. 1990. Early 19th century fire decline following sheep pasturing in a Navajo ponderosa pine forest. *Ecology* 71:2374-2378.
- Scott, J. and Burgan, R. (2005). Standard fire behavior fuel models : a comprehensive set for use with Rothermel's surface fire spread model. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-153, 72 pp.
- Seyedbagheri, K.A. 1996. Idaho forestry best management practices: Compilation of research on their effectiveness. Gen. Tech. Rep. INT-339. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 89 p.
- Smith, Lamar et al. 2005. Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands. University of Arizona. College of Agriculture and Life Sciences. Tucson, AZ. Cooperative Extension Report 1375.
- Smith, Troy. 2011. Improving Pond or Stock Dam Water Quality. *ANGUS Journal*. January 2011. p. 122.
- Society of Rangeland Management (SRM) 1998. A Glossary of Terms Used in Range Management. Fourth Edition. Thomas E. Bedell, Chairman.
- Stein, S.J. 1988. Explanation of the imbalanced age structure and scattered distribution of ponderosa pine within a high-elevation mixed conifer forest. *Forest. Ecol. Manage.* 25:139-153.
- USDA Forest Service. 1988. Kaibab National Forest Land Management Plan, and all subsequent amendments.
- USDA Forest Service. 1991. Terrestrial Ecosystem Survey of the Kaibab National Forest: Coconino County and Part of Yavapai County, Arizona; May 1991.
- USDA Forest Service. 1997. Region 3 Rangeland Analysis and Management Training Guide. USDA Forest Service, Southwestern Region, Albuquerque, NM.
- USDA Forest Service. 2001 and 2005. National Visitor Use Monitoring Results, Kaibab National Forest. Report. USDA Forest Service, Southern Research Station.
- USDA Forest Service. 2005. Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds: Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona; MB-R3-16-1; January.
- U.S. Forest Service. 2005b. Forest Service Manual sections 2202.1, 2203.1, 2230.5. Unpublished, available in the project record. Last updated September 9, 2005.
- USDA Forest Service. 2006. Livestock Stocking Strategy During and After Drought: Coconino, Prescott, and Kaibab National Forests. February, 2006.

- USDA Forest Service. 2007. Forest Service Handbook, FSH 2209.13 – Grazing Permit Administration Handbook, Chapter 90 – Rangeland Management Decisionmaking. Supplement No.: R3-2209.13-2007-1; Effective Date: September 8, 2007. USDA Forest Service, Southwestern Region, Albuquerque, NM.
- USDA Forest Service. 2010. Management Indicator Species of the Kaibab National Forest: An Evaluation of Population and Habitat Trends. Version 3.0. Kaibab National Forest, North Kaibab, Arizona. Available at: http://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5114494.pdf
- USDA Forest Service, 2010. Southwestern Region Climate Change Trends and Forest Planning 2010, Southwestern Region, Albuquerque, NM.
- USDA Forest Service, 2012. Effects of Climate Variability and Change on Forest Ecosystems: A Comprehensive Science Synthesis for the US Forest Sector. Pacific Northwest Research Station.
- USDA Natural Resources Conservation Service. 1997. Introduction to Microbiotic Crusts. Soil Quality Institute; Grazing Lands Technology Institute.
- U.S. Fish and Wildlife Service. 2013. FWS-R2-ES-2013-0025; Revisions to Proposed Critical Habitat for Acuna Cactus and Frikeisen Plains Cactus under the Endangered Species Act and Reopening of Comment Period. (letter correspondence dated July 9, 2013).
- U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <http://www.fws.gov/migratorybirds/>]
- USDI, Fish and Wildlife Service. 2009. Threatened and Endangered Species List for Coconino County; <http://www.fws.gov/southwest/es/arizona/>
- USDI Fish and Wildlife Service. 2012. A Review of the Third Five Years of the California Condor Reintroduction Program in the Southwest (2007-2011). Pacific Southwest Office (Region 8), Sacramento, California.
- Van Dyne, G. M., and H. F. Heady. 1965. Botanical composition of sheep and cattle diets on a mature annual range. *Hilgardia* 36:465-492.
- White, A.S. 1985. Presettlement regeneration patterns in a southwestern ponderosa pine stand. *Ecology* 66:589-594.
- USDA Forest Service. 2003. First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities Among New Mexico Historic Preservation Officer, and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer, and Oklahoma State Historic Preservation Officer, and the Advisory Council on Historic Preservation, and United States Department of Agriculture Forest Service Region 3.
- USDA Forest Service. 2007. Appendix H, Standard Consultation Protocol Rangeland Management, pp. 61-67. In, First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities Among New Mexico Historic Preservation Officer, and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer, and Oklahoma State Historic Preservation Officer, and the Advisory Council on Historic Preservation, and United States Department of Agriculture Forest Service Region 3.

Whisenant, S.G. 1990. Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications. In: McArthur, E.D., E.M. Romney, S.D. Smith, and P.T. Tueller, eds. Proceedings—Symposium on Cheatgrass Invasion, Shrub Die-off, and Other Aspects of Shrub Biology and Management. General Technical Report INT-276. USDA Forest Service, Intermountain Research Station, Ogden, UT. Pages 4-10.

Appendix A-1

Consideration of Public Comments

Summary of Responses to Public Comments on the Preliminary Environmental Assessment for the Kane Ranch Allotment Management Plan (Public Comments Received/Postmarked by July 10, 2013)

As of July 10, 2013, seven (7) respondents to the Preliminary Environmental Assessment (EA) for the Kane Ranch Allotment Management Plan had been received. The public comment period for the Preliminary EA ran from June 10, 2013 through July 10, 2013.

Notifications or mailings were made by the Forest Service through: **(1)** a publication notice in the Flagstaff Arizona Daily Sun (public legal notice released on Sunday, June 9, 2013), **(2)** standard mail (approximately 118 letters sent out that were dated June 13, 2013), and **(3)** information posted to the USDA Forest Service Kaibab National Forest world-wide-webpage (<http://www.fs.usda.gov/projects/kaibab/landmanagement/projects>), which contained the scoping and analysis documents (i.e., the Preliminary EA and copies of the other information as aforementioned). Each entity that commented and their associated organization (if any) are listed in Table A-1 presented below. Within the pages of text following the table, each of the seven (7) comment letters are broken down by specific comment, followed by the Forest Service's response to that specific comment. Some responses or consideration of the comments have been subdivided to indicate comments of a more specific nature or to address bulleted items within a comment received. With regard to statements in general, and articles or quotes from other sources which may have accompanied an original comment, if attachments had no bearing on the content or scope of this EA, or were considered to be a matter of opinion, then the Forest Service is not obligated to respond to such statements. The break-down of the letters/comments as indicated in Table A-1 (below) are also listed in the right margin of pages 181-201 of Appendix A-2, "Public Comments Received."

TABLE A-1 - SUMMARY OF COMMENTS RECEIVED ON THE PRELIMINARY EA FOR KANE RANCH ALLOTMENT MANAGEMENT PLAN

Date Received	Assigned Letter No.	Number of Comments	Name(s) / (EA Acronym)	Organization / Address	City	State
06-29-2013	1	4	John A. Schoppmann, and Valerie J. Schoppmann (J&V Schoppmann)	Self – Public Person(s) P.O. Box 598 (letter also via fax)	Page	AZ
07-06-2013	2	2	Mark Overas (M. Overas)	Self – Public Person 95 North 100 East / P.O. Box 811	Fredonia	AZ
07-08-2013	3	6	Craig McMullen / Regional Supervisor (AZG&FD)	Arizona Game and Fish Dept. Flagstaff Regional Office Region II, 3500 S.Lake Mary Rd.	Flagstaff	AZ
07-10-2013	4	6	T.Whitham, Regent's Prof. of Biology / Exec. Director; A. Whipple, Asst. Research Prof. of Biology / Research Station Director, NAU; & Kristin Haskins, Arboretum at Flagstaff Research Scientist (SEGA)	Merriam-Powell Center for Environmental Research (MPCER) Northern Arizona University (NAU) & The Southwest Experimental Garden Array (SEGA)	Flagstaff	AZ
07-10-2013	5	25	Sandra Bahr Chapter Director (Sierra Club GCC)	Sierra Club – Grand Canyon Chapter, 202 E. McDowell Rd. Suite 277	Phoenix	AZ
07-10-2013	6	5	Matt Williamson Kane-Two Mile Ranch Program Director (GC Trust)	Grand Canyon Trust 2601 N. Fort Valley Rd.	Flagstaff	AZ
07-10-2013	7	15	Rick Erman (FOAM)	Friends of Anderson Mesa 3435 E. Windrose Drive	Phoenix	AZ

Comment Coding: LX-CY [coded as Letter X (where “X” is the Letter Number) & Comment Y (where “Y” is the Comment Number within the letter); for instance L1-C5 would be Letter 1, Comment 5, or the fifth comment within letter number one.]

Below, each specific comment is listed by comment code, followed by the response showing consideration or applicability of the specific comment, as it relates to the Environmental Assessment. [Note: Some commenters submitted reference materials along with their specific comments, in these instances the references were printed out and included or incorporated into the project record as reference material, not as specific comments to the EA.]

Comments from John A. and Valerie J. Schoppmann (J&V Schoppmann) - Letter Number 1

L1-C1 Comment: (J&V Schoppmann)

The required notice and opportunity for public comment regarding the preliminary draft environmental assessment (EA) is deficient under 36 CFR 215.5. No reasonable person interested in the proposed action would be apprised of the possibility that the final result could result in no grazing. The notice required under NEPA does not require that all alternatives be described in legal notices, but when the stated purpose is "... for the re-authorization of cattle grazing... in a manner that is consistent with the...Forest Plan..." and one of the alternatives is for 'no grazing' (Alternative 3), the notice is deceptive. Hence, several interested persons, who might have known that no grazing was an option, have been left out of the process.

Response / Consideration of Comment:

The main purpose of the legal notice is to notify the public and other agencies of the availability of the Environmental Assessment (EA) for public review and comment. The actual purpose statement in the June 9, 2013 legal notice is as such: “*The purpose of this project is to re-authorize cattle grazing on the Kane Ranch Allotments in a manner that is consistent with the goals, objectives, standards and guidelines of the Forest Plan (1988), as amended, as well as provide logical, flexible, and adaptive grazing rotations.*” The required notice and opportunity for public comment regarding the preliminary/draft EA is “not” deficient. The notice and opportunity to comment was issued per regulations, rules, and procedures as directed under the Forest Service Handbook (FSH) 1509.12 - 36 CFR 215 Appeals handbook, Chapter 10 - NOTICE, COMMENT, AND DECISION. Specifically, chapter 11.4 - Legal Notice Requirements, in accordance with 36 CFR 215.5(b)(1), as follows:

- 1) The responsible official is responsible for publishing a legal notice in the newspaper of record (i.e., the Arizona Daily Sun, located in Flagstaff, AZ), informing the public of the opportunity to comment on a proposed action. The publication date in the newspaper of record determines the start of the 30-day comment period. A copy of the newspaper legal notice showing the date published must be kept in the project record.

The Forest Service has complied with the policy and coordination requirements as dictated by NEPA regulations. The notice and comment period required for proposed actions provides a clearly defined period when public comments on projects and activities, analyzed and documented in an environmental assessment (EA) are solicited. This comment period provides the opportunity to make substantive comments regarding concerns and objections known to the responsible official during a time when they can be considered and responded to efficiently and prior to a decision.

The Council on Environmental Quality (CEQ) NEPA Regulations 40 C.F.R. § 1508.27 state that when preparing an EA, the agency has discretion as to the level of public involvement. The CEQ regulations

state that the agency shall involve environmental agencies, applicants, and the public, to the extent practicable, in preparing EAs.

In response to “No Grazing” as to not being stated in the legal notice, the directed purpose of the legal notice is to inform the public of the proposed action and the availability of the NEPA analysis document (i.e., the Draft or Preliminary EA) and its availability for public review.

The Preliminary EA clearly indicates the “Management Direction” and “Purpose and Need” for action on page 5, which states: “This project is consistent with the direction listed in the Forest-wide standards and guidelines, and in the standards and guidelines for Land Management Planning Areas GAs 11, 12, 13, 16 and 19, otherwise referred to as Geographic Areas (GAs) (Forest Plan – pp. 38-48, pp. 62-87, and pp. 97-104), which encompasses the Kane Ranch Allotments.” This section also goes on to show what other laws, rules and regulations (including Forest Service Policy) are applicable to the project. The main purpose is clearly stated on page 5 of the Draft EA:

“The purpose of this project is to re-authorize cattle grazing on the Kane Ranch Allotments in a manner that is consistent with the goals, objectives, standards and guidelines of the Forest Plan (1988), as amended, as well as provide logical, flexible, and adaptive grazing rotations. There is a need for this analysis to ensure the maintenance and/or improvement of vegetation and soil conditions that provide for ecosystem stability while allowing livestock grazing to occur on the allotments.”

Additionally, under the heading of “Alternatives,” page 11 of the EA it clearly states that the Forest Service developed and analyzed three alternatives to meet the requirements of Forest Service Handbook (FSH) 1909.15 and Forest Service Manual (FSM) 2209.13. A comparison and summary of the alternatives analyzed is presented in this section of the EA; furthermore page 20 of the Preliminary EA clearly listed Alternative 3 as “No Grazing,” and goes on to state that “this alternative would discontinue livestock grazing on Central Winter, Central Summer, and Kane Allotments. This alternative will be fully analyzed.”

The “No Grazing” alternative was utilized to show the comparison between grazing (Alternatives 1 and 2) and no-grazing (i.e., Alternative 3 – with no grazing being a baseline if “no cattle” were being stocked on the allotments). Thus, the public could be informed on what the changes actually are predicted or modeled, versus making assumptions or educated guesses which are not based on science. In livestock management, the courts have determined that the Forest Service must fully consider a “No Grazing” alternative even if it does not meet the proposed purpose and need. The Courts have said issuance of permits is a discretionary action – therefore, the no-action alternative required by NEPA is defined as no-grazing (or not issuing permits).

In addition, there will normally be an alternative based on the “current or existing management.” This alternative may or may not be considered in detail, depending on whether or not it meets law, forest plan direction, and so forth. Finally, there will be one or more additional action alternatives. These alternatives need to be based on the purpose and need statement, and on resolving the key issues. Alternatives can be suggested by anyone, but it is the Ranger’s decision as to whether they can or should be fully considered. A suggestion from the public or permit holder can at times be placed within an existing alternative. Permittees are also encouraged to submit alternatives in the scoping process. Scoping for the project’s proposed action was completed in July-August of 2012. The scoping legal notice was published July 8, 2012; the scoping period began on Monday, July 9, 2012 and ended Tuesday, August 7, 2012.

The legal notice for the 30-day public review and comment on the preliminary EA fully meets the intent of laws, rules, and regulations. As the commenters stated “*The notice required under NEPA does not require that all alternatives be described in legal notices...*” At a minimum, the information circulated for comment should describe the proposed action and its location in enough detail to allow the interested public to provide meaningful comment on the consequences of the proposed action. As stated in the June 9, 2013 published legal notice, on March 27, 2013, the USDA Forest Service published the Final Rule for 36, CFR part 218 "Project-Level Pre-decisional Administrative Review Process" in the Federal Register, which was effective at said time of publication of the legal notice for the preliminary EA. The Kane Ranch Allotment Management Plan is an activity implementing a land management plan and not authorized under the Health Forest Restoration Act of 2003, and is subject to 36 CFR 218 Subparts A and B; therefore the project will be subject to the new rule / objection process (i.e., Final Rule for 36 CFR part 218). The legal notice instructed the public on how to comment and timeframe, and stated “Specific written comments (§218.2) on the project EA will be accepted for 30 calendar days following publication of this notice in the Arizona Daily Sun newspaper (Flagstaff, Arizona).” Additionally, the current “Forest Plan” was developed and approved according to federal regulations and is being implemented per federal and forest service policy.

L1-C2 Comment: (J&V Schoppmann)

NEPA requires the FS to undertake an assessment of their proposed actions prior to making a decision.¹ That assessment requires citizen involvement.² Reliance on FSM 2209.13,92.31 is misplaced given the stated purpose of "...the re-authorization of cattle grazing...in a manner..." as the FSM can't trump the legislative and regulatory requirements of NEPA and other public land management laws. The FS is often required to consider 'no action' alternative in environmental assessments. However, Alternative 2 is really the 'no action' alternative given the stated purpose.

¹A Citizen's Guide to the NEPA, page 2.

² Id.

Response / Consideration of Comment:

See Response or Consideration of Comments under L1-C1 above; the public has been involved as is evident from the commenters comments received during the 30-day public comment and review period for the Preliminary EA.

The USDA Forest Service (FS) makes forest management decisions by developing a Land and Resource Management Plan (Forest Plan) for each unit of the National Forest System. The FS then implements the Forest Plan by approving or disapproving site-specific actions. The NFMA and service regulations require that proposed actions be consistent with the Forest Plan. 16 U.S.C. § 1604(I). The Kaibab National Forest Land Management Plan (i.e., the “Forest Plan”) (USDA Forest Service, April 1988, as amended) provides direction for all resource management programs, practices, uses, and protection measures on the Kaibab National Forest.

Page 5 of the EA states that the project is consistent with the following laws:

- Congressional intent to allow grazing on suitable lands (Multiple Use-Sustained Yield Act of 1960, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976).
- 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 (AMP) would be prepared consistent with land management plans, and the Clean Water Act of 1948, the Endangered Species Act of

1973, and 13186 (Conservation of Migratory Birds), National Historic Preservation Act 1966, and the Clean Air Act of 1970, as amended.

- 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). The only exception to this requirement is unless there is pending disposal, or it would be devoted to other uses prior until the end of 10 years, or it would be in best interest of sound land management to specify a shorter term.

Livestock grazing on National Forest System lands occurs in the areas presently grazed and in a variety of forms; grazing has been present for the last hundred years. Typically during that time numerous grazing systems have been implemented along with accompanying range improvements. Stocking rates and seasons of use have been adjusted; the timing, intensity, frequency, and duration of grazing have been continually fine-tuned over time. More recently, further adjustments have been made on many allotments to provide for the needs of species listed under the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), clean water, and archeological structures and artifacts. This dynamic evolution of management, on most allotments, results in the ability to narrow the range of alternatives that must be analyzed in detail. When a proposed action includes re-authorization of livestock grazing, and lacks any significant issues identified during scoping, alternatives analyzed in detail would be limited to: the proposed action, no action (which is current management), and no grazing.

With regards to the “No-Action Alternative,” the no-action alternative provides a baseline for estimating the effects of other alternatives; therefore, include the effects of taking no-action in each environmental analysis. A no action alternative is required in an EIS (40 CFR 1502.14(c)). There is no requirement to include a no action alternative in an EA. In an EA, the effects of a no-action alternative may be documented as follows:

The EA may document consideration of a no-action alternative through the effects analysis by contrasting the impacts of the proposed action and any alternatives(s) with the current condition and expected future condition if the proposed action were not implemented. (36 CFR 220.7(b)(2)(ii))

Two interpretations of no-action are possible. The first interpretation involves an action such as the amendment or revision of a land management plan where ongoing programs described within the existing plan continue, even as new plans are being developed. In these cases, the no-action alternative means no change from current management direction. Consequently, the responsible official would compare the projected impacts of alternative management schemes to those impacts projected for the existing plans or actions.

The second interpretation of no-action is that a proposed action or activity, such as a proposal to construct a road or authorize special uses of National Forest System lands, would not take place. The nature and scope of the proposed action will aid the responsible official in determining which interpretation is appropriate to the analysis.

Occasionally, to address an issue an analysis could include both interpretations. For example, to update a range allotment plan, the no action alternative is no grazing, as specified in the Grazing Permit Administration Handbook (FSH 2209.13, sec. 92.31). FSM 2209.13, 92.31 fully states the following:

“At least two alternatives must be analyzed; the “no action” alternative and the proposed action. The current management alternative should be developed with a clear description. Current management may or may not be analyzed in detail. In some situations, current management, or a slight modification of current management, may be the proposed action. This would be appropriate if current management is consistent with the Forest Plan, and if, through monitoring, it has been shown that current management is achieving resource management objectives. Whether current management responds to the purpose and need for the project, determines the level of analysis of current

management. Adaptive management should be well defined if it is being considered under any alternative.

Current management is a combination of the current permit and how the current permit has been administered through the AMP and AOI, for at least the past 3-5 years (3-5 years is a minimum, longer periods of 10 years or more may also be utilized to document current management), in order to meet resource management objectives.”

The Forest Service considered in the Preliminary EA the proposed action (Alternative 1), the current-action alternative (Alternative 2), and the “No-Grazing” alternative (Alternative 3). These alternatives show what the changes would be between the proposed action and these two other alternatives. The proposed action (Alternative 1) offers a range of the number of head to be grazed on allotments, as well as being able to follow an adaptive management or make slight modifications based on goals and objectives as stated in the EA. Alternative 2, the current-action would continue the current allotment management plan as developed from alternative six of the 2001 Kane Ranch EA and Decision Notice. Alternative 3, the No-Action alternative is presented in the analysis of the EA to discuss or show what would be the effect or change if grazing was eliminated.

L1-C3 Comment: (J&V Schoppmann)

Similarly and regardless of the notice requirement, the inclusion of Alternative 3 bolsters any argument that appropriate alternatives were not considered³ If the draft EA was not fundamentally flawed in regards to notice and appropriate alternatives, it would appear the Proposed Action (Alternative 1) may be an appropriate course of action. However, it is hard to say what the best alternative is in "... the re-authorizing of cattle grazing..." in this area when only 1 genuine alternative from the Current Action has been proposed. If the FS wants to end cattle grazing in the area, they should fight the issue head on by clearly stating the purpose of the assessment is to determine whether grazing should be allowed at all, versus surreptitiously implying that the issue is simply about what manner current grazing⁴ should continue.

³ 42. USC §4332 requires the FS to study, develop, and describe appropriate alternatives to the proposal.

⁴ The use of "current grazing" is used loosely. Even the EA admits that essentially no grazing has occurred in the area in the last several years. It appears that no grazing is the intention of the current permit holder. One could argue that an appropriate and obvious alternative that was not considered was that of a version of the current action with strict permit compliance.

Response / Consideration of Comment:

See Response or Consideration of Comments under L1-C1 and L1-C2 above.

Federal agencies are required by NEPA to explore and objectively evaluate all reasonable alternatives. The consideration of alternatives were evaluated and/or narrowed down between the scoping process and the publication of notice of availability of the Preliminary EA for Public Review and Comment. The Preliminary EA discusses this in detail under the section titled “Alternatives Considered but Eliminated from Detailed Study.” (EA, pp. 24-25). The public involvement process and issues that went into narrowing the alternatives are discussed on pages 9 and 10 of the Preliminary EA. The commenter does not offer or discuss any reasonable alternative in making their comment(s); the Forest Service does present alternatives in an objective manner and state the purpose of the EA (See Introduction to EA, p. 1). Additionally, the “Decision Framework” discussion of the Preliminary EA (pp. 8-9) indicates what decisions are to be made:

1. Whether to re-authorize cattle grazing and in what manner, as described in the Proposed Action;
2. Whether to implement any alternative to the proposed action, or current cattle management;
3. What mitigation measures are needed; and

4. What monitoring is required?

Nowhere in the Preliminary EA does it state that the Forest Service wants to eliminate grazing. This statement by the commenters must be a perception or conclusion they formulated on their own. The EA discloses the environmental consequences which may occur if the Proposed Action, or alternatives to that action, are implemented. A decision notice (DN) and finding of no significant impact (FONSI), signed by the North Kaibab District Ranger, will document the decisions made as a result of this analysis. Should the decision authorize cattle 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 AMP and grazing permit.

L1-C4 Comment: (J&V Schoppmann)

The FS should: (1) correct the problems detailed above, (2) consider additional alternatives; and (3) avoid the improper Alternative 3. Furthermore, we adopt all the comments and concerns detailed by Mr. Steve Rich in his 3 emails submitted in 2012 (Scoping Letter(s) #13) and request that the FS more fully consider and implement those concerns. Please consider these comments and call with any questions.

Response / Consideration of Comment:

See Response / Consideration of Comment under L1-C1 and L1-C2 above. Per the Council on Environmental Quality, Section 1502.14 requires the Environmental Analysis to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable" rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. "Reasonable alternatives" include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. To be reasonable, an alternative has to respond to the Purpose and Need, it has to be technically and economically feasible, needs to be consistent with the basic policy objectives for management of the area (the Forest Service's land use plan), its implementation must not be remote or speculative, and it must not be substantially similar in design and effects to an alternative that is already analyzed. To consider other alternatives just for arguments sake, is not a reason for consideration of additional alternatives.

The phrase "range of alternatives" refers to the alternatives discussed in environmental documents. It includes all reasonable alternatives, which must be rigorously explored and objectively evaluated, as well as those other alternatives, which are eliminated from detailed study with a brief discussion of the reasons for eliminating them (Section 1502.14). A decisionmaker must not consider alternatives beyond the range of alternatives discussed in the relevant environmental documents. Moreover, the decisionmaker must, in fact, consider all the alternatives discussed in the EA. Section 1505.1(e). Alternatives were considered but narrowed in the EA as explained in Chapter 2 of the EA. If the commenter wanted additional alternatives to be considered, they should have given specific details and comments during the scoping period for the proposed action. The Scoping period in July 2012 narrowed the focus of alternatives to be considered through the public involvement process. [Note: John Schoppmann was included in the July 10, 2012 Scoping Notice Mailing/Letter; the Schoppmanns did not respond or provide any scoping comments on the proposed action at that time.] The references and comments from Mr. Steve Rich were reviewed and evaluated; See *Summary of Scoping Comments* in Project Record. Also see "Alternatives Considered but Eliminated from Detailed Study" section of the EA (pp. 24-25). The Forest Service has followed the required public involvement/notification and public review process for the project.

Comments from Mark Overas (M. Overas) - Letter Number 2

L2-C1 Comment: (M. Ovaras)

At present, the grazing health of these allotments appears extraordinarily strong. The grass on the slopes across from KCW is the best I have ever seen it, and it appears to be able to support well-managed grazing without threat. Importantly, restoring well managed cattle grazing to these areas would result in several significant benefits that would otherwise be unrealized.

The ranch managers would have to improve the stock watering infrastructure in these areas, which can only benefit the mule deer population, as well as all forest wildlife. It goes without saying that in order to successfully reintroduce grazing, troughs and tank storage, and possibly trickle fields, will have to be constructed. In terms of the grasses, cattle grazing should improve seed dispersal.

Response / Consideration of Comment:

The Forest Service agrees with your grazing health assessment of these allotments. Based on the comment, the Forest Service assumes that “*slopes across from KCW is the best I have ever seen it, and it appears to be able to support well-managed grazing without threat,*” means the Central Winter allotment area or the west side of the Kaibab Plateau. This area is currently grazed and has limited seasonal use from May 1 to June 30 in a rest rotation grazing system. One pasture is to be grazed for one month, and then livestock are to be moved to the next pasture for one month. The following year, the two different pastures are utilized in the same manner. Thus the grasses in these areas (including sloped areas) have ample time for recovery and growth the other ten (10) months out of the year.

According to Arizona Game and Fish Department hunting areas, hunting success figures for mule deer on the 12A West Hunt Unit have fluctuated around 40-50% range for the last decade, some of the highest hunt success for mule deer in the state of Arizona. With conditions slowly improving in the west side burn area within 12A West, and with the initiation of landscape scale habitat restoration efforts, the outlook for the Kaibab deer herd is very optimistic. (*Arizona Game and Fish Department, 2013-14 Arizona Hunting Regulations*).

With regard to the Kanab Creek Allotment (KCW, is the abbreviation used by the commenter, assumed to mean Kanab Creek Wilderness), as stated on page 4 of the EA, the Kanab Creek Allotment is closed to grazing. The 2001 NEPA decision called for no grazing in the Kanab Creek Allotment. The Kanab Creek Allotment will remain closed to livestock grazing and no permit will be issued for this area. The continued closure of this allotment to livestock grazing is primary due to poor rangeland conditions and archeological site protection. Other reasons for continued closure include: riparian resource protection, remote wilderness values, lack of functioning range improvements needed for proper livestock management, noxious weed expansion, and difficulty of managing livestock in this rough remote desert area. Even though there may be some slopes with grass on them within this area, these other resource issues (as previously mentioned) override re-opening this area to livestock grazing. In addition, because the area is within a wilderness area, adding new range improvements would be difficult, as most of the topography of the Kanab Creek Wilderness area is canyons and cliffs, with very limited accessibility, like that provided by Snake Gulch on the northern end. The majority of cheat grass occurs on the lower west side and/or within the Kanab Creek Wilderness area.

L2-C2 Comment: (M. Ovaras)

Perhaps the most important value of using the forest in this manner is the fact that we are talking about the production of food. A vast number of Americans are still fond of their beef, and for good reason. Let us not forget that the USFS is a part of the USDA, the Department of Agriculture. Food is not so

plentiful, nor sources of protein so inexpensive, that our national forests cannot be used for feeding the citizens for whom the forests are managed. I believe that the NKRDC has found the permit holders for these allotments to be professionals who hold sustainability as their highest management priority.

Response / Consideration of Comment:

The Forest Service appreciates your statements of opinion; the statement as presented have no context or bearing on proposed action or the evaluation of alternatives as presented in the EA, which deals with the re-authorization and use of the Kane Ranch Allotments and the management plan which will direct or manage the use of the allotments. The mission statement of the USFS: “It is the mission of the USDA Forest Service to sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.” The preliminary EA has been presented to the public to show that the Proposed Action and Alternatives thereto, have been evaluated or analyzed, and thus help make the decision maker in on making an informed decision as to a course of action. As, such the NEPA analysis is primarily presented as an objective review of the alternatives. [Note: Comments from L2-C2 are statements of opinion and not comments on the EA or the scope of the EA.]

Comments from Craig McMullen / Regional Supervisor from Arizona Game and Fish Department (AZG&FD) - Letter Number 3

L3-C1 Comment: (AZG&FD)

The Arizona Game and Fish Department (Department) welcomes this opportunity to comment on the Draft Environmental Assessment (EA) for the Kane Ranch Allotment Management Plan. The Forest Service proposes to re-authorize grazing on 3 Kane Ranch Allotments (Central Summer, Central Winter, and Kane), comprising approximate 435,000 acres on the Kaibab Plateau. These provide habitat for one of the West's premier deer herds, along with a diversity other wildlife. Managing these areas for improved habitat and healthy wildlife populations has been and remains a top priority for the Department. We appreciate the degree to which our previous comments on the Proposed Action have been incorporated into the draft EA and offer the following additional suggestions:

Response / Consideration of Comment:

The Forest Service appreciates the Arizona Game and Fish Department’s comments, especially from an agency which has co-management authority with regards to wildlife, and a common goal of protection, improvement and diversity with regards to wildlife habitat areas on the Kaibab Plateau.

L3-C2 Comment: (AZG&FD)

Flexibility in management will be essential to cope with the many uncertainties at hand. As noted in the EA, climatic conditions exert a strong influence on condition and trend in these arid ecosystems, which have also been impacted by recurring drought, spread of invasive weeds, and, unnaturally large and severe wildfires. The Department supports the multi-faceted adaptive management approach outlined in Alternative 1, particularly the ability to incorporate information gained from collaborative research undertaken by the Kane/2 Mile Partnership. It would be helpful to provide a more formal framework describing how that part of the adaptive management process will function. The Department also believes the adaptive management process could be strengthened by conducting long-term (effectiveness) monitoring at more frequent intervals (e.g., every 3-5 years) and identifying specific trigger points for monitoring variables that would lead to changes in management. The Department would also welcome

the opportunity to provide input into development of the annual operating instructions for these allotments.

Response / Consideration of Comment:

The Forest Service appreciates the support of adaptive management. The monitoring strategy as outlined in Chapter 4 of the EA is presented as required “minimum” monitoring. If a need for more frequent monitoring arises, the Forest Service is committed to do additional monitoring with the support of both the permittee and AZG&FD. Specific trigger points for management action, besides the ones already in the EA, may be developed as we learn more from our research program in the Central Winter Allotment. The Forest Service will accept input on the annual operating instruction for these allotments, which the Forest Service will review with the permittee during our annual spring meeting. Modifications based on needs or adaptive management, or from stakeholder input and development, may be included in the annual operating instructions for allotment management. The annual operating instructions will be available to everyone on our Kaibab National Forest website.

L3-C3 Comment: (AZG&FD)

The Department supports the use of alternative management strategies prior to considering construction of a new fence along Highway 67. We remain concerned about potential impacts on wildlife movements and thus appreciate the stated intent to use wildlife-friendly specifications if this fence is built. We would further recommend setting the fence as far back as feasible, with a minimum distance of 100-120' from the edge of the blacktop.

Response / Consideration of Comment:

The Forest Service appreciates the AZG&FD comment concerning impacts to wildlife movements, such as mule deer or elk. The EA (pp. 12 & 58) states: “The fence design would follow AGFD guidelines to reduce potential wildlife crossing and entrapment concerns.” Detailed design features of fencing information are supplied in the EA (p. 22). However, consideration also needs to be given regarding public health and safety for those utilizing this stretch of highway 67 to the north rim of the Grand Canyon. Cows (especially black cows at night) entering into the highway 67 right-of-way pose a risk to the health, safety, and welfare of travelers on highway 67.

Arizona is an Open Range state, and although there may not be an actual open range law on the books, there are nine state statutes that pertain to livestock and fences (Arizona Revised Statutes (ARS) Title 3, Chapter 11, Article 8). It is a property owner’s responsibility to fence out unwanted livestock using a “Lawful Fence,” as defined in ARS 3-1426. Arizona is a fence-out state and the Forest Service sees this as a public safety issue between the cattle and vehicular traffic on the highway 67. In consideration of wildlife movement, fence development will include modifications to allow animals to jump over and crawl under easily without injury and be highly visible for both ungulates (i.e., animals having hoofs) and birds. The Forest Service will consider wildlife compatible fence design.

The “*Kaibab Plateau – North Rim Parkway Scenic Byway Corridor Management Plan*” was recently finalized on July 22, 2013. Highway 67 is utilized and open to traffic between mid-May to late-November. Arizona Department of Transportation (ADOT) closes the highway to the north rim from Jacob Lake in the winter due to heavy snow fall. In order to keep the intrinsic qualities associated with this stretch of highway 67, any fences to be installed will be set back as far as possible. Due to aesthetic concerns expressed from our visuals and scenery specialist, the southern 14-mile section of fencing (from Pleasant Valley meadow to the GCNP boundary) would be placed along the treeline at the meadow edges. Page 18 of the new Byway Corridor Management Plan addresses livestock, and states that there are

currently no fences to prevent uninhibited movement of livestock onto the Byway. In the EA, the southern section of pasture fence would not be planned for immediate construction, but would be considered as part of the adaptive management process. The meadows along the highway and the area east of the highway would become the Southeast pasture and would be for limited spring and fall transitional use only, when less traffic occurs.

L3-C4 Comment: (AZG&FD)

Water sources are critical to effective management of wildlife and livestock on the Kane Allotments. The Department supports the proposed steps to protect wetland vegetation at natural lakes while also providing water to livestock. We likewise support efforts to restore natural flow and riparian vegetation at springs in the project area. The description of spring restoration (p. 16) includes the following statement: "Fences would be built, removed, or modified to best protect the spring while still providing water to livestock and wildlife where necessary." The intent here is unclear; however the Department considers that natural water sources should be available to wildlife, unless there are compelling reasons to the contrary.

Response / Consideration of Comment:

Current water resources that are excluded to livestock are available to wildlife by fence design. Wooden post-and-pole fences are preferred to achieve visual quality objectives and is a design which has been proven to still allow wildlife access to the water feature. Additionally, where fences around springs are in disrepair and there are no indications of livestock use, these fences may be removed or redesigned to prevent livestock access while maintaining wildlife access to water bodies and riparian vegetation. As an example, if there was a circular cow tank depression that supplies water to livestock and wildlife, a post-and-pole or buck-and-rail fence could be installed to bisect the cow tank (i.e., a fenceline that cuts the tank in half) so as to allow water access for both uses.

L3-C5 Comment: (AZG&FD)

The EA indicates that 10 earthen tanks or wildlife guzzlers on the Central Summer Allotment would be modified, repaired, or replaced. The Department supports that effort and would appreciate the opportunity to help select and prioritize sites. We would also request that dual-use waters be managed so as to provide water to wildlife when livestock are not present. As you are probably aware, the Department has made significant capital investments renovating old catchments and building new ones on the West Side Winter Range. We encourage the Forest Service to continuing partnering with the Department to ensure availability of water for wildlife on the Central Winter and Kane Allotments as well.

Response / Consideration of Comment:

The Forest Service has been working with the department and will continue to do so to ensure that tanks and guzzlers continue to be available to wildlife. Catchments and cow tanks do serve wildlife, especially since grazing rotation is utilized on most all allotments [EA, pp. 3-4]. A rotation grazing system is where one pasture is grazed each year while the other is rested, which naturally means that during the non-use periods (i.e., every other year), wildlife will fully benefit from the infrastructure and water catchment features or improvements, without having to compete with the livestock during those specific timeframes.

L3-C6 Comment: (AZG&FD)

The Department appreciates the open and collaborative approach taken by the Forest Service in preparing this draft EA and is pleased to support the proposed action (Alternative 1). As a member of the Kane/2 Mile Research and Stewardship Partnership, we also wish to acknowledge the considerable efforts of Forest Service staff to facilitate research and learning on the project area. We look forward to continued proactive engagement to accomplish our mutual conservation objectives.

Response / Consideration of Comment:

The Forest Service also appreciates the Arizona Game and Fish Department's support and engagement in this NEPA process and well as its participation in the research and stewardship partnership. The Forest Service looks forward to your continued proactive engagement in the management of this area.

Comments from T. Whitham, A. Whipple, & K. Haskins, with the Southwest Experimental Garden Array (SEGA) - Letter Number 4

L4-C1 Comment: (SEGA)

We are writing to comment on the draft Environmental Analysis (EA) of the Kane Ranch Allotment Management Plan prepared in response to the proposed action to reauthorize grazing on the Central Summer, Central Winter, and Kane grazing allotments of the Kaibab National Forest (KNF), Arizona. We strongly support the common garden experiments included in the Preferred Alternative for reasons that are detailed below.

Response / Consideration of Comment:

The Forest Service appreciates SEGA comments and acknowledges their support of the "Preferred Alternative," which the Forest Service interprets to mean Alternative 1 – the Proposed Action.

L4-C2 Comment: (SEGA)

First, The Kane Ranch Allotment Management Plan is well designed and has key components in place to be executed well. Making the objectives of The Partnership a goal of the Allotment Management Plan (AMP) makes good sense and we support and applaud the USFS.

Response / Consideration of Comment:

The Forest Service is willing to work with the permittee and the public to ensure that the Kane Ranch Allotment Management Plan facilitates the need of the permit holder, while addressing concerns other stakeholders may have about the use or protection of resources found on the Kaibab Plateau.

L4-C3 Comment: (SEGA)

Second, we are involved in a Northern Arizona University and National Science Foundation-funded research project that has recently started to participate in the Kane-Two Mile Research and Stewardship Partnership. Our project seeks to find genetics-based solutions to mitigate the effects of climate change on the landscape. We anticipate installing environmental monitoring equipment at three sites on the Kaibab National Forest that will be used to study the impacts of climate change on vegetation.

Our aim is to provide the support needed for researchers and land managers to conduct projects on the grasses, forbs, trees/shrubs, and the associated invertebrate and microbial communities that currently, or in the future may, provide the basis for productive ecosystems or inhibit ecosystem services. This type of research will be invaluable for producing future management plans in a changing climate across a wide variety of habitats on the KNF and beyond.

Response / Consideration of Comment:

Monitoring and mitigation play an important role in most all projects as they relate to climatic change conditions. The implementation of an Adaptive Management strategy into this plan will allow for environmental monitoring and data gathering on the Kaibab National Forest. The Forest Service will continue to work with the permittee, as well as other interested stakeholders to ensure that data is gathered in a sound and scientific manner, so it can support future decisions in determining whether or not goals or objectives of the Kane Ranch Allotment Management Plan are being met, or whether modifications and adjustment thereto may be warranted.

With regards to climate change, the Forest Service has a responsibility to determine effective ways to respond to changes and manage the land. One of our identified goals is maintaining and improving watershed health. Healthy, resilient watersheds are more likely to support desired ecological services in the face of climate change [Final EA, pp. 28-30]. The Forest Service fully supports research projects that may benefit, protect, or improve the ecosystem and make it more resilient to drought conditions. Research projects may require additional NEPA review and clearance. Projects should promote connected landscapes and endeavor to restore significantly altered biological communities, thus restoring their resilience to changes in climate. [Final EA, pp. 49-50]

L4-C4 Comment: (SEGA)

Third, as a member of The Partnership, our collaboration will enable us to bring resources for water and fence infrastructure installation and repair to these sites. Furthermore, the combined leveraging power of the new collaboration will greatly support future endeavors to seek funds for these facilities and to support the AMP in general. The outcome of these expenditures and new relationships is that the needs of scientists and land managers will be more easily met. Additionally, through support of the AMP and the common garden experiments, we see the opportunity for expanded education and outreach events and experiential learning activities, and we look forward to working with the KNF and The Partnership on these endeavors.

Response / Consideration of Comment:

The Forest Service welcomes collaboration and support concerning water and fence infrastructure installation and repairs. The Forest Service encourages the Partnership to work closely with the KNF and other agencies (i.e., Arizona Game and Fish Department) to ensure that all stakeholders are involved in the Adaptive Management Process, and that adjustments or changes to goals or objectives are adjusted and/or implemented in order to reach a desired outcome.

L4-C5 Comment: (SEGA)

Finally, we would like to see that the species allowed in experimental plantings in the gardens include species native to western North America. As climate change is likely to result in changes to both species ranges and ecological niches, we need to study northern Arizona's current and future plant communities, which could be quite different. Where invasive/non-native species already exist on a site we would support projects that include them in their research designs because of the potential benefits for large-scale weed management.

Response / Consideration of Comment:

We agree, and the species list for experimental planting will be changed to native species of the western North America. Because these species are native to western North American and will not be allowed to expand beyond the confines of the experimental plots they will have no effect to the native species in the area beyond where they are planted. The use of any non-native species must be approved through a supplemental NEPA process.

Comments from S. Bahr/Sierra Club – Grand Canyon Chapter (Sierra Club GCC)
- Letter Number 5

L5-C1 Comment: (Sierra Club GCC)

The Kane Ranch Allotments encompass approximately 435,000 acres of national forest, so the allotment plans and any livestock grazing allowed will have a profound effect on the forest and its vegetation, soils, and wildlife. As discussed below, livestock grazing issues clearly exacerbate other management issues and challenges; there is clear scientific data linking livestock grazing with soil instability, impaired water quality, and invasive vegetation.

Pursuant to the National Environmental Policy Act (NEPA), the Forest Service has a duty to take a hard look at the impacts of reauthorizing these grazing allotments and how climate change, invasive plant species, and other stresses will cumulatively affect these lands. It further requires the Forest Service to consider the full range of reasonable alternatives and, in this case, a strategy for mitigating impacts from grazing as well as the other stressors. The Council on Environmental Quality (CEQ) regulations instruct agencies to consider alternatives to their proposed action that will have less of an environmental impact. 40 C.F.R. § 1500.2(e) states that “[f]ederal agencies shall to the fullest extent possible . . . [u]se the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment.”

Response / Consideration of Comment:

Section of the EA regarding Vegetation [Final EA, pp. 65-80], Soils [Final EA, pp. 23, 29-37, & 47-49] and Wildlife [Final EA, pp. 89-99] are all discussed and analyzed within the EA. Non-Native Invasive Plant Species are thoroughly discussed on pages 80-84 of the EA. The direct, indirect and cumulative effects of the alternatives are analyzed or discussed on pages 84-89 of the EA. Consideration to changing climate conditions are discussed on pages 28-30, 49-50, and 78-79 of the Final EA. Watershed, water resources and water quality are analyzed on pages 37-48 of the EA.

The effects of livestock grazing are presented and analyzed throughout the EA and supported by specialist report found in the project record. The alternatives presented in Chapter 2 of the EA responded to the legal requirements of livestock grazing NEPA (FSH 2209.13 90) and also comments received during the NEPA process. Three alternatives, including the No Grazing alternative, were considered during the NEPA process in order to insure that we had taken a “hard look” at the effects of continued livestock grazing on Forest resources. Also see the response to L4-C3 above with regards to climate change.

See the discussion on “reasonable alternatives” and “range of alternatives” under response and consideration of comment to numbers L1-C3 and L1-C4 above. “No Grazing” as an alternative is not “reasonable” considering the Forest Service’s mission statement [EA, p. *i*] and multiple use, and the sustainability of the use of the land and its resources. Additionally, if impacts of actions can be mitigated, then the action may be considered as reasonable. The deciding official has the right and authority to consider picking the “No Grazing” alternative as long as there is a valid “rationale” behind the decision to do so.

40 C.F.R. § 1500.2(b) also states the following: (b) Implement procedures to make the NEPA process more useful to decisionmakers and the public; to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives. NEPA Analysis documents shall be concise, clear, and to the point, and shall be supported by evidence that agencies have made the necessary environmental analyses. The current EA does present a full range of reasonable alternatives and a strategy for mitigating impacts from grazing as well as the other stressors. These are

the principals behind the operation of an Adaptive Management program. [See responses to L1-C2, L3-C2, and L4-C3 regarding adaptive management.]

L5-C2 Comment: (Sierra Club GCC)

PURPOSE AND NEED ESTABLISH A BIAS: The purpose of the Environmental Assessment should be to determine the effects of grazing on the Kane Ranch Allotments and decide on the best way to manage for Forest resources, including wildlife and recreation. By crafting the Purpose and Need statement to say, “The purpose of this project is to re-authorize cattle grazing on the Kane Ranch Allotments...There is a need for this analysis to ensure the maintenance and/or improvement of vegetation and soil conditions that provide for ecosystem stability while allowing livestock grazing to occur on the allotments” (DEA, p. 5, emphasis added), the Forest Service is biasing the outcome of the analysis to prevent a no grazing alternative, even if it is found to be beneficial to the land.

Response / Consideration of Comment:

The “Purpose and Need for Action” and “Proposed Action” are clearly stated on pages 5-6 of the EA. What the commenter fails to present is that the EA text also states that the current grazing rotations have been logistically challenging to successfully operate, and that re-authorization of the cattle grazing is in a manner that is consistent with the goals, objectives, standards and guidelines of the Forest Plan (1988), as amended, while providing a logical, flexible, and adaptive way to utilize the grazing rotations. (which is what the permittee would like to see to facilitate the logistics of such a large area involving the allotments). The Forest Service has re-worded the last sentence to make its intent more clear. The sentence will now read: “The analysis presented should indicate whether the maintenance and/or improvement of vegetation and soil conditions can provide for ecosystem stability (i.e., is sustainable) while allowing livestock grazing to continue to occur on the allotments.” Watershed function is also a key element when discussion involves plants/vegetation cover and soils.

The Forest Service disagrees with the commenter’s statement that the purpose establishes a bias. First, the grazing permit is already in use and previous NEPA analysis was performed back in 2001. The purpose is to establish whether re-authorization of the permit should be allowed and under what conditions (this is not a new grazing permit on land that has not been grazed on before). The Decision Framework is clearly presented on pages 9-10 of the Final EA. Here it clearly states that the EA is not a decision document, but rather it discloses the environmental consequences which may occur if the Proposed Action or alternatives to that action are implemented. A finding of no significant impact (FONSI), and a decision notice (DN) signed by the North Kaibab District Ranger, will document the decisions made as a result of this analysis.

With regards to the comment on no grazing, Alternative 3 the “No Grazing” Alternative is a fully described [EA, pp. 21] and analyzed in various sections of the EA; additionally, the deciding official has the ability to choose this alternative.

L5-C3 Comment: (Sierra Club GCC)

The need for this re-authorization is questionable considering the significant and detrimental impact livestock grazing has on the lands, wildlife, native vegetation, soils, and water resources. It is even more difficult to understand when the economics are evaluated. Grazing on the Kane Ranch Allotments will provide nine jobs at the maximum, and provide approximately \$1,700 to Counties (Table 17, DEA p. 99). The Forest Service neglects to identify the economic value of maintaining ecological systems, avoiding

and cleaning up cattle-vehicle collisions, restoring native species and natural waters, or the increased fire risk from livestock grazing-induced noxious weed spread and increased tree density. Please compare these expenses, often charged to taxpayers, to livestock revenues. Might these expenses better benefit the American public if invested in ecological restoration projects?

Response / Consideration of Comment:

The economic section of this EA is written and analyzed to compare the alternatives for the basic economic values using known costs and benefits. It is not meant to show the value of maintaining ecological systems. According to the 2010 Census data, Fredonia, Arizona's "total" population was only 1,314. Nine jobs (table 17 of the EA) relative to a small community population or the number of jobs available locally, may be considered somewhat significant. The costs for fences/exlosures for plant research and wetland/spring protection are included in the economic analysis [Final EA, pp. 100-103].

The cost of cattle-vehicle accidents are not included, because each accident may be of a different magnitude each time they occur. A vehicular accident, which involves minor repairs to the automobile and no loss of cattle, may be less than \$1,000. While, a major accident involving life threatening injuries (i.e., totaling a vehicle and involving a collision with one or more cattle) could easily cost over one-hundred thousand dollars (when emergency response such as a helicopter and medical bills are added into the equation); predictions on the severity and/or cost of each accident cannot be estimated. However, page 59 of the Final EA presents the number of accidents that have occurred in the last two years (six in 2010 and five in 2012). Statistically, with an average of 5.5 for the two year period, one could conclude that there is a potential for up to 55 accidents during a ten-year time period. Additionally, there may be a loss associated with the cost of the cattle to the permittee.

Chapter 3 of the EA describes the effects of alternatives to the ecological system including vegetation, wetland, springs, fires, weeds. The EA includes protection and restoration of several springs within the Kane Ranch Allotments, which is also a "qualitative" benefit to the local ecosystem function.

The Final EA on page 38 discusses water resources (Livestock Waters, Wetlands and Springs) in some detail. It goes on to state: "It should be understood that the majority of water resources within the Kane Ranch Allotments analysis area are excavated, diked, or otherwise impounded bodies of water that were initially developed for the purpose of providing water for domestic livestock and wildlife. They were not intended to serve as functioning wetland habitats, and most do not. A list of natural and developed waters in the Kane Ranch Allotments analysis area and available condition information are included in the Soil and Watershed Specialist Report (2013)."

Additionally the EA on page 3 discusses natural water features: "There are over thirty natural springs or seeps known to occur on the allotment. Over fifteen of the springs are inaccessible to livestock due to terrain. Approximately ten locations where livestock could access the springs and adjacent riparian vegetation have been fenced off to exclude livestock access. At least ten of these inaccessible or excluded springs have developed pipeline systems that provide water for public use, livestock, and/or wildlife use. Additional known and unknown seeps and springs are likely to occur across the allotment that may have no to minimal livestock access."

The EA also discusses Natural Lake fencing and Spring Restoration and Development under the Proposed Action (see EA, pp. 17-18). The Proposed Action also presents the standard rotation, as well as adaptive management in grazing rotation. The benefits of these two concepts are presented in "Responses to Comments:" L1-C1, L3-C5, and L5-C2 above, as well as responses L5-C5, L5-C11, and L5-C12 below.

Based on the information above, it is hard to understand how the Sierra Club can draw a conclusion that there is a “significant and detrimental impact” by livestock grazing on the lands, wildlife, native vegetation, soils, and water resources. Improvements to infrastructure like springs and cow tanks, along with grazing rotation and adaptive management, offer an additional benefit to wildlife that is provided through the proposed action.

Title 40: Protection of Environment, Part 1508 –Terminology and Index, § 1508.27 states that “*Significantly*,” (as used in NEPA) requires consideration of both context and intensity. Where *Context* means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. *Intensity* refers to the severity of impact. The Decision Notice (DN) and Finding of No Significant Impact (FONSI) discuss these (Context and Intensity factors) in detail.

L5-C4 Comment: (Sierra Club GCC)

Because, according to the draft Forest Plan revisions (Draft Plan p. 31-2), “[i]mpacts from grazing...that started in the late 1800s are still discernible on the landscape today,” removing livestock grazing in areas where native herbaceous cover and seed sources are sparse should be considered as a means for restoring these areas. Furthermore, “[a]bout 200,000 acres of grassland communities across the forest have been encroached (i.e., invaded) upon by pinyon, juniper, and ponderosa pine trees due to...historic grazing patterns.” Grazing should be removed from areas where the Forest Service will be investing in the restoration of encroached areas.

Response / Consideration of Comment:

The effects of livestock grazing for each alternative are presented in the EA, including the “No Grazing” Alternative. In the grazing alternatives, range readiness determines when livestock can graze after restoration projects have been completed.

With regards to the Sierra Club’s reference to the draft Forest Plan revision, a general reference to past or historical conditions of grassland communities (i.e., grassland communities with less than 10 percent tree cover occurring between 4,400 and 8,400 feet in elevation), as stated in the draft Plan, should not be taken out of context with reference to livestock grazing overall. The Draft Forest Plan revision covers Livestock Grazing on pages 60-62 of the new plan. Page 60 states:

“During World War II, Congress demanded as much protein production as possible from rangelands, and many areas were grazed unsustainably. The Kaibab NF made major reductions in authorized livestock from the 1950s through the 1970s in an effort to balance forage production with capacity. Further adjustments to grazing management have been made through site-specific NEPA analysis and decisions on all allotments. Currently, the forest manages the range resource to balance livestock numbers with forage capacity.”

The Management Approach to grazing under the draft Forest Plan also includes: adaptive management, making adjustments for changing conditions when the annual operating instructions are reviewed, and deferred rotation on allotments, just as a few examples.

L5-C5 Comment: (Sierra Club GCC)

The loss of the permittee's economic interest is considered as a negative effect of Alternative 3, No Action (no grazing) (DEA, p. 115). If the permittee's economic interest is to be considered, then why doesn't the Forest Service offer the possibility of voluntary retirement of grazing leases on these allotments? That way, it would be the permittee who would make the decision about whether the economic investment is worth more than the ecologic degradation from cattle grazing.

Response / Consideration of Comment:

The system for grazing on Forest Service and Bureau of Land Management lands in the American West was established by the Taylor Grazing Act of 1934. In most areas, qualifying ranches were assigned an exclusive amount of AUMs (animal unit months: forage for a cow and calf for one month), theoretically based on the land's carrying capacity. Public land livestock grazing is a privilege, not a right. If the government chooses to discontinue a "giving," that does not constitute a constitutional "taking."

Voluntary retirement of grazing leases is outside the scope of this decision. Quantifiable factors such as economic costs and outputs, along with projected animal months (AM) or animal unit months (AUM) have been used to help describe the economic effects of grazing on the Kane Allotments. An economic analysis program called Quicksilver was used to calculate these factors. [Final EA, Economy section, p. 100-103]. However, the "No Grazing Alternative" is an alternative that is fully addressed in the EA analysis; the benefit/costs of Alternative 3 "No Grazing Alternative" are displayed in the EA along with two other grazing alternatives for comparison [Final EA, pp. 100-102].

Additionally, the voluntary retirement of grazing leases would most likely lead to the surrender of any permittee related water rights. Under Arizona State law water rights may have to be forfeited since there would be no use for the water by the permittee, if grazing allotments were retired. Thus, under Alternatives 1 and 2, wildlife, along with grazing livestock, can continue to benefit from water improvement projects as long as grazing is still being implemented under the permit. Also see responses to L3-C4 and L3-C5 above. With regards to ecological degradation, see response involving "rest rotation grazing system" on allotments and pastures under L1-C1, L2-C1 and L3-C5 above, and L5-C11 below.

L5-C6 Comment: (Sierra Club GCC)

POSITIVE ASPECTS OF PREFERRED ALTERNATIVE: Alternative 1, the Preferred Alternative, makes a clear attempt to use adaptive management and experimentation to decrease the negative impacts from livestock grazing. This doesn't mean that it will remove the detrimental effects of grazing, but it could provide some useful information. If Alternative 1 is chosen, we support monitoring and research to be conducted within the allotments, including livestock exclosures and enclosures (DEA, p. 17, 19-20).

Response / Consideration of Comment:

The Forest Service agrees with the positive aspects of the preferred alternative. The EA describes all the effects of grazing within each alternative. With regards to monitoring and research, please see responses to L3-C2 and L4-C3 above.

L5-C7 Comment: (Sierra Club GCC)

We support the decision to keep the Kanab Creek Allotment closed (DEA, p. 19).

Response / Consideration of Comment:

The Kanab Creek Allotment is discussed in the EA and was originally closed to grazing under the previous 2001 NEPA Decision document. Kanab Creek is discussed in the EA under various resource

areas throughout the EA [EA, Chapters 1 through 4]. The Forest Service is following standard protocols to protect resources in this area, which includes the Kanab Creek Wilderness Area.

L5-C8 Comment: (Sierra Club GCC)

We support the use of monitoring and/or riders to prevent livestock trespass into sensitive meadows and natural lake areas, and highway signage to prevent vehicle/livestock collisions, rather than installing fencing (DEA, p. 12).

Response / Consideration of Comment:

The Forest Service agrees that following the highway 67 fence protocol listed in Alternative 1 will be the best course of action for the resources. Part-time or periodic (i.e., weekly) monitoring by the permittee and the riders during the timeframe a pasture is utilized for grazing in an allotment is a reasonable solution to monitoring resource impacts from an implementation standpoint. However as the EA states that if the large flashing signs warning the public of livestock hazard or open range areas are not effect, then a fence would be built to mitigate the hazard as soon as funding is granted. The southern fence would serve multiple purposes, including public safety on the highway, sensitive plant species and natural lakes in Pleasant Valley and DeMotte Park Meadows, mitigating livestock/public interface around the Kaibab Lodge/north Rim Country Store/DeMotte Campground area, and reducing livestock impacts in the Saddle Mountain Wilderness and related recreational areas [EA, p.13]. If fencing is installed along highway 67, adjacent to meadow areas, it will meet certain wildlife friendly design criteria. Additionally, the fencing will most likely be set back along the meadow-forested area, so as to preserve the visual quality of the scenic highway corridor area along highway 67. For natural lakes/ponds, fencing will be constructed of wood post-and-pole or buck-and-rail type fencing, both of which are deemed wildlife friendly based on the basic fence design. (See response to L3-C3, L3-C4 above). Fencing is considered a long-term, cost-effective mitigation measure and/or design feature that will prevent livestock from entering the highway right-of-way or travel corridor utilized by tourists and the public.

L5-C9 Comment: (Sierra Club GCC)

The Paradine plains cactus monitoring and livestock trailing protocol has clear criteria that would trigger changes in trailing protocol if Paradine Plaines cacti are damaged by livestock (DEA, p. 13).

Response / Consideration of Comment:

This is a true statement, there is no response required.

L5-C10 Comment: (Sierra Club GCC)

Inclusion of up to 20 spring restoration projects that will remove existing improvements, restore sinuosity, and/or exclude livestock (DEA, p. 16-17). This is much needed and we would like to see more of this across the forest.

Response / Consideration of Comment:

The Forest Service agrees that the spring restoration portion of Alternative 1 will be positive improvement for these spring areas. Most all the springs or seeps that exist along the Kaibab Plateau are very low flow and have no “sinuosity” associated with them, unlike most normal streams, brooks, or creeks. Most of the springs or seeps are surface water features that feed small drainages, where water dissipates or disappears into the geological features (i.e., the permeable limestone) of the plateau, thus there is little-to-no perennial flow associated with the springs; most all drainages are ephemeral in nature. Flows from seeps and springs is marginal, varies seasonally, and is very dependent upon the hydrologic

cycle and seasonal precipitation. (See Response to L3-C4 and L5-C3 above with regards to water features). The draft Forest Plan includes direction for protection and restoration of springs and other natural waters throughout the Forest.

L5-C11 Comment: (Sierra Club GCC)

UTILIZATION RATES: The preferred alternative would increase the utilization rate to double the past rate. Previously, the utilization rate was 20 percent. Some areas may be utilized up to 30 percent as long as the average for each pasture is no more than 20 percent. (DEA, p. 20). The new plan proposes a 30-40 percent conservative utilization rate throughout these allotments (DEA, p. 11-12).

Response / Consideration of Comment:

These utilization rates are consistent with the USDA Forest Service. 2005, *Framework for Streamlining Informal Consultation for Cattle Grazing Activities*, Southwestern Region, Albuquerque, NM. 112 pp. (as referenced in the Biological Evaluation, Gatto - 2013). The 30-40 percent utilization rate is the same rate used throughout the Kaibab National Forest and is backed by multiple research publications presented in the EA.

The Final EA [p.12-13] states: “While the proposed range of 600 to 1,000 head of livestock represents the lower and upper limits of permitted grazing, numbers can drop to as low as zero head and/or a reduced season of use if conditions require such an action. Possible rationale for dropping below 600 includes prolonged drought, large wildfires, or declining vegetative conditions.

A 30-40 percent conservative utilization rate would be used throughout these allotments. This amount of use follows the guidance of the Forest Plan, as amended. This percent utilization rate reflects the proportion of current year’s herbaceous vegetation that is consumed or destroyed by all animals (including wildlife species and insects) compared to the amount produced during the year.”

Additionally, the pastures in the Central Winter, Central Summer and Kane Allotments are in a rest rotation grazing system where one pasture is grazed each year while the other is rested, and then alternates the following year, through which the rotation allows for recovery and protection of resources. [EA, pp. 3-5, 13, 15-21, 52-55] This standard rest rotation is considered a standard Best Management Practice (BMP) and would continue under each action alternative [Final EA, p. 23]. Also see responses to L2-C1, L3-C5, and L5-C5 above.

L5-C12 Comment: (Sierra Club GCC)

Alternative 1 allows decreased numbers of livestock, from 800 head in the Central Summer Allotment to a range of 600-1000; and from 400-800 head in the Central Winter Allotment to 200-400 (Table 2, DEA p. 21). The decrease is welcome and certainly justified, but the utilization percentages should not be raised.

Response / Consideration of Comment:

See Response to L5-C11 above. As discussed on pages 19 and 20 of the EA, under Alternative 1, monitoring plays a key role. Rangeland conditions would be monitored to assess plant population stability and soil stability. Managers would adjust timing, duration, and frequency of livestock grazing in areas with declining conditions via the Annual Operating Instructions. Visual observations would be conducted annually to assess permit compliance, range readiness, and forage production.

Forage utilization would be monitored to ensure the “conservative” grazing intensity is not exceeded. Utilization is measured before the end of the growing season and is used to determine when livestock shall move to the next pasture in the rotation. Other factors that aid in rotation decisions include weather

patterns, the likelihood of plant regrowth, and previous years' utilization levels. Livestock would move to the next pasture when grazing intensity approaches a conservative level (30-40% utilization).

L5-C13 Comment: (Sierra Club GCC)

Increasing the utilization rate, potentially to double the current rate, will increase all of the direct and indirect negative effects of Alternative 1 such as reduction in ground cover and litter, increases in bare mineral soil, degradation of surface water quality, destabilization of streambanks, loss of soil productivity, etc. (DEA, p. 40). Adaptive management might be responsive to problems once they occur, but the Forest Service should not exceed the current 20 percent utilization rate. After years of managing at the lower rate, there are approximately 145,000 acres of soil that have been left in impaired or unsatisfactory condition (DEA, p. 31). The Forest Service has not provided any scientific explanation for how it can increase the utilization rate without increasing damage to soil, water, and vegetation resources. Besides, there is no demonstrated need to increase the utilization rates, since utilization has never exceeded the currently authorized use rates in Central Summer Allotment (DEA, p. 52). If the current plan can't be implemented with a utilization rate of 20 percent, then the stocking levels must be reduced more.

Response / Consideration of Comment:

See Responses to L5-C11 and L5-C12 above. Soil condition is based on the primary soil functions of soil hydrology, soil stability, and nutrient cycling [Final EA p. 30]. There are approximately 193,731 acres of soils in satisfactory condition [Final EA, p.32].

Impaired soils generally occur in pinyon-juniper woodlands, juniper-semi desert grassland transitional areas, semi desert grassland/shrublands, and in some areas affected by high severity wildfires.

Unsatisfactory soils are assigned potential capability to support grazing, but no grazing capacity is assigned to these TES map units. Hydrologic function, soil stability, and the ability of these soils to cycle nutrients are currently unsatisfactory. Similar to impaired soils, most unsatisfactory soils are located within recent wildfire scars (i.e., wildfires that have occurred within the last 20 years), in pinyon and juniper woodlands, in grasslands encroached by pinyon and juniper, and in grasslands dominated by non-native cheatgrass (*Bromus tectorum*).

With regard to the Central Summer Allotment, the EA on page 53 states: "The Central Summer pastures are too large. The idea is that the cows would spread out into small bunches. This has proven true each year. However, there are locations that would always be the most desirable and receive the highest use (Joe's Mudhole and recent burn areas). Utilization has yet to exceed the authorized use rates."

Alternative 2 or "Current Use" is 800 head of cattle, and under Alternative 1, the range would be 600-1000 head of cattle. The Final EA at page 12 states the following: "A term grazing permit would authorize cattle grazing on the Central Summer and Kane Allotments for a range of up to 600 to 1,000 head of livestock from May 15 to November 30. Upon implementation of the new Allotment Management Plan, the initial stocking would be 600 head of livestock. Once post-implementation monitoring has occurred and indicated static or increasing vegetative conditions (over a 2-5 year period), the permittee would have the option to increase livestock numbers to the upper limit of 1,000 head. In terms of the amount of vegetation, the average cow could consume for this season of use, the proposed range of numbers would reflect up to 3,900 to 6,500 Animal Unit Months (AUM's)." Also see response to L5-C11 above.

L5-C14 Comment: (Sierra Club GCC)

NOXIOUS WEEDS: The Forest Service says that Alternative 3, No Action (no grazing) would cause range conditions to improve in some areas but that conditions would not improve in areas damaged by wildfires or where invasive and noxious weeds have spread (DEA, p. 43, 45-47). There is no evidence for this. Instead, we know that continued livestock grazing threatens large portions of the landscape with new noxious weed invasions. Grazing can cause soil loss, denude ground cover, disrupt cryptobiotic soil crusts, trample native vegetation, lead to vegetation type conversions, and spread, or accelerate the spread of, noxious weeds (Arnold 1950, Eckert et al. 1986, Rosentreter 1994, Brown et al 1997, Mack 1989, Schiffman 1997, Kaltenecker and Wicklow-Howard 1999, Belsky and Gelbard 2000, Jones 2000, Brooks and Berry 2006). Livestock grazing decreases the abundance of native Arizona perennial grasses and shrubs (Fleischner 1994).

Response / Consideration of Comment:

The effects of all the alternatives to noxious weeds is addressed in the EA [Final EA, pp. 24, 46-47, 56-57, 80; p. 81 -Table 16; pp. 82-89, and 119], including grazing and no grazing alternatives. Invasive and noxious weeds are discussed on pages 24 and 46 of the Final EA. The cumulative effect of the increased risk of spread on noxious weeds on soil productivity can only be described in general terms because of the large number of unknown factors. Areas where soil disturbance includes compaction, displacement, erosion, and excessive heating are at the greatest risk of invasion by noxious weeds.

Noxious weeds populations have expanded in this area with or without livestock grazing (i.e., Grand Canyon National Park and Kanab Creek Wilderness). The Forest has not seen any difference in noxious weed expansion in grazed or non-grazed areas (Hannemann, personal communications 2013). There is enough natural bare soil in these ecosystems to allow for these weeds species to be established, with or without livestock grazing. The Forest is committed to treat, eliminate, and reduce the spread of the noxious weeds (when possible) whether livestock grazing is occurring or not.

The KNF follows Forest Plan standards and guidelines with regard to treatment of noxious or invasive weeds. The use of Appendix B “*Design Features, Best Management Practices and Mitigation Measures*” in the “*Record of Decision and Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona*” (USDA Forest Service. 2005) for specific mitigation measures.

L5-C15 Comment: (Sierra Club GCC)

The Forest Service needs to provide references to back up its statements that soils will not improve if it removes grazing from areas with cheatgrass or where fires occurred.

Response / Consideration of Comment:

See Response to L5-C14 above. EA, at page 44 states that the No Action Alternative does not address the need to control cheatgrass in the Kane Ranch Allotments as well as other Proposed Action as it does not include research on grazing as it relates to control of cheatgrass. Thus, there is a potential for the cheatgrass infestation to increase in size under the No Action alternative, further impairing soil function on affected TES map units.

L5-C16 Comment: (Sierra Club GCC)

CLIMATE CHANGE AND DROUGHT: The Forest Service does a good job of outlining the impacts of climate change on the allotments (DEA, pp. 27-28, 48-49). It is clear that the ability to provide water for livestock will be variable in the future, and that vegetation communities are changing in response to longer, warmer growing seasons.

Response / Consideration of Comment:

No response is necessary for this comment. The EA also discusses drought and vegetation on pages 12, 19, 28, 52-70, 75, and 78-82.

L5-C17 Comment: (Sierra Club GCC)

Recent droughts have rendered livestock watering systems unusable (Conley et al. 1999, DEA, p. 28), and climatic changes are limiting water availability by lowering precipitation, increasing rain-on-snow events, and changing seasonality of snowmelt (USDA 2010, p. 28). Yet, the Forest Service will continue to allow hundreds of head of livestock on the Kane Ranch Allotments. If water becomes unavailable in the middle of a grazing season, what is the contingency plan? Will taxpayers fund water delivery? Will animals be removed? Would water that livestock are consuming otherwise provide a reliable water source to wildlife?

Response / Consideration of Comment:

Following the past history of drought on these allotments, livestock numbers will be reduced or seasonally eliminated to match reduced water availability. The comment about “recent droughts have rendered livestock watering systems unusable” is a general discussion about on climate change consideration [Final EA, pp. 28-30]. The actual text reads: “Some ranchers rely on well water for livestock watering, but often ranchers use earthen tanks to capture summer monsoon rainfall runoff from snow melt (USDA 2010). During the recent droughts, earthen tanks have dried prematurely, making many pastures problematic for livestock management, even though forage was still available (Conley et al. 1999).

It is difficult to conclude whether recently observed trends or changes in ecological phenomena are the result of human influences, natural climatic variability, or other factors (USDA 2012). As documented in the U.S Climate Change Science Program Synthesis and Assessment Product 4.3 (Backlund et al. 2008), climate change is occurring and we are observing many effects on forests. A growing body of science has demonstrated that the Earth’s climate warmed rapidly during the 20th century (USDA 2010).”

Managers would adjust timing, duration, and frequency of livestock grazing in areas with declining conditions via the Annual Operating Instructions. [See Final EA, p.23]. Annual operating instructions (AOI) make adjustments to livestock numbers and time and duration of pasture use based on current and anticipated range conditions. Annual operating instructions may be adjusted throughout the grazing season as conditions change. Livestock numbers may vary annually, but would not exceed the maximum number set in this decision. The annual minimum livestock number is zero.

The AOIs may be changed to reflect new information based on applicable studies and/or field observations. If changes are suggested that fall outside the parameters of the decision resulting from this EA, they would be subject to NEPA analysis and a decision by the responsible official. The Forest Service would make the determination whether or not to undertake a new NEPA analysis at the time the recommendation is brought forward.

The permittee can haul water to these allotments, but the Forest Service (government) has no responsibility for providing or hauling water on the permittee's behalf. See responses to L3-C5, L5-C3, L5-C5, and L5-C10 above with regards to water sources and water features.

L5-C18 Comment: (Sierra Club GCC)

WILDFIRE: Livestock grazing in areas that have burned, especially in the last two to three years, should be excluded. Post-fire livestock grazing can delay recovery of burned areas and should not be permitted in burned areas until vegetation recovery has occurred (Beschta et al. 2004), if at all.

Response / Consideration of Comment:

Livestock grazing on these allotments will continue to follow National, Regional, and Forest policy for returning grazing to a burned area when range readiness has occurred. See response to L5-C17 above with regards to Annual Operating Instructions (AOI), and ability to make adjustments or change.

L5-C19 Comment: (Sierra Club GCC)

The Forest Service provides no reason why the Proposed Action would provide the “best opportunity to prevent adverse cumulative effects of fire and livestock grazing.” (DEA, p. 51) How would it be better than a no grazing alternative? There is no valid research to support the statement. It should be removed from the EA and an acknowledgement of the detrimental impacts of livestock grazing to the fire regime should be included.

Response / Consideration of Comment:

The Forest Service disagrees that the statement should be removed. This statement is stating that the proposed action is the best alternative for the cumulative effect of both fire and livestock grazing.

The whole paragraph is a discussion with regards to “cumulative fire effects” and how the last 20-years and recent low-severity high-frequency fire has helped the ecosystem: It reads as such: “Although several high severity wildfires have occurred on the North Kaibab over the last 20 years as a result of historic fire suppression and exclusion, efforts to return low and moderate severity fire to fire adapted ecosystems has been underway for several years on the North Kaibab Ranger District. When a wildfire occurs, it typically results in the burned area being rested until the herbaceous understory has recovered sufficiently to support livestock grazing and protect soil surfaces from accelerated erosion. **Through improved management of the timing, frequency, intensity, and duration of livestock grazing, the Proposed Action, when combined with fire effects, provides the best opportunity to prevent adverse cumulative effects of fire and livestock grazing.**” The statements in the EA are based on historic knowledge accumulated by fire personnel. Additionally, the statement is in reference to the management approach which is adaptive management when it comes to fire and livestock grazing. More monitoring is required and will take place under the two action alternatives when compared to the no action or no grazing alternative.

Also see discussion on Grazing Rotations under the response to L5-C2, above. [Final EA, pp. 5, 16, 52, 60-61, 80, & 85].

L5-C20 Comment: (Sierra Club GCC)

Livestock grazing increases the risk of catastrophic wildfires by promoting the spread and colonization of non-native invasive plants and a related increase in fire frequencies (Billings 1990, Billings 1994, Rosentreter 1994, Belsky and Gelbard 2000). Grazing by livestock significantly alters vegetation communities by changing both the composition and structure of upland forest areas. It also reduces

density of understory grasses that can out-compete conifer seedlings and prevent dense stands of conifer species from developing, plus it reduces native grasses that formerly carried low-intensity fires (Belsky and Blumenthal 1997). In Zion National Park, ungrazed mesas showed no increase in woody plant establishment after years without fire, while grazed plots with frequent fire had high sapling recruitment after European arrival, demonstrating that livestock grazing, not fire suppression, was causing an increase in sapling density (Madany and West 1983).

Response / Consideration of Comment:

The Forest Service reviewed these publications:

- Billings (1990) attributes changes to vegetative composition, including cheatgrass invasion in the Western Great Basin to introduction of the species by early settlers and 19th century grazing practices, which were markedly different than current grazing practices on the Kane Ranch Allotments. It is well documented that overgrazing occurred historically during the 19th and early 20th centuries throughout much of the western U.S.
- Rosentreter (1994) noted that most native species can tolerate moderate grazing utilization rates, which are consistent with Proposed Action and the USDA Forest Service. 2005. Framework for Streamlining Informal Consultation for Cattle Grazing Activities. Southwestern Region. Albuquerque, NM. 112 pp.
- Belsky and Gelbard (2000, pg. 18) noted that a number of studies have not found a decline of nonindigenous weeds when disturbances, including livestock grazing, were eliminated. Additionally, they indicated that evidence exists to support a conclusion that livestock grazing can be effective for short-term reductions in weed cover (pg. 20).
- Belsky and Blumenthal (1997) provide several references where authors have speculated that conditions conducive to ponderosa pine regeneration include (1) and adequate seed crop, (2) reduced herbaceous competition, (3) high rainfall in the spring and early summer following germination, and (4) avoidance of mortality from fire, predation, and frost heaving. All of these conditions can exist in the absence of livestock grazing, while some (such as high rainfall following germination) can exist during periods of livestock grazing.

Finally, livestock grazing has also been shown to reduce standing biomass and fine litter that contributes to wildfire, thereby reducing wildfire severity and frequency (Davies et al. 2010, Weber et al. 2011). Additionally, Weber et al. noted that grazing results in selective removal of fuels thereby avoiding the potential sterilizing effect to soils caused by high severity wildfire. The statement about Zion National Park shows that it's a combination of fire and grazing: "...while grazed plots with frequent fire had high sapling recruitment after European arrival, demonstrating that livestock grazing, not fire suppression, was causing an increase in sapling density (Madany and West 1983)" The statement says that livestock grazing, when combined with fire was causing an increase in saplings, it was not grazing alone.

L5-C21 Comment: (Sierra Club GCC)

AIR QUALITY: In the section on air quality, denuded vegetation cover is not considered as a dust source, only roads (DEA, p. 40). The Forest Service should examine the impacts of bare soils on regional air quality as well.

Response / Consideration of Comment:

Most agricultural activities (including grazing) are exempt from the Arizona Department of Environmental Quality regulations pertaining to air quality, as the majority of agricultural facilities are defined as nonpoint sources. The impacts to soils for each livestock grazing alternative is analyzed within this EA [Final EA, pp. 24-25, 31-52, 54, 57-58, 78, 82 116, 119 & 129]. Dust from bare soil is a natural

part of the environment on these allotments. Bare soils within the grazed portion of these allotments are not outside the natural range of variability.

Page 89 of the Soils and Watershed Specialist's Report clearly states that minor, localized dust from livestock management is expected to occur occasionally as a result of livestock trailing and livestock movement under dry soil conditions. Since fugitive dust resulting from livestock management will be minor and localized, it will not contribute to detectable changes in regional air quality or result in additional non-attainment areas.

L5-C22 Comment: (Sierra Club GCC)

SOILS: Approximately 105,249 acres of soils in the Kane Ranch Allotments are in impaired condition, and approximately 39,615 acres are unsatisfactory (DEA, p. 31). These conditions are partially attributed to pinyon-juniper encroachment, but tree encroachment can result from grazing (Madany and West 1983, Belsky and Blumenthal 1997). The impairment of these soils occurred and persisted during a grazing regime that only allowed a 20 percent utilization rate. That rate should not be allowed to increase unless soil conditions improve.

Response / Consideration of Comment:

See Responses to L5-C11, L5-C12, and L5-C13 above. Current grazing management on these allotments has not increased the level of pinyon-juniper. Encroachment of pinyon-juniper can be seen equally on grazed and un-grazed areas throughout this area. Pinyon-juniper treatment of encroached grassland will continue to be part of management within this area and the draft Forest Plan will carry forward this emphasis of treatment into the future.

This comment is only partially correct. Unsatisfactory and impaired soils in the Kane Ranch Allotments are partially attributed to pinyon and juniper encroachment as well as recent (i.e., within the last 20 year) high severity wildfires. While tree encroachment can result from overgrazing, which generally occurred in the late 19th and early 20th centuries, it has not been conclusively shown that conservative grazing contributes to expansion of pinyon and juniper woodlands. Additionally literature supports that other factors have altered historic fire regimes. One of these factors is changes in Native American lifestyles during the late 19th and early 20th century. It is well documented that Native Americans would purposefully set fires to control vegetation for human consumption as well as to attract wildlife through improved browse. As European settlers arrived in the region, intentional burning by Native American decreased, thereby reducing the number and frequency of intentionally ignited wildfires. The reduced fire frequency has been attributed to the increase in pinyon and juniper woodlands. It is important to understand that pinyon and juniper, once established, will persist in the absence of both wildfire and grazing, regardless of grazing frequency and intensity.

L5-C23 Comment: (Sierra Club GCC)

HABITAT FRAGMENTATION: We support alternatives to fence construction such as riders and highway signage. However, the plan includes several miles of fencing to split pastures, create corrals, and exclude livestock from sensitive areas (DEA, p. 12-19). Fencing, even when well constructed, poses habitat fragmentation and entanglement risks. Fencing to exclude livestock from water sources can also exclude wildlife from those vital places. The Forest Service should ask whether these risks are worth the small amount of monetary value obtained from livestock grazing. It is pretty clear, they are not. Rather than continue to fence off springs to exclude livestock and wildlife, wouldn't it make more sense to

exclude livestock from the entire landscape, restore springs, and allow for the native plants and animals to flourish?

Response / Consideration of Comment:

The effects of all proposed fences to wildlife are presented in the EA and Wildlife Specialist Report. Fences will be built for wildlife access, especially around water sources. See Responses to L3-C3 and L5-C8 above with regard to fencing. See responses to L3-C5, L5-C3, L5-C5, L5-C10 and L5-C17 above with regards to water sources and water features.

L5-C24 Comment: (Sierra Club GCC)

PROTECTION AND RESTORATION OF SPRINGS: Restoring 20 springs in the allotments is a step in the right direction. However, many other water sources will remain altered to support grazing. Wildlife will be fenced out of some springs so that they can be protected from livestock damage. Others will be denuded of vegetation. Water will be siphoned out of some springs and impounded in tanks where it will evaporate in the sun, rather than pooling in shady protected areas. Water volume available to wildlife will be decreased because it will be consumed by livestock. If livestock cannot be sustained without supplemental water sources, then the Forest Service should seriously consider the suitability of the landscape for this use.

Response / Consideration of Comment:

See responses to L3-C3 and L5-C8 above with regard to fencing. See responses to L3-C5, L5-C3, L5-C5, L5-C10 and L5-C17 above with regards to water sources and water features.

See response to L5-C23 with regard to wildlife. Most wildlife that need frequent water (beyond that they get from dew, succulents, and their food sources) are capable of moving long distances for water and don't necessarily need water every half mile to one mile, like livestock. So while it would be optimal to make sure each and every earthen livestock tank had adequate water after livestock got done using it, it is unnecessary for most wildlife.

In the absence of livestock waters (i.e., stock tanks), the only sources of water for wildlife in the Kane Ranch Allotments would be springs, natural lakes, and a few wildlife water sources (i.e., trick tanks). Therefore, constructed earthen stock tanks that provide water for domestic livestock (commonly called cow tanks) serve as important sources of water for a variety of wildlife species.

L5-C25 Comment: (Sierra Club GCC)

RARE PLANTS: Fickeisen pincushion cactus (Pediocactus peeblesianus fickeisenae) is a sensitive plant that is a candidate for listing on the endangered species list. It is found in the Central Winter Allotment. No grazing should be allowed in areas where this species occurs. This cactus is mentioned, but no plans to protect it are identified. That is a significant oversight in the DEA.

Response / Consideration of Comment:

Recent surveys efforts completed by the Kaibab NF in April of 2013 did not yield any known populations in the Snake Gulch (Willow Point) area where they were previously thought to exist. There are no known populations of Fickeisen plains cactus in the area at this time. As a result, the Fish and Wildlife Service is proposing to remove Unit 4 –Snake Gulch Unit from proposed critical habitat listing because this area is now considered to be unoccupied habitat (AESO/SE FWS-R2-ES-2013-0025). In addition there is no authorized livestock use within Kanab Creek wilderness (location of Unit 4-Snake Gulch Unit). [US Fish and Wildlife Service correspondence dated July 9, 2013].

The Final EA has more discussion under a new section “Rare Plants - Fickeisen pincushion cactus (*Pediocactus peeblesianus fickeisenae*).” The project is not likely to jeopardize the continued existence of Fickeisen plains cactus or adversely modify proposed critical habitat. [Final EA, p. 94].

Comments from M. Williamson, with Kane-Two Mile Ranch, Grand Canyon Trust (GC Trust) - Letter Number 6

L6-C1 Comment: (GC Trust)

II. COMMENTS: The Trust commends the USFS for its active participation in the Kane and Two Mile Research and Stewardship Partnership (“Partnership”) and its commitment to “create principles of cooperation and coordination... [to] establish a research and stewardship program on the Kane and Two Mile Ranches” that allows the development of studies “that will address management questions relevant to federal lands and wildlife on the Colorado Plateau” (Kane and Two Mile Research and Stewardship Partnership Memorandum of Understanding, 2012). The inclusion of all of the elements of the collaboratively developed experimental design and a commitment to adaptive management of the Kane allotments represents a significant step towards realizing the objectives of the Partnership and creates a strong foundation for developing and demonstrating “land management practices that sustain ecological resilience of federal lands on the Colorado Plateau” (Kane and Two Mile Research and Stewardship Partnership Memorandum of Understanding, 2012). We offer the following comments on the EA and the Preferred Alternative in the hopes that the Final Record of Decision: a) exemplifies an ongoing commitment to science- and conservation-based land management as a context for livestock grazing across the Kane Ranch; b) emphasizes the need for rigorous science, innovation, and caution in dealing with future environmental changes; c) identifies, to the extent possible, clear decision points for adaptive management in order to ensure that it is efficient, transparent, and effective; and d) recognizes the potential for additional economic and social benefits that result from a broader interpretation of the ranching economy.

Response / Consideration of Comment:

No response is necessary for this comment.

L6-C2 Comment: (GC Trust)

A. Environmental Change: The EA identifies both invasive species and ongoing climate change as key stressors facing the Kane Ranch and highlights the uncertainty both in the effects of these impacts and the management strategies necessary for addressing them. Moving beyond our disagreements about the potential results of these threats and developing the solutions necessary for addressing them requires innovation and a commitment to a rigorous approach for evaluating the results of that innovation. We enthusiastically support the inclusion of pasture scale experimental units and enclosure/exclosure pairs in the Preferred Alternative as these elements combined with rotational flexibility will provide our best opportunity for meeting these challenges. Further, the common garden experiments included in the Preferred Alternative will allow the development of new restoration approaches that leverage understanding of how climate and non-native species interact to change the foundation of the Ranch ecosystems. We encourage the USFS, however, to use these key components to allow evaluation of other species native to western North America as climate change is likely to result in changes to both species ranges and ecological niche requiring us to think both about northern Arizona’s current and future

¹ Walther et al. 2002. Ecological responses to recent climate change. *Nature*.

plant communities. Lastly, with respect to cheatgrass invasion on the Central Winter Allotment, we believe the USFS should rely on the “precautionary principle” as we develop the initial stocking plan for those pastures. Type conversion to cheatgrass seems to represent an ecological threshold that is difficult (if not impossible) to reverse. As we work together to answer questions related to the relationship between livestock grazing and cheatgrass, we encourage the USFS to be extremely conservative in its plans for livestock on Central Winter. Not only does this allow time for the necessary experiments to be completed, it also allows time for repair of the water infrastructure that is critical to any/all successful livestock management within that portion of the Ranch. With this minor change we feel the Preferred Alternative provides the most robust mechanism for dealing with uncertainty and disagreement about the effects of climate change and invasive species and provides a clear path to developing the solutions necessary for dealing with both.

Response / Consideration of Comment:

The Forest Service agrees, the Final EA will include native Western plants to the common gardens. The Forest Service is committed to this range research within this area and look forward to gaining additional information that will lead us to the best livestock management practices for the Central Winter Allotment. We are committed to working with you on these projects.

Climate Change Conditions are considered and discussed in the EA [Final EA, pp. 28-30, 49-50, 57, 64, & 78-79]. Monitoring and Adaptive Management will be utilized to make adjustments and determine the appropriate scale of livestock grazing as the Allotment Management Plan is implemented in the future. [See responses to L1-C2, L3-C2, L4-C3, L5-C1, and L6-C5 regarding adaptive management.]

L6-C3 Comment: (GC Trust)

*B. Adaptive Management: Related to the above discussion of environmental change is the crucial role of adaptive management in the ecological and economic sustainability of the Ranch operation. Adaptive management, whereby uncertainty is addressed by testing alternative management approaches and evaluating monitoring data in the context of clearly identified decision points (or thresholds), provides a transparent mechanism for land management decision-making and allows for more efficient monitoring by identifying the data most critical to decision-making. The Preferred Alternative contains several excellent examples of this in defining how decisions regarding AZ Highway 67 fencing will be approached, dealing with livestock in the meadows along that highway, and defining success of mitigation measures for avoiding impacts to *Pediocactus paradenei*. The Preferred Alternative also specifies that stocking rates lower than those specified in the Preferred Alternative may be necessary; however, it does not describe how the decisions related to those rates will be made. Identification of the decision points related to lower stocking rates would provide greater certainty that negative ecological and operation impacts could be provided and allow the Partnership to develop monitoring strategies specifically tailored to those decision points. Further, given the limited spatial resolution of utilization assessments and the need to account for both intra- and inter-annual variability in a changing climate we encourage the USFS to work with the Partnership to develop a broader suite of metrics for assessing when stocking rates need to be adjusted. Through its ability to leverage resources and combine efforts, the Partnership provides an opportunity to develop a monitoring program that is both implementable and clearly tied to management decisions and we encourage the USFS to take advantage of this opportunity by including additional metrics that we can work together to define and measure. The inclusion of these items would further reduce the likelihood of negative ecological effects occurring under the Preferred Alternative.*

Response / Consideration of Comment:

The Forest Service believes that working out these finer details, as we gain better information through monitoring, is the best way to accomplish our joint adaptive management and ranch management goals. The Forest Service is committed to working out these details, for the best possible resources results.

See responses to L3-C3 and L5-C8 above with regard to fencing.

See responses to L3-C5, L5-C3, L5-C5, L5-C10, L5-C17, L5-C23 and L5-C24 above with regards to water sources and water features.

Monitoring and Adaptive Management will be utilized to make adjustments and determine the appropriate scale of livestock grazing as the Allotment Management Plan is implemented in the future. [See responses to L1-C2, L3-C2, L4-C3, L5-C1, and L6-C5 regarding adaptive management.]

L6-C4 Comment: (GC Trust)

C Diversifying the Ranching Economy: The economics effects analysis of the various alternatives rests primarily on assumptions about the cattle market, costs associated with a typical ranching operation, and the jobs produced by such an operation. This analysis neglects a number of additional economic and social benefits provided by the Preferred Alternative and the Partnership. Developing the necessary infrastructure for the common gardens and enclosure/exclosure pairs will require significant investments in infrastructure on the Ranches, investments that are likely to be made in local communities. Further, the costs of these improvements will be borne by a much broader range of participants reducing the costs to the ranch operation. In addition, operating the various experiments will result in an increased investment in labor and creates an additional income stream for the Ranches that is independent of the highly volatile cattle market, creating stability for the Ranch operation. Lastly, through the use of the experimental infrastructure we have an opportunity to develop ecosystem service markets that can benefit livestock producers across the Colorado Plateau providing economic, ecological, and social benefits. The engagement of the USFS and other partners in the Partnership also creates numerous volunteer opportunities that allow a broad cross-section of the public to experience and appreciate their public lands while being active participants in their stewardship. In our estimation a broader investigation of the economic impacts of the various alternatives results in the Preferred Alternative being the most economically beneficial as it creates the broadest suite of economic opportunities for the Ranch.

Response / Consideration of Comment:

The Forest Service analyzed the economic effects of Alternative 1 as it relates to the improvements and monitoring. The economic report has been supplemented to add the additional experimental and monitoring aspects directly related to the management not covered in the draft version. The costs of research structural improvements are included in the economic analysis. [EA, pp. 100-102.]

According to the EA, “Ecosystem Management, Effects, and Sustainability” all include economic factors [As defined in Final EA, pp. 126 and 129]. Monitoring and Adaptive Management will be utilized to make adjustments and determine the appropriate scale of livestock grazing as the Allotment Management Plan is implemented in the future. [See responses to L1-C2, L3-C2, L4-C3, L5-C1, and L6-C5 regarding adaptive management.]

L6-C5 Comment: (GC Trust)

III. CONCLUSION: We believe that the Kane and Two Mile Research and Stewardship Partnership creates an exciting opportunity to achieve large-scale forest restoration, reduce the impacts of non-native

species invasion, and improve wildlife habitat across the Kaibab Plateau. We are seeking an approach that allows for rigorous science, collaborative monitoring, and mutually defined decision points to provide the mechanism for determining the appropriate scale of livestock grazing across the Kane Ranch. We believe that the Preferred Alternative (with modifications suggested here), in conjunction with the research plan and experimental infrastructure, provides a strong foundation for achieving these goals. We intend to be a lasting participant in the conservation of this amazing landscape both as a conservation organization and livestock permittee and look forward to working with you to build on the foundation set out in the Preferred Alternative.

Response / Consideration of Comment:

The Forest Service also looks forward to continuing working with the GCT on the management of these allotments and continued research. [See responses to L6-C2 through L6-C5 above].

Comments from R. Erman, with the Friends of Anderson Mesa (FOAM) - Letter Number 7

L7-C1 Comment: (FOAM)

It there must be domestic livestock on the “North Side” we whole-heartedly support the installation / construction of large exclosures as well as minimal fence construction.

Response / Consideration of Comment:

No response necessary for this comment.

L7-C2 Comment: (FOAM)

After detailed review the information provided in the DEA we could not find any justification or rationalization to the need for the proposed activity.

Response / Consideration of Comment:

The Forest Service is a multiple-use agency in which livestock grazing is part of this use. See responses to L1-C1 and L1-C3 above with regard to the Purpose and Need and Goals of the Project, and see response to L5-C2 above. The need is very basic in that permit renewals for grazing permits should be evaluated under NEPA approximately every ten (10) years (Final EA, p. 5). Forest Plan consistency (i.e., applicable standards and guidelines) are referenced and the “purpose and need” are also stated on page 5 of the EA; the “Decision Framework” is presented on page 10 of the EA. Justification or rationalization for the chosen alternative by the responsible official will be presented in the Decision Notice.

L7-C3 Comment: (FOAM)

There was nothing to an ecological need, where grazing by non native species were a net benefit to the ecosystems of the NKRD.

Response / Consideration of Comment:

The Forest Service is a multiple-use agency in which livestock grazing is part of this use. The “No Grazing Alternative” is a fully analyzed alternative and can be selected by the deciding official. See responses to L5-C2 and L5-C4 above with regards to the Forest Plan. As an example, the EA at page 91 states how Alternative 1 allotment improvements can benefit wildlife.

L7-C4 Comment: (FOAM)

There was nothing to a legally mandated need, Congress does not require that a specific number of AUM's be assigned to a specific area of land. It does through the Taylor Grazing Act and MUSY say "make available" but no where do they proclaim how many AUM's or for how long.

Response / Consideration of Comment:

The Forest Service analyzed the effects of grazing the number of livestock for each alternative. The effects of grazing are analyzed in the EA. See Responses to L1-C2 and L5-C5 above with regard to the Taylor Grazing Act, MUSY, and AUMs. [See EA pp. 5 and 9; 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)]. Page 5 of the EA states: "Federal regulation (36 CFR 222.2 (c)) which states that National Forest System lands would be allocated for cattle grazing and allotment management plans (AMP) would be prepared consistent with land management plans, and the Clean Water Act of 1948, the Endangered Species Act of 1973, and 13186 (Conservation of Migratory Birds), National Historic Preservation Act 1966, and the Clean Air Act of 1970, as amended. A brief discussion of applicable Regulations and Forest Service Policies has been added to the EA (Final EA, pp. 8-9).

L7-C5 Comment: (FOAM)

There was nothing to an economic need such as red meat production as seen in WW I & WW II. Nor the necessity for revenue for the local communities or state. Factually we know that given the current AUM fee and the cost to administer an AUM, there is a net loss of \$9.97 / AUM.

Response / Consideration of Comment:

This comment is outside the scope of this decision. See responses to L5-C3, L5-C5, and L6-C4 with regards to discussion on economic analysis.

L7-C6 Comment: (FOAM)

Those combined with review of the supporting documentation we could find, of the alternatives presented, we can only support alternative # 3.

Rational

- *Alternative # 1 we cannot support even though it has a number of interesting and potentially beneficial aspects such as the large exclosures, the problem we find is the mandated to a minimal stocking levels without any specificity to what thresholds must be meet to reduce numbers, rather left in the ambiguous process of Adaptive Management confined to the KNF and the Permittee. Further it must be pointed out that this Permittee has made it abundantly clear that they are most willing to pay a reasonable fee to the FS each year for this area to be ungrazed. It is our understanding this idea has been rejected by the FS and there must be a minimal stocking rate each year, and yet we find no justification for that position other than the FS justify the political fall-out from such a decision.*

It would appear to be a win-win solution for any allotment to be in Non-Use and still generating revenue without any or minimal costs, in light of NFMA & ESA to provide long-term sustainability.

Response / Consideration of Comment:

The "No Grazing Alternative" is a fully analyzed alternative and can be selected by the deciding official. Adaptive management in Alternative 1 will use monitoring to insure the long term health of the grazing resources into the future.

According to the EA, "Ecosystem Management, Effects, and Sustainability" all include economic factors [Final EA, pp. 126 and 129]. Monitoring and Adaptive Management will be utilized to make adjustments and determine the appropriate scale of livestock grazing as the Allotment Management Plan is

implemented in the future. [See responses to L1-C2, L3-C2, L4-C3, L5-C1, and L6-C5 regarding adaptive management.]

See discussion on Grazing Rotations under the response to L5-C2 and L5-C19, above. [EA., pp. 5, 16, 52, 60-61, 80 and 85]. Also see response to L7-C4 above regarding applicable laws, rules and regulations.

L7-C7-A Comment: (FOAM)

Alternative # 2 is the current management, which by admission does not meet the direction of the current Forest Plan.

We favored the alternative briefly described on page 24, Reduction in Cattle Numbers and Utilization Alternative put forward early in the process, but was dropped for what we feel are two very misleading arguments.

First, noted by the KNF is RMRS GTR – 169 2006, D.G. Milchunas. It is very disingenuous for the KNF to point to this document as rationalization to continue livestock use of any habitat type at what are presented by Holechek & Galt as “conservative” levels of use – 31 to 40% of annual production has little or no difference that non to light use 0 to 30%.

- *Factually the NKRD or the KNF or the Regional Office cannot produce one scientific paper specific to the ecosystems of the KNF which documents the impacts of herbivore by cows which are non-native species on / to the ecosystems or their key elements.*
- *The study by Holechek & Galt was conducted on ecosystems not found on the NKRD or the KNF. It is important to point out that this study and the associated recommendations are from, AND most importantly the authors state FOR the habitat types of those studies.*

These studies were conducted in New Mexico and Colorado. These habitat types are not found on the Kaibab National Forest. Given these ecosystems are not found on the area of consideration for this project the suggested values are invalid. Further it is unethical for managers to take findings which have been turned into suggestions of management from one ecosystem and put them onto another.

- *Milchunas is very clear in GTR – 169 within each of the specific habitat discussions to;*
 - *The limited number of studies to draw good conclusions.*
 - *The scope of those studies; they are not holistic in considering the total impacts of livestock grazing such as erosion, effects on wildlife, insects and fire.*
 - *A common statement in the various habitat discussions, this example is quoted from the Mixed Conifer Forest page 12 “No solid conclusions should be attempted concerning the effects of grazing on mixed conifer forests of the southwest based only on a single ungrazed/grazed comparison.”*
 - *Page 99 in the Conclusion ,,,, “From a conservative stand point ... there are places where grazing by livestock should be encouraged in the absence of a native grazer and other places where livestock grazing should be discouraged or at least cautiously managed because similar grazers were not present historically.”*

Clearly the “take-away” from Milchunas is if, if the FS has sufficient reason and site specific science to conduct livestock grazing on any given area, and that area such as the National Forests of R-3 which did not have a heavy bodied herbivore – Pre Settlement, then such use should be conducted in a very conservative manner. Here the term Conservative from Holechek & Galt to a utilization level not to exceed 30%.

Response / Consideration of Comment:

The Forest Service believes that Alternative 2 does meet the current Forest Plan, however logistics with moving livestock between summer and winter ranges is a challenge and very costly to the permittee. The effects of livestock grazing for each alternative (including utilization rate) have been analyzed within this EA and specialist reports. See Responses to L5-C11 through L5-C13, and L6-C3 above. The utilization

studies that you document here have not been done on the Kaibab National Forest, but are general grazing guidelines that range managers have been following in Northern Arizona for many years. The 30-40% utilization rate has been analyzed in many NEPA documents on the Kaibab and Coconino National Forest throughout the 20+ years and has always been found to leave adequate residual vegetation for natural processes and wildlife (Hannemann, personal communications, 2013).

This utilization rates are standard conservative rates found within many professional range management texts, including The Rangeland Analysis and Management Training Guide for the Southwest Region of the Forest Service. The Forest Service believes we have enough knowledge of the area and effects of grazing to conduct a proper analysis of the alternatives without a scientific published research that are claimed by the commenter. However, the Forest Service is committed to grazing research that is provided by the proposed alternative that will guide livestock management into the future, if this alternative is selected.

L7-C7-B Comment: (FOAM)

The second point put forward in the DEA sights a number of court decisions, the KNF offering the summary; “Because reduced cattle numbers/utilization alternative would result in similar environmental effects as that of the Proposed Action.”

Factually the KNF nor R-3 nor the FS per say, has any site specific scientific research which supports the statement. Indeed if the KNF has such science from the area of consideration of this project or if the KNF has such science for any of the lands under its administration we would love to get a copy and study it.

Further, sadly we must say that we are not too sure the statement presented in the DEA is totally accurate and valid. Given our involvement for the past 30 plus years with the Agency at times has shown the propensity of “cherry picking” bits and pieces of information or data that “fit” the goal of the project and once detailed analysis is completed found not to be 100% correct. As noted above with Milchunas & Holechek et al. We would need legal counsel to advise us to the validity and scope of the court findings then to understand how those applied to this proposed project.

Response / Consideration of Comment:

The Forest Service has conducted several range analysis studies in Northern Arizona and have come up with the same conclusions.

See responses to L1-C1 and L1-C3 above with regard to the Purpose and Need and Goals of the Project.

See responses to L7-C13 below with regard to site specific scientific data utilized in the analysis as presented in the EA.

L7-C8 Comment: (FOAM)

It was refreshing for the EA to go into detail on the topic of drought in the Climate section pages 27 & 28.

After reading this section the KNF presents the current status of moderate to severe drought conditions as formulated by NOAA – the Drought Monitor, a statement which is factual. In reviewing a second time page 11, last sentence in the last full paragraph, “Possible rationale for dropping below 600 (head) includes prolonged drought, ...”

Noting from NOAA and the Drought Monitor the southwest, including Arizona has been in drought for the past 17 years. So long and so bad this drought it has been given a name, The Early 21st Century Drought. No where in the EA or the current forest plan or the published draft forest plan and its EIS

can we find the official FS definition for “prolonged drought”, if 17 years is not long enough, what is ? We ask the KNF to please define how many years of drought there must be to be considered prolonged.

Response / Consideration of Comment:

The Forest Service follows rainfall and forage production throughout the year and makes adjustments with our permittees when necessary to match livestock numbers with forage production. Our records of use throughout the years following drought patterns follow this. National Oceanic and Atmospheric Administration’s (NOAA’s) 12 month Standard Precipitation Index is also used to key in to drought conditions are a more broad scale. More information on this subject is available at the NOAA website: <http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/spi.html>

The Final EA on page 28 states: “Two drought models that are available for this area include the Standardized Precipitation Index (SPI) and the Palmer Drought Severity Index (PDSI). The latest 12-month SPI through the end of March 2013 shows all of the regions mapped near the Kane Ranch Allotments to be in near normal conditions. The PDSI long term meteorological conditions dated April 20, 2013 show the area surrounding the Kane Ranch Allotments to be in a severe drought. Drought monitoring data and forecasts are always changing and are useful tools for assessing short term and long-term forecasts.”

L7-C9 Comment: (FOAM)

In order to factual interact with the FS on its various projects including the current efforts on Forest Planning we have been compiling and analyzing historical precipitation records for all the reporting stations on or closely adjacent to the NF’s of AZ. That data is from the Western Regional Climate Center - <http://www.wrcc.dri.edu/summary/azF.html> . On page 27 of the DEA, the first sentence of the 4th paragraph, the reader is told that Jacob Lake and Fredonia information on Temps and Precip have been gathered for over 100 years.

Sadly this statement is not factual.

- *The Jacob Lake Coop was opened in 1916 however complete annual month by month precip records were only recorded from 1963 through 1973 and again in 1982 through 1986. Noting;*
 - *The Mean Precip for this station was 22.02 inches*
 - *the current drought started in 1996.*
- *The Fredonia Coop was opened in 1906 however complete annual month by month precip records were only from 1937 through 1974. Noting the current drought started in 1996.*
- *The Kanab Station started recording in 1912, has a very good / complete record set and thankfully is still active today.*
 - *The Mean for this station is 13.42 inches*

Factually and sadly the only accredited precip station is the Kanab Station and thus its impossible to know what the precip value is for most of the NDRD.

Response / Consideration of Comment:

The Forest Service has changed the wording with regards to the 100 years of records to read as follows:

“Temperature and precipitation data/records are available for the Kaibab Plateau and adjacent areas are available through the Western Regional Climate Center (WRCC). Climate data sets that are available through the WRCC vary in location and time-duration, and include such locations as Jump Up Springs (1906), Big Springs (1931-1948), , House Rock (1948-1958), **Jacob Lake** (1948-current), the Ryan Station (1952-1955) located at the bottom of Warm Springs Canyon, Buffalo Ranch (1959-1962), Grand Canyon National Park (1957-current) for north rim area, and **Fredonia, Arizona** (1948-current). The objective of the WRCC is to provide the best quality climate data and information possible. Information presented on the WRCC web site is derived from data received from the National Climatic Data Center, the National Weather Service, the Natural Resources Conservation Service, the Bureau of Land Management, the U.S. Forest

Service, and other federal, state and local agencies. The presentation of this data does not prequalify its accuracy or the fact there may be certain data gaps, however, it is the best available data reflecting changes in climatic conditions for approximately the last 60 years or so.”

Consideration to changing climate conditions are discussed on pages 27-29, 49-50, and 78-79 of the Final EA. Annual temperature and precipitation summaries for the stations near Fredonia and Jacob Lake, Arizona are included in the Soil and Watershed Specialist Report (2013).

L7-C10 Comment: (FOAM)

In the section dealing with soils;

- *Page 30 we learn that total acres for this project are 435,800*
- *Page 31 we learn that only 193,731 acres – 44% are considered satisfactory condition*
- *Page 31 and 32 we learn that 241,269 acres – 55% are considered; impaired, unsatisfactory or unstable.*
- *Page 32 we learn that only 78,600 acres 18% have slight erosion hazard rating and 356,900 acres - 82% are rated at moderate and severe*

The KNF must supply the scientific justification for any livestock grazing on those soils found to be impaired and unsatisfactory. Also it must supply the science to justify grazing on those soils rated at having a moderate and severe hazard erosion rating.

Response / Consideration of Comment:

The Forest Service follows the protocols set by Forest and Regional soils and range professionals. These professionals believe that the protocols used in this analysis are a conservative and proper use of forage resources in Northern Arizona.

Chapter 1 of the EA (Introduction, page 1) discusses the layout of the EA chapter-by-chapter and states that the EA discloses the direct, indirect, and cumulative environmental impacts that would result from implementing the Proposed Action or an alternative. The document is organized into five chapters and includes a glossary, references, and appendices. The Introduction concludes with following: “Additional documentation, including specialist reports, correspondence, and public comments and responses, may be found in the Project Record Document located at the North Kaibab Ranger District in Fredonia, Arizona.”

Additionally, Chapter 3 of the EA [Final EA. p. 27] leads in with the following explanation of the analysis:

“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.

Both a project record index and the Final Specialist Reports will be available upon publication of the Final EA and Draft DN-FONSI.

Kit MacDonald, Soils Scientist, Kaibab NF completed a “Soil and Watershed Specialist Report 2013” and the summarization of the analysis is presented throughout the EA. Soils were analyzed as part of the “Soils, Watershed, Water Quality, and Air Resources” analysis section within the EA. [EA., pp. 29-50]. The methodology and analysis is discussed in detail and is based on a site specific data or analyses report. Page 29 of the EA gives very specific details with regard to the scientific data and information utilized in the analysis and states the following:

“Analyses for environmental consequences to soils and watershed resources that may result from implementation of each alternative were conducted using information contained in the Terrestrial Ecosystem Survey (TES) of the Kaibab National Forest (Brewer et al. 1991), the Watershed Condition Framework, the Kaibab National Forest Land Management Plan, as amended (1988), information obtained from other KNF resource specialists, other agency reports, available literature,

and input from KNF collaborators and cooperators. Geospatial analysis was used to quantitatively and qualitatively assess soils and watershed conditions using Geographic Information Systems (GIS) data obtained from a variety of sources. [Final EA., p. 30].

Soils of the KNF were mapped as part of the TES of the Kaibab National Forest. The TES is the result of the systematic analysis, mapping, classification and interpretation of terrestrial ecosystems, also known as terrestrial ecological units (TEU) that are delineated and numbered. A TES represents the combined influences of climate, soil and vegetation, and correlates these factors with soil temperature and moisture along an environmental gradient. It is an integrated survey and hierarchical with respect to classification levels and mapping intensities. It is the only seamless mapping of vegetation and soils available across the KNF that includes field visited, validated and correlated sites with a stringent Regional and National protocol stemming from decades of work. Field surveys for the Kaibab TES were completed from 1979 through 1986. Map units are identified by numbers ranging from 3 to 683. One hundred and thirty-two major soil types have been mapped and described and management interpretations developed on the KNF....
 The TES follows National Cooperative Soil Survey Standards similar to Soil Surveys conducted by the Natural Resource Conservation Service (NRCS). There has therefore been strict quality assurance, including Project Leader field reviews, Regional Office reviews, and annual progressive and final field reviews to approve map unit design and mapping.

The TES is used to evaluate and adjust land uses to the limitations and potentials of natural resources and the environment. It presents important properties pertaining to the natural, physical, and behavioral characteristics of the terrestrial ecosystems and provides the background for making interpretations. Interpretations based upon TES incorporate 1) soil physical and chemical properties, 2) climatic considerations, 3) **topographic position and slope**, 4) vegetation and anthropogenic influences **as well as animal impacts**, 5) productive and successional potentials, and 6) geologic influences.

Soil condition is based on the primary soil functions of soil hydrology, soil stability, and nutrient cycling.”

L7-C11 Comment: (FOAM)

Also not found is any reference to;

- *The delineation of acres of the project area capability related to slope. Historically the Region has sighted work of Holechek and others which speaks directly to this question is found in the text book, Range Management – Principles and Practices, Holechek, Piper & Herbel, the 5th edition, page 239, Table 8.10. In table 8.10 we learn;*

<i>Percent Slope</i>	<i>Percent Reduction in Grazing Capacity</i>
<i>0-10</i>	<i>none</i>
<i>11-30</i>	<i>30 %</i>
<i>31-60</i>	<i>60 %</i>
<i>over 60</i>	<i>100 %</i>

The KNF must provide the public the number of acres for this project defined as capable to support domestic livestock by the percent slope.

Response / Consideration of Comment:

The Forest Service did not sure this table (i.e., table 8.10 as presented by the commenter) in this analysis, nor are we required to use it. Capacity is primarily set with historical and current stocking the allotment and monitoring how the livestock use the area. The definition of “Grazing Capacity” includes “No Capacity” area or slopes over 40% grade, which are considered as lands not capable of being grazed by

domestic cattle under reasonable management goals, and are areas that were not used in the capacity estimates in this analysis. [See Grazing Capacity definition - EA, pp. 125] Examples include areas where slopes are over 40 percent, where forage production is less than 100 pounds per acre, and in the wetlands.

Slope is accounted for in the EA and the analysis. See “Table 5 - Predicted Soil Erosion Hazard by TEU within the Kane Ranch Allotments.” [Final EA., pp. 34-35].

L7-C12 Comment: (FOAM)

Given the popularity of Holechek and his cohorts, we find it most interesting and a very diplomocous that other important works authored by this group are not part of the FSH, each Forest Plan as well as presented by the Agency on projects like this that have soil and plant issues.

Another important aspect of livestock grazing capability according to the Range Management text book oft sighted is found on page 239 in Table 8.9 Distance from Water.

<i>Distance From Water</i>	
Miles	% Reduction in Capacity
0 - 1	None
1 - 2	50%
2	100% - Ungrazable

We request the KNF show the acres deemed capable of supporting domestic livestock based on the criteria put forward by Holechek et al.

Response / Consideration of Comment:

Holechek is referenced in the EA with regard to “Reduction in Cattle Number and Utilization Alternatives.” [Final EA, p. 25]. Holechek is also a standard reference in “*FSH 2209.13 – Grazing Permit Administration Handbook, Chapter 90 – Rangeland Management Decisionmaking*” (See response to L7-C14 below). Carrying capacity is defined in the EA under the “Glossary” section on page 124. Watershed and water resources are thoroughly summarized in the Final EA (pp. 37-41).

The Forest Service did not sure this table (i.e., Table 8.9 from *Range Management – Principles and Practices, Holechek, Piper & Herbel, the 5th edition, page 239*) in this analysis, nor are we required to use it. Capacity is primarily set with historical and current stocking the allotment and monitoring how the livestock use the area. Water is not a limiting factor for most of the year on the summer pastures after the start of the monsoon season, when puddles are found throughout this area. The winter pastures can be limited by water, but capacities have been set as maximums, and additional research will determine how these pastures will be grazed in the future. Currently a 30-40 percent conservative utilization rate would be used throughout these allotments. This amount of use follows the guidance of the Kaibab National Forest Plan, as amended. This percent utilization rate reflects the proportion of current year’s herbaceous vegetation that is consumed or destroyed by all animals (including wildlife species and insects) compared to the amount produced during the year.

The Forest Service fails to understand how publications by Holechek and others, Forest Service Handbooks, and Forest Plans relate to a herbivorous dinosaur of the Jurassic period (i.e., the commenter’s use of the word “diplomocous.”)

Table 4 (copy as displayed below) of the Kaibab National Forest Land Management Plan (Forest Plan) presents the “Average Annual Grazing Capacity and Intensity of Range Management” [Forest Plan., pp. 10, and 142-145] for the Kaibab National Forest.

Grazing Capacity	Intensity of Range Management (Full Capacity Acres)				
	R1	R2	R3	R4	R5
71,000 AUM	4,719	0	648,220	137,761	0
R1 through R5 are levels of livestock grazing management. They are defined in the Glossary.					

Per Forest Plan direction, the EA analysis breaks this discussion out further by Geographic Areas [EA, p. 5], and states the following:

“This project is consistent with the direction listed in the Forest-wide standards and guidelines, and in the standards and guidelines for Land Management Planning Areas GAs 11, 12, 13, 16 and 19, otherwise referred to as Geographic Areas (GAs) (Forest Plan – pp. 38-48, pp. 62-87, and pp. 97-104), which encompasses the Kane Ranch Allotments.”

Additionally, Table 11 of the Forest Plan displays the estimated supply and projected use of selected outputs (including “Grazing Capacity” and “Permitted Grazing Use”) from the Kaibab National Forest. These supply and use estimates were analyzed during the development of the Forest Plan so as to predict and schedule necessary investments, resolve issues, and eliminate or minimize conflicts.

The Draft Forest Plan revision defers to “Adaptive Management” as a management tool/approach to be used in the Forest’s rangeland management projects by using monitoring to adjust management to maintain and improve the rangeland resources. In general, the Kaibab NF will continue to keep grazing at conservative use levels (30 to 40 percent). This grazing intensity, based on percent use of forage by weight, should provide for plant integrity, density, diversity, and regeneration over time.

L7-C13 Comment: (FOAM)

Setting aside the fact that the studies sighted are not of the ecosystems / habitat types for the area of this consideration, how is it that the FS assigns validity for domestic livestock grazing in just a few selected studies from a group of well known Range Experts and yet ignore other studies that are just as important and are linked together by the authors to present a holistic approach to livestock management?

Response / Consideration of Comment:

The Forest Service has conducted numerous range assessments throughout Northern Arizona in the last 20 years and has found in every case that type of grazing found in the presented alternatives meet Forest Service rangeland management guidelines and Forest Plan direction.

Site specific data from previous plots and studies is available for most all the allotments on the NKRD. Condition of these plots will be monitored for watershed and vegetative condition and trend monitoring would determine the effectiveness of the allotment management plan, and long-term range and watershed trends. Chapter 4 of the EA discusses monitoring (See response to L3-C2 above), including long-term trend monitoring at the historic Parker Three-Step plot locations on most allotments every 5 to 10 years, or as funding becomes available. Parker Three-Step and paced transect monitoring points were established in the 1950’s. Transect data from these monitoring points is the best historic records of range condition and trend available. The photo points and vegetative ground cover data show how the site has changed over time. Pace-frequency and ground cover transects were established on top of the Parker Three-Step transects in 2010-2012 to supplement this historic data. Frequency and ground cover data were collected using the widely accepted plant frequency method (Ruyle 1997). These plots monitor trends in species abundance, composition, and ground cover. This would provide information on plant composition and additional information on plant community dynamics. [EA, pp. 199-121].

Monitoring data at the Parker Three-Step plots currently includes frequency, canopy cover, dry-weight rank, comparative yield, repeat photography, and ground cover to estimate trend. Plant frequency, ground cover, canopy cover, and repeat photography is used to assess rangeland trend; dry-weight rank is used to estimate relative species composition by weight; and comparative yield is used to estimate forage

production. Vegetation plots are discussed mainly within the “Vegetation” section of the EA [EA. pp. 19-20, 30, 60, 64-80, and 84-89].

Each resource specialist has completed a report which summarizes their analysis of the proposed actions and alternative thereto. See EA, Reference section and project record.

L7-C14 Comment: (FOAM)

The text book, Range Management – Principals and Practices, our most current copy being the 5th edition, copyright of 2004 has 603 pages, and in all of that text only uses one small piece which speaks to Grazing Intensities. The rest apparently is invalid or hampers the agenda of the FS to use what ever means possible to maximize livestock use even when the land cannot support that use.

Response / Consideration of Comment:

The Forest Service followed the established protocols (including FSH 2209.13 – Grazing Permit Administration Handbook, Chapter 90 – Rangeland Management Decisionmaking) for grazing intensities in the EA analysis, including the reference /text book referred to by the commenter. This reference includes the support of grazing utilization of 30-40 percent.

FSH 2209.13 defines Grazing Intensity as follows:

Grazing Intensity is discussed by Holechek (Reference 1 below):

- 1) Grazing Intensity is the degree of herbage removed through grazing and trampling by livestock. Grazing intensity may be described in terms herbage removed during the grazing and/or growing period or as a utilization level at the end of the growing period.
 - Light- Only choice plants are used. There is no use of poor forage plants. The range appears practically undisturbed.
 - Moderate- About ½ of the good and fair forage value plants are used. There is little evidence of livestock trailing and most of the accessible range shows some use.
 - Heavy- Range has a clipped or mowed appearance. Over half of the fair and poor value forage plants are used. All accessible parts of the range show use and key areas are closely cropped. They may appear stripped if grazing is very severe and there is evidence of livestock trailing to forage.

The above descriptions, may be especially helpful when reviewing grazing during the growing season.

Additional qualitative assessment of grazing intensity can be determined using the Landscape Appearance Method. It can be found in the Interagency Technical Reference 1734-3 Utilization Studies and Residual Measurements. Page 119.

Grazing Intensity as depicted as a utilization level at the end of the growing season as discussed by Holechek, (Reference 2 below):

Light to non-use	0-30 percent
Conservative	31-40 percent
Moderate	41-50 percent
Heavy	51-60 percent
Severe	61+ percent

References: (1) Holechek, Jerry L., Rex D. Pieper, and Carlton H. Herbel. 2004. Range Management, Principles & Practices. Prentice Hall, page 248.

(2) Holechek, Jerry L. and Dee Galt. 2000. Grazing Intensity Guidelines. Rangelands 22(3): 11-14.

An additional qualitative grazing assessment and planning tool is the Grazing Response Index (GRI). Reed Floyd, Roy Roath, and Dave Bradford. 1999. The Grazing Response Index: A Simple and Effective Method to Evaluate Grazing Impacts. Rangelands 21(4): 3-6.

Grazing intensity as it relates to carrying capacity, adaptive management, and monitoring during implementation is discussed in the EA [Final EA, pp. 16, 20-21, 25, 27, 119, and 124-125]. Vegetation, including the analysis process, for the allotments is presented and discussed in the EA in detail [Final EA, pp. 65-80].

L7-C15 Comment: (FOAM)

We want to thank the KNF & District for providing us the opportunity to provide our comments. We look forward to the timely delivery of the information requested, (again) so we can fully participate in this public process. Please include our group to participate in the project as it moves forward.

Response / Consideration of Comment:

Your organization has been added to the project's standard mailing and notification list, thus the Forest Service will keep you inform of progress as this project moves forward. The Forest Service response or consideration of comments (herein) and as posted in the Final Environmental Assessment for the Kane Ranch Allotment Management Plan and Decision Notice will facilitate delivery of any information requested.

END OF RESPONSES / COSIDERATION OF COMMENTS