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Environmental Assessment for Juan Tank Allotment

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

Cover photo: Monitoring plot on the Juan Tank Allotment Kaibab National Forest (USDA 2012).

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Introduction and Background

The Williams Ranger District of the Kaibab National Forest is proposing to re-authorize cattle grazing on the Juan Tank Allotment. The Juan Tank Allotment is entirely within Coconino County northwest of Williams, Arizona (Figure 1). The Allotment is located within all or portions of: T23N, R1W, Section 36; T22N, R1W, Sections 1, 12, 15 and 24; T22N, R1E, Sections 1-19, 22-26, 35-36; T22N, R2E, Sections 7, 17-21, and 30; T21N, R1E, Sections 1-2.

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 of and need for the project, and the Agency's proposal for achieving that purpose and need. This section also details how the Forest Service involved the public in developing the proposal.

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 need 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 environmental assessment.

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

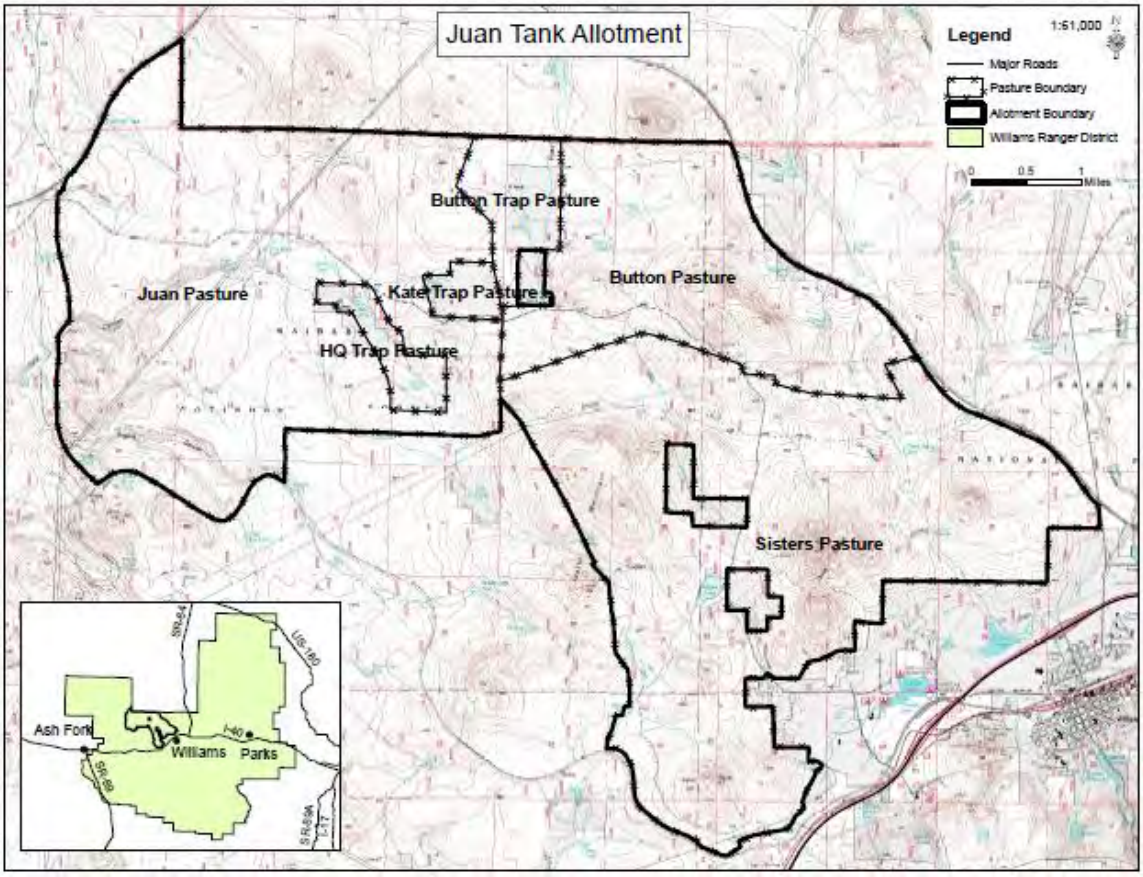

Figure 1. Vicinity map of the Juan Tank Allotment.

Historical records indicate that the allotment was grazed by both cattle and sheep until the early 1940s. Since 1945 the allotment has been grazed by cattle only. The area has likely been grazed by domestic livestock since the late 19th century or early 20th century. Prior to 1974 the area consisted of two separate allotments: Juan Tank and Hearst Mountain; they were combined in 1974. A more detailed history of use can be found in the Range Specialist Report. Actual use from 1995-2012 is shown in Figure 2.

The current grazing permit is issued to Durward G. or Glen D. Reed and has been in their family since the early 1940s. There are 3 pastures, 2 holding pastures (traps), and one horse pasture (Figure 2). The allotment includes approximately 18,535 Forest Service acres and 821 private acres, of which 680 acres are owned by the permittee. Yearlong cattle grazing currently occurs on the allotment using a deferred-rotation grazing system, with the permitted use allowing up to 190 adult cattle (i.e., 2,280 animal unit months, AUMs). Average use from 1995 (the last Environmental Assessment and Decision Notice) through 2012 has been approximately 146 cattle yearlong (1,752 AUMs).

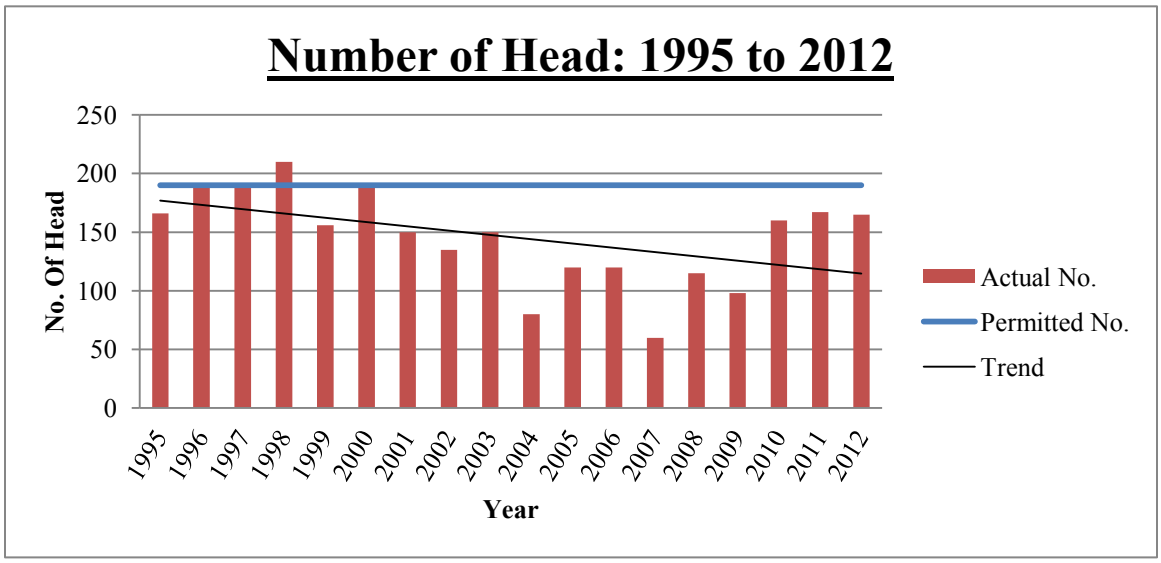

Figure 2: Juan Tank Allotment Permitted Use, Actual Use, and Trend: 1995-2012.

The topography within the allotment varies from mostly flat with rolling hills on the west side to steeper terrain on the east and south sides. Major topographic features include Signal Hill, Three Sisters Peak, Hearst Mountain, Rogers Canyon, Juan Tank Canyon, and Holden Lake.

The canyons and washes are ephemeral drainages and are part of the Upper Verde and Colorado River drainage systems. These drainages flow only during periods of spring snow melt and heavy monsoon storms, and do not contain riparian vegetation types. Holden Lake is the only wetland known to occur on the allotment; there are no springs. There are no listed (i.e., threatened or endangered) animal or plant species on the allotment. Sensitive plants and animals may occur.

Piñon/juniper, savanna, and grasslands are the dominant vegetation types on the allotment. There is a minor component of ponderosa pine. Predominant grass species include blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), prairie junegrass (*Koelaria cristata*) and bottlebrush squirreltail (*Elymus elymoides*). A loss of herbaceous understory species, in some areas the entire herbaceous plant community, is evident due to juniper encroachment.

Juniper treatments (i.e., grassland and savannah restoration) have taken place on the allotment beginning in the 1950s and continue today. These treatments have allowed for the recovery of native plant communities, thus providing forage for wildlife and livestock while increasing vegetative ground cover to reduce erosion. However, those early treatments are believed to be when Japanese brome (*Bromus japonicus*), a non-native invasive species, was introduced. To date, the affected area containing Japanese brome in the Juan Tank Pasture is approximately 5,000 acres. An affected area (gross area) is defined as the total area of a polygon drawn around the population (Final EIS for Integrated Treatment of Noxious or Invasive Weeds 2005). The frequency of Japanese brome in the affected area (how often it occurred in a transect) ranges from 25-94 percent in concentrated stands of brome.

There are no wild and scenic rivers, research natural areas, designated wilderness areas, inventoried roadless areas, designated parklands, or prime farmlands within or near the Juan Tank Allotment. There are no known populations of Threatened, Endangered, Proposed, Candidate, or Conservation Agreement Species within the allotment boundary.

Management Direction

Kaibab Forest Plan Consistency: The Forest Plan 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 1988 Kaibab 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. A forest plan consistency check was completed for both the current forest plan and the revised forest plan, which may be signed around the same time as this decision. This project is consistent with the direction listed in the Forest-wide standards and guidelines, and in the standards and guidelines for Management Area 1 (Western Williams), which encompasses all of the Juan Tank Allotment.

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.
- 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 Juan Tank Allotment is scheduled for environmental analysis of grazing use on the Kaibab National Forest, as required by the Rescission Act (Rescissions Act Section 504 of Public Law 104-19). The purpose of this project is to re-authorize cattle grazing on the Juan Tank Allotment in a manner that is consistent with the goals, objectives, standards and guidelines of the 1988 Kaibab National Forest Plan, as amended.

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 allotment.

Proposed Action

A Proposed Action has been developed to meet the project's purpose and need. The Proposed Action would reauthorize grazing on the Juan Tank Allotment by issuing a new grazing permit and continuing adaptive management and monitoring. Specific details for each Alternative are listed in Chapter 2. The Proposed Action has been modified from what was scoped in September 2012 to include the following:

- Authorizes up to 5 horses yearlong;
- Construction of a new fence in the HQ Pasture;
- Apply a 40% utilization standard on the Forest Service System lands in the HQ Pasture, and when that standard is met, horses would be moved to private land; and
- Construction of up to 4 exclosures in order to conduct trials on Japanese brome treatments.

The Williams Ranger District of the Kaibab National Forest specifically proposes the following:

- Reauthorize grazing on the Juan Tank Allotment. A Term Grazing Permit would authorize seasonal livestock grazing on the Juan Tank Allotment for up to 360 cattle from May 15 through November 30, and 5 horses yearlong. Cattle may come on earlier (mid-March or early April) to graze Japanese brome in the Juan Tank Pasture, and/or when conditions permit in the other pastures. However, permitted use would not exceed 2,280 AUMs.

Applicable Laws and Regulations

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

Clean Air Act of 1955: Cattle grazing is not anticipated to cause disproportionate adverse human health or environmental effects to air quality (see "Air Quality" analysis in Chapter 3).

Clean Water Act of 1948, as amended: 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 project is consistent with applicable Kaibab National Forest Plan standards and guidelines.

National Historic Preservation Act (NHPA) of 1966, as amended: A Heritage Resources compliance report is being finalized for the permit renewal and new reports would 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 would continue to consult over proposed allotment improvements.

National Environmental Policy Act (NEPA) of 1969, as amended: The effects of the Proposed Action and alternatives have been analyzed and are disclosed in this EA.

Endangered Species Act (ESA) of 1973, as amended: The Endangered Species Act (ESA, PL 93-205), Forest Service Manual (FSM) 2670.11, 2670.21 and 2670.31 direction, and the Kaibab National Forest Plan standards and guidelines all require that National Forest System lands are not only 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 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 because the project area is either outside of their range and/or lacks suitable habitat.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended: This project is consistent with applicable Kaibab National Forest Plan standards and guidelines.

National Forest Management Act (NFMA) of 1976, as amended: This project complies with the Kaibab National Forest Plan and associated amendments. This project addresses all applicable Forest Plan forest-wide standards and guidelines and 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.

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.

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 Kaibab National Forest 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 Juan Tank Allotment.

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 Kaibab National 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 National 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 Environmental Assessment documents the environmental analysis of the Modified Proposed Action and Alternatives. The Williams District Ranger is the responsible official for this project and would decide:

- Whether to re-authorize livestock grazing and in what manner, as described in the Modified Proposed Action;
- Whether to implement any alternative to the proposed action;
- What mitigation measures are needed; and
- What monitoring is required.

Items in this decision include: number of cattle and/or horses, utilization level, season of use, grazing management system, treatments to Japanese brome, authorizing cross-country motorized travel for range improvements, and structural range improvements. 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 Williams District Ranger may select any of the alternatives analyzed in detail, or may modify an alternative, as long as the resulting effects are within the range of effects displayed in this document.

This document is not a decision document. Rather, it discloses the environmental consequences that may occur if the Modified Proposed Action or alternatives to that action are implemented. A decision notice (DN) and finding of no significant impact (FONSI), signed by the Williams District Ranger, would document the decisions made as a result of this analysis. Should the decision authorize livestock grazing, any and all grazing practices adopted and within the scope of this analysis would be further detailed in the terms and conditions of a new Allotment Management Plan (AMP) and a new term grazing permit.

Public Involvement

This project was first listed in the Kaibab National Forest Schedule of Proposed Actions (SOPA) in April 2012. Seven Native American tribes have been consulted on this project since April 2012. The grazing permittee has been involved throughout the development of this project. On September 14, 2012, a description of the Proposed Action and a series of maps were mailed to individuals and organizations who have expressed interest in similar past projects or who were otherwise determined to be affected (adjacent landowners, interest groups, and agencies). Eight comment letters were received regarding the proposed action, and a comment analysis was completed. The Proposed Action was modified in response to these comments.

The EA was released for a 30-day notice and comment period on June 30, 2013. Eight comment letters were received during this comment period. The Kaibab National Forest's responses to these comments can be found in Appendix F. Minor modifications were made to the EA as a result of comments received during this period.

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 eight scoping comment letters received regarding the Proposed Action were considered and analyzed for issues during the development of this EA. Based on economic and ecological concerns raised by the allotment permittee, Alternative 4 – Adaptive Management was developed (see Appendix E for full text).

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Chapter 2: Proposed Action and Alternatives

This chapter describes and compares the alternatives considered for grazing management on the Juan Tank Allotment. 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 four 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 in Tables one through three

Alternative 1 - No Action/No Grazing

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

Alternative 1 would not authorize livestock grazing on the Juan Tank Allotment. 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) would require a separate analysis and coordination with other agencies to determine whether or not to maintain or remove these structures.

Alternative 2 - Current Management

The Forest Service Grazing Permit Administration Handbook (FSH 2209.13) states that current management should be analyzed in detail as an alternative to the proposed action (Chapter 92.31). Current management is defined as "…a combination of the current permit and how the current permit has been administered through the [allotment management plan] and [annual operating instructions], for at least 3-5 years (3-5 years is a minimum, longer periods of 10 years or more may also be utilized…), in order to meet resource management objectives" (R3 supplement to FSH 2209.13, chapter 92.31). The current grazing permit allows up to 190 adult cattle (2,280 animal unit months, AUMs). Average use from 1995 through 2012 has been approximately 146 cattle yearlong (1,752 AUMs).

Alternative 2 would reauthorize yearlong cattle grazing on the Juan Tank Allotment through a Term Grazing Permit for up to 150 adult cattle (i.e., 1,800 Animal Unit Months, AUMs). This considers actual use since 1995 and the trend in declining numbers since 1995. The grazing management system under Alternative 2 would incorporate deferred-rotation grazing system, with an emphasis on spring-early summer deferment (i.e., March 15 - June 15). Deferment would include minimizing the number of areas used during this time period, and not using the same areas during this time period during consecutive years. An example grazing schedule which illustrates this is shown in Appendix B.

The utilization guideline would to allow up to 40 percent use by cattle and/or wildlife. This is considered "conservative" grazing intensity, and is measured at the end of the growing season.

Seasonal utilization could be used to determine when livestock should move to the next pasture in the rotation, in addition to other factors such as weather patterns, likelihood of plant regrowth, and previous years' utilization. For example, pastures grazed in the spring have a higher likelihood of regrowth since the grazing is occurring at the start of the growing season.

Pastures should not be grazed again during the same grazing season unless resource conditions permit (i.e. wetter than normal monsoons, warmer fall temperatures, abundant regrowth etc.). If a pasture is grazed twice in the same season, a light grazing intensity standard of 20 percent should be applied.

Alternative 2 would require the grazing permittee to maintain existing range improvements assigned to the Juan Tank Allotment. It would not authorize cross-country motorized travel or use of closed roads when needed in association with permitted grazing activities (moving salt and/or water, fixing fence, etc.).

Alternative 2 includes the continued use of adaptive management, which allows the Forest Service to adjust the timing, period and occurrence of livestock grazing, as well as livestock numbers. If adjustments are needed, they would be implemented through the Annual Operating Instructions so that livestock use is consistent with current productivity and rangeland conditions. This ensures the maintenance and/or improvement of vegetation and soil conditions that provide for ecosystem stability while allowing livestock grazing to occur on Forest Service lands.

Rangeland monitoring would continue to occur on the allotment, and may include permittee and permit compliance, range readiness, forage production, rangeland utilization, long-term condition and trend, noxious weeds, threatened and endangered species, and soil condition.

Alternative 3 – Modified Proposed Action

Alternative 3 - Proposed Action would continue grazing on the Juan Tank allotment by issuing a new grazing permit and continuing adaptive management and monitoring. This alternative was modified based on comments received during the scoping period.

Authorization

- A Term Grazing Permit would authorize seasonal grazing for up to 360 cattle from May 15 through November 30, and 5 horses yearlong (2,280 AUMS).
- Permitted use would not exceed 2,280 AUMs
- The proposed grazing management system would incorporate seasonal deferment, with an emphasis on spring-early summer deferment. This deferment, generally from March 15 to June 15, would include minimizing the number of pastures used during this time period, and not using the same pasture in consecutive years during this time period. A grazing schedule example can be seen in Appendix B.
- The utilization guideline would allow up to 40 percent use by cattle and/or wildlife. This is equivalent to "conservative" grazing intensity.

- Integrated Pest Management (IPM) would be used to address Japanese brome. Techniques could include adjusting the timing of cattle grazing and prescribed sheep grazing. Cattle could be allowed on the allotment earlier (mid-March or early April) depending on the onset of spring growth of Japanese Brome. Sheep numbers in any given year would not exceed 1,200 and would be dependent on the extent of the invasion, the need for control, and any early grazing by cattle. Authorized cattle numbers following prescribed grazing would be adjusted to not exceed the 40% utilization level at the end of the growing season.
- Authorize cross-country motorized travel and use of closed roads, when needed in association with permitted grazing activities (moving salt and/or water, fixing fence, etc.).

The proposed change in season of use is based on Japanese brome research indicating that early spring/summer is the best time to utilize grazing as a treatment measure; this is before seed set and accumulation of litter that provides a microclimate conducive to seedling establishment (Vermeire et al. 2008 and Vermeire et al. 2009).

Structural Improvements

Unless otherwise identified, structures would be paid for and built via cooperative agreements in which the permittee and the Forest Service contribute approximately 50% of the total costs incurred.

- The Forest Service would fence off the Holden Lake wetland in order to exclude livestock grazing while allowing livestock access to both earthen tanks (Figure 3). The fence would be built to wildlife standards. The permittee would construct a waterlot/corral around the two earthen tanks at his expense. Construction would occur in year 1 or 2 following a decision. The permittee would continue to haul water from Holden Lake for use in troughs elsewhere on the allotment.
- Corrals (1-2) may be constructed to aid in livestock management if and when the Juan Tank and Sisters Pastures are split. Up to four trick tanks may be constructed to provide water in other areas of the allotment. Locations for these developments would be determined after consulting with the grazing permittee and Forest Service archaeologists, wildlife biologists, soil scientist, and range management personnel.
- Access to Holden Lake from Forest Road 124 would be eliminated immediately following a decision. A wildlife viewing overlook and interpretive kiosk would be built within 6-7 years following a decision.
- Waterlot Fencing – up to six existing earthen tanks may be fenced to aid in the distribution of livestock (Bootlegger, Doe, Gate, Juan, Mud Ketch, and Perrin). Current waterlot fences would be rebuilt or repaired. These projects would start in the first year following a decision. Limiting the number of waters available to livestock would aid in meeting resource objectives. All fencing would meet specifications for wildlife, and would vary in size from 1- 6 acres depending on surrounding topography and size of tank (Figure 1). Waterlot gates would be left open when cattle are not in those pastures.
- The Juan Tank and Sisters Pastures may be divided if waterlot fencing does not achieve the desired level of livestock distribution and/or resource objectives. Locations of those fences, if needed, would be determined after consultation with the grazing permittee and

Forest Service archaeologists, wildlife biologists, soil scientist, and range management personnel.

- Bottom wires (i.e., strands) that are currently barbed would be replaced with smooth wire on all rebuilt fences within the allotment. All new fences would meet standards for wildlife passage as recommended by Forest Service Biologists in cooperation with the Arizona Game and Fish Department.
- Up to 4 exclosures would be built in the Juan Tank Pasture in order to conduct trials on Japanese brome treatments (Forest Service expense). These would be built in the first or second year following a decision. The exclosures would be up to 3 acres in size and treatments could include grazed/ungrazed, burning, herbicide, disking, and seeding as well as other methods as they are developed. Treatments that are determined to be successful could then be applied to larger areas of the pasture.
- A new fence would be constructed in the HQ Pasture on the Forest Service boundary in year 1 or 2 after a decision (Forest Service expense).

Adaptive Management

The Modified Proposed Action includes the continued use of adaptive management, which provides flexibility for managing livestock and rangeland resources. Adaptive management 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 Modified Proposed Action.

Monitoring

Monitoring is adaptive, and as improved methods are developed these new methods would be considered. Allotment monitoring includes the following:

- Forage utilization would be monitored to ensure the "conservative" grazing intensity is not exceeded. 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. Seasonal utilization could be used to determine when livestock should move to the next pasture in the rotation, in addition to other factors such as weather patterns, likelihood of plant regrowth, and previous year's utilization.
- Rangeland conditions (e.g., plant vigor) would be monitored. 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.
- Long-term trend monitoring would continue to be conducted at the historic Parker Three-Step plot locations on the allotment. Monitoring data at these locations 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.

- Photo points and/or vegetation plots would be used to assess wetland recovery at Holden Lake.

Alternative 4 – Adaptive Management

Alternative 4 – Adaptive Management. This alternative was developed by input from a Coordinated Resource Management Planning group (CRMP). Refer to Appendix E for the complete text of this alternative as developed by the CRMP.

Authorization

- Alternative 4 would authorize yearlong grazing for up to 185 cattle and 5 horses (2,280 AUMs).
- The horses would graze the HQ Pasture until a 40% utilization standard is reached on the Forest Service portion, and then moved to private land. If a fence is needed the permittee would build it on his property line and at his expense. Cattle would rotate through the remaining pastures. An example of a grazing schedule unique to Alternative 4 is displayed in Table 16.
- Integrated Pest Management (IPM) would be used to address Japanese brome. Techniques could include prescribed sheep grazing. Sheep numbers in any given year would not exceed 1,200 and would be dependent on the extent of the invasion and need for control. Authorized cattle numbers following prescribed grazing would be adjusted to not exceed the 40% utilization level at the end of the growing season.
- If changes are to be made to grazing management, the following protocol is recommended: Stage allotment management changes as conditions dictate. Please refer to the adaptive management section of the document for description and example.
- Obtain seasonal deferment by rotation through use of waterlots. The majority of the allotment (98.4 percent) is within one mile or less of water, thus, facilitating the first change to management grazing (Appendix E, Table 5). It is important to note that the forage and animal balance is well within the capacity limits as analyzed using Forest Service production data gathered in 2011, which is considered to be a drought year (Appendix E, Table 5). See the structural improvements section for a list of waterlots needed.
- If waterlots do not produce desired effect, then use temporary electric fence or other means to distribute cattle (i.e. patch burning).
- If temporary electric fence does not produce the desired effects, then build a permanent fence.
- Develop Integrated Pest Management Plan to address Japanese brome. Examples include, but not limited to, cultural control (i.e. intensively targeting Japanese brome with sheep or cattle when conditions dictate the need to obtain higher (60-80%) utilization levels), fire, herbicide, and targeted/prescriptive mechanical (i.e. Disking, Plowing, Seed Drilling, etc.) treatments. The first example is the preferred method to start with. A higher degree of species-specific utilization can be obtained through the use of sheep

with herders. Multiple methods may need to be utilized in conjunction and alternated over different environmental gradients to determine if the Japanese brome is being contained and/or controlled so that the species does not disrupt the structure or function of ecosystems. If it is deemed that the affected areas are not being contained and/or controlled by the end of the first 10 year planning period and new tools outside the scope of this NEPA are identified to treat affected areas then a new NEPA would be conducted. The effectiveness of treatments would be evaluated on 1-3 year intervals and would be reviewed by a CRMP team at least three (3) times prior to the end of the ten (10) years.

- The utilization guideline would allow up to a conservative 40 percent use by cattle and/or wildlife at the end of the growing season (Appendix E, Figure 1). Forage utilization would be monitored to ensure livestock numbers are in balance with available forage and that adequate residue remains at the end of the grazing season (defined here a grazing season begins at the start of the first growing period within the calendar year, generally the "cool season" which starts about March 1, then a short semi-dormant period from late may through early July, followed by a "warm season" growing period from early July through mid to late September, and finally the winter, mostly dormant period from late September through late February) to protect and enhance the plant community, soil health, watershed value, and wildlife habitat. A management guideline of forty (40) percent forage utilization, measured at the end of the growing season, would be employed to protect and enhance the plant community, soil health, watershed value, and wildlife habitat.
- For pastures grazed by livestock during a growing season, forage utilization would be measured at the end of the growing season for the pasture. For pastures grazed during the dormant season, forage utilization would be measured at the end of the grazing period. Climatic conditions, primarily precipitation amount and timing, projected as well as past would be monitored in each pasture to determine if authorized AUMs should be temporarily adjusted due to extreme climatic conditions, such as prolonged or extreme drought. Climate history would be used in conjunction with available forage utilization levels in determination of proper livestock numbers to available forage balance.
- Climatic conditions, primarily precipitation amount and timing, projected as well as past, would be monitored in each pasture by the grazing permittee. The information would be shared with the Forest Service and the CRMP Team to determine if AUMs should be temporarily adjusted due to climatic conditions, such as prolonged or extreme drought. Climate history would be used in conjunction with available forage utilization levels in determination of proper livestock numbers to available forage balance.
- If monitoring indicates that due to extreme climatic conditions, natural disaster, or other reasons, utilization levels would exceed the target utilization level to a point that the plant community, soil health, watershed value and/or wildlife habitat value of the range may be impaired, livestock numbers in the pasture would be adjusted. Utilization levels, averaged over a three (3) to five (5) year period, of either above or below the target utilization level of forty (40) percent would be taken into account and may trigger an evaluation to determine if there is a need to adjust AUMs through either adjustment of total livestock numbers or duration of grazing in the pasture.
- Forage availability would be assessed at the start of each grazing season to determine that the residual forage combined with the anticipated forage growth would provide adequate

forage to stay within the target utilization of forty (40) percent in the upcoming grazing season.

Structural Improvements

- This alternative allows for a trial of electric fencing (at permittee' s expense) to split the Juan Tank and Sisters Pastures if waterlot fencing does not meet resource objectives. The trial with electric fence would be evaluated annually and could last for up to 3 grazing periods (years) and if it is ineffective at controlling livestock, permanent fencing would be built.
- The Holden Lake wetland would be fenced to exclude livestock grazing (see figure 3). This wetland ex-closure fence would be built and maintained by the Forest Service. The fence around the two tanks in Holden Lake would be built and maintained by the Permittee. Access to the waterlot would be granted to livestock to both tanks from the west side. Water can be removed from the two tanks and hauled to other areas within the allotment. This waterlot may be used as temporary holding when gathering from the Sisters pasture.
- Corrals (1-2) may be constructed to aid in livestock management. One to four trick tanks may be constructed to provide water in other areas of the allotment. Locations for these developments would be determined after consulting with the grazing permittee and Forest Service archaeologists, wildlife biologists, soil scientist, and range management personnel.
- Access to Holden Lake from the Forest Road 124 would be eliminated, and an overlook and interpretive kiosk would be established there for wildlife viewing.
- Waterlot Fencing – up to 6 existing earthen tanks may be fenced to aid in the distribution of livestock (Juan Tank pasture: Bootlegger, Doe, Mud Ketch, Perrin, Dude. Sisters pasture: Gate). Current waterlot fences would be rebuilt or repaired. Limiting the number of waters available to livestock would aid in meeting resource objectives. All fencing would meet specifications for wildlife, and would vary in size from 1-6 acres depending on surrounding topography and size of tank. Waterlot gates would be left open when cattle are not in those pastures.
- Dude Tank is located in a very poor location due to terrain, fencing this tank would be considered as a last resort.
- The Juan Tank and Sisters Pastures may be divided if waterlot fencing does not achieve the desired level of livestock distribution and/or resource objectives.
- Bottom wires that are currently barbed would be replaced with smooth wire on all rebuilt fences within the allotment. All new fences would meet standards for wildlife passage as recommended by Forest Service Biologists in cooperation with the Arizona Game and Fish Department.
- Install up to 4 test plot exclosures to try different treatments on a smaller scale (i.e. seasonal grazing, seeding, mechanical, etc.). These plots would be anywhere from ½-3 acres/plot in size.

Monitoring

Monitoring is adaptive, and improved methods would be considered as they are developed. Allotment monitoring includes the following:

- See monitoring information included in the authorization section for this alternative.
- Long-term trend monitoring would continue to be conducted:
    - Current monitoring data includes frequency, 10th acre canopy cover, dry-weight rank (relative composition), comparative yield (production), repeat photography, ground cover estimates, and rain gauges. Other methods may or may not be added to above mentioned methods. New plots may need to be removed or added.
- Desired Conditions, Management Actions and Monitoring Methods must be developed for Terrestrial Ecosystem Units (TEU's) contained within the allotment as exemplified below and be adaptive through time (Appendix E, Table 6).
- Monitor the test plots using the above stated methods.

Adaptive Management

- Alternative 4 – Adaptive Management includes the continued use of adaptive management, which provides flexibility for managing livestock and rangeland resources. Adaptive management, by definition, is a dynamic iterative process. Thus, a given plan developed under current conditions and knowledge would be periodically updated based on emerging conditions. Management decisions on stocking rate, pasture rotation, or protein supplementation for example can be based on a series of indicators. These indicators can be drawn from publically available sources (i.e. various drought indices), monitoring data (i.e. utilization or ecological trend) or local management experience (i.e. amount of precipitation in a given pasture by given date to support some number of livestock for specified period of time). Examples of how adaptive management scenarios can be developed and inform this iterative planning process are provided below.

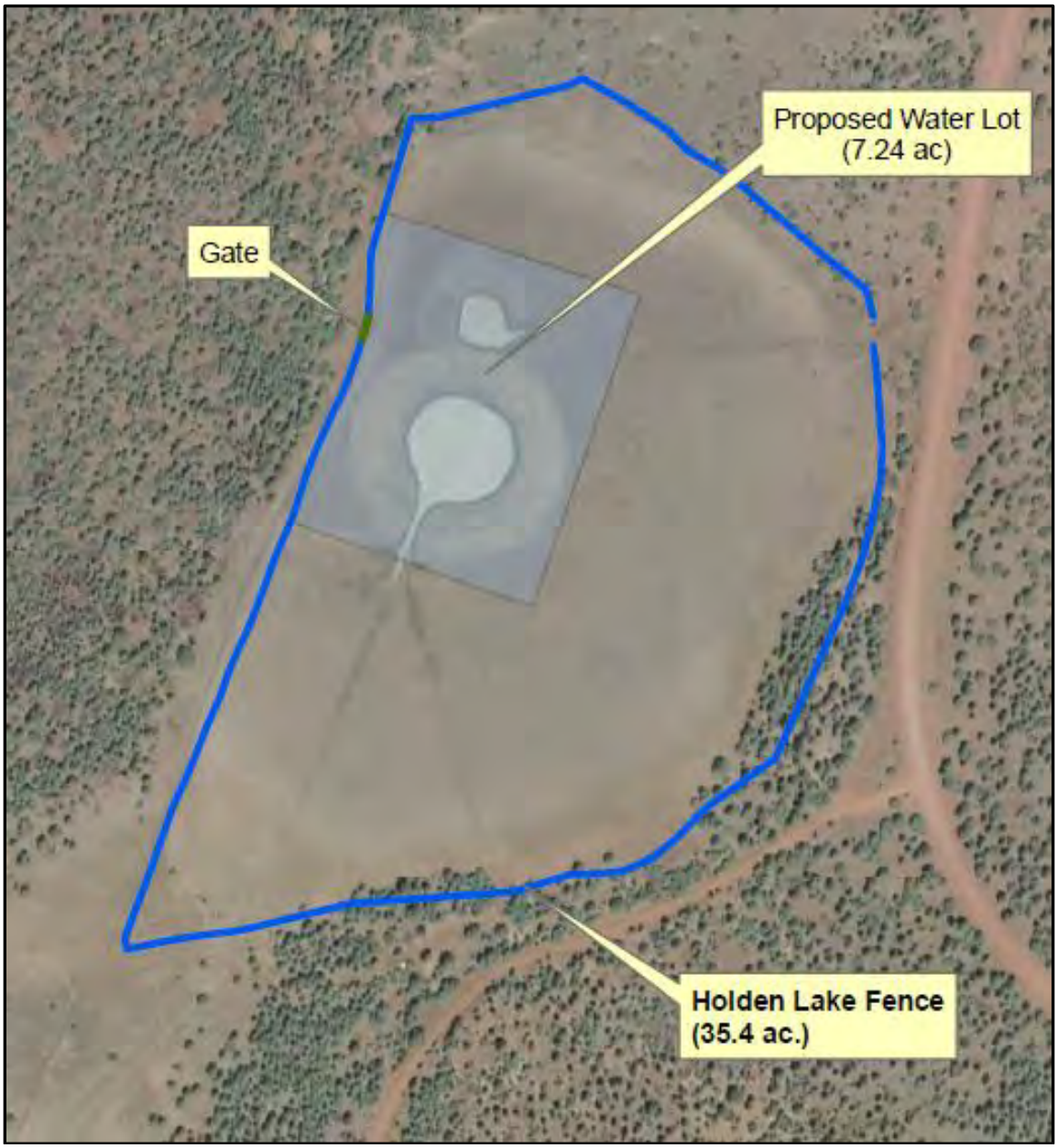

Figure 3. Proposed Holden Lake Exclosure and Waterlot.

Design Features Common to all Action Alternatives

The following is a list of items that are common to all 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 for Juan Tank Allotment 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 for Range 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.

Stock Tank Maintenance and Heavy Equipment Use: A written request from the grazing permittee would be required prior to stock tank maintenance or use of heavy equipment, and would only be granted following the completion of resource reviews (archaeology, wildlife, soils).

Best Management Practices for Livestock Grazing: The following grazing practices were selected for the Juan Tank Allotment 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. "Enough" vegetative ground cover refers to "tolerance" level of vegetative ground cover, below which the risk of accelerated soil erosion increases. Conservative allowable use would maintain vegetative ground cover at levels sufficient to prevent accelerated soil erosion that would result in a long-term loss of soil productivity.

Resource Protection Measures

The Forest Service would apply the resource protection measures listed in Table 1 to any action alternative to minimize and reduce potential impacts from proposed activities.

Table 1. Resource Protection Measures Required for All Action Alternatives.

Resource Protection Measure	Purpose
Soils	
BMP #1 - Manage forage utilization by livestock to maintain healthy ecosystems for all resource objectives	Safeguard water and soil resources under sustained forage production.
BMP #2 - Several techniques are used to achieve proper livestock distribution, or lessen the impact on areas which are sensitive or which would naturally be overused. These techniques include: a. Construction of fences, and implementation of seasonal or pasture systems of management. b. Water development in areas that receive little use and closing off water developments when proper use has been achieved. c. Riding and herding to shift livestock locations. d. Using salt or supplements as tools to gain proper distribution of livestock. e. Range improvements, prescribed burning, or seeding. f. Prevention of intensive livestock grazing or concentrated livestock use on soils that have low bearing strength and are wet. g. Developing sufficient watering places is one way to limit the amount of trailing. Livestock distribution needs are determined through evaluations of range conditions and trends, including utilization studies	To manage sustained forage production and forage utilization by livestock while protecting soil and water resources. Maintaining healthy ecosystems for wildlife and other resources.
BMP #3 - Soil condition class is determined by qualified soil scientists using Terrestrial Ecosystem Survey (TES). A range conservationist would use the soil condition class in determining the grazing capacity.	This practice is an administrative and preventative control. Soil condition classes, based on the relationship of current and natural soil loss tolerances, are used to determine grazing capability. Only land with soils in

Resource Protection Measure	Purpose
	stable condition are considered as "full capability" range. Grazing capability ratings are then used in conjunction with other grazing considerations to determine the actual grazing capacity of an area.
BMP #4 - Where soil has been severely disturbed by past overgrazing and the establishment of vegetation is needed to minimize erosion, the appropriate measures shall be taken to establish an adequate cover of grass or other vegetation acceptable to the Forest Service and outlined in the allotment management plan. This measure is applied where it is expected that disturbed soils in parts of the area would require vegetative cover for stabilization and the problems would not be mitigated by other management plan provisions.	To establish a vegetative cover on disturbed sites to prevent accelerated erosion and sedimentation.
BMP #5 - Rangeland improvements are intended to enhance forage quality, quantity, and/or availability, and to provide protection to the other resources. Building fences to control the movement of livestock, improve watershed condition, and develop watering sites are just a few of the types of rangeland improvements implemented by the permittee or Forest Service as identified in the allotment plan. If a structure is causing soil erosion or water quality degradation, the allotment plan would identify it and state corrective measures. Other measures may include stream channel stabilization efforts such as riprapping, gully plugging, and planting; or mechanical treatments such as pitting, chiseling, or furrowing. Reseeding and/or fertilization may be done alone or in conjunction with any of these measures.	To improve, maintain or restore range resources, including soil and water through the use of rangeland improvements.
Sensitive Plant Species	
Survey for sensitive plant species prior to ground disturbing activities.	Protection of sensitive plant species.
Monitor known and/or newly documented populations of sensitive plants for viability and management effects.	Protection of any populations of sensitive plant species.

Alternative Comparison

Tables 2, 3, and 4 provide a side-by-side comparison of structural improvements, livestock grazing statistics, and management need for all alternatives.

Table 2. Structural improvements by alternative.

Structural Improvements (maximum)	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Waterlot Construction	0	0	6	6
Corral Construction	0	0	2	2
Trick Tank Construction	0	0	4	4
Pasture Division Fences	0	0	3	2
Japanese brome exclosures	0	0	4	4

Table 3. Livestock grazing statistics by alternative.

Grazing Statistic	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Season of use	None	Yearlong	Seasonal	Yearlong
Months of livestock use	0	12	6-8	12
Number of cattle permitted	0	150[1]	245-360[2]	185[2]
Number of horses permitted	0	0	5	5
Animal Unit Months (AUMs)	0	1,800	2,280	2,280
Utilization guideline	N/A	40%	40%	40%

[1]Although the current grazing permit allows up to 190 adult cattle, 150 was used to analyze current management based on actual use since 1995 and the trend in declining numbers since 1995.

[2]These represent maximum numbers. Actual numbers may be less in a given year due to climatic, forage, and economic conditions.

Table 4. Alternative comparison by management need.

Management Need	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Authorize livestock grazing	No	Yes	Yes	Yes
Allotment is managed in a manner that maintains and/or moves the area toward Forest Plan desired conditions	No	No	Yes	Yes
Prioritizes treatment of Japanese brome	No	No	Yes	Yes
Holden Lake wetland excluded	No	No	Yes	Yes
Road access to Holden Lake from FR 124 eliminated	N/A	Yes	Yes	Yes
Motorized cross-country travel authorized for maintenance of range improvements	N/A	No	Yes	Yes

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. There were no alternatives considered but eliminated from detailed study.

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 those environments. 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 Environmental Assessment 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.

Appendix A identifies 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 presented in Appendix A were carried forward into each resource's 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 historical activities, such as livestock and wildlife grazing and small-scale agricultural activities, have likely altered natural conditions in some areas beyond a particular biotic threshold.

Climate

The project area occurs within the North central climatological division of Arizona and is generally classified as low sun cold climate class. Precipitation varies from 18 to 30 inches annually and is bimodal. 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 at lower elevations to 34° Fahrenheit at higher elevations. For the month of January, mean minimum temperatures range from 10° to 20° Fahrenheit; mean maximum temperatures range from 32° to 50° Fahrenheit. For the month of July, mean minimum temperatures range from 45° to 52° Fahrenheit; mean maximum temperatures range from 70° to 105° Fahrenheit.

The NOAA U.S. Seasonal Drought Outlook released April 18, 2013 indicates that drought would persist or intensify in the vicinity of the Juan Tank Allotment. Currently, the NOAA U.S. Drought Monitor (dated April 16, 2013) indicates that the area is under moderate to severe drought conditions.

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 would persist (NOAA Climate Prediction Center, 2013). Available online at: http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html

The Standardized Precipitation Index (SPI) was developed by Thomas McKee, Nolan Doesken and John Kleist of the Colorado Climate Center in 1993 and has been embraced by the Western Regional Climate Center as a statistical method from assessing rainfall. In calculating the SPI rainfall data, values are fitted to a gamma distribution and are then transformed to a Gaussian distribution to standardize the results. All of the above steps make the SPI independent of both the location and the range in values so that the different seasons and climate areas are represented on an equal basis (WRCC, 2013). The purpose is to assign a single numeric value to the precipitation which can be compared across regions with markedly different climates (WRCC, 2013). The latest 12- month Standardized Precipitation Index through the end of March 2013 shows all of the regions mapped near the Juan Tank Allotments to be in near normal conditions.

The Palmer Drought Severity Index (PDSI) was one of the first techniques to demonstrate success at quantifying the severity of droughts across different climates (Wells et al., 2004). Instead of being purely based on precipitation, the PDSI is based upon a primitive water balance model and has been used for approximately 40 years to quantify the long-term drought conditions.

The NOAA Palmer Drought Severity Index Long Term meteorological conditions dated April 20, 2013 show the area surrounding the Juan Tank Allotment 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 records have been kept in the town of Williams for nearly 100 years. Average annual temperatures during the last 10 years have exceeded the 100-year average every year by 2 to 4 degrees F.

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. Climate model projections for the southwest United States predict average temperatures would continue to rise as would 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.

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 stream flows that appear to be peaking earlier in the year, suggesting that the spring temperatures in these regions are warmer than in the past, causing snow to melt earlier. 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, the Forest Service has a responsibility 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 et al., 2010).

Soils, Watershed, Water Quality, and Air Resources

Affected Environment

Soils

Elevations across the Juan Tank Allotment range from 5,940 feet to 7,643 feet. Slopes range from 1 percent (flat) to as much as 60 percent with steeper slopes occurring on hillsides of prominent knolls including the Three Sisters and Hearst Mountain.

The terrestrial ecosystem survey (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. Soil stability is generally assessed through visual inspection of the soil surface for evidence of erosion including rilling, pedestaling (i.e., plants or rock fragments elevated above surrounding soil), and soil displacement. 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 surface soil horizons. Effective vegetative ground cover consists of litter greater than 1.25 cm in depth plus plant basal area.

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

Soil conditions were evaluated in March of 2012 using the Soil Condition Field Evaluation Form and Soil Condition Rating Guide (Reference FSH2509.18). Satisfactory soils have high amounts of effective ground cover that protect the soil from accelerated erosion. 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 and still allow for maintenance of soil productivity when utilization guidelines are not exceeded.

Impaired soils generally occur in piñon-juniper woodlands and in juniper-grassland transitional areas. These soils have reduced nutrient cycling functions as a result of juniper encroachment, which has reduced species diversity and decreased the amount of effective vegetative ground cover, leaving these areas at risk of accelerated erosion. These 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. In the absence of treatments to control the density of juniper trees, impaired soils will continue to trend downward, with continued accelerated erosion and further reduction in nutrient cycling and hydrologic function.

Areas of Satisfactory, but Inherently Unstable soils (portions above 40 percent slope) currently do not have the capacity for grazing without risking loss of long-term soil productivity. Though

incidental use may occur, by assigning no capacity to these soils, grazing capacity would be reduced and the impacts would be minimized to allow for soil conditions to improve. Figure 4 and table 5 show the location and soil condition classes and predicted soil erosion hazard by TEU within the Juan Tank Grazing Allotment analysis area.

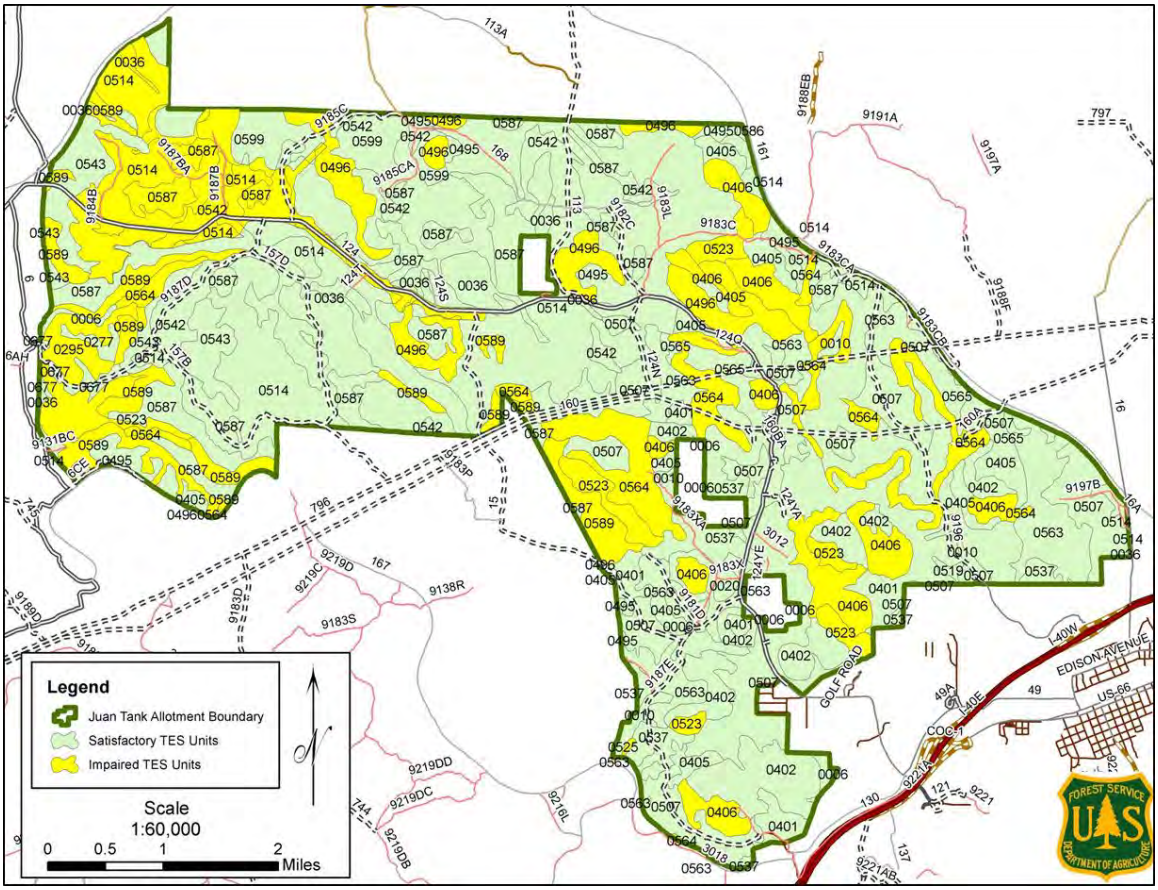

Figure 4. Terrestrial Ecosystem Map Units and their associated condition classes within the Juan Tank Grazing Allotment Renewal EA

Table 5. Soil condition classes and predicted soil erosion hazard by TEU within the Juan Tank Grazing Allotment Renewal EA Analysis Area (Brewer et al, 1991). (Acres are approximate)

MAP UNIT	SOIL CONDITION	CURRENT EROSION RATE TONS/AC/YR	TOLERANCE EROSION RATE TONS/AC/YR	POTENTIAL EROSION R9ATE TONS/AC/YR	SLOPE (%)	ACRES
6	Satisfactory	0.65	2.71	2.10	0-5	67.3
10	Satisfactory	0.53	2.71	2.47	0-5	104.4
20	Satisfactory	0.12	3.64	0.93	0-5	30.0
36	Satisfactory	0.12	3.64	0.93	0-5	232.1
36	Impaired	0.36	2.71	0.85	0-5	20.5
277	Satisfactory	0.89	1.82	2.06	0-15	34.5
295	Impaired	6.11	1.82	11.41	15-40	333.2
401	Satisfactory	0.16	2.71	0.93	0-15	1,446.7
402	Satisfactory	1.70	2.71	9.96	15-40	787.0
405	Satisfactory	0.20	2.71	0.61	0-15	460.6
406	Impaired	2.99	2.71	9.96	15-40	826.8
495	Satisfactory	0.20	2.71	0.53	0-15	369.0
496	Impaired	3.64	2.71	8.38	15-40	719.5
507	Satisfactory	0.16	2.71	0.28	0-15	1,288.9
514	Satisfactory	0.36	2.71	0.53	0-15	3,629.4
514	Impaired	0.36	2.71	0.53	0-15	822.5
519	Satisfactory	0.20	1.82	0.61	0-15	15.9
523	Impaired	6.96	1.82	17.81	15-120	346.8
525	Impaired	3.40	2.71	14.37	15-40	6.1
537	Satisfactory	0.12	2.71	0.61	0-15	566.3
542	Satisfactory	0.36	2.71	0.81	0-15	1,158.8
543	Satisfactory	0.28	2.71	0.53	0-15	562.7
543	Impaired	0.28	2.71	0.53	0-15	73.3
563	Satisfactory	0.20	2.71	0.61	0-15	1,624.5
564	Impaired	3.64	2.71	12.38	15-40	1,025.5
565	Satisfactory	0.36	1.82	0.61	0-15	168.6
586	Satisfactory	0.20	2.71	0.53	0-15	20.1
587	Satisfactory	0.24	1.82	0.53	0-15	1,146.3
587	Impaired	0.24	1.82	0.53	0-15	153.6
589	Satisfactory	3.44	2.71	8.09	15-40	12.4
589	Impaired	3.44	2.71	8.09	15-40	749.2
599	Impaired	0.61	2.71	0.81	0-15	446.4
677	Satisfactory	0.81	1.82	2.67	0-15	61.2
Total						19,310.1

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.

Arizona's most recent Integrated Report (305(b) Water Quality Assessment and 303(d) list) is available from the Arizona Department of Environmental Quality (ADEQ). The Arizona Impaired Waters List can be found at:
http://www.azdeq.gov/environ/water/assessment/download/2006_2008.pdf

There are no perennial running waters within the Juan Tank Allotment; there is therefore no surface water quality data for the project area. No water bodies are listed as impaired within the project area on the Arizona 2006/2008 Impaired Waters List.

Stream Courses

Drainages in the Juan Tank Allotment analysis area exhibit a dendritic drainage pattern with low-gradient ephemeral and intermittent drainages flowing to the west and northwest from the Allotment. Approximately 38.7 miles of streamcourses occur in the Juan Tank Allotment, with none having riparian reaches. Most of the streamcourses are best characterized as ephemeral, or dry washes. However, two drainages that exhibit intermittent flow characteristics (Cataract Creek and West Cataract Creek) do occur within the analysis area. These washes flow primarily during spring snowmelt and, to a lesser extent, during the summer monsoon. Since streamcourses in the Juan Tank Allotment are generally ephemeral, most are functioning properly with regard to floodplain characteristics, bank stability, and sediment transport, with few indications of instability, downcutting, or aggradation. However, the unnamed ephemeral stream segment (Reach Code 15010004000890) that flows into Canyon Tank is delivering large amounts of sediment into the Tank, creating a small deltaic deposit where water velocities decrease, causing the sediment load to drop out of suspension. This is likely a result of dense ponderosa pine forest conditions in the watershed above Canyon Tank where vegetative ground cover is reduced due to a relatively dense mat of forest litter (duff) that does not provide adequate soil stabilization when compared to a vegetative ground cover of grasses and forbs.

Livestock and Wildlife Waters, Wetlands, and Springs

There are 32 livestock and wildlife waters and natural depressions within the Juan Tank Allotment boundary. The only one known to impound water for a sufficient duration to exhibit some wetland characteristics is Holden Lake, which supports a relatively sparse population of sedges along the perimeter of the wetland during wet spring seasons. An access road from Forest Road 124 into Holden Lake has caused soil rutting, compaction, and displacement within the Holden Lake wetland (Figure 5).

Figure 5. Rutting, compaction and displacement of soils in the Holden Lake wetland caused by vehicle use under wet conditions.

Springs

There are no known springs on the Juan Tank Allotment.

Flood Zones

Flood zones are geographic areas defined by the Federal Emergency Management Agency (FEMA) according to varying levels of flood risk. There are no FEMA-designated floodplains within the Juan Tank Allotment. However, Holden Lake is known to flood during years of extreme snowmelt. There are likely other areas within the allotment that retain runoff, resulting in minor flash flooding conditions.

Environmental Consequences

Methodology

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 each grazing versus the no grazing alternative. 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).

Direct and Indirect Effects of Alternative 1, No Action

As previously noted, the No Action Alternative would mean livestock grazing on the Juan Tank Allotment 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 effect and a decision made by the Responsible Official to resume livestock grazing.

Soil erosion and sediment delivery rates were modeled under current management and no grazing alternatives. The RHEM-modeled total average annual soil erosion rates were approximately 3,427 tons ac-1yr-1 and 1,997 tons ac-1yr-1 for current management and no grazing, respectively. The total average annual sediment delivery rates were approximately 3,242 tons ac-1yr-1 and 1,900 tons ac-1yr-1 for current management and no grazing, respectively. Total average annual soil erosion rates under the No Action Alternative would therefore be approximately 42 percent less than under current management. Total average annual sediment delivery rates would also be approximately 42 percent less than sediment delivery rates under current management. It is important to understand that the RHEM model indicates that almost all soil erosion is delivered to stream courses, with only small amounts (i.e., 185 tons and 97 tons for current management and no grazing, respectively) remaining in upland areas as soil movement that is not delivered to stream courses, but is instead re-deposited on upland locations. It is also important to note that modeled erosion rates for current management and no grazing do not exceed tolerance thresholds, indicating that long term soil productivity would not be compromised under either alternative.

The No Grazing alternative has the potential to improve long term soil stability and reduce sediment delivery rates by returning vegetative ground cover to approximately natural levels. Soil erosion and sediment delivery rates would initially continue at current rates, decreasing to natural, or background rates over time. It is likely that continued light to moderate grazing by wildlife ungulates would maintain vegetative vigor and diversity, with some areas exhibiting excessive use, such as areas near water bodies.

Under the No Action Alternative, direct and indirect effects of cattle grazing would be eliminated. Under this alternative there would be no direct effects from removal of biomass by domestic livestock. Standing crop would increase where canopy cover of piñon, juniper does not impede development of an herbaceous understory, and no compaction or soil displacement would occur as a result of grazing management. The amount and probability of increased effective ground cover would depend on precipitation patterns and wildlife utilization, but would be expected to occur at a faster rate than the action alternatives. 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 piñon, and juniper trees, which inhibit development of understory herbaceous vegetative communities. 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 action alternatives, although, if drought conditions persist or increase, such improvement may not be fully attained by 2020.

The No Action Alternative does not include livestock grazing to control Japanese brome. A potential direct effect is Japanese Brome would persist within the Allotment under the No Action Alternative. In the absence of strategically timed grazing of Japanese brome by livestock, there would be an increase in Japanese brome litter which provides microsite conditions conducive to seed germination. Currently, there are approximately 5,000 acres within the Juan Tank Allotment that are infested with Japanese Brome. The size of this population has potential to increase under favorable conditions due to viable seed bank and competitive ability. Annual

bromes have been shown to compete with seedlings of perennial seeded grasses and perennial plants (Drawe and Palmblad 1977, Vermeire et. al, 2009).

Eliminating grazing on the Juan Tank 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 (Smith 2011, Pfost and Fulhage 2001). Wildlife use would continue as a source of shoreline disturbance of these 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 fill with sediments.

Livestock removal would result in reduced upland utilization. However, utilization by deer, elk, pronghorn, small mammals, and avifauna would continue. Vegetative composition and diversity (including an increase in perennial graminoids), and vegetative ground cover (plant basal area and litter) would improve at a faster rate than under the action alternatives.

The No Action Alternative would lead to the most improvement in plant canopy cover, basal area, litter cover, soil condition, soil productivity, and watershed condition. This increase would be dependent upon precipitation and weather patterns and utilization levels by wildlife. Drought combined with high levels of wildlife utilization would reduce some of the gains expected from termination of livestock grazing. Nutrient cycling would occur at more consistent rates across the landscape. Water infiltration, soil moisture retention, aeration, aggregate stability, and resistance to erosion would also improve. Compaction may be reduced around water developments, pasture gates, fence lines, and trailing areas where livestock currently concentrate. Soil structure, stability, productivity, infiltration rates, and moisture retention would improve slowly under this alternative but more rapidly than the Action Alternatives.

Alternative 1 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 Japanese brome in the Juan Tank Allotment as well as other Action Alternatives as it does not include consideration of targeted grazing as a cultural control option. There is therefore potential for the Japanese brome infestation to increase in size under this alternative, further impairing soil function on currently affected TES map units.

Direct and Indirect Effects of Alternative 2, Current Management

Alternative 2 would reauthorize yearlong cattle grazing on the Juan Tank Allotment through implementation of a new Term Grazing Permit for up to 150 adult cattle (1,800 Animal Unit Months, AUMs). Under this alternative, there would be direct and indirect effects from grazing management activities on soils, surface water quality, and watershed condition.

A 40 percent utilization guideline would remain in effect throughout the allotment. The 40 percent utilization guideline reflects “conservative” grazing use, and has been shown to contribute to sustainable management of soils and watershed resources.

Seasonal deferment (i.e., a period of non-grazing during part of the growing season) would continue to be practiced, with an emphasis on spring-early summer deferment (i.e., March 15 - June 15). Spring deferment would include minimizing the number of areas grazed during late spring/early summer, and not using the same areas during consecutive years. Adaptive management, monitoring, and implementation of rangeland Best Management Practices (BMPs) would be used to minimize and mitigate direct and indirect effects to soils, water quality and watershed conditions.

Alternative 2 would require the grazing permittee to continue to maintain existing rangeland improvements on the Juan Tank Allotment, including earthen livestock and wildlife waters, and fences.

Direct effects of livestock grazing to soils and water resources include:

- reduction of vegetative canopy cover that protects soil surfaces from raindrop impact and soil particle detachment,
- reduction of vegetative ground cover that provides soil stability and prevents entrainment of soil particles in surface runoff,
- 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, and food for soil organisms.
- Increased bare mineral soil that is subject to raindrop impact
- Soil compaction and displacement
- degradation of surface water quality in livestock and wildlife waters
- destabilization of ephemeral and intermittent stream banks
- damage to the riparian plant community of Holden Lake

Indirect effects of livestock grazing to soils and water resources include:

- loss of long term soil productivity
- degradation of downstream surface water quality through increased sediment delivery to stream courses and water bodies and increased nutrient concentrations in surface waters

Adverse effects of livestock grazing to soils and watershed resources are primarily controlled through adherence to forage utilization guidelines, controlling livestock distributions, and monitoring of rangeland conditions and BMPs.

Alternative 2 does not provide for seasonal deferment opportunities since only one pasture is available during winter months when snowpack precludes livestock use of higher elevation pastures. As a result, the grazing permittee has resorted to supplemental feeding during some winter months, causing some areas to exhibit indications of concentrated use. Additionally, Alternative 2 does not adequately address the Japanese brome infestation since livestock distribution aids or cultural control (e.g. prescribed grazing) are not considered under this alternative.

Alternative 2 includes 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 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.

Direct and Indirect Effects of Alternative 3, Modified Proposed Action

Alternative 3 would implement a change from yearlong to seasonal grazing. The structural improvements and authorization of motorized cross-country travel and use of maintenance level 1 roads for grazing management activities under Alternative 3 are the same as Alternative 4.

Shifting from yearlong grazing to a season of use ranging from 6 to 8 months ensures that grazing deferment can be applied to all areas of the allotment, allowing the permittee to synchronize the timing and duration of grazing with the phenology of the plants being grazed. This improves vegetative ground cover by ensuring maximum vegetative growth during the period of rest when no grazing occurs and provides opportunity for successful seed set. Deferment also provides an opportunity for cultural control of Japanese brome through targeted grazing when the practice is most effective at controlling this invasive species (i.e., in late spring and early summer, before seed-set). Research indicates that targeted grazing can adversely affect annual bromes through consumption of seeds, leaves, and reduction of litter (Harmoney 2007).

Up to 360 cattle would be permitted to enter the allotment as early as mid-March, depending on range readiness of the main pastures. Use of the Juan Tank Pasture would depend on the phenology of the Japanese brome. Sheep have also been proposed as a cultural control agent of Japanese brome under this Alternative. Up to 1,200 sheep could enter the allotment as early as mid-April (again, depending on the phenology of the brome) to graze areas of high brome density. The livestock could remain in the Juan Tank Pasture until a utilization level of 60-80 percent of the brome is achieved. Sheep would only be used on the allotment when conditions are appropriate.

Short-duration, high-intensity grazing has the potential to cause increased soil compaction, disturbance, loss of effective ground cover, and erosion. However, with successful control of Japanese brome, soil conditions would begin to improve through development of native herbaceous plant communities that is better adapted and more resilient. Over the long term, there is potential for soils to return to desired conditions in Japanese brome infested areas.

Control of Japanese brome in the Juan Tank Allotment would improve approximately 5,000 acres of TES map units currently in impaired condition since portions of these map units are dominated by this invasive species. Establishing a successional trend toward native grasses and forbs would provide for sustainable plant communities that are adapted to these soils, thus improving ecosystem stability and resilience. Soil productivity would be improved through reduced nonnative plant populations and improved vegetative cover of desirable native species.

Five horses would be added to the permit and would be located in the HQ pasture yearlong; they would be on the Forest portion of this pasture until a 40 percent utilization limit is reached after which they would be moved to private land for the remainder of the year.

The amount of effective vegetative cover to protect soils and watershed resources would largely depend on timing of grazing. Under Alternative 3 the grazing use period within a pasture would be seasonally controlled so that forage is grazed and rested at different times each year. This approach helps maintain effective vegetative ground cover, while simultaneously maintaining or improving forage production, forage quality, and plant species composition. Additionally, adaptive management, monitoring, and implementation of rangeland management BMPs would provide the necessary resource information and protection to ensure that desired conditions for soils and watershed resourced are achieved.

Direct and Indirect Effects Common to Alternatives 3 and 4

Construction of the Holden Lake exclosure, waterlot fences, two corrals, the HQ pasture fence, four trick tanks, brome exclosures, and fences to split pastures would have short-term direct adverse effects to soils resources through soil disturbance, displacement, and compaction. Long term indirect adverse effects include ongoing soil disturbance in corrals, waterlots, and around trick tanks by livestock use. These effects are estimated to amount to approximately 40 acres. Additional direct and indirect adverse effects to soils include authorizing motorized cross-country travel for the purposes of livestock management. Motorized cross country travel has the potential to disturb, displace, and compact soils in traveled areas, subjecting them to risk of accelerated erosion.

Long-term beneficial effects to soils and watershed resources includes improved vegetative cover, including litter, in pastures throughout the allotment as a result of improved timing, duration, frequency and distribution of livestock. Riparian vegetation in Holden Lake is expected to improve with the exclusion of livestock from this area since soil disturbance and compaction would be reduced. Soil disturbance and compaction would not be totally eliminated since wildlife would continue to use Holden Lake.

Splitting the Juan Tank and Sisters pastures would improve flexibility in grazing management through additional pastures. Adding these pastures to the grazing system ensures that areas can be rested following treatments such as forest thinning and prescribed burning, thereby maintaining vegetative cover that protects soil surfaces from raindrop impact, accelerated erosion, and sediment delivery to stream courses.

In the interest of assessing treatment options for control of Japanese brome, treatment trials in the brome plots would result in increased soil disturbance through such activities as disking, seeding, and herbicide applications. However, it is likely that subsequent treatments would not occur in these plots within 3 to 4 years following treatments in order for resource managers to assess their efficacy in controlling Japanese brome and improving native vegetation composition.

Direct and Indirect Effects of Alternative 4, Adaptive Management

Under Alternative 4, yearlong grazing would continue. Direct and indirect effects to soils resources would be similar to Alternative 2, although some improvement in vegetative cover may be realized through improved livestock distributions and timing, duration and intensity of grazing. Control of Japanese brome infestations would be addressed through integrated pest management (e.g. through management of livestock distribution). A herdsperson would move cattle as needed to graze brome, and waterlots and corrals would be used to hold cattle during

pasture rotations. In conjunction with livestock grazing management, treatment trials for control of Japanese brome would be undertaken in exclosure plots.

The use of electric fencing is proposed under this alternative in lieu of permanent fences to split the Juan Tank and Sisters Pastures. This option allows the allotment permittee to remove fences when livestock exit the pasture. Electric fences would only be in use when livestock are to be enclosed in a particular grazing area. Adverse effects to soils from use of electric fences include frequent cross country motorized travel to install, inspect, maintain, and remove electric fences.

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 Juan Tank Allotment 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:

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 Williams Ranger District. These activities could occur on private lands as well.

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 Juan Tank Allotment.

Urban development and interface growth would likely continue on private lands, particularly in close proximity to the City of Williams.

Road construction, maintenance and right-of-way clearing can be expected to continue on non-National Forest System land. Road use maintenance would continue on National Forest System lands. Tables 10 and 11 provide a summary of past and present projects considered in the soils and watershed cumulative effects analysis for the Juan Tank Grazing Allotment Renewal EA. Table 12 provides a summary of reasonably foreseeable projects for this analysis.

Cumulative Effects of Alternative 1, No Action

The No Action Alternative would result in no grazing in the Juan Tank Allotment. Cumulative effects include reduced acreage subjected to grazing in watersheds that include the Juan Tank Allotment. An increase in vegetative and effective ground cover would likely occur in the Juan Tank portion of these watersheds in the absence of grazing. The risk of accelerated erosion would be reduced proportionally by areas of the Juan Tank allotment no longer subjected to livestock grazing. When combined with past, present and reasonably foreseeable future actions, the No Action Alternative would be consistent with Forest Plan standards and guidelines for soils and watershed resources.

Cumulative Effects of Alternative 2, Current Management

Downstream water quality

Ephemeral and intermittent drainages in the project area respond to seasonal surface runoff (usually during snow melt and the summer monsoon season). Surface runoff potentially carries varying amounts of sediment and bio solids (manures), contributing to water quality degradation through increased turbidity, bacteria, and other pathogens. Turbidity is the water quality standard that is most likely affected by land management activities. Turbidity is a measure of particulate matter suspended in water. Typically, in wildland settings, turbidity is the existence of fine to very fine soil particles and organic matter in water. Sediment delivery ratios normally decline with increasing watershed area, resulting in dilution of sediment delivered to streams from a given activity. The ADEQ 305(b) Assessment and 303(d) Listing Report for 2010 was consulted to determine water quality status of streams that flow from the project area. There are no exceedances or impairments noted on either the 305(b) Assessment or 303(d) List for any stream segments or water body within the Juan Tank Allotment. It is unlikely that the current management would contribute enough sediment or bacteria to ephemeral or intermittent drainages in the subwatersheds which include lands of the Juan Tank Allotment.

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 improves surface roughness and nutrient cycling. As native grasses and forbs increase in numbers, fine root material would contribute to soil profile 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 fuels treatments that result 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, which are typically implemented during vegetation treatments and timber harvests, are designed to maintain soil productivity and surface water quality by minimizing soil loss and associated sediment delivery to water bodies.

Soil Stability and Erosion Processes
Gullies and head cuts 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.

In combination with vegetation management activities associated with the City Project and 4FRI, and grazing of adjoining allotments, grazing under current management of the Juan Tank Allotment would result in a static to upward trend in soil and watershed condition. This is primarily due to improvements resulting from stand density reduction in forested areas of watersheds that include the Juan Tank Allotment. In the absence of vegetation management projects, current management of the Juan Tank allotment would likely result in static to downward trend in soil condition, water quality, and watershed conditions.

Nutrient Cycling
Grazing in combination with vegetation treatments would result in improved nutrient cycling over time due to the addition of small and large woody material. 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, retention of soil moisture, and sequestration of 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).

Soil Hydrology
The current percentage of soil disturbance and ruderal areas on USFS lands in watersheds that include the Juan Tank Allotment is estimated at 3 to 5 percent. There are several miles of roads proposed for obliteration in the Bill Williams Mountain Restoration Project area that are compacted, rutted, and are channelizing surface runoff and are not exhibiting substantial recovery. In order to mitigate any additional compaction and displacement of soils under the Bill Williams Mountain Restoration Project and the City Project, temporary roads, skid trails, and landings would be stabilized using BMPs and SWCPs, which may include ripping or decompacting, slashing, and seeding to alleviate reductions in porosity and infiltration capacity.

Therefore, it is not expected that the percentage of compacted areas would increase substantially (i.e., beyond an additional 1 to 2 percent over the current condition).

Areas of water repellency, which form as a result of the prescribed fire use are expected to recover within 3 to 5 years as natural processes such as freeze-thaw, wetting and drying, natural revegetation, root elongation, and chemical weathering occur.

In combination with vegetation management projects, road decommissioning, and grazing of adjacent allotments, current management of the Juan Tank project would result in static to upward trends in soil hydrologic function.

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 Juan Tank Allotment 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 stream flow would depend on whether precipitation or snowmelt exceeds evapotranspirational demand, 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 Juan Tank Allotment is intercepted by tree canopies. Some of this moisture evaporates or sublimates without contributing to 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. For the first 1 to 3 years following vegetation treatments in watersheds that include the Juan Tank Allotment, a slight increase in storm water runoff is expected since understory vegetation of grasses, forbs and shrubs would not have reached maximum ground cover levels, snowpack interception would be reduced, and there would be fewer trees to create evapotranspirational demand for soil moisture during the growing season.

Recreational Activities
Recreational activities common to the Williams Ranger District and likely to occur within the Juan Tank Allotment 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 Arizona Game and Fish Department's Game Management Unit 10, and is popular for pronghorn, bighorn sheep, turkey, elk, mule deer, javelina, bear and mountain lion hunting. 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.

Livestock Grazing
Cumulative effects from livestock grazing on other allotments in the watersheds that include the Juan Tank Allotment include minor, generally localized soil disturbance, displacement, compaction, puddling, and erosion from livestock trailing and in areas where animals congregate such as stock tanks, corrals, and areas where mineral supplements are placed. Individual wildlife and livestock trails occur throughout the Juan Tank Allotment, but these trails comprise a small percentage of the allotment. Livestock grazing is not expected to increase the area of soils characterized as impaired in watersheds that include the Juan Tank Allotment.

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 of invasive and noxious weeds are found, 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.

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 includes 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 in 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.

Cumulative watershed effects

When combined with projects and activities listed in Tables 10 through 12, cumulative watershed effects from grazing of the Juan Tank Allotment under current management would include improved overall soils and watershed condition and restoration of the ecological interrelationships of soils, vegetation, and watersheds throughout the analysis area. However, many areas within the Juan Tank Allotment would exhibit static to downward trend due to the lack of flexibility in controlling the timing, distribution, intensity and frequency of grazing since the Allotment currently has only 3 pastures, there would be no new fencing of Holden Lake or creation of water lots, and there would be limited opportunity to control Japanese brome infestations.

When combined with past, present and reasonably foreseeable future actions, current management would remain consistent with Forest Plan standards and guidelines for soils and watershed resources.

Cumulative Effects of Alternative 3, Modified Proposed Action

Cumulative effects of Alternative 3 would be similar to those described under Alternative 2. However, under Alternative 3, vegetative ground cover, riparian vegetation, and water quality are expected to remain static or improve slightly. In addition to adaptive management strategies, Alternative 3 would not cumulatively result in a decline of vegetation condition or trend given the implementation of adaptive management. When combined with past, present and reasonably foreseeable future actions, Alternative 3 would be consistent with Forest Plan standards and guidelines for soils and watershed resources.

Cumulative Effects of Alternative 4, Adaptive Management

Cumulative effects of Alternative 4 to soils and watershed resources would be similar to those described for Alternative 3. Vegetative ground cover, riparian vegetation, and water quality are expected to remain static or improve slightly. Alternative 4 would not cumulatively result in a decline of vegetation condition or trend given the implementation of adaptive management strategies. When combined with past, present and reasonably foreseeable future actions,

Alternative 4 would be consistent with Forest Plan standards and guidelines for soils and watershed resources.

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 an initial, short-term increase in atmospheric CO2 and other greenhouse gases from the proposed treatments through burning of hydrocarbons to conduct mechanical vegetation treatments, rapid oxidation of vegetation and woody debris during prescribed burning, and increased decomposition of woody debris. However, long-term effects would be positive as the ground cover of grasses and forbs increases. Woody debris would provide long term nutrient sources and contribute to surface roughness, decreasing potential erosion. Nutrients released in ash during prescribed burning and through decomposition of residual woody debris from forest thinning would also improve soil quality. As previously noted the increase in ground cover of grasses, forbs, and shrubs, which have higher fine root turnover rates than large woody plants would result in greater soil organic matter content over time. Soils within the project area would therefore sequester more carbon dioxide (CO2) over the long term.

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 CO2, methane (CH4), nitrous oxide (N2O), and hydro fluorocarbons 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 would 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 would 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 regional 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 would 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

Irretrievable commitments of soil productivity would continue under all alternatives except the No Action Alternative until areas of existing disturbance are returned to a productive capacity by restoring and protecting soil productivity and hydrologic function. No irreversible commitments to soil productivity would occur as a result of any of the alternatives analyzed for this project.

Air Quality

The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act identifies two types of national ambient air quality standards. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings (EPA 2008).

EPA has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. These include carbon monoxide, lead, nitrogen dioxide, ozone, particulate pollution, and sulfur dioxide. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m3).

The Juan Tank Allotment is 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) 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 Grand Canyon National Park and the Sycamore Canyon Wilderness Area. 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 would “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 Kaibab National Forest to minimize fugitive dust from road use, range improvement construction and maintenance, or grazing allotment management.

Vegetation

Affected Environment

Eight permanent vegetation monitoring transects were established on the Juan Tank Allotment in 1958 using the Parker 3-Step method (Parker 1950); another was established in 1963, and one more in 1984. Vegetation Condition and Trend was assessed for the Juan Tank Allotment using these monitoring locations. All locations were converted to the Pace Quadrat Frequency method and one-tenth acre canopy cover plots in 2011. The change in the monitoring methods was necessary to obtain baseline vegetation data that correlates with data presented in the Kaibab National Forest Terrestrial Ecosystem Survey (Ruyle and Dyess 2010).

In 2011, Pace Quadrat Frequency (i.e., ground cover, canopy cover, species occurrence, frequency, relative species composition, and forage production) measurements were conducted at sites 1, 4, 8, 9, and 10. Additional forage production data was collected at five sites: three historic pace transect sites (# 7, 15, 17), the Button Exclosure, and a ponderosa pine unit. Repeat photography dating back the transect establishment date was also conducted at all 10 sites. In 2012, Clusters 8 and 9 were read again to assess any change in Japanese brome populations. Cluster 6 was also read in 2012. Trend was summarized for the 10 permanent monitoring locations based on data collected in 2011, as well as the historical data that has been collected from these sites and is summarized in the following three paragraphs. Detailed information on these sites can be found in the range specialist report. Historical data prior to the 2011 readings exists for years 1958, 1984, and 1993/94. Units of measure for this analysis include species diversity, species abundance, ground cover, and soil conditions (e.g., evidence of erosion).

Clusters 1, 3, 4, 8, and 10 showed an upward or static trend between the 1994 and 2011 readings, because the attributes listed above (e.g., species diversity, ground cover, etc.) have either improved or they have not changed.

Clusters 2, 5, 6, 7, and 9 showed a downward trend between the 1994 and 2011 readings because of reduced vegetative ground cover, presence of Japanese brome, and/or increasing juniper size and density. Juniper thinning at Clusters 2, 5, and 6 would likely reverse the downward trends. A reduction of Japanese brome on Cluster 9 should reverse the downward trend. Cluster 7 (established in 1958) no longer represents an appropriate key area due to the close proximity to a pasture fence/gate and Forest Service Road 124.

Rangeland management status is considered to be in satisfactory condition when the existing vegetation community is similar to the desired condition, maintaining or improving vegetation trend, and/or short-term objectives are being achieved to move the rangeland toward the desired condition.

Interannual variation in climatic conditions is one of the major contributing factors, if not the primary factor, affecting range condition and trend in the southwestern United States. In most cases, the condition of water-limited ecosystems, such as those on the Kaibab National Forest, is more sensitive to the high variability in precipitation and soil moisture than to livestock management, given that appropriate management (i.e., moderate grazing intensity) is being implemented (Holechek et al. 1999, Loeser et al. 2001, Curtin 2005).

Comparative Yield data was collected on the Juan Tank Allotment during the fall of 2011 and 2012 to estimate forage production. That data represents six soil map units totaling 11,271 acres. Comparative Yield data collected from other allotments was used for the remaining map units. Forage production was assessed on the pasture level to better understand the most appropriate grazing system for this allotment, and is displayed in the range specialist report.

The primary component of forage production was warm and cool season grasses. Forage production is highly variable on an annual basis due to the variability in precipitation amounts and timing. It is important to note that forage production is assessed annually, and livestock numbers are adjusted to match annual forage production by means of adaptive management.

Grazing capacity is a function of grazing capability, forage production, topography, allowable use, and the level of management that may be applied. This analysis used grazing capability, forage production, topography, and an appropriate allowable use to determine the estimated grazing capacity. The following describes these factors and their implications on the calculation of the estimated grazing capacity:

1. Grazing Capability: Grazing capability was assigned only to Full Capacity and Potential Capacity acres. A conservative assignment of capacity to Potential Capacity acres was achieved through a 50% reduction in estimated grazing capacity (Grazing Capability Reduction Factor) and a conservative allowable use.

2. Forage Production: Estimates generated from Comparative Yield data collected in 2011/12 on the Juan Tank Allotment were assigned to specific TES units and multiplied by the total area of TES unit to calculate forage production.

3. Topography: Adjustments in the land area appropriate for grazing were made to account for slope. The following were used for topography adjustments on the allotment:

   Class 1 - 0 to 10% Slope; No reduction in grazing capacity
   Class 2 - 11 to 30% Slope; 30% reduction in grazing capacity
   Class 3 - 31 to 40% Slope; 60% reduction in grazing capacity
   Class 4 - >40% Slope; 100% reduction in grazing capacity (No Capacity)

   Sources: 1) Region 3 Rangeland Analysis and Management Training Guide; June, 1997; 2.8-2.10. 2) J.L. Holechek, 1988. An approach to setting the stocking rate. *Rangelands* 10:10-14.

4. Allowable Use: Allowable use was established at 40%. This is the utilization level allowed for both livestock and wildlife.

Estimated capacity is expressed in Animal Unit Months (AUMs). An Animal Unit Month is defined as the amount of forage required by an animal unit (mature cow with or without a nursing calf) for one month; approximately 800 pounds of forage per AUM.

Based on existing conditions and the factors listed above, the estimated grazing capacity for allotment is approximately 3,397 AUM's; the estimated capacity of the Full Capability areas only is approximately 3,235 AUM's.

Environmental Consequences

Effects of Alternative 1, No Action / No Grazing

The direct, indirect, and cumulative effects of Alternative 1 are described below.

Direct and Indirect Effects – Alternative 1

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

When cattle graze, herbaceous plant height and canopy cover is reduced; however this is a temporary reduction because these plants recover with favorable climatic conditions. Wildlife

grazing/browsing would continue to occur, potentially having similar effects as livestock grazing.

Short-term changes in range condition and trend (as measured by changes in vegetation density and diversity) may be observed under this alternative. However, a long-term increase in vegetation density and diversity is not expected due to livestock removal. Courtois et al. (2004) found few differences in species composition, cover, density, and production in comparing 16 long-term livestock exclosures (65 years) with adjacent areas that had been moderately grazed. Under this alternative, range condition and trend is expected to remain static or move upward, except in areas where overstory species limit improvement potential. The ability for improvement in range condition and trend would be most affected by climatic conditions.

Wildlife grazing on the allotment would continue at its current rate or potentially increase due to the lack of herbivore competition, thus cool-season species would continue to receive a disproportionate share of grazing by wildlife. If wild ungulate numbers across the landscape fluctuate up or down this would also affect the vegetative resource on the allotment, as plants are either allowed to recover from grazing effects or are continually grazed. In the latter case, the eventual result may be a loss in plant species diversity (Archer, et al 1991, Briske D.D. 1991).

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

Under this alternative, structural range improvements would not be maintained, as a result there would be no direct or indirect effects relating to those activities. Indirect effects would be realized through a loss of available water for wildlife as earthen water tanks fill with sediment.

Japanese brome would continue to persist and possibly expand its range since it benefits from the accumulation of plant litter. Without livestock to graze the brome, there would be an increase in plant litter which provides both a seed bed and a microclimate conducive to seed germination. Brome treatments would be confined to burning and limited use of herbicide.

Cumulative Effects of Alternative 1

The geographical extent of the cumulative effects analysis is confined to the analysis area of the Juan Tank Allotment. The timeframe selected for this analysis is 20 years; 10 years in the past and 10 years in the future. This timeframe was selected because ground disturbing activities that have occurred within the analysis area are expected to recover within 10 years. The past, present, and reasonably foreseeable future activities considered in the cumulative effects analysis for vegetation include vegetation management, fuels management, noxious weeds treatments, fuelwood harvesting, prescribed fire, cinder extraction, wildlife grazing, and recreational activities.

Under this alternative, there would be no direct or indirect effects from cattle grazing; therefore, there would be no cumulative effects.

Effects of Alternative 2, Current Management

The direct, indirect, and cumulative effects of Alternative 2 are described below.

Direct and Indirect Effects of Alternative 2

Under this alternative, livestock grazing would occur and as a result, there would be direct and indirect effects from cattle grazing on vegetation. Adaptive management and monitoring would be used to mitigate the direct and indirect effects. Wildlife would continue to graze on the allotment, creating localized impacts and potentially areas of excessive utilization.

Livestock grazing effects to vegetation occur through a reduction in plant height and cover and are primarily managed through forage utilization and grazing intensity monitoring. The reduction in plant height and cover, as a result of grazing, does recover with favorable climatic conditions. Provided appropriate forage utilization and the implementation of conservative grazing intensity and adaptive management, livestock effects on vegetation can be adequately mitigated to maintain and/or improve vegetation and soil conditions to a desirable state. A review of rangeland management studies dating back to 1949 by Holecheck et al. (1999) showed that moderate grazing intensity resulted in an improvement in ecological condition.

However, Vermeire et al. (2008) states that "Although repeated seasonal use, in which the same pasture is grazed annually at the same time of year… is often done to simplify animal management, such use may be expected to alter productivity and species composition because of seasonal differences in plant response to herbivory and subsequent effects on competitive plant interactions." Therefore, we can expect a downward to static trend under Alternative 2 because it does not allow spring deferment or pasture rest through the use of livestock distribution aids (e.g., waterlots, pasture splitting), which would be essential to control/contain Japanese brome.

Adaptive management and monitoring would provide the ability to reduce utilization guidelines if needed to maintain or improve vegetation conditions. In Galt, et al. (2000), a 25 percent utilization guideline is recommended for livestock, with 25 percent allocated for wildlife and natural disturbance, and the remaining 50 percent left for site protection. Under Alternatives 2, 3, and 4, wildlife use is included within the proposed forage utilization guideline of 40 percent, thus leaving 60 percent of the forage production available at the end of the growing season for site protection and nutrient cycling.

Cumulative Effects of Alternative 2

The geographical extent, timeframe, and past, present, and reasonably foreseeable future activities is the same as described in the No Action alternative.

Livestock grazing, in combination with grassland restoration activities, dispersed recreation and roads, firewood gathering, pipeline and power line maintenance, invasive species treatments, prescribed and/or wild fire, cinder extraction, and wildlife grazing is possible with little conflict.

Under the action alternatives, livestock grazing would have direct effects to understory plants by reducing plant height and canopy cover. When the effects from cattle grazing are added to the effects from the other activities, the overall cumulative effect of cattle grazing on plant height and canopy cover is more than the No Action Alternative. Condition and trend is expected to be static to downward under Alternative 2, with cattle grazing additive to other activities and natural

events. Alternative 2 may result in a decline of vegetation condition or trend as it doesn't adequately address Japanese brome nor provide for the additional structures needed for increased pasture flexibility.

Direct and Indirect Effects of Alternative 3, Modified Proposed Action

The change from yearlong to seasonal grazing is unique to Alternative 3 and those direct and indirect effects are discussed in this section. Effects common to alternatives 3 and 4 are discussed below.

Changing from yearlong grazing to a six-eight month season of use ensures that deferment from grazing can be applied to all areas of the allotment and matches the grazing period with the developmental needs of the grasses. This also places cattle on the Japanese brome infested areas when grazing is most useful as a treatment, late-spring and early summer, before the brome produces seed. Research shows that grazing can affect annual bromes through consumption of seeds, leaves, and reduction of litter. During early spring, annual bromes have high forage quality. Seed heads of Japanese brome may have crude protein values of 8-13% and cattle would selectively graze annual bromes in spring and select the spikelets later (Vermeire et al. 2009).

Up to 360 cattle would enter the allotment as early as mid-March, depending on range readiness of the main pastures. Use in the Juan Tank Pasture would depend on the phenology of the Japanese brome.

Under Alternative 3 the grazing use period within a pasture is seasonally rotated so that forage is grazed and rested at different times each year. By alternating the livestock use and rest periods on cool and warm season species, forage production, forage quality, and plant species composition would be maintained or improved. Additionally, adaptive management and monitoring would provide the necessary resource information and management options to adjust the timing, intensity, frequency and duration of livestock grazing to ensure that vegetation condition is maintained or improved.

Direct and Indirect Effects of Alternative 4, Adaptive Management

Yearlong grazing would continue under Alternative 4 and effects would be similar to those described under Alternative 2. Japanese brome would be addressed primarily through livestock management (use of a day rider to keep cattle where needed in combination with waterlot fencing) while trials occur in exclosure plots.

Electric fencing would be tried under this alternative instead of building permanent fences to split the Juan Tank and Sisters Pastures. This would enable the permittee to remove the electric fence when cattle leave an area. Motorized cross-country travel may increase under this alternative as the permittee puts the fence up and takes it down throughout the year. This type of fence would possibly require more maintenance (daily checks) to insure that wildlife or livestock haven't broken through it and/or it remains charged (electrified).

Direct and Indirect Effects Common to Alternatives 3 and 4

Alternatives 3 and 4 would have direct effects to understory plants by reducing plant height and canopy cover. This reduction could lead to a reduction in grass, forb and/or shrub plant species composition, canopy cover, abundance, and productivity. However, findings in Courtois, et al

(2004), Loeser (2004), and Curtin (2005) indicate that there is not an increase in grass, forb, and shrub abundance, diversity, and production when the areas are rested or excluded from cattle grazing. Given effective implementation of monitoring and adaptive management, vegetation condition and trend is expected to remain static or move upward under these alternatives, except in areas where overstory species limit improvement potential. The ability for improvement in range condition and trend in water-limited ecosystems is more affected by climatic conditions than by moderate intensity livestock grazing (Holechek et al. 1999, Loeser et al. 2001, Curtin 2005).

Livestock grazing can have the effect of improving or decreasing plant species composition depending on the timing of grazing. For instance, spring and early summer grazing occurs mainly on cool season species. Following the monsoon season, grazing occurs mainly on warm season species. These relationships can be attributed to higher forage values for younger plant materials relative to older plant materials. As temperature cool in the fall, use changes back to cool season species because of the reinitiating of cool season grass production.

Sheep may also be used to aid in the treatment of Japanese brome. Sheep numbers in any given year would not exceed 1,200 and would be dependent on the extent of the invasion, the need for control, and any early grazing by cattle. Authorized cattle numbers following prescribed grazing would be adjusted to not exceed the 40% utilization level at the end of the growing season. The ideal time for targeted grazing of Japanese brome is while the plant is actively growing and has reached a height of 3-4 inches, and before seed set.

The livestock could remain in the Juan Tank Pasture until a utilization of 60-80% of the Japanese brome is reached. They would be removed prior to the brome going into dormancy and before the seeds start dropping. This could occur anywhere from mid-May to late-June, depending on conditions (whether or not it was a wet winter or spring, what spring temperatures are like, etc.). The variability of climatic conditions makes it difficult to say for certain exactly when livestock would be turned out and how long they would stay. However, sheep would only come onto the allotment when conditions are appropriate for them.

It is anticipated that sheep would be used 3-5 times out of the 10-year implementation period, although it could be more or less, depending on conditions. Regardless of when they are used, resource managers would assess the impacts of sheep on brome when sheep grazing is applied as a treatment.

Up to 5 horses would be kept in the HQ Pasture yearlong. They would be permitted on the Forest Service part of that pasture until a 40% utilization limit is reached. After that the horses would be placed on private land and remain there until conditions warrant a return to the Forest Service portion.

The installation of two corrals, four trick tanks, the construction of the Holden Lake exclosure and waterlots, construction of the HQ pasture fence, construction of the brome exclosures, and the pasture splits would primarily have short-term direct effects on the vegetation in the immediate vicinity of the improvements.

Approximately 40 acres would be permanently disturbed by the installation of corrals, trick tanks, and waterlots. Long-term effects may be improved vegetation at the allotment level

through improved livestock distribution. Additional water sources may lead to improved vegetation conditions surrounding existing waters through a reduction in the number of animals and the number of days in which they congregate at any particular water source.

The construction of the Holden Lake exclosure fence, the HQ Pasture fence, and the brome exclosures would have short-term direct effects on vegetation. Plant height and canopy cover would be reduced in the immediate area by construction activities; however, plant height and canopy cover would recover with favorable climate conditions. Wetland vegetation at Holden Lake is expected to increase in frequency with the removal of livestock; however, wildlife would still have access so grazing would not be eliminated but would be reduced. The construction of this exclosure would allow for improved control of livestock, as would splitting the Juan Tank, Sisters, and HQ pastures.

Splitting the Juan Tank and Sisters pastures would add greater flexibility to livestock management by incorporating a five pasture system instead of a three pasture system. Rest and deferment would occur on a regular basis, and having two extra pastures ensures that areas can be rested following treatments such as prescribed burning and thinning.

Treatments in the brome plots could be considered short term in nature. If disking and seeding are tried, for example, no follow up treatments would be applied to that area for perhaps 3-4 years, in order for resource managers to assess the adequacy of the disking and seeding.

Likewise, if herbicide is applied, an adequate period of time is needed following that treatment to see if it worked on these small scales. If a treatment(s) is successful in reducing Japanese brome in the exclosure plots, it may be applied to larger areas of the Juan Tank pasture. No ground disturbing activities would occur without Heritage surveys.

Cumulative Effects of Alternatives 3 and 4

The geographical extent, timeframe, and past, present, and reasonably foreseeable future activities are the same as described in Alternative 1.

Livestock grazing, in combination with grassland restoration activities, dispersed recreation and roads, natural gas developments (i.e., pipelines), prescribed fire, cinder extraction, and wildlife grazing is possible with little conflict.

Under this alternative, livestock grazing would have direct effects to understory plants by reducing plant height and canopy cover. When the effects from cattle grazing are added to the effects from the other activities, the overall cumulative effect of cattle grazing on plant height and canopy cover is more than the No Action Alternative. Cumulatively, condition and trend for vegetation is expected to remain static or move upward with cattle grazing additive to other activities and natural events. This alternative does not cumulatively result in a decline of vegetation condition or trend given the implementation of adaptive management.

Direct and Indirect Effects of Authorizing Motorized Cross-County Travel

Motorized cross-country travel would be authorized under Alternatives 3 & 4. Limited cross-country travel is expected when the permittee is moving supplements and/or when maintaining range improvements (fences, water). Off-road travel can damage vegetation and compact soils but would only be authorized when soils are dry or frozen. Compacted soils absorb and retain

less water than aerated soils resulting in reduced vegetative growth of grass and forb species; see the soils and watershed section for a more detailed account of these effects.

Noxious Weeds

Affected Environment

The affected environment for the Juan Tank invasive plants analysis is the area that is included within the Juan Tank Allotment boundary (18,535 USFS acres).

Invasive plant species have been inventoried on the Williams Ranger District (WRD) beginning in 1997, and continue today. Areas of the Juan Tank allotment with highly disturbed soils (e.g., roadsides) may provide suitable habitat for invasive plant species. Weed inventories, monitoring, and treatments occur on an annual basis on the WRD, where those populations are believed to have highly adverse effects and/or the highest success of control being the highest priority.

A search of the Forest Service database (NRIS) that archives invasive species occurrences was conducted for the Juan Tank allotment for the period during 1997 – 2010. The following species have been documented within the Juan Tank Allotment boundary (acreages are approximate):

1. **Bull Thistle** (<1 acre within project area) is a stout biennial thistle with purple flowers from Eurasia that commonly invades disturbed sites that include slash piles, log decks, burned areas, and roadsides. Regeneration occurs solely from short-lived seed. Bull thistle is limited within the Juan Tank Allotment, and it is not thought to increase as a result of grazing. Two populations have been documented within the Juan Tank grazing allotment.

2. **Cheatgrass** (<1 acre within project area) is an erect cool season annual grass that was introduced from Europe. Cheatgrass is a prolific seed producer that can quickly establish and persist following disturbances that increase resource availability (e.g., fire). The presence of cheatgrass can increase fire frequency, creating a positive feedback loop that can result in cheatgrass monocultures. Cheatgrass is limited within the Juan Tank Allotment, and it is not thought to increase as a result of grazing within the project area. One population has been documented within the Juan Tank grazing allotment.

3. **Mullein** (2 acres within project area) can be biennial, perennial or, rarely, an annual with a deep tap root that is native to Europe and Asia. In its first year it produces a low vegetative rosette up to 60 cm in diameter which overwinters and is followed in the succeeding growing season by a stout flowering stem 5-18 dm tall. An individual may produce 100,000-180,000 seeds, and seeds may remain viable for up to 100 years. Mullein is limited within the Juan Tank Allotment, and it is not considered an ecological threat. Seventeen occurrences have been documented within the Juan Tank allotment.

4. **Field Bindweed** (2 acres within project area) is a perennial vine arising from deep, persistent spreading roots. It reproduces by rhizomes and seeds. Field bindweed is commonly found along roadsides within the Juan Tank Allotment, as is not considered an

ecological threat. Twenty-four occurrences have been documented within the Juan Tank Allotment.

5. **Japanese Brome** (4,986 acres within project area with varying density) is an introduced, cool-season, annual grass that reproduces entirely from seeds. Japanese brome colonizes disturbed sites and is usually regarded as a noxious weed on rangelands and prairies because it competes with native perennials for water and nutrients. Japanese brome is widely distributed on the Juan Tank Allotment, with some areas having dense populations. Its density varies annually, mostly based on the timing of precipitation events.

6. **Horehound** (1 acre) is a gray-leaved herbaceous perennial plant native to Europe that grows to 12 to 30 inches in height, and is thought to be disturbance dependent. Seven occurrences have been documented within the Juan Tank allotment. Horehound is not considered to be an ecological threat within the Juan Tank Allotment.

7. **Siberian Elm** (<1 acre within project area) is widely grown in many areas of northern Arizona as a shade tree. However, it is not appropriate in wildland settings where it can out-compete native tree species in riparian zones and other sensitive areas. The trees reproduce through winged seeds that can be transported long distances on the wind or by vehicles to new locations. The abundant production of seed will make this species difficult to control. One population has been documented within the Juan Tank allotment, and is not considered to be an ecological threat within the Juan Tank Allotment.

8. **Yellow Sweet Clover** (<1 acre within project area) is an erect annual or biennial that grows from strong taproots; often forming colonies. It reproduces by seeds that are drought tolerant and cold hardy. It can outcompete native species by overtopping and shading. Three occurrences have been documented within the Juan Tank allotment, and is not considered to be an ecological threat within the Juan Tank Allotment.

The overall desired condition is maintenance of sustainable ecosystems in which livestock grazing, range improvement construction and maintenance, and range/livestock management do not impair ecosystem structure and function, such as vegetation diversity and productivity. The desired condition for vegetation includes:

1. Maintain a stable to upward trend in total herbaceous plant cover.

2. Eradicate or contain existing populations of noxious and invasive exotic weeds when possible, and prevent new introductions of weeds.

Environmental Consequences

Direct and Indirect Effects Common to All Alternatives

Invasive species will continue to spread, regardless of livestock grazing, due to continued propagule pressure and inevitable disturbance. The Williams Ranger District will continue its invasive species program, which includes inventory, treatment, and monitoring of invasive plant species, with those populations having the most significant ecological impact and those having the greatest chance of successful control being the highest priority.

Direct and Indirect Effects of Alternative 1, No Action / No Grazing

Alternative 1 may have the most potential to reduce the rate of introduction and spread of weed species. However, it is difficult to discern the direct effect of livestock grazing on invasive plant abundance since invasions occur in both grazed and ungrazed systems (D'Antonio et al. 1999).

Implementation of Alternative 1 would eliminate livestock grazing. Elimination of livestock grazing may restrict opportunities for exotic weeds to establish by reducing the abundance and levels of disturbances, as well as additional opportunities for established weed species to disperse seed. Other mechanisms of disturbance that would remain in the absence of livestock include, but are not limited to, drought, fire, wildlife and insect herbivory, recreational activities, etc. These disturbance events would continue to favor invasive plant recruitment and expansion should there propagules be present (D'Antonio and Chambers 2006, Lonsdale 1999). Invasive species' seeds would no longer be distributed by livestock, but other vectors would still exist (e.g., wind, water, gravity, wildlife, recreation, etc.). The rate of introduction and spread of invasive exotic weeds may decline under Alternative 1.

Direct and Indirect Effects of Alternative 2, Current Management

Implementation of Alternative 2 would continue livestock grazing on the allotment. Livestock would continue to be vectors of disturbance and seed dispersal (Fischer et al. 1996), as would wind, water, gravity, wildlife, recreation, etc. However, it is difficult to discern the direct effect of livestock grazing on invasive plant abundance since invasions occur in both grazed and ungrazed systems (D'Antonio et al. 1999).

Several studies have shown that heavy livestock use can lead to increases in aggressive invasive species establishment (Zouhar et al. 2008). There have also been studies that indicate that well managed grazing with low stocking rates can be comparable to grazing rest. On a seven year study performed in north central Arizona during drought conditions, Loeser et al. (2007) compared exotic species colonization on plots experiencing high impact grazing, moderate intensity, and livestock removal. Their study noted that high impact grazing did show a considerable increase in exotic species, especially cheatgrass, while moderate grazing and complete livestock removal plots experienced very similar results of only small increases in exotic species. Grazing on the Juan Tank Allotment is expected to be well within the conservative stocking intensity level, thus the potential for additional invasive species recruitment and establishment should be minimal.

Livestock would have potential to consume invasive species (i.e., targeted grazing), thus reducing their potential to spread and persist. However, this is heavily dependent on the phenology of the particular species during the time in which it is grazed. Plants grazed at maturity may disperse seed greater distances by passing seeds through the digestive system. The effects of targeted grazing are dependent on management, and may range from positive to negative.

Alternative 2 may not maintain and/or improve vegetation and soil conditions because does not guarantee seasonal deferment due to a single pasture being available during the winter months when snow cover can prohibit livestock from grazing higher elevation pastures. The absence of seasonal deferment may result in the reduction of cool-season native plants and an increase in Japanese brome.

Direct and Indirect Effects Common to Alternative 3 and 4, Proposed Action and Adaptive Management

Construction of the proposed rangeland improvements (earthen tanks, trick tanks, etc) associated with Alternative 3 would create localized areas of intense disturbance, providing suitable habitat for invasive species establishment. Best Management Practices (monitoring and treatment) would mitigate invasive species concerns.

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Alternatives 3 and 4 would maintain and/or improve vegetation and soil conditions because it guarantees seasonal deferment or grazing rest at the pasture scale, which can result in the enhancement of the native plant community, thus creating a stronger competitive environment that can reduce Japanese brome. Further, Japanese brome research conducted by Vermeire et al. (2008) and Vermeire et al. (2009) indicates that early spring/summer grazing can be beneficial because it prevents seed maturation and litter accumulation of Japanese brome, which can reduce microsites that are conducive to Japanese brome seedling establishment. Because Japanese brome is typically the first forage species to begin growth in the spring, early spring grazing can create opportunities to remove Japanese brome individuals, which can be followed by grazing rest to allow for native species to complete their lifecycle in the absence of livestock grazing. It is believed that both Alternatives 3 and 4 can adequately address Japanese brome, and move infested areas towards desired conditions.

Direct and Indirect Effects of Alternative 4, Adaptive Management

Soil disturbing activities that may occur in trial plots(e.g., disking, plowing) would likely increase the density of Japanese brome, as well as other disturbance dependent invasive species, in areas where such activities occur. Conducting trials that include soil disturbing activities may result in seed sources that contribute to persistent noxious weeds populations.

Cumulative Effects

The geographical extent of the cumulative effects analysis is confined to the analysis area of the Juan Tank Allotment. The timeframe selected for this analysis is 20 years; 10 years in the past and 10 years in the future. This timeframe was selected because ground disturbing activities that have occurred within the analysis area are expected to recover within 10 years. The past, present, and reasonably foreseeable future activities considered in the cumulative effects analysis for vegetation include: juniper thinning, fuelwood harvesting (referred to as grassland restoration hereafter), dispersed recreation and roads, natural gas developments (i.e., pipelines), prescribed fire, Steel Dam/Stone Dam Interpretive Trail, cinder extraction, and wildlife grazing.

Under the action alternatives, livestock grazing would have direct effects to invasive species by acting as vectors of soil disturbance and seed dispersal. When the effects from cattle grazing are added to the effects from the other activities, the overall cumulative effect of cattle grazing on invasive species is more than the No Action Alternative. Cumulatively, the status of invasive species is expected to remain static or increase with cattle grazing additive to other activities and natural events. Implementation of adaptive management and the Best Management Practices outlined in the Coconino, Kaibab, and Prescott EIS for Noxious and Invasive Weeds (USDA Forest Service 2005) would mitigate the negative cumulative effects that can be associated with cattle grazing.

Climate

Successful invaders are often superior in resource acquisition relative to native species, which can lead to the displacement of natives, and a reduction in biodiversity. This may be especially problematic with predicted climatic shifts, which may make resources less abundant where plant competition will be more intense (Seager et al. 2007). However, several uncertainties exist regarding species performance and shifts in distributions in the presence of climate change (Hellman et al. 2008). The Forest Service will continue to conduct inventory, monitoring, and treatments, with those populations having the most significant ecological impact and those having the greatest chance of successful control being high priority.

Botany

Affected Environment

The scope of this analysis focuses on Threatened, Endangered, Proposed, Candidate, Conservation Agreement, Forest Service Sensitive, and Kaibab National Forest Management Indicator Species within the Juan Tank Allotment boundary. The analysis includes both known occurrences and suitable habitat for such plant species.

Environmental Consequences

Effects Common to All Alternatives

Both known populations and newly discovered populations of all Threatened, Endangered, Proposed, Candidate, Conservation Agreement, Forest Service Sensitive, and Kaibab National

Forest Management Indicator Species will continue to be monitored and protected from management activities that may have adverse effects.

Wildlife/insect herbivory will continue regardless of the alternative chosen, potentially effecting sensitive plant species.

Mitigation Measures for Rare Plants Common to Alternatives 2, 3, & 4:

1. Survey for sensitive plant species prior to ground disturbing activities.
2. Monitor known and/or newly documented populations for viability and management effects.

Direct and Indirect Effects of Alternative 1, No Action / No Grazing

Implementation of Alternative 1 (No Grazing) would have no anticipated adverse effects on Threatened, Endangered, Proposed, Candidate, Conservation Agreement, Forest Service Sensitive, and Kaibab National Forest Management Indicator plant species should they exist on the Juan Tank Allotment.

Eliminating grazing would reduce livestock herbivory and trampling to sensitive species. However, natural disturbance events such as wildlife/insect impacts, high-intensity fire, recreational activities, drought, etc. would continue to affect these plant species.

Direct and Indirect Effects of Alternatives 2, 3, and 4, Current Management, Modified Proposed Action and Adaptive Management

1. Mt. Dellenbaugh sandwort

   A single Mt. Dellenbaugh sandwort (Forest Service Sensitive) occurrence was recorded in 1938 outside of the allotment boundary. Although coordinates for this occurrence are outside of the Juan Tank allotment boundary, the spatial deviation is ±1000m; therefore the occurrence may be within the project boundary. Little is known about the grazing ecology of Mt. Dellenbaugh sandwort, including tolerance and/or resistance to grazing. Although grazing by cattle and sheep may negatively affect Mt. Dellenbaugh sandwort individuals or populations should they be grazed or trampled by livestock, it is unlikely that it would result in a loss of viability or distribution throughout the analysis area of the sensitive species because only a single occurrence has been documented near the Juan Tank Allotment boundary, and would not move the species toward Federal listing under the Endangered Species Act.

2. Other species

   Rusby milkvetch, Tusayan rabbitbrush, Arizona leatherflower, Flagstaff pennyroyal, and Flagstaff beardtongue have not been documented on the Juan Tank Allotment, but suitable habitat may exist. Little is known about the ecology of these species, including their tolerance and/or resistance to grazing. Although grazing by cattle and sheep may negatively affect individuals or populations should they exist on the allotment and be grazed or trampled by livestock, it is unlikely that it would result in a loss of viability or distribution throughout the analysis area of the sensitive species because no known

populations occur within the Juan Tank Allotment boundary, and would not move these species toward Federal listing under the Endangered Species Act.

Cumulative Effects

The cumulative effects area for all species is US Hwy 64 on the east, the western boundary of the Double A Allotment, the Atchison and Santa Fe railroad line on the north, and Interstate 40 on the south.

Past and ongoing uses and actions within or adjacent to the project area that may affect sensitive plant species include the City thinning and burning project, 4 Forest Restoration Initiative project (4FRI), the Juan Tank Burning project, and livestock grazing on the Pine Creek Allotment and Corva/Double A Allotments.

These activities remove portions of the overstory, understory, and/or litter cover, with the objective of maintaining or improving forest health and increasing the herbaceous understory. Native species diversity and abundance can increase resistance to invasion (Elton 1958). Reducing fuels and tree canopy cover can also reduce the threat of catastrophic wildfires that often times provide optimal conditions for weeds to establish. Weeds could be spread by heavy equipment, vehicles, and personnel associated with these activities.

Livestock grazing before or after burning can influence invasive species establishment, persistence, and spread, but the interaction of grazing with invasive species and fire is poorly understood (Zouhar et al. 2008). However, the dispersal of invasive species propagules while stressing more palatable native species deserves consideration. Livestock are often attracted to recently burned areas due to the associated increase in forage abundance and quality. Burned areas are usually rested from grazing until native plants have successfully established, thus no adverse effects are expected from grazing following prescribed burning. Once livestock are allowed to graze the burned area, the Forest Service monitors their effects and applies adaptive management when warranted. Best management practices and mitigation measures are implemented at project sites to reduce the introduction and spread of weed species.

Invasive Species Treatments

Treatments occur on an annual basis, where those populations believed to have highly adverse effects and/or the highest success of control being the highest priority. Removal of weed species can create small patches of bare ground where native plants can re-establish. Monitoring and re-treatments will be conducted to ensure the likelihood of success, and allow native plants the opportunity to establish. Seeding of native plants may be necessary to increase resistance to re-invasion, and should be evaluated on a site/project specific basis. Invasive species treatments will be completed in coordination with Range Management to avoid any possible adverse effects to livestock and to ensure the success of the treatment.

Recreational Activities (e.g., dispersed camping, horseback riding, hiking, biking, hunting, etc.) and Pipeline/Transmission Line Use and Maintenance

These activities will continue to occur on the WRD. These activities can disturb resident vegetation, and promote weed invasions and expansion. The Forest Service will continue to monitor and control populations of weed species as they are discovered. Best management

practices will be required on all projects, when possible. Implementation of the Travel Management Rule will greatly reduce the opportunities for the introduction and spread of weed species due to the restrictions on cross-country vehicle travel.

Climate

Global climate change models project warmer, more arid conditions in the southwestern United States (Seager et al. 2007). However, the impact of global climate change on species' distributions is mostly uncertain (Thuiller et al. 2007). Climate change may result in more frequent and severe droughts, as well as more high-intensity wildfires. Drought and high-intensity wildfire may result in sensitive plant species mortality, habitat loss, and the loss of species viability. Invasive plant species may increase in abundance following drought and high-intensity wildfires, also contributing to habitat loss. Native species mortality can result in niche vacancy and increased resource availability in which highly competitive weed species are able to capitalize (Davis et al. 2000). As a result, habitat for rare plant species may be altered and/or lost.

Wildlife

Affected Environment

The eastern third of the allotment lies in GA 1. This portion of the allotment lies primarily in the Cataract Creek 5th code watershed. The predominant vegetation is ponderosa pine (*Pinus ponderosa*). Gambel oak (*Quercus gambelli*) and alligator juniper (*Juniperus deppeana*) also occur throughout this portion of the allotment. The shrub layer is not well developed in this part of the allotment but can be quite dense on south facing slopes. Cliffrose (*Purshia Mexicana)*, shrub-live oak (*Quercus turbinella*), ceanothus (*Ceanothus* spp.), and mountain mahogany (*Cercocarpus montanus*) are the most common species found in this area. A variety of grasses occur including blue grama (*Bouteloua gracilis*), junegrass (Koeleria macrantha), mountain muhly (Muhlenbergia montana), and squirreltail (*Elymus elymoides*).

The western two-thirds of the allotment, which lies in GA 2, is mostly flat with a few small knolls occurring throughout the area. This portion of the allotment lies primarily in the Ash Fork Draw-Jumbo Tank 5th code watershed, with a small portion in the Upper Partridge Creek 5th code watershed. Dominant tree species in these lower elevations are pinyon pine (*Pinus edulis*), one-seed juniper (*Juniperus monosperma*), and Utah juniper (*Juniperus osteosperma*). There is not a well-developed shrub layer here but Fremont barberry (*Berberis fremontii*), cliffrose, Apache plume (*Fallugia paradoxa*), and shrub live oak occur scattered throughout the area. Sub-shrubs include broom snakeweed (*Gutierrezia sarothrae*) and rubber rabbitbrush (*Ericameria nauseosa*). Blue grama is the dominant grass in this area. Other grasses include squirreltail, western wheatgrass (*Pascopyrum smithii*), muttongrass (*Poa feddleriana*), side-oats grama (*Bouteloua curtipendula*), three-awns (*Aristida spp*.), and muhlys (*Mulenbergia spp*.). Forbs which are found in this area include buckwheat (*Eriognum spp*.), fleabane (*Erigeron spp*.), Wheeler's thistle (*Cirsium wheeleri*), talloweed (*Heliomeris multiflora*), and globemallow (*Sphaeralcea parvifolia*).

Ephemeral drainages, including Cataract Creek, Johnson Canyon and Ash Fork Draw, are the primary drainages within the allotment. These drainages run during snow melt and heavy summer storms and do not support riparian vegetation. Holden Lake is the only wetland within the allotment.

Juniper treatments have been conducted on the lower elevations of this allotment as far back as the 1950s to improve forage conditions for wildlife and livestock. These restoration treatments are necessary because fire suppression has led to the invasion of juniper in areas that previously were more open grassland.

Environmental Consequences

General Effects of Livestock Grazing on Wildlife Habitat

Livestock grazing has a wide range of direct and indirect effects on ecosystem structure and function and thus on wildlife habitat (e.g., see literature reviews in Kauffman and Krueger 1984, Fleischner 1994, Severson and Urness 1994, Saab et al. 1995, Belsky and Blumenthal 1996, Milchunas 2006). The primary effects of livestock grazing on wildlife habitat are the direct and indirect effects associated with repeated reductions in understory vegetation (cover/density/biomass/frequency) due to grazing and trampling by livestock. This results in reduced food resources available for a wide variety of invertebrate and vertebrate species that eat plant parts (leaves, flowers, fruits, seeds) and reduced cover for a wide variety of invertebrate and small vertebrate species (e.g., lizards, snakes, ground-nesting birds, small mammals). Cover provided by both live herbaceous vegetation as well as the herbaceous litter layer is reduced by livestock grazing. Reduced cover can negatively affect microhabitat conditions for some of these species and potentially results in increased predation risk.

Livestock grazing also alters the composition of plant communities. Plant species vary in their palatability to livestock. Plant species that are less palatable to livestock tend to increase over time as a result of herbivory on plant species that are more palatable, which tend to decrease over time.

Livestock grazing also has had many indirect effects on ecosystem structure and function and thus wildlife habitat as a result of effects on fire regime and tree establishment patterns. Fire frequency in southwestern ponderosa pine forests decreased significantly about the time that large numbers of livestock began grazing, most likely due to the annual removal of herbaceous fine fuels by grazing livestock (Swetnam et al. 1999). In addition, reductions in herbaceous vegetation cover by grazing livestock resulted in reduced plant competition for pine seedlings and created more areas of mineral soil favorable to establishment of pine seedlings (Rummell 1951, Milchunas 2006). Thus, livestock grazing, in conjunction with active fire suppression, has likely resulted in losses of grassland areas and widespread transformation of savannas and woodlands into denser woodlands and forests (Johnsen 1962, Swetnam et al. 1999, Saab et al. 1995).

Although livestock grazing affects wildlife habitat, the existing current environmental baseline within the Juan Tank Allotment is a landscape that has been continuously grazed by livestock for approximately 130 years. Numbers of livestock grazed today on the Juan Tank Allotment and throughout the western U.S. are a fraction of numbers grazed during the late 1800s and early

1900s (Milchunas 2006). Many of the greatest ecological impacts of livestock grazing (e.g., severe erosion and loss of palatable forage species) likely occurred by the early 1900s (Milchunas 2006).

Species Listed Under the Endangered Species Act

A complete list of all species listed as threatened, endangered, or proposed for listing under the Endangered Species Act and identified for either Coconino or Yavapai County by the US Fish and Wildlife Service can be found at (http://www.fws.gov/southwest/es/arizona/).

Species listed under the Endangered Species Act and identified by the US Fish and Wildlife Service for Coconino County would not be affected by the proposed action because the Williams District is either outside of their range and/or the district lacks suitable habitat.

The analysis area contains no suitable aquatic habit for the Apache trout, Chiricahua leopard frog, Humpback chub, Kanab ambersnail, little Colorado spinedace, razorback sucker, northern Mexican garter snake, and roundtail chub, nor perennial riparian habitat for the Southwestern willow flycatcher and yellow-billed cuckoo. Only ephemeral streams and constructed earthen stock tanks occur within the allotments. The allotment is not located within Mexican spotted owl Critical Habitat and lacks mixed conifer or pine oak Restricted spotted owl habitat.

Reintroduced black-footed ferret populations occur in Aubrey Valley (30 miles away) and on the Espee Ranch (20 miles away), west and north, respectively, of the project area. There are currently no known populations in northern Arizona outside of these reintroduction areas. The project currently lacks suitable habitat because there are currently just 7 acres occupied by prairie dogs within the project area. Analysis was based on presence of suitable habitat, as the colonies within the Juan Tank Allotment are isolated and are not within a complex of colonies as described in Biggins et al. (1993).

The California condor, a federally listed species, is classified as an experimental, nonessential 10(j) population in Arizona. The Juan Tank allotment is located within the geographic bounds of the designated 10(j) area of the Southwest. The California condor is a wide ranging species and may travel over one hundred miles to forage. Condors do forage regularly along the south rim of the Grand Canyon, especially in the developed areas of the park. They are scavengers that feed primarily on large carrion such as elk, deer, and livestock. Condors nest in caves, on rock ledges, or in tree cavities. Condors have been known to fly well beyond the bounds of the 10(j) area, but generally remain within the Grand Canyon Ecoregion/Colorado River corridor. Condors have not been documented nesting or roosting on the Williams Ranger District.

Forest Service Sensitive Species

The following Forest Service Sensitive wildlife species are known to occur or potentially occur on the Williams Ranger District based on geographic range and presence of suitable habitat: northern leopard frog (*Lithobates pipiens*), bald eagle (*Haliaeetus leucocephalus*), northern goshawk (*Accipiter gentilis*), burrowing owl (*Athene cunicularia*), American peregrine falcon (*Falco peregrinus*), Merriam's shrew (*Sorex merriami*), Mogollon vole (*Microtus mogollonenis*), spotted bat *(Euderma maculatum)*, Townsend's big-eared bat (*Corynorhinus townsendii*), and Allen's lappet-browed bat (*Idionycteris phyllotis*), western red bat (*Lasiurus blosssevilli*), and

four spotted skipperling (*Piruna polingi*). Species were analyzed using the 2007 Region 3 Forester's Sensitive Species List.

Northern leopard frog

There are no known existing populations of northern leopard frogs on the Williams District. No further analysis would occur.

Western red bat

Western red bat occurs in deciduous riparian habitat. With the exception of Sycamore Canyon (approx. 15 miles) there is no suitable Western red bat habitat on the Williams Ranger District. Western red bats have not been detected on the Williams Ranger District; however they likely occur in Sycamore Canyon. No further analysis would occur.

Four-spotted skipperling

Four-spotted skipperlings occur in moist meadows and around springs. There are no documented occurrences of four-spotted skipperling on the Williams Ranger District. The closest known population is at Kehl spring in southern Coconino County. No further analysis would occur.

Bald eagle

Affected Environment

On the Williams District, bald eagles are primarily migratory and occur in the area from November to February. They are often seen at the larger fishing lakes where they feed on fish and waterfowl. They also prey on small mammals such as rabbits and ground squirrels. They can also be found feeding on carrion from road-kill animals (primarily elk and mule deer) along highways and on gut piles of hunter-killed elk and deer scattered across the district. Bald eagle surveys are conducted every January on the forest. Sightings are variable year to year but eagles are often seen on the route that loops through the eastern portion of the allotment.

Direct and Indirect Effects of Alternative 1

Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in habitat quality for bald eagle prey species, increasing foraging habitat quality for bald eagle. Alternative 1 would have a beneficial effect on bald eagle and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4

Grazing does not affect nest trees or roost sites, but it does affect herbaceous and shrubby vegetation which in turn may affect small mammal abundance. Because grazing would continue to result in decreased forage and cover for some bald eagle prey species, it is assumed that livestock grazing under Alternatives 2, 3, and 4 would continue to result in decreased quality of bald eagle foraging habitat. Alternatives 3 and 4 would have a slightly greater impact than Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Alternatives 2, 3, and 4 may impact individuals but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Northern Goshawk

Affected Environment
Most northern goshawk territories on the Williams Ranger District and in Northern Arizona occur in ponderosa pine forest (Beier and Maschinski 2003). Goshawks prey on a wide variety of small mammals and bird species including; American robin, band-tailed pigeon, Stellar's jay, northern flicker, chipmunks, ground squirrels, and tree squirrels with mammals providing most of the prey biomass (Beier and Maschinski 2003). There is 1 known goshawk territory within the 5,900 acres of ponderosa pine type in the Juan Tank Allotment.

Direct and Indirect Effects of Alternative 1
Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in food and cover for certain northern goshawk prey species. As a result, habitat quality for northern goshawk would increase. Alternative 1 would have a beneficial effect on northern goshawk and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Numerous small mammal species are present in the project area and each feeds on various herbaceous plant parts. Livestock grazing reduces food availability for these prey species as well as vegetative cover. Because grazing may affect habitat quality for some goshawk prey species, it is assumed that livestock grazing under these alternatives would continue to result in decreased habitat quality for many northern goshawk prey species. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 verses Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Burrowing owl

Affected Environment
The Kaibab National Forest has only two records of burrowing owls on the Williams Ranger District, both outside of the project area. Burrowing owls occur in a wide variety of open habitats including agricultural fields. Nesting typically occurs in abandoned burrows of small mammals, such as ground squirrels and prairie dogs.

Direct and Indirect Effects of Alternative 1
Habitat quality may decrease slightly for burrowing owls because they select areas with bare ground and bare ground would likely decrease under Alternative 1. Thus, habitat quality may decrease slightly under alternative 1 but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Main threats to burrowing owls are the conversion of grasslands to woodlands and the loss of burrowing mammal colonies such as prairie dogs and ground squirrels. The response of burrowing owls to grassland grazing has been positive. Saab et al. (1995) concluded that livestock grazing favors burrowing owl habitat. Alternatives 2, 3, and 4 would likely have a

beneficial impact to burrowing owl and would not lead to a trend toward federal listing or a loss of viability for the species or population.

American peregrine falcon

Affected Environment
Peregrine falcons typically nest on cliffs and rock outcrops and prey on a wide variety of bird species. There are three known nest sites on the Williams Ranger District; the closest one is approximately 3 miles from the Juan Tank Allotment. Because of the proximity of the allotment to the nest site it is assumed that peregrine falcons forage within the allotment.

Direct and Indirect Effects of Alternative 1
Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in food items such as seeds and berries for certain peregrine falcon prey species, thus resulting in increased foraging habitat quality for peregrine falcon prey species. Alternative 1 would likely have a beneficial effect on peregrine falcon and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
The main threats to peregrine falcons continue to be chemical contamination from organochlorine compounds and disturbance from rock climbing near nest sites. There would be no impacts to nest areas or nesting falcons under these alternatives. However, because grazing may affect habitat quality for some peregrine falcon prey species, it is assumed that livestock grazing under these alternatives would cause a decrease in habitat quality for peregrine falcon. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 compared to Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Merriam's shrew

Affected Environment
Merriam's shrew inhabits grassy areas in a variety of conifer types from piñon-juniper woodland to spruce-fir forest. It is known to occur in ponderosa pine forests and piñon-juniper woodlands on the Williams and Tusayan Districts.

Direct and Indirect Effects of Alternative 1
Under Alternative 2 herbaceous and shrubby vegetation would likely increase, resulting in an increase in forage availability and hiding cover. Thus, overall habitat quality would increase for Merriam's shrew. Alternative 2 would have a beneficial effect on Merriam's shrew and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Merriam's shrew is insectivorous so does not feed on plants directly, but many of the arthropods that it eats are dependent on herbaceous vegetation. The herbaceous litter layer provides important cover for this species. Annual reductions in herbaceous vegetation could result in reduced insect abundance which would result in reduced habitat quality for Merriam's shrew.

Construction of water lots, water catchments, fences, and corrals under Alternatives 3 and 4 would cause ground disturbance which could negatively affect Merriam's shrew. Alternatives 3 and 4 would have a slightly greater impact than Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Mogollon vole

Affected Environment
Mogollon 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 piñon-juniper woodland. It is also known to occur in larger grassland areas on the Williams District such as Garland Prairie and Government Prairie.

Direct and Indirect Effects of Alternative 1
Under Alternative 1 herbaceous and shrubby vegetation would likely increase, resulting in an increase in forage availability and hiding cover. Thus, overall habitat quality would increase for Mogollon vole. Alternative 2 would have a beneficial effect on Mogollon vole and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2 and 4
Mogollon vole, like other voles (Microtus spp.), rely on herbaceous vegetation (especially grasses) for food 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. Construction of water lots, water catchments, fences, and corrals under Alternatives 3 and 4 would cause ground disturbance which could negatively affect Mogollon vole. Alternatives 3 and 4 would have a slightly greater impact because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Spotted bat

Affected Environment
There are no records of occurrence on the Williams Ranger District, but this species has been detected on the Tusayan District and in the Grand Canyon. Spotted bats roost in crevices and cracks in cliff faces and rock outcrops and forage in a wide variety habitat types including ponderosa pine forests. Spotted bats forage primarily for moths in open meadows but they occasionally forage around individual trees or isolated clumps of trees (Luce and Keinath 2007).

Direct and Indirect Effects of Alternative 1
Under Alternative 1 herbaceous and shrubby vegetation would likely increase, resulting in an increase in overall habitat quality. Alternative 1 would have a beneficial effect on spotted bat and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Livestock grazing does not affect roosting habitat but it may have indirect effects on foraging habitat because of the reduction in biomass caused by grazing. Reduction in biomass may cause reductions in insect numbers and composition resulting in decreased foraging habitat quality for spotted bat. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 compared to Alternative 2 because of the use of sheep to control Japanese, brome due to the short term increase in AUM's. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Townsend's big-eared bat

Affected Environment
Distribution on the Williams District is unknown although it has been detected on the District. It typically roosts in caves and old mines. Small moths are the primary food of these bats. They forage along forested edges taking prey from leaves and in flight.

Direct and Indirect Effects of Alternative 1
Under Alternative 1 herbaceous and shrubby vegetation would likely increase, resulting in an increase in overall habitat quality. Alternative 1 would have a beneficial effect on Townsend's big-eared bat and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Livestock grazing does not affect roosting habitat but it may have indirect effects on foraging habitat because of the reduction in biomass caused by grazing. Reduction in biomass may cause reductions in insect numbers and composition resulting in decreased foraging habitat quality for Townsend's big-eared bat. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 compared to Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUM's. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Allen's lappet-browed bats

Affected Environment
Allen's lappet-browed bats have been detected at a variety of sites on the Williams and Tusayan Districts. They roost in caves and crevices and behind pieces of loose bark in large conifer snags and trees. Small moths are the primary food source of these bats. They are known to forage in a variety of forest and woodland types.

Direct and Indirect Effects of Alternative 1
Under Alternative 1 herbaceous and shrubby vegetation would likely increase, resulting in an increase in overall habitat quality. Alternative 1 would have a beneficial effect on Allen's lappet-browed bat and would not lead to a trend toward federal listing or a loss of viability for the species or population.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Livestock grazing does not affect roosting habitat but it may have indirect effects on foraging habitat because of the reduction in biomass caused by grazing. Reduction in biomass may cause reductions in insect numbers and composition resulting in decreased foraging habitat quality for Allen's lappet-browed bat. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 compared to Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUM's. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat but would not lead to a trend toward federal listing or a loss of viability for the species or population.

Management Indicator Species

Management Indicator Species and the habitats they represent are listed in the most recent Kaibab National Forest Management Indicator Species report (Forest Service 2010: page 10). Information on species biology, management effects, population trends, and habitat trends are summarized in this report, and this information will not be duplicated here.

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, piñon-juniper woodland, grassland, and wetland (Table 6). Management Indicator Species that are indicators for at least one of these four habitat types are **northern goshawk, wild turkey** (*Meleagris gallopavo*), **Cinnamon teal** (*Anas cyanoptera*), **hairy woodpecker** (*Picoides villosus*), **juniper titmouse** (*Baeolophus ridgwayi*), **pygmy nuthatch** (*Sitta pygmaea*), **elk** (*Cervus elaphus*), **mule deer** (*Odocoileus hemionus*), **pronghorn** (*Antilocapra americana*), 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 macro invertebrates** (aquatic macro invertebrates 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**, and high-elevation riparian habitat for **Lincoln's sparrow**.

Table 6. Acres of vegetation types in the project area and forest wide.

Cover Type	Project Area	Kaibab National Forest
Ponderosa pine forest	6,262	502,682
Piñon-juniper woodland	6,566	687,601
Grassland	5,294	231,237
Wetland	35	334

Indicator habitats for **hairy woodpecker** (snags in ponderosa pine, mixed conifer, and spruce-fir habitats), **juniper titmouse** (late-seral piñon-juniper and snags in piñon-juniper woodland), **pygmy nuthatch** (late-seral ponderosa pine habitat), 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; ponderosa pine trees and arboreal insects for pygmy nuthatches; ponderosa pine trees, mushrooms, and truffles for Abert's squirrels). Therefore, there would be no measurable effects to habitat quantity or quality for each of these species

under all Alternatives. Implementation of Alternatives 1, 2, 3, or 4 would not affect the Forest-wide habitat or population trend of hairy woodpecker, juniper titmouse, pygmy nuthatch, or Abert's squirrel.

Cinnamon teal

Affected Environment
Indicator habitat for cinnamon teal on the Kaibab National Forest is late-seral wetlands (USDA Forest Service 2010b: pages 21-26). Cinnamon teal are relatively common in wetland areas throughout the western U.S, including northern Arizona. Cinnamon teal nest in the low matted dead stems of aquatic vegetation. They forage in shallow flooded areas along the edges of wetlands.

Direct and Indirect Effects of Alternative 1
Without grazing, wetland vegetation in Holden Lake would recover; over time the earthen stock tanks would fill in and the wetland would return to Proper Functioning Condition (PFC). The result would be an increase in habitat quality and quantity for cinnamon teal.

Direct and Indirect Effects of Alternatives 2
Under Alternative 2 the Holden Lake wetland would continue to be grazed. Livestock grazing would continue to result in reduced levels of wetland vegetation in Holden Lake, resulting in continued degradation of cinnamon teal foraging and nesting habitat. Alternative 2 would not result in changes to forest-wide habitat of population trend for cinnamon teal.

Direct and Indirect Effects of Alternatives 3 and 4
Under Alternatives 3 and 4 the Holden Lake wetland, with the exception of the earthen tanks, would be fenced and livestock would be excluded from grazing (figure 3). Under alternatives 3 and 4 vegetation Holden Lake wetland would recover and provide foraging and potentially nesting habitat for cinnamon teal. Alternatives 3 and 4 would be beneficial to cinnamon teal could result in an increase in forest-wide habitat and population trends for the species.

Northern Goshawk

Indicator habitat for northern goshawk on the Kaibab National Forest is late-seral ponderosa pine forest (USDA Forest Service 2010b: pages 26-33). Alternatives 2, 3, and 4 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 all alternatives there are 6,262 acres of ponderosa pine forest mapped within the current allotment boundaries. This is approximately 1% of the total ponderosa mapped across the Kaibab National Forest. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 1, 2, 3, or 4 would not result in changes to forest-wide habitat or population trends for northern goshawk.

Wild Turkey

Affected Environment
Indicator habitat for wild turkey on the Kaibab National Forest is late-seral ponderosa pine forest (USDA Forest Service 2010b: pages 62-64). 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.

Direct and Indirect Effects of Alternative 1
Without cattle grazing, there would be increases in herbaceous and shrub-level vegetation cover, resulting in increased food and cover resources for wild turkey. As a result, there would be an increase in wild turkey habitat quality under Alternative 1. However, Alternative 1 would not likely result in increased Forest-wide habitat or population trend of wild turkey because the 6,262 acres of ponderosa pine indicator habitat within the project area represents only about 1% of the total area of ponderosa pine indicator habitat across the Kaibab NF and other factors such as natural mortality, predation, and legal harvest also affect turkey population levels.

Direct and Indirect Effects of Alternatives of 2, 3, and 4
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. Alternatives 2, 3, and 4 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 cattle grazing. Effects of these alternatives on wild turkey would be very similar. The 6,262 acres of ponderosa pine indicator habitat within the project area represents only about 1% of the total area of ponderosa pine forest across the Kaibab NF. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Although there would be continued decreases in wild turkey habitat quality that would result from Alternative 2, 3, or 4, neither alternative would affect the Forest-wide habitat or population trend for wild turkey.

Elk

Affected Environment
Indicator habitat for elk on the Kaibab National Forest is early-seral ponderosa pine, mixed conifer, and spruce-fir forest (USDA Forest Service 2010b: pages 74-76). Historic records show that the occurrence of elk in northern Arizona was primarily in the east-central part of the state (Truett 1996). Unregulated harvest extirpated elk from Arizona by 1900. Rocky Mt. elk were introduced in north central Arizona in 1913 and now occur in higher elevations throughout much of the state. Factors for this range expansion are the availability of free water from stock tanks, lack of predators, and harvest regulations.

The Juan Tank Allotment provides both summer and winter range for elk. During the warmer months elk occur through the allotment. During the winter they are found primarily within the low elevations of the allotment. Similar to cattle, elk feed heavily on grasses, although they also feed on forbs and shrubs.

Direct and Indirect Effects of Alternative 1
Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in food resources for elk. However, Alternative 1 would not likely result in increased Forest-wide habitat or population trend of elk because the 6,262 acres of ponderosa pine indicator habitat within the project area represents only about 1% of the total area of ponderosa pine indicator habitat across the Kaibab NF and other factors such as natural mortality and legal harvest also affect elk population levels.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 would not affect habitat quantity but would result in continued decreases in elk foraging habitat quality in the ponderosa pine and mixed-conifer indicator habitat within the project area. Under Alternatives 2, 3, and 4 the 6,262 acres of ponderosa pine indicator habitat mapped within the project boundary is 1% of the total ponderosa mapped across the Kaibab NF. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, or 4 would not result in changes to Forest-wide habitat or population trends for elk.

Mule Deer

Affected Environment
Indicator habitat for mule deer on the Kaibab National Forest is early-seral aspen and piñon-juniper woodland (USDA Forest Service 2010b: pages 76-80). Mule deer feed on forbs and shrubs more than cattle, but there is dietary overlap between mule deer and cattle. Therefore, cattle compete for forage with mule deer.

Direct and Indirect Effects of Alternative 1
Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in habitat quality for mule deer. However, Alternative 1 would not likely result in increased Forest-wide habitat or population trend of mule deer because the 6,566 acres of piñon-juniper indicator habitat within the project area represents only about 1% of the piñon-juniper indicator habitat across the Kaibab NF and other factors such as natural mortality and legal harvest also affect mule deer population levels.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 would not affect habitat quantity but would result in continued negative effects to mule deer habitat quality within the piñon-juniper indicator habitat within the project area. Under Alternatives 2, 3, and 4 the 6,566 acres of mapped piñon-juniper is approximately 1% the total piñon-juniper mapped forest-wide. There would be a slightly greater impact to habitat quality under Alternatives 3 and 4 compared to alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 would not result in changes to Forest-wide habitat or population trends for mule deer.

Pronghorn

Affected Environment
Indicator habitat for pronghorn on the Kaibab National Forest is early and late-seral grassland (USDA Forest Service 2010b: pages 81-85).

Because cattle and pronghorn are ungulates there is dietary overlap and the two compete for forage. Between 80-90% of the pronghorn's diet is forbs, but they also rely heavily on browse in time of less rain and when snow covers the ground (Brown and Ockenfels 2007). Because cattle

also consume forbs when available and browse in time of less rain and when snow covers the ground, there is competition for food between cattle and pronghorn. Vegetation height is also important for pronghorn fawning cover, and livestock grazing reduces vegetation height and thus cover, which could reduce pronghorn fawn survival.

Direct and Indirect Effects of Alternative 1
Under Alternative 1, herbaceous and shrubby vegetation would increase, resulting in an increase in habitat quality for Antelope. The resulting increase in grasses and herbaceous cover would help disguise newborn antelope fawns from predators potentially increasing pronghorn fawn survival.

Direct and Indirect Effects of Alternatives 2, 3, and 4
Alternatives 2, 3, and 4 would not affect habitat quantity but would result in continued negative effects to pronghorn habitat quality within the grassland indicator habitat in the project area. Under Alternatives 2, 3, and 4 the 5,294 acres of grassland is approximately 2% of the total grassland mapped forest-wide. New fencing could also potentially affect pronghorn movement. All new fences built in the project area would be built to wildlife standards to facilitate pronghorn crossing. There would be a slightly greater impact to habitat quality for pronghorn under Alternatives 3 and 4 compared to Alternative 2 because of the use of sheep to control Japanese brome, due to the short term increase in AUMs. Grazing under alternatives 2, 3, and 4 would be limited to 40% utilization at the end of the grazing season. Implementation of Alternatives 2, 3, and 4 would not result in changes to Forest-wide habitat or population trends for pronghorn.

Migratory Birds

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). 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 Williams District.

Arizona Partners in Flight Priority Species and U.S. Fish and Wildlife Service Birds of Concern that are known to occur or potentially occur in the project area are olive-sided flycatcher (*Contopus cooperi*), gray flycatcher (*Empidonax wrightii*), Cordilleran flycatcher (*Empidonax occidentalis*), purple martin (*Progne subis*), black-throated gray warbler (*Dendroica nigrescens*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), Swainson's hawk (*Buteo Swainsoni*), grasshopper sparrow (*Ammodramus savannarum*), prairie falcon (*Falco mexicanus*), flammulated owl (*otus flammeolus*), Lewis's woodpecker (*Melanerpes lewis*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), phainopepla (*Phainopepla nitens*), olive warbler (*Peucedramus taeniatus*), Grace's warbler (*Dendroica graciae*), red-faced warbler (*Cardellina rubrifrons*), and Cassin's finch (*Carpodacus cassinii*).

Direct and Indirect Effects of Alternative 1

Under Alternative 1 herbaceous and shrubby vegetation would likely increase resulting in potential increases in overall habitat quality providing more cover and food resources for ground nesting birds.

Direct and Indirect Effects of Alternatives 2, 3, and 4

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. Cattle grazing under Alternatives 2 and 4 may result in limited unintentional take of certain migratory birds as a result of cattle trampling the nests of certain ground-nesting bird species such as killdeer, common poor-will, vesper sparrow, lark sparrow, dark-eyed junco, red-faced warbler, and western meadowlark.

Of the bird species of management concern that potentially occur in the project area, livestock grazing under Alternatives 2, 3, and 4 is most likely to affect ferruginous hawk, golden eagle, Swainson's hawk, and prairie falcon. Each of these species preys on small mammals, and most potential small mammal prey species in the project area eat plant parts. Livestock grazing thus reduces food availability for these prey species as well as cover. Decreases in habitat quality of key prey species would likely result in some level of decreased habitat quality for ferruginous hawks, golden eagles, Swainson's hawks, and prairie falcons.

Livestock grazing under Alternatives 2, 3, and 4 is unlikely to affect habitat quality for bird species that nest and forage in vegetation layers above the low-shrub layer. The following species of conservation concern nest and forage primarily above the low-shrub layer and are thus unlikely to be impacted by livestock grazing under Alternatives 2, 3, and 4: olive-sided flycatcher, cordilleran flycatcher, purple martin, gray flycatcher, black-throated gray warbler, flammulated owl, Lewis's woodpecker, gray vireo, piñon jay, phainopepla, olive warbler, Grace's warbler, and Cassin's finch.

Neither Alternative 2, 3, or 4 would result in measurable negative effects to migratory bird populations because 1) the 40% allowable use guideline should ensure that adequate residual vegetation is left to provide sufficient forage and cover resources for migratory birds, and 2) neither alternative would cause new effects because the project area has been grazed by livestock for approximately 130 years.

Cumulative Effects of Alternative 1

Past, present, and reasonably foreseeable actions that are relevant to wildlife resources are described below for the action alternatives. The cumulative effects analysis area for the action alternatives is defined as the Cataract Creek 5th Code watershed, Ash Fork Draw-Jumbo Tank 5th code watershed, and the Upper Partridge Creek 5th code watershed. 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 1870's. At that time cattle numbers were many time higher than they are currently. Livestock grazing currently occurs west of the Juan Tank Allotment on most of the

state, private and Forest Service land, south and east on Forest Service land, and north on state and private land.

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 6,000 acres of prescribed fires have occurred within the Juan Tank Allotment in the past 10 years. Prescribed fires would continue over the district in the coming years to reduce accumulated fuels that can cause catastrophic wild fire. Past, present, and reasonably foreseeable projects that include burning in the cumulative effects area include The Juan Tank Burning Project, Four Forest Restoration Initiative, Bill Williams Mountain Restoration Project, the City Project, and the Williams and Tusayan Districts Grassland Restoration Project.

Juniper thinning treatments continue to occur on the west side of the Williams Ranger District. The result of these treatments would be restored grasslands with an increase in herbaceous and shrubby vegetation. Past, present and reasonably foreseeable projects that include juniper thinning are the Bill Williams Mountain Restoration Project, City Project, Winter Range Juniper Treatment Project, Irishman Dam Juniper treatment Project, and the Williams and Tusayan Districts Grassland Restoration Project.

Human recreational activities can affect nesting, roosting, foraging, and general movement of wildlife. The Kaibab National Forest has implemented the Travel Management Rule. Under the Travel Management Rule numerous roads have been closed, thus reducing recreational disturbance to wildlife.

Direct and indirect effects of Alternative 1 were identified for various species above, primarily as a result of no livestock grazing. These effects are primarily beneficial and continue to be beneficial when added to the effects of past, present, and reasonably foreseeable future action described above.

Cumulative Effects of Alternatives 2, 3, and 4

Past, present, and reasonably foreseeable actions that are relevant to wildlife resources are described below for the action alternatives. The cumulative effects analysis area for the action alternatives is defined as the Cataract Creek 5th Code watershed, Ash Fork Draw-Jumbo Tank 5th code watershed, and the Upper Partridge Creek 5th code watershed. 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 1870s. At that time cattle numbers were many times higher than at present. Livestock grazing currently occurs west of the Juan Tank Allotment on most of the private, state, and Forest Service land, south and east on Forest Service land, and north on state and private land.

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 6,000 acres of prescribed fires have occurred within the Juan Tank Allotment in the past 10 years. Prescribed fires would continue over the district in the coming years to reduce accumulated fuels that can cause catastrophic wild fire. Past, present, and reasonably foreseeable projects that include burning in the cumulative effects area include The Juan Tank Burning Project, Four Forest Restoration Initiative, Bill Williams Mountain Restoration Project, the City Project, and the Williams and Tusayan Districts Grassland Restoration Project.

Juniper thinning treatments continue to occur on the west side of the Williams Ranger District. The result of these treatments would be restored grasslands with an increase in herbaceous and shrubby vegetation. Past, present and reasonably foreseeable projects that include juniper thinning are the Bill Williams Mountain Restoration Project, City Project, Winter Range Juniper Treatment Project, Irishman Dam Juniper treatment Project, and the Williams and Tusayan Districts Grassland Restoration Project.

Human recreational activities can affect nesting, roosting, foraging, and general movement of wildlife. The Kaibab National Forest has implemented the Travel Management Rule. Under the Travel Management Rule numerous roads have been closed, thus reducing recreational disturbance to wildlife.

Direct and indirect effects of Alternatives 2, 3, and 4 were identified for various species above, primarily as a result of annual reductions in forage and cover resources due to cattle 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 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 Alternatives 2, 3, and 4 should ensure that habitat degradation does not occur across the allotment; and 3) the project area has been grazed by livestock for over a hundred years, 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 discusses the effects based on jobs, national forest fees, and other revenues.

Affected Environment

Cattle grazing contributes to the livelihood of the Juan Tank 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 Juan Tank Allotment is in Coconino County. This allotment is currently permitted for 190 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 Allotment.

Income associated with cattle grazing represents a small percentage of the Williams, Arizona economy. The nearest community to the allotment is Williams, 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 Juan Tank permittee directly contribute revenues to Coconino County through property taxes.

Environmental Consequences

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 7 estimates the effects expected on these indicators in Coconino County from implementing the modified proposed action, current management, adaptive management, and no grazing on the Allotment.

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 Juan Tank Allotment. An economic analysis program called Quicksilver was used to calculate these factors.

Table 7. Economic effects expected to Coconino County for jobs and federal payments.

Economic Effects	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Direct and Indirect Jobs* (#)	0	2	2	2
Federal Payments to Counties**	$0	$607	$770	$770

*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 improvments. Based on current conditions maximum numbers.

Projections from the Quicksilver model serve well as an indicator of change rather than being used as 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 Juan Tank Allotment. 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 8 displays the results of this investment analysis for the Allotment over the first 10 years. 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 structural improvements (waters, fences, corrals) could be procured in the Modified Proposed Action and Adaptive Management.

Table 8. Investment analysis

Investment Analysis	No Grazing	Current Management	Modified Proposed Action	Adaptive Management
Forest Service				
Present Value of Benefits[1]	0	21,288	26,965	26,965
Present Value of Costs[2]	0	-12,300	-298,498	-288,715
Present Net Value[3]	0	8,988	-271,533	-261,751
Benefit/Cost Ratio[4]	0	1.73	0.09	0.09
Permittee				
Present Value of Benefits	0	179,292	227,103	227,103
Present Value of Costs	0	-33,073	-135,130	-152,407
Present Net Value	0	146,219	91,973	74,696
Benefit/Cost Ratio	0	5.42	1.68	1.49
Partners/Grants, etc.				
Present Value of Benefits	0	0	0	0
Present Value of Costs	0	0	-125,000	-125,000
Present Net Value	0	0	-125,000	-125,000
Benefit/Cost Ratio	0	0	0	0
All Partners				
Present Value of Benefits	0	200,580	254,068	254,068
Present Value of Costs	0	-45,372	-558,628	-566,123
Present Net Value	0	155,208	-304,560	-312,055
Benefit/Cost Ratio	0	4.42	0.45	0.45

[1] *Present value of benefits* represents the income generated from grazing on the Juan Tank Allotment by the permittee, along with the present value of the grazing fees collected by the Forest Service.

[2] *Present value of costs* represents the cost of 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).

[3] *Present net value* represents present value of benefits minus present value of costs.

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

Effects to the Permittee

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

represents costs and benefits that are known and easily comparable between alternatives. This gives the decision maker a good way to compare the alternatives economically. The decision maker understands additional costs that are not included in this table such as day-to-day operational costs, the cost of finding alternative pastures for the livestock when not on allotment, trucking costs, vehicles, trailers, feeding, fence repair (labor is already included), hay storage facilities, horses and additional bulls.

This analysis does not include the cost associated with additional pastures and feed needed when the cattle are not permitted on the Forest. Estimated costs were provided by the permittee and they can be found in Appendix F, Response to Comments. The Forest understands that finding feed for the livestock is an additional expense.

Gross revenue estimates are created by estimating the amount of calves produced each year for each alternative. Alternative 2 would allow up to 150 head yearlong, Alternative 3 would allow up to 360 head for 6-8 months, and five horses yearlong; and Alternative 4 would allow up to 185 cattle yearlong and five horses yearlong (maximum numbers and season of use). Alternative 1 would remove grazing from the allotment.

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.

Based on the above assumptions and calculations, the estimated gross annual revenue for each alternative is as follows: Alternative 2 would be $48,000, Alternative 3 would be $115,200, and Alternative 4 would be $59,200. The 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 allotment. 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. The Forest Service allotment represents approximately 96 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.

Effects to Local and Federal Economy for All Alternatives

In Alternative 1, the loss of the Allotment permits would eliminate $770 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 Allotment may help maintain current jobs within communities around this allotment and revenues for Coconino County and the state. If changes are made in the use of the Allotment in the future, contributions to state, county and local

economies from fees, taxes and jobs associated with cattle grazing on this allotment would change accordingly.

The loss of direct and indirect jobs shown for the no grazing alternative is also shown in Table 8 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 Allotment also support these businesses.

Recreation, Scenery, and Social Environment

Affected Environment

Recreation Resources

The following is a discussion of existing and expected trends in recreation use levels, recreation activities visitors engage in and current recreation facility developments located in and adjacent to the project area.

Information on current recreation use levels and preferences in derived from public contacts, field observations, and 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 (NAU- Boussard, 2002) indicate area visitors come from the local area, the surrounding region (Arizona, Colorado River, Las Vegas) and from across the nation and abroad. While local residents are consistent users of the project area, and have immediate access to the national forest, the project area receives a few recreational visitors from the lower-elevation, densely populated Phoenix Valley urban communities and Colorado River communities.

There are no Forest Service developed recreation facilities in the immediate project area.

As recreation use increases, the types of recreation 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 mostly dispersed settings in all seasons. These activities include camping, picnicking, hiking, mountain biking, hunting, horseback riding, riding ATVs, driving, and viewing wildlife and scenery. National Forest visitors are diverse in their preferences for recreational settings, experiences, and activities, and for the reasons mentioned above, as well as changing demographics, are becoming even more diverse.

Scenic Resources

The following is a discussion of scenic resource management, including the Kaibab National Forest Plan scenery management direction, a description of existing landscape character and scenic integrity, and the Scenic Integrity Objectives of the Juan Tank Grazing Allotment area.

The Juan Tank Allotment area is bounded by the Perrin Ranch to the north, the Pine Creek Allotment to the east, and the Corva/Double A Allotment to the south and west. A corridor of the project area is highly visible and viewed by large numbers of people travelling on Forest Road 124.

The Scenery Management System (SMS), adopted by the Forest in 2004, provides the overall framework for the inventory, analysis, and management of scenery and scenic resources. The SMS inventories visual sensitivity, existing and desired landscape character and scenic integrity. Subsequent analysis and mapping of landscape visibility and scenic attractiveness and correlation with Recreation Opportunity Spectrum (ROS) class mapping produced Scenic Integrity Objectives (SIOs) maps for all national forest system lands on the south zone of the Kaibab National Forest.

The following is the existing landscape character description from the Kaibab NF ROS/SMS Guidebook (KNF ROS/SMS Guidebook; USDA Forest Service 2004a). The Juan Tank Allotment is located within the Flagstaff Character Type, a fairly un-dissected plateau with extensive lava flows and volcanic cones, drained by dry washes with a few natural and created reservoirs. The project area is of the Coniferous Woodland subtype, piñon and juniper dominate coniferous woodlands. Historically, some of the coniferous woodlands were open, diverse communities of trees, shrubs, and perennial grasses and forbs. The typical appearance of the woodlands would be that of dispersed groups of piñon, juniper or evergreen oak, with the forest floor mostly bare, or covered by tree litter, grasses or shrubs.

The pattern of tree patches is influenced by ecosystem conditions and processes including soil depth, nutrients, microbes, seasonal drought, plant competition, fire etc. In the past 100 years, heavy grazing and lack of periodic fires have contributed to expansion of the coniferous woodlands into grasslands. Management activities in the past have focused on clearing coniferous woodlands from associated grasslands, in order to provide more forage.

Scenic integrity is an expression of the "intactness" of landscape and how much deviation is present, and can also be considered as an expression of the gap between existing and desired conditions. The allotment area can be described as having "Moderate Scenic Integrity". This is a reflection of the presence of some direct human-caused deviation in the landscape (such as power line and natural gas pipeline rights-of-way (ROW)), and of years of indirect deviation from historic fire regimes, leading to much denser forest stands than were here historically, and less diversity (loss of grasslands and reduced species diversity in the grasses and forbs). The desired condition for coniferous woodlands is to reduce tree invasion into grassland areas and maintain dispersed groups of trees where they would have historically been found. Coniferous woodlands and associated grassland areas are important for species diversity, wildlife habitat and scenic integrity.

Desired Conditions

Recreation Resources

Landscapes are carefully managed to maintain or enhance recreation and scenic values, sites, and features. Roaded Natural areas are managed to be natural-appearing, although may contain highly developed travel routes (roads and trails). The Juan Tank Allotment area has only a small

portion of this recreation experience available on the Williams Ranger District. Roaded Natural areas along the FR 124 corridor provide a small portion of the district's outdoor recreation settings, where use is low and scenic values are high only along the road corridor. Roaded Modified areas within the allotment are not managed for high recreation use or values.

Other resource management needs would generally take priority over recreation values in this area designated Roaded Modified; however, some sensitive travel routes (roads and trails) within or adjacent to the area may require some consideration to maintain desired recreation values.

The national forest system lands within the Juan Tank Allotment, within the Roaded Natural classification, would continue to provide high quality recreation opportunities and setting that support the use that occurs within the area. Management activities on national forest system lands are consistent with recreation setting objectives.

Manage for a wide spectrum of desired settings that provide opportunities for the public to engage in a variety of developed and dispersed recreational activities, in concert with other resource management and protection needs.

Scenic Resources

The 2004 South Zone ROS/SMS Guidebook is the source for the following desired conditions for Landscape Character and Scenic Integrity.

The scenic integrity level is high and appears unaltered. The desired condition for coniferous woodland is to reduce tree invasion into grassland areas, and maintain dispersed groups of trees where they would have historically been found. Coniferous woodlands and associated grassland areas are important for species diversity, wildlife habitat and scenic integrity. Achieving the desired condition may require mechanical treatments as well as reintroduction of fire into these ecosystems.

Environmental Consequences

Direct and Indirect Effects of Alternative 1, No Action / No Grazing

Recreation Resources
Under the no-action alternative there would be no immediate direct, indirect, or cumulative effects on the existing recreational setting or facilities. Since grazing activities, or range improvements, would not take place, the existing recreational setting would not change.

Scenic Resources
Under the no action alternative there would be no immediate direct, indirect, or cumulative effects on overall landscape character, scenic integrity, or other scenic resources and forest plan Scenic Integrity Objectives (SIOs) would be met.

Direct and Indirect Effects of Alternative 2, Current Management

Recreation Resources
Under Alternative 2, current grazing management and range improvements would continue to take place under this alternative, it is expected that there would be some short-term direct and

indirect effects to recreationist and very little effect to the recreation setting provided. Some recreationists may be temporarily displaced by the activity of the cattle or the associated ranching activities (support trucks, disturbance during fence, 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 scenic integrity in 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, cleaning of stock tanks and other activities associated with the maintenance of range improvements.

Direct and Indirect Effects of Alternatives 3 and 4, Proposed Action and Adaptive Management

Recreation Resources
Under Alternatives 3 and 4, continued current management of grazing and range improvements would continue to take place, it is expected that there would be some short-term direct and indirect effects to recreation setting. Some recreationists may be temporarily displaced by the activity of the cattle or the associated ranching activities (support trucks, disturbance during fence, or other improvement, repairs).

Scenic Resources
Under these alternatives, it is expected that there would be some short-term direct and indirect negative effects on scenic integrity in 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, cleaning of stock tanks and other activities associated with the maintenance of range improvements. The mitigation measures in place for the range improvements in this alternative would meet the scenic integrity level requirements. Materials, colors, and textures would be selected so that the structures are not evident to the casual observer.

Cumulative Effects

The cumulative effects analysis for the recreation and scenic resources is defined as the coniferous woodland component of Hunt Unit 10 over a 20 year time period, from 2014 to 2024. Potential cumulative actions include management activities associated with past, present and future management activities including: activities such as vegetation management, fuels management, livestock grazing, recreational activities, and other management activities (e.g. noxious weed treatments).

Cumulative Effects of Alternative 1, No Action / No Grazing

Recreation Resource
There are no cumulative effects of Recreation for the no action alternative (no grazing alternative).

Scenic Resource
There are no cumulative effects of scenic resources for the no action alternative (no grazing).

Cumulative Effects of Alternative 2, Current Management

Recreation Resource
The cumulative effect of the proposed action when combined with past, current, and planned actions, would be to increase the amount of disturbance and displacement of recreationist. Overall the number of recreationists disturbed from grazing activities is minimal in the project area as the total number of recreationists during the grazing periods is low, with the greatest potential of displacement to occur during the large-game (elk and deer) hunting seasons. Past experience has shown that these effects are short in duration and localized. When combined with the direct and indirect effects of implementing Alternative 2, 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 scenic resources. 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 scenic resources. However, the cumulative effect is negligible because activities do not all occur at the same time and are spatially distributed across the allotment and the mitigation measures were selected so that the structures are not evident to the casual observer.

Cumulative Effects of Alternatives 3 and 4, Proposed Action and Adaptive Management

Recreation Resource
Same as Alternative 2 (current grazing management)

Scenic Resource
Same as Alternative 2 (current grazing management)

Social Environment (Human Perceptions)

The current permittees of the Juan Tank Allotment are native to Arizona and ranching has been part of their lifestyle for a long time. Ranching makes up a substantial portion of their income. The permittees contribute 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 Flagstaff area is very low compared to the rest of the population. There are 24 different permittees on the Kaibab National Forest. 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 the Juan Tank Allotment 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.

A few small in-holdings of private land do exist near the Juan Tank Allotment. Some of this property is owned by the permittee. Few complaints have been received to date from cattle wandering onto private land. Arizona law requires landowners to fence their property if the presence of cattle is undesirable.

Environmental Consequences

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 would be the same under Alternatives 2 (Current Management) and 4 (Adaptive Management), and reduced to 6-8 months in Alternative 3. Cattle grazing would not be permitted under Alternative 1 (No Action/No Grazing).

An increase in residents on private land could occur if those lands are developed. However, due to the small percentage of private land in the allotment area, conflicts should remain low. Eliminating cattle grazing on the Juan Tank Allotment may resolve direct conflicts between recreationists, homeowners, and grazing permittees, and would satisfy the visual concerns of those who do not wish to see livestock on the Kaibab National Forest. 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 1 would eliminate a source of income and possibly the current lifestyle of the permittee of the Juan Tank Allotment 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 2, 3, and 4 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

Cultural Resources: As a result of mainly roads and agra axe surveys over the last decade, archaeologists have inventoried 5836 out of 18535 acres (31%) of the Juan Tank Allotment. The allotment has a high site density. Within surveyed areas, there are 117 sites for an average of 12.7 sites per square miles (Forest wide average is 9.74). Overall, archaeologists have discovered 134 sites within the allotment. Site types include mostly prehistoric artifact scatters, one or two room masonry outlines, soil/water retention or agricultural sites, railroad camps, rock art, rock shelters, artifact scatters, and cabin foundations.

As defined in Appendix H of the First Amended Programmatic Agreement (PA) 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, sites that may be considered sensitive to range land management decisions " may include, but are not limited to, ruins with free-standing walls, historic structures, and Traditional Cultural Properties." (USDA 2004).

Because cattle rub against basalt outcrops and rest in shaded rock shelters (some which also have rock art), Kaibab archaeologists consider these sites as sensitive under the PA. Of the 134 sites found within the project boundary, only thirteen sites are considered sensitive sites in regards to range land activities. These include two cabin foundations, two historic railroad camps, six petroglyph sites, and three rock shelters. However, only 4 of these sites (two petroglyph sites and two historic cabin foundations) occur in grasslands where cattle graze. During May 2013, archaeologist Neil Weintraub and Range Conservationist Jason Stevens monitored all of these sites and did not observe any effects from the current grazing management practices.

Tribal consultation

The Juan Tank Allotment EA was added to the KNF Schedule of Proposed Actions (SOPA) during the Third Quarter of Fiscal Year 2013. Letters containing a copy of the SOPA that included the Juan Tank Allotment project were sent to the Havasupai, Hopi, Hualapai Tribes, Kaibab Paiute, Navajo Nation, Pueblo of Zuni and Yavapai Prescott tribe on May 25, 2012, August 24, 2012 and December 18, 2013. No comments were received regarding this specific project. Nor has there been any major concerns raised regarding past projects in this area.

Environmental Consequences

Direct and Indirect Effects of Alternative 1, No Action / No Grazing

The no action alterative (not renewing the grazing in Juan Tank) would have no measurable direct or indirect effects on any cultural resources as no cattle would be placed on the allotment.

Direct and Indirect Effects of Alternative 2, Current Management

Alterative 2 would have no measurable direct or indirect effects to cultural resources within the allotment. The current permit authorizes 190 head yearlong (2280 AUMs). Since 1995, the actual use has been 150 head (1800 AUMs). This alternative would permit 150 cattle (1,800 Animal Unit Months; AUMs) yearlong, on the Juan Tank Allotment. To date, archaeologists have not observed any adverse effects as a result of cattle grazing in the Juan Tank Project area. Thirteen sites are considered sensitive sites in regards to range land management grazing. However, only 4 of these sites are located in the grassland vegetation type where cattle graze. These include two petroglyph sites and two historic cabin foundations. During past monitoring events for grassland maintenance projects, none of these sites have exhibited signs of cattle damage. Archaeologists would continue to monitor the sites during the extent of the permit. If cattle damage is noted during future monitoring events, then appropriate protection measures such as building fences would be implemented.

Should any undertaking arise that would involve ground disturbing activities, cultural resource specialists would consider those projects under the Section 106 process of the National Historic Preservation Act of 1966. South Kaibab Zone cultural resource specialists would conduct appropriate consultations and take protective measures such as site avoidance to ensure no adverse effects occur.

Direct and Indirect Effects of Alternative 3, Modified Proposed Action, and Alternative 4, Adaptive Management

With regards to direct and indirect effects to cultural resources, Alternatives 3 and 4 are the same and both may result in increased direct or indirect effects to cultural resources within the allotment. While Alternative 3 allows for an increase of 230 head of cattle (150 to 380), it cuts back the number of days that cattle graze on the allotment from yearlong to May 15-November 30. Alternative 4 would issue a yearlong permit for up to 185 cattle which is equivalent to the 2280 AUM proposed in Alternative 3. Additionally, both alternatives include prescribed grazing of up to 1,200 sheep for control of Japanese brome.

Both actions included adding five horses would be added to the permit and would be placed in the HQ pasture yearlong; they would be on the forest portion of this pasture until a 40% utilization limit is reached and then moved to private land for the remainder of the year. Both Alternatives 3 and 4 include: splitting the Juan Tank and Sisters Pastures to improve livestock distribution; constructing up to four trick tanks, 2 corrals, and 5 waterlots; and fencing Holden Lake to exclude livestock from the wetland while allowing livestock to water at the two tanks at this location.

When compared to Alternative 2's 1800 AUMs, Alternative 3 and 4's 27% increase to 2280 AUMs may increase direct effects such as cattle trampling artifacts and indirect effects such as increased soil erosion that may lead to undesirable artifact movement of artifacts or down cutting within or near archaeological sites. However, of the 134 sites in the allotment, only 13 are considered sensitive to rangeland management activities. While direct and indirect effects may slightly increase on these 13 sites, only 4 of them occur in grasslands where cattle typically graze. Archeologists would monitor the sites on an annual basis during the extent of the permit. If cattle damage is noted during future monitoring events, then appropriate protection measures such as building fences would be implemented.

While the addition of up to 1,200 sheep may lead to additional trampling on cultural resources, the sheep are also meant to counteract the effects of the invasive Japanese brome. Mitigating Japanese brome invasion could prevent soil erosion that has the potential to damage archaeological resources. Archeologists believe that the addition of sheep to alternative 3 and 4 will have no adverse effects on cultural resources. With regards to sheep grazing as a method of controlling noxious weeds, a no adverse effect finding is supported by Appendix F of the aforementioned Programmatic Agreement. Both Appendix F and Appendix H well recognize that Forest Service adaptive management practices graze sheep and cattle in number far below historic figures and that any effects likely occurred in the past. In accordance with both Appendix F and Appendix H, if during monitoring of grazing sensitive cultural resources archeologists discover adverse effects, then either protection measures such as fencing or removal of animals will mitigate those problems.

Should any undertaking arise that would involve ground disturbing activities, then cultural resource specialists would consider those projects under the Section 106 process of the National Historic Preservation Act of 1966. South Kaibab Zone archaeologists would conduct appropriate consultations.

Cumulative Effects

In complying with Section 106 of the National Historic Preservation Act of 1966 as amended, Kaibab National Forest archaeologists ensure that all Forest projects result in no adverse effects to cultural resources. If archeologists note any effects from increased grazing, they would ensure that the sites are excluded from grazing with fencing. Because of this, there would be no cumulative effects to cultural resources from any past, present or foreseeable future actions within/or from the area surrounding the Juan Tank Allotment.

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 the Juan Tank Allotment 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 1 (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 1 (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.

The Action Alternatives 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 grazing would temporarily reduce wetland plant height and cover in an unfenced wetland (Holden Lake) under Alternative 2-Current Management. This effect would be short term in nature, as plants would regrow once moisture returns to the wetland and cattle are moved from the pasture.
- Vegetation abundance and diversity at Holden Lake wetland should increase within 2-3 years after livestock exclusion under Alternatives 3 and 4. No increases are expected under Alternative 2.

- Hauling water out of Holden Lake by the permittee for use elsewhere would be short term in nature and is not expected to impact wetland function. This could be mitigated by construction of trick tanks.

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 Juan Tank Allotment 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 Juan Tank Allotment. 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.
- Cattle consumption of wetland water, reduction in wetland plant height and cover, and effects within the Holden Lake waterlot is not expected to change the overall function of the wetland. Wetland function and wetland vegetation would improve or remain static under Alternatives 3 and 4.
- Hauling water out of Holden Lake by the permittee to be used elsewhere is not expected to change the overall function of the wetland as it would not be completely drained. Water is to be left for wildlife and would be mitigated by construction of the trick tanks.
- Additional water developments would provide water to wildlife and cattle. Trick tanks would be left on for wildlife yearlong (except during freezing periods).
- Impaired soil conditions in piñon/juniper woodlands and piñon/juniper invaded grasslands are expected to remain static under all alternatives, and improve in Japanese brome dominated sites following treatments identified in Alternatives 3 and 4.

- The effects of grazing from this project would not change the habitat trend for grasslands, open piñon-juniper, 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 Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line 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 Juan Tank Allotment, a renewable resource, is managed in such a way they would be available for future generations. There are no irreversible or irretrievable commitments associated with this project.

Chapter 4: Monitoring

Monitoring would occur under all action alternatives during the permit term and can include one or more of the following activities: permit compliance, allotment inspections, range readiness, forage production, rangeland utilization, condition and trend, soil condition, noxious weeds, and threatened and endangered species. Monitoring frequency varies by each activity and may be accomplished by either the permittee and/or Forest Service personnel. Under Alternative 1 (No Grazing), condition and trend and wildlife utilization may continue to be monitored, if funding is available.

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 livestock coming onto spring pastures to determine if vegetative conditions are ready for livestock 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 (see Design Features for complete information).

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 help 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 this allotment in the 1950-1960s. These transects are one of the best historic records of range condition and trend. The photo points and vegetative ground cover data show how the site has changed over time. Canopy cover and frequency plots were placed with the Parker Three-Step transects in 2011/12 to add to this historic data.

Ocular plant canopy cover 0.10-acre plots were used to compare existing conditions with potential and desired vegetative community conditions. Over time, these plots would show how

canopy cover changes. Canopy cover would provide an indication of how plants are growing, assuming that if they are getting bigger and occupying more space they are doing well and can be a relative gauge of vigor.

Frequency and ground cover data were collected using the widely accepted plant frequency method (Ruyle 1997). These plots would monitor trends in plant species abundance, plant species distribution, and ground cover. This would provide information on plant composition and additional information on regeneration.

These transects would be read at least every 10 years by Forest Service personnel. These plots would help determine the effectiveness of livestock management.

Precipitation: Precipitation is currently recorded at the Flagstaff National Weather Service Office at Bellemont. 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.

Chapter 5: Consultation and Coordination

Preparers and Contributors

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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 Environmental Assessment. The proposed action was mailed to 58 individuals with expected interest in the project, and posted on the Kaibab National Forest Schedule of Proposed Actions.

Local, State, and Federal Agencies

Arizona Department of Agriculture
Arizona Department of Environmental Quality

Arizona Game and Fish Department
Arizona State Historic Preservation Office
Arizona State Lands Department
City of Williams
U.S. Fish and Wildlife Service
Arizona Department of Water Resources

Tribes

Havasupai Tribe
Hopi Tribe
Hualapai Tribe
Kaibab Band of Paiute
Navajo Nation
Pueblo of Zuni
Yavapai-Prescott Indian Tribe

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Michael and Cynthia Leonard
Coconino 2006 LLC
Tom and Mary Chauncey
Perrin Ranch LLC
Black Family Revocable Trust
Teets Family Trust
Williams Creek Investors
Stanford and Edith Stoneman
Three Sisters Commercial LLC
Royal Media Inc.
Smoketree Properties, LLC
Lazy E LLC
Gonzales Ranch Holding Company
TG Ranch LLC
Dick Artley

Table 9. Coordinated Resource Management Planning Team

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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 would 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 would 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.

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: 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).

Deferment: the delay of grazing, usually until seed ripening, to achieve a specific management objective. A strategy aimed at providing time for plant reproduction, establishment of new plants, restoration of plant vigor, a return to environmental conditions appropriate for grazing, or the accumulation of forage for later use.

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 would not have a significant effect on the human environment and for which an environmental impact statement would 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

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.

Herding: 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, would reflect the overall acceptability of current grazing management over the range.

L

M

Management Area (MA): As defined in the "Kaibab National Forest Plan." An area that has common direction throughout and that differs from neighboring areas. The entire forest is divided into management areas where common standards and guidelines apply.

Management Indicator Species: Any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity (FSM 2605).

Microphytic Soil Crust: Formed when all or some of a diverse array of photosynthetic blue-green algae, fungi, bacteria, lichens, and mosses bind together with inorganic particles in the first few millimeters of a soil (also called cryptogamic crust).

Mitigation Measures: Actions that are taken to lessen the severity of effects of other actions.

N

Nongame Species: Animal species that are not usually hunted.

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 livestock for a specific period of time on a range allotment.

Prescribed Fire: Fires set under conditions specified in an approved plan to dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, and change successional stages to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives.

Present Net Benefit: Future benefits "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable dollars in the future.

Present Net Cost: Future costs "discounted" to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable dollars in the future.

Present Net Value: "The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area." (36 CFR 219.3)

Proper Functioning Condition (PFC): A methodology for assessing the physical functioning of riparian and wetland areas. The term PFC is used to describe both the assessment process, and a defined, on-the-ground condition of a riparian-wetland area. In either case, PFC defines a minimum or starting point. The PFC assessment provides a consistent approach for assessing the physical functioning of riparian-wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. The PFC assessment synthesizes information that is foundational to determining the overall health of a riparian-wetland area. The on-the-ground condition termed PFC refers to *how well* the physical processes are functioning. PFC is a state of resiliency that would 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 livestock 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 piñon-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.

Wild and Scenic Rivers (WSR): Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted (Wild and Scenic Rivers Act usage).

Wildfire: Any wildland fire that requires a suppression action. This includes all fires not meeting the requirements of a prescribed fire.

Woodland: Plant communities with a variety of stocking comprised of various species of piñon pine and juniper, typically growing on drier sites.

References

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.

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. Department of Environmental Quality; Arizona's 2008 303 (d) List and Other Impaired Waters (DRAFT).

Arizona Game and Fish Department. 2008. Hunt Arizona 2008 Edition. Arizona Game and Fish Department, Phoenix, AZ.

Backlund, P; Janetos, A; Schimel, et al. 2008. The effects of climate change on agricultural, land resources, water resources, and biodiversity in the United States. Final Report, synthesis, and assessment product 4.3. Washington, D.C.: U.S. Department of agriculture. 362 p.

Bakker, J.D. and M.M. Moore. 2007. Controls on vegetation structure in southwestern ponderosa pine forests, 1941 and 2004. Ecology 88: 2305-2319.

Beier, P., and J. Maschinski. 2003. Threatened, endangered, and sensitive species. Pages 306-327 in P. Friederici, editor. Ecological Restoration of Southwestern Ponderosa Pine Forests. Island Press, Washington D.C.

Belsky, A. J., and D. M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior west. Conservation Biology 11:315-327.

Biggins, D. E., B. J. Miller, L. R. Hanebury, B. Oakleaf, A. H. Farmer, R. Crete, and A. Dood. 1993. A Technique for Evaluating Black-footed Ferret Habitat. Proceedings of the Symposium on the Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. Biological Report 13. July 1993.

Boussard, L., M.E. Lee, and A.J. Stevens. 2002. Kaibab National Forest user study: final report. Flagstaff, AZ: Northern Arizona University.

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.

Briske D.D. 1991. Developmental Morphology and Physiology of Grasses. P. 85-108. In: Grazing Management: An Ecological Perspective. R.K. Heitschmidt and J.W. Stuth (eds.), Timber Press, Portland, OR.

Brown, D. E. and R. A. Ockenfels. 2007. Arizona's Pronghorn Antelope: A Conservation Legacy. David E. Brown and the Arizona Antelope Foundation. 190 pp.

CARB, 2007. California Air Resources Board: http://www.arb.ca.gov/cc/cc.htm

Conley, J., H. Eakin, et al. (1999). CLIMAS Ranching Case Study: Year 1. Tucson, AZ, Institute for the Study of the Planet Earth, Arizona State University.

Courtois, D.R., B.L. Perryman, H.S. Hussein. 2004. Vegetation change after 65 years of grazing and grazing exclusion. Journal of Range Management 57: 574-582.

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 Zaimes, Niina Haas, Christopher K. Jones, Gregg Garfin, and Theresa M. Crimmins. 2007. Changes on the Range: Exploring Climate Change with Range Managers. J. Nat. Resource. Life Sci. Educ., Vol. 36 (2007), pp. 76-86.

Curtin, Charles G. 2005. Landscape-level impacts of livestock on the diversity of a desert grassland: preliminary results from long-term experimental studies. In: Gottfried, G.J., B.S. Gebow, L.G. Eskew, and C.B. Edminster (comps). Connecting mountain islands and desert seas: biodiversity and management of the Madrean Archipelago II. Proc. RMRS-P-36. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 231-236.

D'Antonio, C.M. and J. Chambers. 2006. Using ecological theory to manage or restore ecosystems affected by invasive plant species. Pages 260–279 in D.A. Falk, M. Palmer and J.B. Zedler (eds), Foundations of Restoration Ecology.

D'Antonio, C. M., T. Dudley, and M. Mack. 1999. Disturbance and biological invasions. In: L. Walker (ed), Ecosystems of disturbed ground. Elsevier: 429-468.

Davis, M. A., J. P. Grime, and K. Thompson. 2000. Fluctuating resources in plant communities: a general theory of invasibility. Journal of Ecology 88:528–534.

Drawe, D. Lynn and I.G. Palmblad. 1977. Competition Between Russian Wildrye Seedlings and Four Common Weeds. Journal of Range Management 30(3). 223-226.

Ellison, Lincoln, 1960. Influence of Grazing on Plant Succession of Rangelands. The Botanical Review, 26(1):1-78.

Elton, C. S. 1958. The ecology of invasions by animals and plants. Methuen, London.

Environmental Protection Agency. 2010. http://www.epa.gov/climatechange/

Fischer SF., Poschlod P., Beinlich B. 1996. Experimental studies on the dispersal of plants and animals on sheep in calcareous grasslands. J. Appl. Ecol. 33,p. 1206–1222.

Fleischner, T. L. 1994. Ecological costs of livestock grazing in western North America. Conservation Biology 8:629-644.

Fredrickson, L. H. and B. D. Dugger. 1993. Management of High Altitude Wetlands in the Southwest, USDA Forest Service Southwestern Region 3. 71 pp.

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.

Galt, D., F. Molinar, J. Navarro, J. Joseph, and J. Holecheck. 2000. Grazing Capacity and Stocking Rate. Rangelands, 22(6):6-11.

Galeano-Popp, Renee; Preliminary Survey for Chrysothamnus molestus (Blake) L.C. Anderson on the Tusayan and Chalender Ranger Districts; Kaibab National Forest; December 1987; unpublished.

Graham, R.T.; Harvey, A.E.; Jurgensen, M.F.; Jain, T.B.; Tonn, J.R; Page-Dumroese, D.S. 1994. Managing course 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

Harmoney, K.R. 2007. Grazing and Burning Japanese Brome (Bromus Japonicus) on Mixed Grass Rangelands. Rangeland Ecology and Management 60(5):479-486.

Hart, R.H. 2001. Plant biodiversity on shortgrass-steppe after 55 years of zero, light, moderate, or heavy cattle grazing. Plant Ecology 155: 111-118

Heffelfinger, J. R. 2006. Deer of the Southwest. Texas A&M University Press. College Station. 282 p.

Hellmann, J. J., J. E. Byers, G. Bierwagen, and J. S. Dukes. 2008. Five Potential Consequences of Climate Change for Invasive Species. Conservation Biology 22: 534-43.

Holechek, Jerry L. 1981. Livestock grazing impacts on public lands: A viewpoint. Journal of Range Management 34: 251-254.

Hoffmeister, D. 1986. Mammals of Arizona. University of Arizona Press, Tucson, AZ. 602 pp.

Holechek, J. 1988. An approach for setting the stocking rate. Rangelands 10: 10-14.

Holechek, Jerry L. 1999. Grazing Studies: What we've learned. Rangelands. 21:12-16.

Ice, George. 2004. History of Innovative Best Management Practice Development and its Role in Addressing Water Quality Limited Water bodies. Journal of Environmental Engineering, Volume: 2, Issue: 6, Pages: 684-689

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. Manninget al. Cambridge, United Kingdom, Cambridge University Press: 996.

Johnsen, T. N., Jr. 1962. One-seed juniper invasion of northern Arizona grasslands. Ecological Monographs 32:187-207.

Kauffman, J. B., and W. C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications: A Review. Journal of Range Management 37:430-438.

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.

Loeser, M.R., T.D. Sisk, and T.E. Crews. 2007. Impact of Grazing Intensity during Drought in an Arizona Grassland. Conservation Biol. 21(1):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. 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.

Lonsdale, W. M. 1999. Global patterns of plant invasions and the concept of invasibility. Ecology 80:1522–1536.

Luce, R.J. and D. Keinath. 2007. Spotted Bat (*Euderma maculatum*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/spottedbat.pdf

Martin, S.C. and D.R. Cable. 1974. Managing semi desert grass-shrub ranges: vegetation responses to precipitation, grazing, soil texture, and mesquite control. U.S. Department of Agriculture Technical Bulletin No. 1480: 45 pp.

McNaughton, S. J. 1983. Compensatory plant growth as a response to herbivores. Oikos 40:329-336.

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* 49(1): 81-86.

NOAA. 2011. U.S. Drought Monitor and El Nino/La Nina Forecasts. http://drought.unl.edu/dm/monitor.html

Ohmart, Robert D., J. E. Walters, R. R. Johnson, E. J. Bicknell. 1978. On Estimating Burro Numbers: A More Reliable Method. *Desert Bighorn Council 1978 Transactions.* pp. 45-46.

Parker, K.W. 1950. Report on 3-step method for measuring condition and trend of forest ranges. USDA Forest Service, Washington D.C. 68pp.

Pfost, Donald L. and Charles D. Fulhage. 2001. Water Quality for Livestock Drinking. University of Missouri Extension Publication EQ381. 7 pp.

Robinson, S. K., S. I. Rothstein, M. C. Brittingham, L. J. Petit, and J. A. Grzybowski. 1995. Ecology and behavior of cowbirds and their impact on host populations. Pp. 428–460 in Ecology and management of neotropical birds (T. E. Martin and D. M. Finch, Eds.). Oxford Univ. Press, New York.

Rummell, R. S. 1951. Some effects of livestock grazing on ponderosa pine forest and range in central Washington. Ecology 32:594-607.

Ruyle, George (ed.). 1997. Some Methods for Monitoring Rangelands and Other Natural Area Vegetation. University of Arizona, College of Agriculture, Cooperative Extension Report 9043.

Ruyle, G. and J. Dyess. 2010. Rangeland monitoring and the Parker 3-step method: overview, perspectives and current applications University of Arizona, College of Agriculture, Cooperative Extension Report AZ1525.

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.

Seegmiller, R. F., and R. D. Ohmart. 1981. Ecological relationships of feral burros and desert bighorn cattle. Wildl. Monogr. No. 78. 58pp.

Severson, K. E., and P. J. Urness. 1994. Livestock grazing: a tool to improve wildlife habitat. Pages 232-249 in M. Vavra, W. A. Laycock, and R. D. Pieper, editors, Ecological Implications of Livestock Herbivory in the West. Society of Range Management, Denver, CO.

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, G. A., and M. V. Lomolino. 2004. Black-tailed prairie dogs and the structure of avian communities on the shortgrass plains. Oecologia 138:592-602.

Smith, T. 2011. Improving pond or stock dam water quality. *Angus Journal* January 2011. 2 pp.

Society of Range Management (SRM) 2006. Climate and Rangeland Workshop: Assessing Climate Change/Variability and Ecosystem Impacts/Responses in Southwest Rangelands. SRM Arizona Chapter Annual Meeting, January 25-26, 2006. San Carlos, AZ.

Society of Range Management (SRM) 1998. A Glossary of Terms Used in Range Management. Fourth Edition. Thomas E. Bedell, Chairman.

Swetnam, T. W., C. D. Allen, and J. L. Betancourt. 1999. Applied historical ecology: using the past to manage for the future. Ecological Applications 9:1189-1206.

Tillam, D. 1999. The ecological consequences of changes in biodiversity: a search for general principals. Ecology 80: 1455-1474.

Thuiller, W., Albert, C., Araujo, M.B., et al. 2007. Predicting global change impacts on plant species' distributions: Future challenges. Perspectives in Plant Ecology, Evolution, and Systematics 9: 137-152.

Truett, J. 1996. Bison and Elk in the American Southwest: In search of the Pristine. Environmental Management. 20:195-206.

USDA Forest Service. 1988. Kaibab National Forest Land Management Plan, as amended.

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. 2004a. Kaibab National Forest Recreation Opportunity Spectrum and Scenery Management System Guidebook. Williams, AZ: Kaibab National Forest.

USDA Forest Service. 2004b. 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. 90 pp.

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.

USDA Forest Service. 2010a. Southwestern Region climate change trends and forest planning. Albuquerque, NM: USDA Forest Service Region 3. 46 pp.

USDA Forest Service 2010b. Management indicator species of the Kaibab National Forest: an evaluation of population and habitat trends. Williams, AZ: Kaibab National Forest. 256 pp.

USDA Forest Service. 2012. Effects of climatic variability and change on forest ecosystems: A comprehensive science synthesis for the U.S. forest sector. PNW-GTR-870. 282 pp.

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/

Department of Interior, Fish and Wildlife Service. 2009. Threatened and Endangered Species List for Coconino County; http://www.fws.gov/southwest/es/arizona/

Vermeire, Lance; Heitschmidt, Rodney; Haferkamp, Marshall. 2008. Vegetation response to seven grazing treatments in the Northern Great Plains. Agriculture Ecosystems and Environment. 125:111-119.

Vermeire, Lance; Rinella, Matt; Muscha, Jennifer. 2009. Managing Annual Bromes in the Northern Great Plains. Range Beef Cow Symposium. Paper 272.

Wagner, D.M., L.C. Drickamer, D.M. Krpata, C.J. Allender, W.E. Van Pelt, P. Keim. 2006. Biological Conservation 130:331-339.

Wells, N., S. Goddard, and M.J. Hayes. 2004. A self-calibrating Palmer Drought Severity Index. *Journal of Climate* 17(12): 2335-2351.

WRCC. 2011. Western Regional Climate Stations. http://www.wrcc.dri.edu/summary/climsmaz.html

Zouhar, K., J.K. Smith, and S. Sutherland. 2008. Effects of fire on nonnative invasive plants and invisibility of wildland ecosystems. Pp 7-31 *In*: Zouhar, K., J.K. Smith, S. Sutherland, and M. Brooks. Wildland fire in ecosystems: Fire and nonnative invasive plants. Gen. Tech. Rep. RMRS-GTR-42-vol. 6. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 355 p.

Appendix A: Cumulative Effects Analysis Activities List

Tables 11-13 identify past, present and reasonably foreseeable activities and natural events that could be considered in a cumulative effects analysis. Foreseeable future projects are listed if there is currently a proposed action available or other document or map that outlines the activity, even if the plan is only conceptual. Table 14 lists active grazing allotments adjacent to the Juan Tank Allotment or within Anderson Mesa. Information from these lists of activities and/or natural events are carried forward into each resource 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.

Monitoring and research activities are not listed if they do not directly affect the resource. Actual monitoring exclosures are listed because they represent small areas of different grazing use.

The tables were created by reviewing the latest Schedule of Proposed Actions (SOPA) and past Forest NEPA decisions.

Table 10. Past projects in the Juan Tank Grazing Allotment Cumulative Effects Analysis Area.

Project	Year NEPA completed	Activities	Status
Williams High Risk Project		Non-commercial thinning	Completed
Clover High Fuels Reduction Project		Non-commercial thinning	Completed

Table 11. Current projects in the Juan Tank Grazing Allotment Cumulative Effects Analysis Area.

Project	Year NEPA completed	Activities	Status
City	2005	Veg. Mgmt.: TS, TSI, & BB; includes some temporary roads and dozer lines	Currently being implemented
Williams Ranger District Travel Management Project	2010	Prohibit cross-country travel (except as designated on MVUM); close 380 miles of system roads to motor vehicle use.	Implemented in July 2011 with publication of MVUM
Hat Allotment Grazing Management	2010	Authorized grazing	Ongoing
EIS for Treatment of Noxious or Invasive Weeds	2004	Treatment of Noxious or Invasive Weeds	Ongoing
Twin Project	2005	Prescribed burning and hazardous fuels reduction	Ongoing
Corva Allotment Grazing	2009	Authorized grazing	Ongoing
Double A Allotment Grazing	2009	Authorized grazing	Ongoing

Project	Year NEPA completed	Activities	Status
Irishman Dam Allotment Grazing	2011	Authorized grazing	Ongoing
Project Name	Location	Description/Effects	Status
Agra-Axe Juniper Projects	Throughout the Allotment	Grassland maintenance to improve understory vegetation. Improved understory ground cover with an increase in grass, forb and shrubs.	Completed 1991-2010
Chaining Juniper Projects	Throughout the Allotment	Grassland maintenance to improve understory vegetation. Improved understory ground cover with an increase in grass, forb and shrubs.	Completed 1950-1970's
Cinder Pits	Throughout the Allotment	Removal of cinders. Disturbed surface soils in localized areas. Rehabilitation of closed areas has increase grass, forb and shrub production.	Completed 1920's to present.
Historic Livestock Grazing	Throughout the Allotment	Started with unregulated livestock grazing and progressed to current management system with a significant reduction in livestock and rotational grazing. During early times, grazing reduced grass and shrubs and reduced the ability of fire to carry through the area. Through time the grass and shrubs recovered where trees are not dominating the site.	Late 1800's to present
Noxious weeds	Scattered primarily along major roads and pipelines throughout the allotments	Noxious weeds reduce native plants and can increase fire occurrence.	Completed 2004
Road Closures	Throughout the Allotment	Small user created roads were closed. This closures improved localized ground cover conditions.	Completed 2005
Natural Gas Developments (Pipelines)	Crossing Allotment from Northwest to Southeast	Below-ground pipeline. Disturbed area is currently infested with Russian thistle. Infestation is approximately 145 acres.	Completed 2007
Climate (drought)	Region wide	Insufficient precipitation	Ongoing

Project	Year NEPA completed	Activities	Status
		for normal plant growth and for providing natural water sources for wildlife and/or cattle. Vegetation is negatively affected in general. Plant composition change shifts to more drought tolerant plants.	
Dispersed Recreation	Throughout the Allotment	Camping, hiking, hunting, recreational driving and other activities outside of developed campgrounds. Affects soil, vegetation, wetlands, and wildlife. Use likely to increase as the growing urban population grows.	Ongoing
Elk Grazing	Throughout the Allotment	Elk graze across the area. The extent and duration of grazing depends on elk numbers and movement. Elk affect vegetation and soil conditions similar to the way cattle do. Depending on climate conditions, elk may graze year-round.	Elk numbers began increasing in the 1950s, peaked in the mid-1990s.
Firewood Gathering	Throughout the Allotment	Removal of dead/down vegetation through a special use permit. People gather firewood in many areas. Effects to vegetation and soil can occur from driving vehicles off road or from trampling in areas where firewood is gathered.	Ongoing; use varies by year but majority of use occurs Oct 1 -Dec 15
Stock tank Maintenance	Throughout the Allotment	Stock tank maintenance includes cleaning of existing tanks. Effects are limited to 2 to 3 days of actual disturbance from equipment and the original stock tank perimeter.	Ongoing
Existing roads	Juan Tank Allotment	There are approximately 95 miles of Forest System roads within the allotment, which are maintained by the Forest Service. User-created	Ongoing

Project	Year NEPA completed	Activities	Status
		roads are localized and not widespread and are not maintained by the FS. People may occasionally turn off an existing forest system road to create a new user road, but this is rare (rocky/rugged conditions generally limit cross-country use).	
Transmission line maintenance	Cutting though the allotments	Tree trimming and vegetation clearing, as needed, within the right-of-way.	On-going
Project Concept	Location	Description	Strategy
Hat Allotment Management Plan	Adjacent (east) of Juan Tank Allotment	Cattle Allotment management plan would be developed to match forage production with use to maintain/improve understory vegetation.	Future years under 2010 NEPA
National Travel Management Rule Implementation	Williams Ranger District	Designate a system of National Forest System roads, trails, and areas open to vehicle use. Motor use off designated roads and trails and outside of designated areas would be prohibited under 36 CFR 261.13. Could possibly reduce the number of roads and trails open to motorized vehicle use within the project and cumulative effects areas.	Future years under 2010 NEPA
Agra-Axe Juniper Projects	Throughout the Allotments	Grassland maintenance to improve understory vegetation. Improved understory ground cover with an increase in grass, forb and shrubs.	Future years under 2001 NEPA
Noxious Weeds Treatments	Scattered primarily along major roads throughout the allotments	Noxious weeds spraying and hand treatments would be completed.	Future years under 2005 Weeds EIS
Stone-Steel Dam Interpretive Trail	Between Stone and Steel Dam (N of I-40)	Hiking Trail.	CE in Progress

Table 12. Reasonably foreseeable projects in the Juan Tank Grazing Allotment Cumulative Effects Analysis Area.

Project	Estimated Year NEPA Completed	Activities	Status
Four Forest Restoration Initiative (Multiple Projects)	Multiple	Restoration of Ponderosa Pine ecosystem (thinning, burning)	Planning team and collaborative group developing strategy and initial PA.
Bill Williams Mountain Restoration Project	In progress	Forest restoration, including thinning and prescribed burning	NEPA analysis in progress.
Juan Tank Japanese Brome Management Project	In progress	Prescribed burning to contain and control Japanese brome	NEPA analysis in progress

Table 13. Adjacent grazing allotments

Allotment Name	Acres	Number of Head	Season of Use	Utilization Guideline
Hat	104,017	4,300 sheep	5/1 to 10/31	40%
Corva/Double A	56,408	250 Cattle	3/1 to 2/28	40%
Pine Creek	8,374	133 Cattle	6/1 to 10/31	40%

Appendix B: Example Grazing Schedules

Grazing schedules for Alternatives 2 (Current Management) and 3 (Proposed Action), and 4 (Adaptive Management) are provided as examples for comparison purposes only. Schedules and livestock numbers would be determined each year depending on weather and the permittees input, via the AOIs.

Table 14. Example Grazing Schedule for Alternative 2 – Current Management

Year 1 Grazing Location	Approximate Graze Dates	Approximate Number of Days
Juan Tank	November 15 – May 31	195
Button	June 1 – July 31	60
Sisters	August 1 – November 30	120
Year 2 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Juan Tank	December 1 – June 15	195
Sisters	June 16 – September 30	135
Button	October 1 – November 30	60
Year 3 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Juan Tank	December 1 – May 15	165
Button	May 16 – July 31	75
Sisters	August 1 - November 15	75
Juan Tank	November 16 – March 1	135

Table 15. Example Grazing Schedule for Alternative 3 – Modified Proposed Action

Year 1 Grazing Location	Approximate Graze Dates	Approximate Number of Days
Juan Tank*	May 15 - July 31	78
Sisters*	August 1 - October 15	76
Button	October 16 - November 30	46
Private Land/open allotments	December 1 – May 14	165
Year 2 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Sisters*	May 15 – July 15	62
Button	July 16 - September 15	62
Juan Tank*	September 16 - November 30	76
Private Land/open allotments	December 1 – May 14	165
Year 3 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Button	May 15 - July 13	60
Juan Tank*	July 14 – August 31	49
Sisters*	September 1 - November 30	91
Year 4 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Juan Tank	**REST**	0
Sisters	March 15 - August 31	165
Button	September 1 - November 30	91
Private Land/open allotments	December 1 – May 14	165

*Once these pastures are split, livestock would be in them for less time or completely rested if needed.

Table 16. Example Grazing Schedule for Alternative 4 – Adaptive Management

Year 1 Grazing Location	Approximate Graze Dates	Approximate Number of Days
Juan Tank East	November 1 – January 31	92
Juan Tank West	February 1 – March 31	60
Button	April 1 – May 31	61
Sisters East	June 1 – August 31	92
Sisters West	September 1 – October 31	61
Year 2 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Button	November 1 – December 31	61
Juan Tank West	January 1 - March 31	91
Juan Tank East	April 1 – June 30	91
Sisters East	July 1- August 31	62
Sisters West	September 1 – October 31	61
Year 3 Grazing Location	**Approximate Graze Dates**	**Approximate Number of Days**
Juan Tank East	November 1 – December 31	61
Juan Tank West	January 1 – March 31	91
Button	April 1 – May 31	61
Sisters East	June 1 – July 31	61
Sisters West	August 1 – October 31	92

Appendix C: Juan Tank Allotment Key Areas

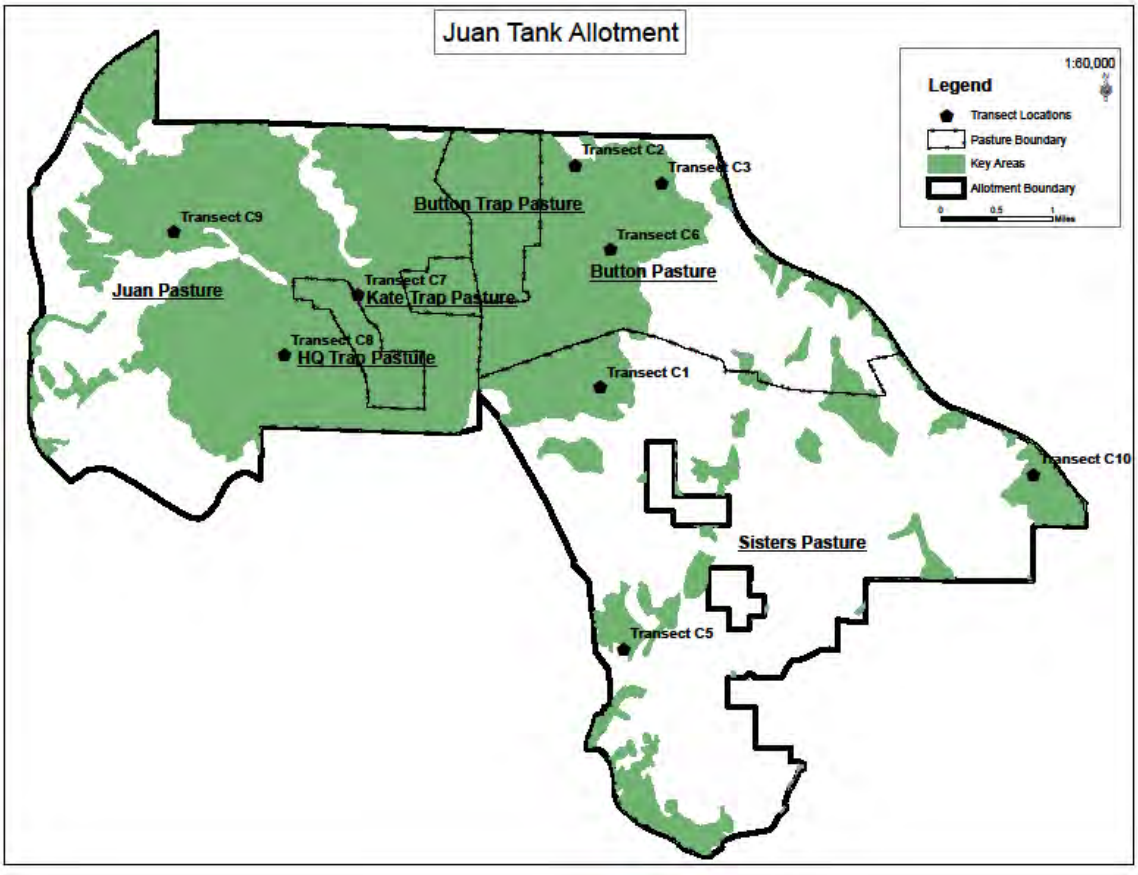


Figure 6. Juan Tank Allotment Key Areas

Appendix D: Juan Tank Plan to Project Matrix

Plan-to-Project Matrix for the Juan Tank Allotment					
Cluster 1. TEU 507. Established in 1984 and reread in 1994. Pace Frequency transect done in 2011.					
TEU 507 is a shrub/grassland community type. There are 1,289 acres of this map unit in the allotment.					
	Vegetation			**Wildlife**	**Ground Cover %**
Potential	Grasses 8 species 6.5% canopy cover Bogr Fear Kocr	Forbs 7 species 4.5% c. cover Anro Hyri Acmil Luar	Shrubs 7 species 3% c. cover Chna Gusa Rice Rhtr	Habitat suitability is rated 'essential' for Pronghorn antelope and 'used' by elk, mule deer, and turkey (per TES).	Bare Soil 45 Litter 5 Rock 40 Vegetation 10
Desired Condition	Grasses 5-11 native species 60-80% c. cover % Frequency Bogr 60-90 Pasm 20-45 Kocr 10-20	Forbs 7-15 species 5-25% c. cover % Frequency HELIO 15-45 ERIG 10-20 Trif 10-20	Shrubs 7-10 species 5-20% c. cover % Frequency Gusa 40-55 Matr3 1-5 RIBE 1-5	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 10-20 Litter 5-40 Rock 20-40 Vegetation 10-25
Existing Condition	Grasses 8 species (1 invasive) 147% c. cover % Frequency Bogr 91 Pasm 42 Elel 15 Kocr 10 **Brja 18 (invasive)**	Forbs 9 species 13% c. cover % Frequency HELIO 48 ERIG 13 Trif 11	Shrubs 7 species 70% c. cover % Frequency Gusa 79 Erwr 7	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 17 Litter 41 Rock 26 Vegetation 22
Interpretation	Shrubs and forbs are a different composition then potential. Higher % cover of shrubs due to HELIO (goldeneye) and Gusa (snakeweed). Grass species differ from potential but it's a good mix of forage species. There is a need to reduce			Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.	Maintain or improve vegetative ground cover at this site to minimize vertic properties.

	Japanese brome cover/frequency while maintaining or increasing native grass species cover/frequency.		
Rangeland Capacity Rating	Full Capability with satisfactory soils and production >100 pounds/acre.	N/A	N/A
Trend	Static to slightly upward		
Soil Condition	Satisfactory	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Reduce frequency of Japanese brome and possibly snakeweed.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 10-15 year interval unless signs of decline (i.e. increasing brome populations) show a need for increased monitoring.		

Plan-to-Project Matrix for the Juan Tank Allotment					
Cluster 4. TEU 563. Established in 1958 and reread in 1984 and 1994. Pace Frequency transect done in 2011.					
TEU 563 is a piñon/juniper community type. There are 1,624 acres of this map unit in the allotment.					
	Vegetation			**Wildlife**	**Ground Cover**
Potential	Grasses 9 species 10.5% canopy cover Bogr Pofe Elel Fear	Forbs 7 species 4% c. cover Luar Acmil	Shrubs 6 species 0.5% c. cover Rhtr Arfr Cefe	Habitat suitability is rated 'impaired' for elk, plain titmouse, turkey, and pygmy nuthatch; 'used' by mule deer (per TES).	Bare Soil 15 Litter 20 Rock 55 Vegetation 10
Desired Condition	Grasses 5-11 native species 40-60% c. cover % Frequency Bogr 30-80 Pofe 30-60 Kocr 5-20	Forbs 12-18 species 40-60% c. cover % Frequency ERIG 40-80 Erwr 10-30 Acmil 5-20	Shrubs 6-10 species 0-5% c. cover % Frequency Gusa 10-40 Arfr 1-10 Rhtr 1-10	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 10-20 Litter 20-50 Rock 20-30 Vegetation 10-20
Existing Condition	Grasses 9 species (1 invasive) 38% c. cover % Frequency Bogr 72 Pofe 40 Kocr 8 Elel 4 Brte 1 (invasive)	Forbs 6 species 4% c. cover % Frequency ERIG 60 Erwr 17	Shrubs 3 species 10% c. cover % Frequency Gusa 40	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 11 Litter 52 Rock 27 Vegetation 13
Interpretation	Shrubs and forbs are a different composition then potential. Higher % cover of shrubs due to Gusa. Grass species differ from potential but it's a good mix of forage species. This area may benefit from thinning and burning.			Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.	
Rangeland	Full Capability with satisfactory			N/A	N/A

Capacity rating	soils and production >100 pounds/acre.		
Trend	Static		
Soil Condition	Satisfactory	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Keep invasive Brte population from expanding.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 10-15 year interval unless signs of decline (i.e. increase of invasive species) show a need for increased monitoring.		

Plan-to-Project Matrix for the Juan Tank Allotment					
Cluster 6. TEU 514. Established in 1963 and reread in 1984 and 1993. Pace Frequency transect done in 2011 and 2012.					
TEU 514 is a grassland community type. There are 4,452 acres of this map unit in the allotment.					
	Vegetation			**Wildlife**	**Ground Cover**
Potential	Grasses 11 species 56% canopy cover Bogr Bocu Hija Pasm	Forbs 3 species 1% c. cover Cali4 Erfl Hyri	Shrubs 7 species 14.3% c. cover Chna[1] Befr Gusa Rhtr	Habitat suitability is rated 'impaired' for elk and mule deer; 'used' by plain titmouse and turkey; 'essential' for pronghorn antelope (per TES).	Bare Soil 49 Litter 1 Rock 40 Vegetation 10
Desired Condition	Grasses 5-11 native species 50-80% canopy cover % Frequency Bogr 60-90 Elel 20-40 Pasm 20-45	Forbs 5-15 species 10-30% c. cover % Frequency Sppa 10-20 Cali 1-5 CIRS 10-30	Shrubs 4-10 species 10-55% c. cover % Frequency Gusa 30-50 Matr 1-5 Rhtr 1-5	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 10-50 Litter 10-55 Rock 10-40 Vegetation 10-30
Existing Condition	Grasses 9 species (1 invasive) 70% canopy cover % Frequency 2011/2012 Bogr 86/77 Elel 26/53 Pasm 6/9 Muwr 2/11 **Brja 1, 2 (invasive)**	Forbs 7 species 17% c. cover % Frequency 2011/2012 Sppa 14/18 CIRS 22/33 Erwr 6/6	Shrubs 4 species 46% c. cover % Frequency2011/2012 Gusa 50/46 Matr 1/2	Forage and hiding cover is provided for above listed wildlife species.	2011 2012 Bare Soil 32 28 Litter 35 44 Rock 14 15 Vegetation 21 18
Interpretation	Shrubs and forbs are a different composition then potential; good forage species diversity. There is a need to increase forb & shrub diversity while maintaining grass species cover/frequency.			Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.	There is a need to maintain or improve ground cover at this site to minimize vertic properties.
Rangeland Capacity	Full Capability with satisfactory soils and production >100			N/A	N/A

Rating	pounds/acre.		
Trend	Static to slightly downward		
Soil Condition	Satisfactory	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Could benefit from a burn to reduce juniper skeletons on site. Keep Brja population from expanding.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 10-15 year interval unless signs of decline (i.e. increase in Brja cover/frequency) show a need for increased monitoring.		

Plan-to-Project Matrix for the Juan Tank Allotment					
Cluster 8. TES Unit 542. Established in 1958 and reread in 1967, 1984 and 1993. Pace Frequency transect done in 2011 and 2012.					
TEU 542 is a shrub/grassland community type. There are 1,159 acres of this map unit in the allotment.					
	Vegetation			**Wildlife**	**Ground Cover**
Potential	Grasses 11 species 56% canopy cover Bogr Bocu Hija Pasm Elel	Forbs 3 species 1% c. cover Cali4 Hyri Erfl	Shrubs 5 species 11% c. cover Chna Gusa	Habitat suitability is rated 'impaired' for elk, mule deer and plain titmouse; 'used' by and turkey and pronghorn antelope (per TES).	Bare Soil 35-50 Litter 0 Rock 40-45 Vegetation 10-20
Desired Condition	Grasses 5-11 native species 60-80% canopy cover % Frequency Bogr 30-80 Elel 10-40 Pasm 20-60	Forbs 12-18 species 10-40% c. cover Frequency Sppa 5-30 Cali 1-5 CIRS 1-5	Shrubs 6-10 species 1-20% c. cover % Frequency Gusa 10-30 Arfr 1-5	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 30-50 Litter 5-40 Rock 15-25 Vegetation 10-30
Existing Condition	Grasses 5 species (1 invasive) 75% c. cover % Frequency 2011/2012 Bogr 61/68 Elel 16/31 Pasm 40/52 **Brja 34/25 (invasive)**	Forbs 5 species 36% c .cover % Frequency 2011/2012 Sppa 3/14 HELIO 66/11 CIRS 3/5	Shrubs 2 species 10% c. cover % Frequency 2011/2012 Gusa 22/28	Forage and hiding cover is provided for above listed wildlife species.	2011 2012 Bare Soil 31 35 Litter 38 37 Rock 18 14 Vegetation 17 21
Interpretation	Shrubs and forbs are a different composition then potential. Higher % cover of shrubs due to Gusa. Grass species differ from potential but it's a good mix of forage species. There is a need to reduce the invasive Japanese brome while maintaining native grass species cover/frequency.			Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.	Maintain or improve ground cover at this site to minimize vertic properties.

Rangeland Capacity rating	Full Capability with satisfactory soils and production >100 pounds/acre.	N/A	N/A
Trend	Static		
Soil Condition	N/A	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Reduce presence of Japanese brome. Area could benefit from some burning.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 2-5 year interval until Japanese brome declines and site improves following treatments; and then on a 10-15 year interval.		

<table>
<tr><th colspan="6">Plan-to-Project Matrix for the Juan Tank Allotment</th></tr>
<tr><td colspan="6">Cluster 9. TES Unit 542. Established in 1958 and reread in 1967, 1984 and 1993. Pace Frequency transect done in 2011 and 2012.</td></tr>
<tr><td colspan="6">TEU 542 is a shrub/grassland community type. There are 1,159 acres of this map unit in the allotment.</td></tr>
<tr><td></td><td colspan="3">Vegetation</td><td>Wildlife</td><td>Ground Cover</td></tr>
<tr><td>Potential</td><td><u>Grasses</u>
11 species
56% canopy cover
Bogr
Bocu
Hija
Pasm
Elel</td><td><u>Forbs</u>
3 species
1% c. cover
Cali4
Hyri
Erfl</td><td><u>Shrubs</u>
5 species
11% c. cover
Chna
Gusa</td><td>Habitat suitability is rated ‘impaired’ for elk, mule deer and plain titmouse; ‘used’ by and turkey and pronghorn antelope (per TES).</td><td>Bare Soil 35-50
Litter 0
Rock 40-45
Vegetation 10-20</td></tr>
<tr><td>Desired Condition</td><td><u>Grasses</u>
5-11 native species
60-80% canopy cover

<u>% Frequency</u>
Bogr 30-80
Elel 10-40
Pasm 20-60</td><td><u>Forbs</u>
12-18 species
10-40% c. cover

<u>Frequency</u>
Sppa 5-30
Cali 1-5
CIRS 1-5</td><td><u>Shrubs</u>
6-10 species
1-20% c. cover

<u>% Frequency</u>
Gusa 1-10
Arfr 1-5</td><td>Forage and hiding cover is provided for above listed wildlife species.</td><td>Bare Soil 30-50
Litter 5-40
Rock 15-25
Vegetation 10-30</td></tr>
<tr><td>Existing Condition</td><td><u>Grasses</u>
11 species (1 invasive)
15% canopy cover

<u>% Frequency 2011/2012</u>
Bogr 18/49
Elel 1/2
Pasm 28/25
Brja 94/89 (invasive)</td><td><u>Forbs</u>
9 species
41% c. cover

<u>% Frequency 2011/2012</u>
ASTRAG 29/50
ERIG 40/17
HELIO 87/15</td><td><u>Shrubs</u>
2 species
trace c. cover

<u>% Frequency 2011/2012</u>
Gusa 0/1
cholla 1/1</td><td>Forage and hiding cover is provided for above listed wildlife species.</td><td><u>2011 2012</u>
Bare Soil 31 35
Litter 38 37
Rock 18 14
Vegetation 17 21</td></tr>
<tr><td>Interpretation</td><td colspan="3">Forbs are a different composition then potential. Higher % cover of forbs due to HELIO (goldeneye). Grass species differ from potential but it’s a good mix of forage species. There is a need to reduce the invasive Japanese brome while maintaining native grass species</td><td>Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.</td><td>Maintain or improve ground cover at this site to minimize vertic properties.</td></tr>
</table>

	cover/frequency.		
Rangeland Capacity rating	Full Capability with satisfactory soils and production >100 pounds/acre.	N/A	N/A
Trend	Static		
Soil Condition	N/A	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Reduce presence of Japanese brome. Area could benefit from some burning.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 2-5 year interval until Japanese brome declines and site improves following treatments; and then on a 10-15 year interval.		

Plan-to-Project Matrix for the Juan Tank Allotment					
Cluster 10. TEU 507. Established in 1957 and reread in 1984 and 1994. Pace Frequency transect done in 2011.					
TEU 507 is a shrub/grassland community type but this site is dominated by piñon/juniper. There are 1,289 acres of this map unit in the allotment.					
	Vegetation			**Wildlife**	**Ground Cover %**
Potential	Grasses 8 species 6.5% canopy cover Bogr Fear Kocr	Forbs 7 species 4.5% c. cover Anro Hyri Acmil Luar	Shrubs 7 species 3% c. cover Chna Gusa Rice Rhtr	Habitat suitability is rated 'essential' for Pronghorn antelope and 'used' by elk, mule deer, and turkey (per TES).	Bare Soil 45 Litter 5 Rock 40 Vegetation 10
Desired Condition	Grasses 5-11 native species 60-80% c. cover % Frequency Bogr 60-90 Pasm 5-20 Kocr 10-15	Forbs 7-15 species 5-25% c. cover % Frequency HELIO 15-45 Eriog 10-20 Trif 10-20	Shrubs 7-10 species 5-20% c. cover % Frequency Gusa 5-10 Rice 1-10 Rhtr 1-10	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 10-30 Litter 5-40 Rock 20-40 Vegetation 10-30
Existing Condition	Grasses 7 species 18% canopy cover % Frequency Bogr 72 Pasm 3 Pofe 24 Kocr 11 Elel 9	Forbs 9 species 16% c. cover % Frequency HELIO 63 ERIG 56 Aster 23 Eriog 20	Shrubs 2 species trace c. cover % Frequency Gusa 5 ARTR 1	Forage and hiding cover is provided for above listed wildlife species.	Bare Soil 14 Litter 36 Rock 34 Vegetation 21
Interpretation	Shrubs and forbs are a different composition then potential. Higher % cover of forbs due to HELIO (goldeneye). Grass species differ from potential but it's a good mix of forage species. Maintain the native grass species cover/frequency.			Maintain or improve forage and hiding cover (grass, shrubs and forbs) at this site.	Maintain or improve vegetative ground cover at this site to minimize vertic properties.
Rangeland Capacity Rating	Full Capability with satisfactory soils and production >100 pounds/acre.			N/A	N/A

Trend	Static		
Soil Condition	Satisfactory	N/A	Satisfactory with little erosion
Objectives	Maintain or improve existing conditions while grazing livestock. Increase frequency of forbs and shrubs by thinning and/or burning piñon/juniper.	Maintain or improve existing conditions throughout while grazing livestock.	Maintain or improve existing conditions while grazing livestock.
Monitoring	The monitoring site would be maintained on a 10-15 year interval unless signs of decline show a need for increased monitoring.		

Appendix E: CRMP Adaptive Management Alternative

JUAN TANK ALLOTMENT

PROPOSED COORDINATED RESOURCE MANAGEMENT PLAN:
AN ADAPTIVE MANAGEMENT ALTERNATIVE

Coordinated Resource Management Plan (CRMP): An Adaptive Management Alternative
This is an alternative developed by cooperating agencies constructed by the Permittee, Mr. Glen Reed, of the Juan Tank Allotment. Cooperating agency affiliations include: University of Arizona Agricultural Extension, Natural Resource Conservation Service, Arizona Game and Fish, U.S. Forest Service, Arizona Cattle Growers Association and the Juan Tank Allotment Permittee (Table 1).

Table 1. Juan Tank Allotment Coordinated Resource Management Plan Affiliates

NAME	AFFILIATION	POSITION	ADDRESS
Dr. Doug Tolleson	University of Arizona Cooperative Extension	Assitant Extension Specialist and Research Scientis	2830 N Common Wealth Dr, Stuite 103 Camp Verde, AZ 86322
Mr. Steve Cassady	Arizona Game & Fish, Region II	Land Owner Relations	3500 S Lake Mary Rd Flagstaff, AZ 86001
Mr. Iric Burden	Natural Resource Conservation Service	Range Management Specialist	1585 S Plaza Way Flagstaff, AZ 86004
Mr. Jason Stevens	U.S. Forest Service	Range Management Specialist	742 S Clover Rd Williams, AZ 86046
Ms. Kerri Lange	U.S. Forest Service	Range Management Specialist	742 S Clover Rd Williams, AZ 86046
Mr. Patrick Bray	Arizona Cattle Growers Asoctiation	Exectutive Vice President	1401 N 24th St, Suite #4 Phoenix AZ 85008
Mr. Glenn Reed	Juan Tank Permittee	Owner/Operator	478 W Edison Ave Williams, AZ 86046
Mr. Kit MacDonald	U.S. Forest Service	Soil Scientist	800 S 6th St Williams, AZ 86046
Mr. Mike Hannemanr	U.S. Forest Service	Forest Range and Watershed Management Specialist	800 S 6th St Williams, AZ 86046
Ms. Clare Hydock	U.S. Forest Service	Range Management Specialist	742 S Clover Rd Williams, AZ 86046

Location and

Description

The Juan Tank Allotment is located entirely within Coconino County northwest of Williams, Arizona. The allotment includes approximately 18,535 Forest Service acres and 821 private acres, of which 680 acres are owned by the Permittee.

The topography within the allotment varies from mostly flat with rolling hills on the west side to steeper terrain on the east and south sides. Major topographic features include Signal Hill, Three Sisters Peak, Hearst Mountain, Rogers Canyon, Juan Tank Canyon, and Holden Lake.

The canyons and washes are ephemeral drainages and are part of the Upper Verde and Colorado River drainage systems. These drainages flow only during periods of spring snow melt and heavy monsoon storms, and do not contain riparian vegetation types. Holden Lake is the only wetland known to occur on the allotment; there are no springs. There are no listed (i.e., threatened or endangered) animal or plant species on the allotment. Sensitive plants and animals may occur.

Piñon/juniper, savanna, and grasslands are the dominant vegetation types on the allotment. There is a minor component of ponderosa pine. Predominant grass species include blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), prairie junegrass (*Koelaria cristata*) and bottlebrush squirreltail (*Elymus elymoides*).

Purpose and Need

The Juan Tank Allotment is scheduled for environmental analysis of grazing use on the Kaibab National Forest, as required by the Rescission Act (1995). This analysis is required in order to ensure that livestock grazing is consistent with goals, objectives and the standards and guidelines of the Kaibab National Forest Plan (1988).

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

CRMP ALTERNATIVE TO PROPOSED ACTION

The following CRMP alternative has been developed to meet the project's purpose and need. The CRMP alternative is in response to the four components outlined in the Proposed Action: **Authorization, Structural Improvements, Monitoring and Adaptive Management**.

Authorization

The Juan Tank Allotment coordinating group members (as listed above) proposes to **continue to authorize yearlong livestock grazing for the Juan Tank Allotment.**

1. Permitted livestock numbers would be a maximum of 185 head of adult cattle and 5 horses or 2,280 AUMs.
2. The following data (gathered by Forest Service personnel) adequately meets the grazing/wildlife requirements as described in the Kaibab Forest Plan, and is the basis to reauthorize yearlong livestock grazing for the Juan Tank Allotment (Tables 2-4).

TABLE 2. Summary of similarity ratings and ground cover. Similarity is based on floristic diversity, where existing condition was compared to the site potential listed in TES							
Cluster Site/TES Unit		C1/507	C4/563	C6/514	C8/542	C9/542	C10/507

Graminoid	Potential	9	9	11	11	11	9
	Existing	7	8	4	4	2	6
Percent of Potential		78	89	36	36	18	67
Forb	Potential	6	6	3	3	3	6
	Existing	9	6	7	5	9	9
Percent of Potential		150	100	233	167	300	150
Shrub	Potential	7	6	7	5	5	7
	Existing	7	3	4	2	2	2
Percent of Potential		100	50	57	40	40	29
Proportion of Potential Number of Species (%)		**105**	**81**	**71**	**58**	**68**	**77**

TABLE 3. TES and 2011 Comparison of Percent (%) Surface Composition by TEU and Cluster.

TES UNIT		Gravel Rock	Basal	Litter	Bare Ground
507	*** TES**	40	10	5	45
	****C1**	26	22	38	17
	****C10**	34	21	33	14
514	*** TES**	40	10	1	49
	****C6**	14	21	35	32
542	*** TES**	45	20	0	35
	****C8**	18	17	35	31
	****C9**	33	9	44	17
563	*** TES**	55	10	20	15
	****C4**	27	13	52	11

* Amalgamated data collected in late 70's - 80's and published in 1990

** Data collected in 2011 - 2012

TABLE 4. TES and 2011 Comparison of Percent (%) Vegetative Ground Cover (basal & litter) for TES Natural, TES Existing and 2011 by TEU and Cluster.

	507		514	542		563
	C1	C10	C6	C8	C9	C4
***Natural**	75	75	70	65	65	70
***TES**	15	15	11	20	20	30
2011	60	54	56	52	51	65

* Amalgamated data collected in late 70's - 80's and published in 1990

** Data collected in 2011

3. If changes are to be made to grazing management, the following protocol is recommended: Stage allotment management changes as conditions dictate. Please refer to the **Adaptive Management** section of the document for description and example.
    a. Obtain seasonal deferment by rotation through use of waterlots. The majority of the allotment (98.4%) is within one mile or less of water, thus, facilitating the first change to management grazing (Table 5). Important to note that the forage and animal balance is well within the capacity limits as analyzed using Forest Service production data gathered in 2011, which is

considered to be a drought year (Table 5). See **Structural Improvements** section for a list of waterlots needed.

b. If waterlots do not produce desired effect, then use temporary electric fence or other means to distribute cattle (i.e. Patch burning).
c. If temporary electric fence does not produce desired effect, then build permanent fence.

Table 5. Animal Balance and Planned Grazing Schedule Example

***Summary Forage - Animal Balance**

Pasture	Acres	Available AUMs/Yr	Planned Years	Planned Avail AUMs	2014	2015	2016	Scheduled AUMs	% of Available
Juan Tank East	3061	575	3	1726	570	570	380	1520	88%
Juan Tank West	3061	575	3	1726	380	570	570	1520	88%
Sisters East	3207	492	3	1477	570	380	380	1330	90%
Sisters West	3207	492	3	1477	380	380	570	1330	90%
Button	2561	424	3	1272	380	380	380	1140	90%

****Planned Grazing Schedule**

Year	2014		Scheduled Number of Animal Unit Equivalents by Month.												
Pasture	Acres	Available AUMs	Sched AUMs	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Juan Tank East	3061	571	570	190	190	190									
Juan Tank West	3061	571	380				190	190							
Sisters East	3207	492	570								190	190	190		
Sisters West	3207	492	380											190	190
Button	2561	424	380						190	190					
Year	**2015**		Scheduled Number of Animal Unit Equivalents by Month.												
Pasture	Acres	Available AUMs	Sched AUMs	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Juan Tank East	3061	571	570						190	190	190				
Juan Tank West	3061	571	570			190	190	190							
Sisters East	3207	492	380									190	190		
Sisters West	3207	492	380											190	190
Button	2561	424	380	190	190										
Year	**2016**		Scheduled Number of Animal Unit Equivalents by Month.												
Pasture	Acres	Available AUMs	Sched AUMs	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Juan Tank East	3061	571	380	190	190										
Juan Tank West	3061	571	570			190	190	190							
Sisters East	3207	492	380								190	190			
Sisters West	3207	492	570										190	190	190
Button	2561	424	380						190	190					

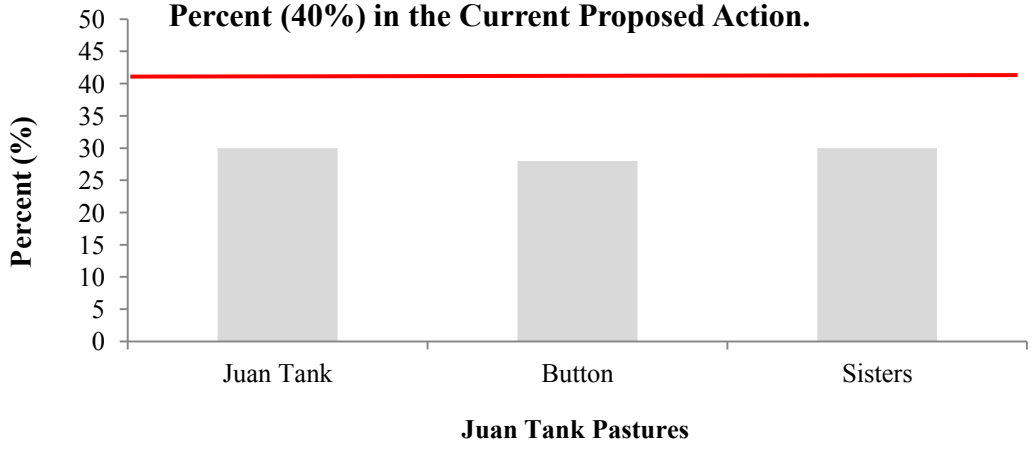
*The data for the animal balance worksheet was obtained from the Juan Tank Proposed Action (pg. 4, Table3).

**The planned graze schedule is used only to exemplify that a three year rotation remains well within capacity limits.

4. Develop Integrated Pest Management Plan to address Japanese brome. Examples include, but not limited to, cultural control (i.e. intensively targeting Japanese brome with sheep or cattle when conditions dictate the need to obtain higher (60-80%) utilization levels), fire, herbicide, and targeted/prescriptive mechanical (i.e. Disking, Plowing, Seed Drilling, etc…) treatments. The first example is the preferred method to start with. A higher degree of species specific utilization can be obtained through the use of sheep with herders. Multiple methods may need to be utilized in conjunction and alternated over different environmental gradients to determine if the Japanese brome is being contained and/or controlled so that the species does not disrupt the structure or function of ecosystems. If it is deemed that the affected areas are not being contained and/or controlled by the end of the first 10 year planning period and new tools outside the scope of this NEPA are identified to treat affected areas then a new NEPA would be conducted. The effectiveness of treatments would be evaluated on 1-3 year intervals and would be reviewed by a CRMP team at least three (3) times prior to the end of the ten (10) years.

5. The utilization guideline would allow up to a conservative 40 percent use by cattle and/or wildlife at the end of the growing season (Figure 1). Forage utilization would be monitored to ensure livestock numbers are in balance with available forage and that adequate residue remains at the end of the grazing season (defined here a grazing season begins at the start of the first growing period within the calendar year, generally the "cool season" which starts about March 1, then a short semi-dormant period from late may through early July, followed by a "warm season" growing period from early July through mid to late September, and finally the winter, mostly dormant period from late September through late February) to protect and enhance the plant community, soil health, watershed value, and wildlife habitat. A management guideline of forty (40) percent forage utilization, measured at the end of the growing season, would be employed to protect and enhance the plant community, soil health, watershed value, and wildlife habitat.
    a. For pastures grazed by livestock during a growing season, forage utilization would be measured at the end of the growing season for the pasture. For pastures grazed during the dormant season, forage utilization would be measured at the end of the grazing period. Climatic conditions, primarily precipitation amount and timing, projected as well as past would be monitored in each pasture to determine if authorized AUMs should be temporarily adjusted due to extreme climatic conditions, such as prolonged or extreme drought. Climate history would be used in conjunction with available forage utilization levels in determination of proper livestock numbers to available forage balance.
    b. Climatic conditions, primarily precipitation amount and timing, projected as well as past, would be monitored in each pasture by the grazing permittee. The information would be shared with the Forest Service and the CRMP Team to determine if AUMs should be temporarily adjusted due to extreme climatic conditions, such as prolonged or extreme drought. Climate history would be used in conjunction with available forage utilization levels in determination of proper livestock numbers to available forage balance.
    c. If monitoring indicates that due to extreme climatic conditions, natural disaster, or other reasons, utilization levels would exceed the target utilization level to a point that the plant community, soil health, watershed value and/or wildlife habitat value of the range may be impaired, livestock numbers in the pasture would be adjusted. Utilization levels, averaged over a three (3) to five (5) year period, of either above or below the target utilization level of forty (40) percent would be taken into account and may trigger an evaluation to determine if there is a need to adjust AUMs through either adjustment of total livestock numbers or duration of grazing in the pasture.
    d. Forage availability would be assessed at the start of each grazing season to determine that the residual forage combined with the anticipated forage growth would provide adequate forage to stay within the target utilization of forty (40) percent in the upcoming grazing season.

Figure 1. Average Utilization by Pasture from 1994 - 2012 Compared to Recommended Utilization Level of Forty Percent (40%) in the Current Proposed Action.



Structural Improvements

1. The Holden Lake wetland would be fenced to exclude livestock grazing (as depicted in Figure 3 of the Juan Tank Allotment Proposed Action) :
    a. The wetland ex-closure fence would be built and maintained by the Forest Service
    b. The fence around the two tanks would be built and maintained by the Permittee.
    c. Access to waterlot would be granted by livestock to both tanks from the west side.
    d. Water can be removed from the two tanks and hauled to other areas within the allotment.
    e. The waterlot may be used as temporary holding when gathering from the Sisters pasture.
2. Corrals (1-2) may be constructed to aid in livestock management. One to four trick tanks may be constructed to provide water in other areas of the allotment. Locations for these developments would be determined after consulting with the grazing permittee and Forest Service archaeologists, wildlife biologists, soil scientist, and range management personnel.
3. Access to Holden Lake from the Forest Road 124 would be eliminated, and an overlook and interpretive kiosk would be established there for wildlife viewing.
4. Waterlot Fencing – up to 6 existing earthen tanks may be fenced to aid in the distribution of livestock (Juan Tank pasture: Bootlegger, Doe, Mud Ketch, Perrin, Dude. Sisters pasture: Gate). Current waterlot fences would be rebuilt or repaired. Limiting the number of waters available to livestock would aid in meeting resource objectives. All fencing would meet specifications for wildlife, and would vary in size from 1-6 acres depending on surrounding topography and size of tank. Waterlot gates would be left open when cattle are not in those pastures.
    a. Dude Tank is located in a very poor location due to terrain, fencing this tank would be considered as a last resort.
5. The Juan Tank and Sisters Pastures may be divided if waterlot fencing does not achieve the desired level of livestock distribution and/or resource objectives.
6. Bottom wires that are currently barbed would be replaced with smooth wire on all rebuilt fences within the allotment. All new fences would meet standards for wildlife passage as recommended by Forest Service Biologists in cooperation with the Arizona Game and Fish Department.
7. Install up to 4 test plot exclosures to try different treatments on a smaller scale (i.e. seasonal grazing, seeding, mechanical, etc…). These plots would be anywhere from ½-3 acres/plot in size.

Monitoring

Monitoring is adaptive, improved methods would be considered as they are developed. Allotment monitoring includes the following:

1. See **Authorization #5.**
2. Long-term trend monitoring would continue to be conducted:
    a. Current monitoring data includes frequency, 10^{th} acre canopy cover, dry-weight rank (relative composition), comparative yield (production), repeat photography, ground cover estimates, and rain gauges. Other methods may or may not be added to above mentioned methods. New plots may need to be removed or added.
3. Desired Conditions, Management Actions and Monitoring Methods must be developed for Terrestrial Ecosystem Units (TEU's) contained within the allotment as exemplified below and be adaptive through time (Table 6).
4. Monitor the test plots using the above stated methods

Table 6. Plan-to-Project Matrix

Juan Tank Allotment – Cluster #9 Monitoring Location, established in 1958, reread in 1979, 1994, 2011 and 2012. TES Unit **542**

TES Unit 542 is a grassland/shrubland community type located on an elevated or lowland plain and swales. There are 1415 acres in this TES unit.

	Vegetation			Wildlife	Soils (Ground Cover percent)
Potential	Grasses 11 species 56% c. cover Bogr[1] Bocu Hija Elel	Forbs 3 species 1% c. cover Cali4[1] Hyri Erfl	Shrubs 5 species 11% c.cov. Chna[1] Gusa Arfr Oppo	Pronghorn antelope is the management indicator species for this site. Potential TES habitat for black-footed ferret & Wupatki Arizona pocket mouse. Potential migratory birds: ferruginous, Swainson's hawk, and burrowing owl.	*Data not available*
Desired Condition	Grasses 10-14 species Maintain or increase diverse native plant species...	Forbs 5-12 species mix. The mix of species varies due to annual and…	Shrubs 1-5 species. seasonal weather (amount & timing ppt).	Forage and hiding cover is provided for above listed wildlife species and their prey.	% of total hits bare soil 15-27 rock 18-35 litter 35-55 vegetation 8-30
Existing Condition	Grasses 12 species 55% c.cover	Forbs 21 species 41% c.cover	Shrubs 4 species T. % c.cover	Forage and hiding cover is provided for above listed wildlife species and their prey.	% of total hits bare soil 17-24 rock 19-33 litter 38-47 vegetation 9-24
Interpretation	High species composition but Japanese brome can dominate site, like in 2011. Minimizing brome increases native perennials.			Maintain or improve forage and hiding cover (grass and forbs) at this site.	There is a need to maintain or improve ground cover at this site to minimize vertic properties.
Rangeland Capacity rating	Full Capability with satisfactory soils and production >100 pounds/acre.				
Trend	2011 downward (juniper/brome), 2012 upward				
Soil Condition	N/A			N/A	Satisfactory with little erosion. Maintain perennial vegetation.
Objectives	Reduce Japanese brome to maintain or improve existing conditions while grazing livestock by 2024.			Reduce Japanese brome to maintain or improve existing conditions.	Reduce Japanese brome to maintain or improve existing conditions.
Monitoring	The monitoring site will be maintained on a 2-5 year interval until Japanese brome declines and site improves. Monitoring methods may include Canopy cover, frequency, dry weight rank, fetch, ground cover, or best available science.			The monitoring site will be maintained on a 2-5 year interval until Japanese brome declines and site improves.	The monitoring site will be maintained on a 2-5 year interval until Japanese brome declines and site improves.

[1]*Species listed from greater to least canopy cover.*

Adaptive Management

The Proposed Action includes the continued use of adaptive management, which provides flexibility for managing livestock and rangeland resources. Adaptive management, by definition, is a dynamic iterative process. Thus, a given plan developed under current conditions and knowledge would be periodically updated based on emerging conditions. Management decisions on stocking rate, pasture rotation, or protein supplementation for example can be based on a series of indicators. These indicators can be drawn from

publically available sources (i.e. various drought indices), monitoring data (i.e. utilization or ecological trend) or local management experience (i.e. amount of precipitation in a given pasture by given date to support some number of livestock for specified period of time). Examples of how adaptive management scenarios can be developed and inform this iterative planning process are provided below

Prescriptive Grazing Scenarios

	J F M A M J J A S O N D	Winter/Summer	SEASON REST
		Wet Wet	
Juan			cool warm
Sisters			cool
Button			warm
		Wet Dry	
Juan			cool warm
Sisters			cool
Button			warm
		Dry Wet	
Juan			cool warm
Sisters			cool
Button			cool warm
		Dry Dry	
Juan			
Kate Trap			
Sisters			
Button			
Button Trap			

Adaptive Mgmt Scenario Example

Scenario Category	Cool Season Indicator	Warm Season Indicator	Stocking Rate Alternative	Pasture Movement Alternative
"Normal"	Holden Tank 75% full	C4 perennials green and 4" tall by May 1	Maintain Allotted Numbers	Move from Juan into Button on March 1 then Sisters on June 1, back to Juan November 1
Wet cool season, wet warm season	Holden Tank 100% full	C4 perennials green and 6" tall by May 2	Maintain Allotted Numbers, add sheep for brome control	Begin moving from Juan into Button on March 1 then Sisters on June 1, back to Juan November 1
Wet cool season, dry warm season	Holden Tank 75% full	C4 perennials green and 4" tall by May 1	Maintain Allotted Numbers	Move from Juan into Button on April 1 then begin moving to Sisters on May 1, begin moving back to Button August 1, back to Juan November 1
Dry cool season, wet warm season	Holden Tank 50% full	Some C4 perennials green, only 3" tall by May 1	Cull dry cows at branding	Move from Juan into Sisters on May 1 then Button on September 1, back to Juan December 1
Dry cool season, dry warm season	Holden Tank 50% full	Some C4 perennials green, only 3" tall by May 2	Cull dry, older, and thin cows	Graze Juan and kate Trap till April 1, move to Sisters. Then to Button and Button Trap on August 1, back to Juan and kate Trap on December 1

Appendix F: Public Comments and Responses

Eight comment letters were received during the notice and comment period for the Juan Tank Allotment Environemntal Assessement (EA). These comments were directly inserted into this comment analysis document, numbered, and responded to by the Interdisciplinary team at the end of each letter.

V Bar V Ranch
Agricultural Experiment Station

THE UNIVERSITY OF ARIZONA
V Bar V Ranch

4005 N. Forest Rd 618
Rimrock, AZ 86335
Phone: (928) 567-6954
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July 23, 2013

Doug Tolleson
Rangeland Management Specialist
University of Arizona, V Bar V Ranch
2830 N. Commonwealth Drive Suite 103
Camp Verde, AZ 86322

District Ranger
Williams Ranger District, Kaibab National Forest
742 S Clover Rd
Williams, AZ 86046

Dear District Ranger,

I am writing to respond to the Environmental Assessment (EA) for the Juan Tank Allotment, Kaibab National Forest dated July 2013. I have contributed analysis and wording to an additional letter from a group of individuals who worked on an alternative to the original proposed action for this allotment. That corporate letter details specific comments on form and content of the EA document. I will confine my comments in this letter to the degree in which a document referred to in the EA as "Alternative 4 – Adaptive Management" was, or was not included in the EA.

In the fall of 2012, I was contacted by personnel with both the Kaibab National Forest and Arizona Cattlegrowers, and asked to participate in developing an alternative management plan for the Juan Tank Allotment. Briefly, I understood that an area of the ranch contained Japanese Brome and it had been proposed that changing the current grazing permit from year-long to summer only would help alleviate this problem (there were also other water/wildlife/fencing issues). After looking at the documents provided (proposed action) and traveling with a group including the permittee, USFS and other extension or agency range professionals to evaluate the condition of the allotment, I felt it would be relatively simple to use existing monitoring data in conjunction with the experience of the permittee and USFS personnel to design an adaptive year-long grazing plan that would meet resource objectives and not place undue economic or logistic burden on the permittee (i.e. where to put ~200 head of cattle for 6 months). As a result of this initial visit, a Coordinated Resource Management Planning (CRMP) team was formed. This group included the permittee and representatives from USFS, NRCS, AZ G&F, Arizona Cattlegrowers, and Arizona Cooperative Extension (see Table 9, page 91 of the EA). The CRMP process is consistent with that approved by USFS and other agencies in Arizona.

Comment 1-1

The CRMP group met as a whole and in sub-groups several times over the winter and spring of 2012/13, some of us traveling to Williams and Flagstaff from some distance. Many phone calls and emails supplemented the in-person meetings. We felt that we worked together well as a team, asked direct questions of the permittee and various specialists, conducted a thorough review of existing literature on Japanese Brome, and evaluated a number of alternative management practices for ecological and economic/logistical viability. In short, considerable time and effort was expended by a largely volunteer team to arrive at what in our collective professional opinion, was a workable solution for permittee and forest. Monitoring data was evaluated and considered. At the heart of this collaborative plan was an adaptive

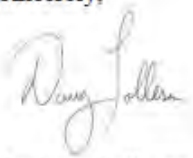
grazing schedule with several contingencies based on precipitation and season of use. This CRMP effort was of course not perfect but it was, in my opinion, a dynamic, flexible, science-based and common sense solution to the resource and ranching operation issues on the allotment.

Comment 1-2

So to get to the point, my objection to this document is that as written, the EA devotes ~160 words to the CRMP effort described above. Yes, I acknowledge that there are references to Alternative 4 elsewhere, and discussion in subsequent sections. There is also the need for brevity where possible and this has been accomplished by statements such as "similar to alternative 2", etc… Quantity is not the entire issue, however. I feel that the efforts of the CRMP group were not fully incorporated in the EA even though the abbreviated discussion of such was labeled as if that is what the group produced (p 17). I understand that there may have been procedural issues with how the CRMP document was constructed and how these fit into the NEPA process. These were discussed in at least one meeting and could certainly have been addressed or footnoted so that a reader could be informed of them and then the plan as submitted by the group, **included in its entirety** or referenced in the EA and made easily available in a public venue (website, etc…) as appropriate.

In summary, although I know the ID team evaluated and reviewed the CRMP group's submission to the EA process, I encourage you to consider the professional experience and collaboration which resulted in the CRMP document, and to incorporate it, **as written**, to be Alternative 4. In addition, I encourage you to take the appropriate steps to revise the current EA to reflect that incorporation.

Sincerely,



Dr Doug Tolleson
Assistant Extension Specialist/Research Scientist
The University of Arizona

Response to comment 1-1
The proposal to change the season of use from yearlong to seasonal was based on Japanese brome research, which found that winter grazing may promote Japanese brome expansion while grazing it during the summer is a more effective means to contain/control it.

Keeping cattle off of those infestations prior to May might be accomplished by controlling waters, by use of a day rider (as proposed by the permittee), or by splitting the Juan Tank Pasture and installing a new pasture division fence. The EA describes the effects of seasonal versus year-long grazing.

Response to comment 1-2
The CRMP document has been included in its entirety as an appendix to this EA. The alternative developed by the CRMP team was included in tables and the description of alternatives in Chapters one and two, with some modifications to improve its compatability with law, regulation, and policy The CRMP alternative was also analyzed in detail by each resource specialist.

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In reply refer to:
AESO/SE
02EAAZ00-2013-I-0268

July 25, 2013

Ms. Martie Schramm, District Ranger
Williams Ranger District
742 South Clover Road
Williams, Arizona 86046-9122

Dear Ms. Schramm:

Thank you for your correspondence of June 27, 2013, which announced the availability of an environmental assessment of the Juan Tank Grazing Allotment for review. We reviewed the July 2013 environmental assessment (EA) and offer the following comments.

Comment 2-1

The EA stated that "reintroduced black-footed ferret populations occur in Aubrey Valley (30 miles away) and on the Espee Ranch (20 miles away, west and north, respectively, of the project area." and "There are no known populations in northern Arizona outside of these reintroduction sites." Although only reintroduced populations of the black-footed ferret are known to exist in the wild (e.g., Aubrey Valley and Espee Ranch), undiscovered wild populations may still exist where there is suitable habitat: prairie dog colonies or complexes of colonies of sufficient size. Estimates of Gunnison's prairie dog colony size needed to support one female ferret range from 150 to 375 acres. Therefore, 3,000 to 7,500 acres of prairie dog colonies would be needed to support a small population of ferrets. We recommend the evaluation for this species be based on the presence or absence of suitable habitat.

Comment 2-2

The EA stated that bald eagles could occur in the project area. The EA also stated that "Integrated Pest Management would be used to address Japanese brome" and "To minimize cumulative adverse effects of invasive and noxious weeds, observed infestations would be managed in accordance with the Final Environmental Impact Statement for Integrated Treatment of Noxious Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties, Arizona." We recommend that any use of herbicide comply with the bald eagle measures of our April 2007 Region 2 *Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service.*

Comment 2-3

The EA stated that "Cattle grazing under Alternatives 2 and 4 may result in limited unintentional take of certain migratory birds as a result of cattle trampling the nests of certain ground-nesting bird species such as killdeer, common poor-will, vesper sparrow, lark sparrow, dark-eyed junco, red-faced warbler, and western meadowlark." These birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. sec. 703-712). The Migratory Bird Treaty

Comment 2-3

Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the FWS. The MBTA does not include provisions that allow incidental or unintentional take. If you believe migratory birds will be affected by the project, we recommend you contact our Migratory Bird Permit Office, P.O. Box 709, Albuquerque, NM 87103, (505) 248-7882, or permitsR2mb@fws.gov. For more information regarding the MBTA, please visit the following web sites:http://www.fws.gov/migratorybirds and http://www.fws.gov/migratorybirds/mbpermits.html. Our office is also available to provide technical assistance to help you with compliance.

Comment 2-4

In keeping with our trust responsibilities to American Indian Tribes, by copy of this letter we are notifying Tribes that may be affected by this proposed action and encourage you to invite the Bureau of Indian Affairs to participate in the review of your proposed action. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

Thank you for your continued coordination. Should you require further assistance, or if you have any questions, please contact Bill Austin (928) 556-2012 or Brenda Smith (928) 556-2157.

Sincerely,

Brenda H Smith

Steven L. Spangle
Field Supervisor

cc (hard copy):
Director, Aha Makav Cultural Society, Fort Mojave Indian Tribe, Mohave Valley, AZ
Tribal Secretary, Havasupai Tribe, Supai, AZ
Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ
Program Manager, Tribal Historic Preservation Office, Hualapai Tribe, Peach Springs, AZ
Director, Apache Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Yavapai Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Cultural Research Program, Yavapai-Prescott Indian Tribe, Prescott, AZ
Director, Zuni Heritage and Historic Preservation Office, Zuni, NM
Environmental Specialist, Environmental Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ

cc (electronic):
Clare Hydock, Kaibab National Forest, Williams, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ

W:\Bill Austin\JUANTANKEA2.268.docx:cgg

Response to comment 2-1
The analysis of black-footed ferret was based on the presence of suitable habitat in the project area. Language was added to the Wildlife Report and the EA to reflect that analysis was based on the lack of suitable habitat for the black-footed ferret in the project area.

Response to comment 2-2
Effects of herbicide on wildlife were analyzed and disclosed in the "Final Environmental Impact Statement for Integrated Treatment of Noxious Weeds on the Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mohave, and Yavapai Counties, Arizona"; this EA tiers to that document. The Forest Service will review the document you reference for compliance.

Response to comment 2-3
The limited take that could potentially occur would be negligible and would not affect any migratory bird species at the population level; therefore, the Forest Service is not required to request an incidental take permit.

Response to comment 2-4
Tribal consultation has been on-going, as has consultation with the Arizona Game & Fish Department.

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
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REGION II, 3500 S. LAKE MARY ROAD, FLAGSTAFF, AZ 86001

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KURT R. DAVIS, PHOENIX
EDWARD "PAT" MADDEN, FLAGSTAFF
DIRECTOR
LARRY D. VOYLES
DEPUTY DIRECTOR
TY E. GRAY

July 29, 2013

Acting District Ranger
Williams Ranger District, Kaibab National Forest
742 S Clover Rd
Williams, AZ 86046

RE: Juan Tank Allotment Environmental Assessment

Dear Acting District Ranger,

The Arizona Game and Fish Department (Department) welcomes this opportunity to comment on the Draft Environmental Assessment (EA) for the Juan Tank Allotment Management Plan on the Williams Ranger District. The modified proposed action would reauthorize seasonal grazing on the 18,535 acre Forest Service portion of the allotment. We have reviewed the EA and offer the following comments.

With respect to the Modified Proposed Action (Alternative #3):

This alternative would create water lots around 6 earthen tanks plus 2 tanks located in the Holden Lake wetland. The Department appreciates that these fences would be built to wildlife standards and that gates would be left open when cattle are not present.

Comment 3-1

The alternative includes potential new fencing to divide the Juan Tank and Sisters Pastures. The Department appreciates the commitment to build these fences to wildlife standards. However, we remains concerned that these new fences may impede wildlife movements on the area and possibly cause other undesirable impacts. We encourage the Forest Service to consider other approaches to manage livestock distribution, constructing new fences only if absolutely necessary for resource protection and/or improvement.

With respect to the Adaptive Management Alternative (#4):

As a signatory to the Memorandum of Understanding for Coordinated Resource Management Planning (CRMP) in Arizona, the Department strongly supports using the CRMP process to cooperatively develop sound resource management programs that meet multiple resource objectives. The Department also considers an adaptive management approach best suited to managing arid rangeland ecosystems in highly variable biological and economic environments.

Comment 3-2

For this EA, a well-qualified CRMP working group worked closely with the permittee to develo this Adaptive Management Alternative. The Department appreciates support provided by the Forest Service in this effort. However, our understanding is that some elements developed by the CRMP working group may not have been incorporated into this alternative. We encourage the Forest Service to fully incorporate these recommendations in the final EA. The Department also feels that this alternative best meets wildlife objectives, particularly by the use of non-permanent fencing to control livestock distribution.

Thank you for considering these comments, any questions should be directed to Steve Cassady, Landowner Relationships Specialist, at our Flagstaff regional office.

Sincerely,

Steve Rosenstock
Habitat Program Manager

cc:/ Barbara Cook, Arizona Game and Fish Department, Habitat Branch, Phoenix
Mike Hannemann, Forest Range and Resource Staff Office, Kaibab National Forest

Response to comment 3-1
As stated in the EA (pages 13, 14, and 17), building new fences to split the Juan Tank and Sisters Pasture would be done if waterlot fencing does not achieve the desired level of livestock distribution and/or resource objectives. Likewise, if use of a day rider fails to control livestock (and/or becomes too cost prohibitive to the permittee) to the degree needed to meet resource objectives (i.e. timing of grazing in Japanese brome areas, provide rest following fire or timber treatments, etc.) these fences would be constructed. All fences would be built to allow wildlife movement, as are all newly constructed fences on the Kaibab National Forest.

Response to comment 3-2
See response to comment 1-2.

The Friends of Anderson Mesa
To Conserve & Enhance Native Habitats & Wildlife

July 29, 2013

Ms. Martie Schramm, District Ranger
Kaibab National Forest, Williams Ranger District
742 South Clover Road
Williams, Arizona 86046

Dear Ms. Schramm,

With this letter we are submitting comments to the Environmental Impact Statement of July 2013, for the Juan Tank Grazing Allotment.

Before we get into presenting the details of our comments to the proposed action, we like to complement the District for is the first EA we have seen that provides the most abundant amount of information specific to the project proposed. One minor critique we offer there should be better delineation between Alt #3 & #4.

Comment 4-1

After detailed review the information provided in the EA we could not find any positive justification or rationalization to the need or benefit for the proposed activity. In the document presented, there was nothing to;

- a ecological need, where grazing by non native species would produce a net benefit to the ecosystems of the area under consideration. Or
- a desired ecological benefit, where the presence of domestic livestock was necessary in replacing a species which had been extirpated from this area in period of settlement and use of cows is to replicate the historical use.

  An example would be cows replacing bison in ecosystems that ecologically / historically supported bison. This may seem like a foreign concept to some in the Public or FS, 95% the ecosystems of R 3 did not evolve nor support bison pre-settlement, only the far northeaster corner of New Mexico is **considered** historical bison habitat. It's a fact, if there are questions we suggest consultation of;

  - Hoffmeister, Mammals of Arizona, U of A Press 1986
  - RMRS-GTR-169 D.G. Milchunas 2006

- a legally mandated need, after 30 plus years interacting with the FS we have yet to find any specific direction by Congress or the Court or Executive Order that requires specific numbers of AUM's be assigned to any specific area of land. It does through the Taylor Grazing Act and MUSY say "make available", nowhere do they proclaim how many AUM's or for how long.
- a national, state or local economic need or the need for the production of red meat as in the periods of WW I & WW II, which would generate copious amounts of revenue. Factually we know that given the current AUM fee and the cost to administer an AUM, there is a net loss to the KNF and Tax Payer to manage the current activity. Details on this further in the comments.

There is a "hint of need" in the EA also noted in the current Forest Plan, a desire, an appeal to a historical / social – a romantic feeling that since grazing has been a segment of the lifestyle in this area for 100 years, it should be continued at some level into the future.

The issue in the discussion of this proposal is to If and to What Level?

Comment 4-2

Again we challenge the Forest Service, specifically the Williams Ranger District, the Kaibab National Forest and / or the Region 3 office to produce the peer reviewed scientific papers for the lands / habitat types / ecosystems of this project which clearly demonstrate;

- ***These lands are capable of supporting herbivore by non-native species***
- ***There is an ecological benefit, an ecological need, a need of economy, for the current and proposed actions.***
- ***The current and proposed management has not been, is currently not and in the future will not be a detriment to the ecological functions of these ecosystems and the key elements within those ecosystems.***
- ***That the current and proposed management will not be detrimental to the long term sustainability of the ecosystems in the area under consideration in the project.***

Without a valid need as noted above, combined with review EA and the supporting documentation noted within it we could find, we can only support Alternative # 1.

Rational

- Alternative # 2 – Current Management – the EA makes it abundantly clear that current stocking numbers and management have and will continue to not move the project area to or beyond the current and Draft Forest Plan DC's / DFC's. Further we find no mention to how this alternative meets the objective to maintain or move to long-term sustainability of the area of this project.

- Alternative # 3 & #4 – Put forward as Possible Proposed Action – according to the EA, Given the FS analysis clearly shows the current stocking and management have not moved the small plant community and soils "upward" to the long term sustainability, either of these alternatives would be an increase in stocking numbers from 1,800 AUM's to 2,280 AMU's of approximately 26%.

Comment 4-3

With the information from field studies and the goals of the current forest plan as well as the new plan under development by the Forest, we were surprised the District / KNF did not produce an alternative which would have considered a reduction of stocking and time of use.

We request the District / KNF fully produce a viable alternative that is based on the conditions of the land from the data collected, AND at the same time reflects the Management Direction as found in the current forest plan and embodies the Management Direction of the new forest plan in development, keeping the clear direction of long-term sustainability as the #1 objective.

Comment 4-4

Key Pieces of the EA that we would like to address;

Page 13, the paragraph Structural Improvements, the first bullet point which puts forward the proposal to fence Holden Lake. Also on page 16 Figure 3, map of the seasonal-wetland with the proposed fencing. We are pleased to hear the proposal to fence the wetland however we are not pleased to see:

- How the fencing lays-out on the wetland, and
- Cows will have full time access to the deepest part of the wetland
- The permittee has permission to remove water and put it somewhere else on the allotment.

Our efforts over the years with the Coconino to put fencing around key seasonal-wetlands on Anderson Mesa would have produced an area defined by the blue line, page 16, where the entire 35 acres are totally excluded from livestock use. There is no issue with the gate for access.
The proposed "water lot" for cattle use of the areas where water is contained the longest is totally unacceptable as is the other pronouncement for the permittee to remove water at will and take it to another location, both actions are counter to the reason seasonal wetlands are fenced and excluded from livestock grazing.

We understand the fencing would keep out livestock and as such over time this wetland would return to a naturally functioning system. Without forage removal and soil compaction the native emergent vegetation would return providing habitat for;

- Macroinverterbrates which are the primary food source for the 230 avian species associated with the seasonal wetlands of northern Arizona. This number of avian species is found in the information for the Important Bird Area on Anderson Mesa, some 50 miles to the east of this project, same elevation, same habitat type, thus the same species.
- Provide nesting habitat for a large number of those species.

Comment 4-5

To the issue of water removal either by livestock or pumping for livestock noting that adult cows require 10 gallons of water per day, the proposed 180 head would be removing 1,800 gallons per day. Not provided in the EA is what time of year cattle would be in the pasture where this wetland is located so we have no idea if avian species such as cinnamon teal could successfully produce viable young.

Also not accounted for is natural evaporation loss. Livestock use and permittee removal will drastically reduce the water volume and thus shorten the time / days of the functional aspects of the wetland. Also not mentioned is the use of this wetland by elk, who also require open water to survive. The result of these removals by non-native species puts in jeopardy the success of nesting birds on or adjacent to the wetland including cinnamon teal.

Its our position this seasonal wetland needs to be fenced as noted on in Figure 3, livestock are not to have access to the stock tanks dug in the lowest areas, and there will be no water removal by the permittee.

It is well known that the KNF has very little natural open water, in order to have any semblance of a commercial ranching operation the seasonal wetlands were configured by making stock tanks in there lowest points to gather as much moisture as possible. Also it is common today for the ranch operation to haul water to various locations to meet the needs of their livestock. If grazing is going to be permitted by the KNF and water is needed to function that activity the permittee can truck it in from another location, please not from another seasonal wetland in the KNF.

There is also the question of, if there is not enough natural water to support non-native herbivore how is there enough water to produce a sustainable small plant community which is being utilized by non-native species ?

With all the discussion of and promotion of Adaptive Management and Best Management Practices its sad to learn that the KNF / District did not seize upon fencing / protecting the riparian values of Holden Lake until this AMP. Looking at our historical documents the issue of wetland protection and photos of the abuse by livestock on the wetlands of the Williams District were well documented from 2001 through 2005, which at that point we were told by KNF staff it was their position that Seasonal Wetlands were not on the KNF, they did not care one twit what the USF&WS said, thus a dead issue.

Non-the-less it was good to learn that the KNF now recognizes there are Seasonal Wetlands and they are being fenced. As someone once said, - “better late than never”

Comment 4-6

Page 21, Table 4 Resource Protection Measures Required for All Action Alternatives.

BMP #1 –

Mitigation - “Manage forage utilization by livestock to maintain healthy ecosystems for all resource objectives.”

Purpose – “Safeguard water and soil resources under sustained forage production.”

Comment 4-6

These statements are quite laudable, however we have yet to see any site specific science which provides any support to the proposal of Alternatives 2, 3, or 4 will comply. Where is the science that supports these objectives ?

Comment 4-7

Page 25, the first full paragraph speaks to drought. We are please to see that the KNF is acknowledging the current drought.

The Facts to the current drought – identified by NOAA as The Early 21st Century Drought;

- the current drought started in 1996 – 17 years. Should note that the current forest plan was developed in one of the wettest periods ever recorded for the southwest.
- From January 1996 through December of 2012 the Williams Station for the Western Regional Climate Center had recorded -31.30 inches of moisture below mean.
  - http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?az9359
- Years of Exceptional drought > - 5 inches of mean
  - 1996 -7.57
  - 2001 -7.56
  - 2002 -6.65
  - 2009 -9.48
  - 2011 -11.41
  - 2012 -7.08

And yet, even with the facts to the long term drought and the severity of the drought, livestock grazing is still functioned as if lack of moisture had no effects at all on the ecosystems on the area of this project or the entire KNF.

With these facts one wonders the validity of the Forest's / Regional Drought Policy ?

Again we request the KNF produce the pier reviewed site specific science for the lands under consideration of this project which show these lands can support any level of use by non-native herbivores – cows in a prolonged drought of this intensity, and not be detrimental to the ecosystems and key elements within those systems.

The EA tries to paint the picture that use of this area by domestic livestock has little impact and thus is a benign activity. We offer a different – a factual view that the KNF does not show in the DEA.

Comment 4-8

The current stock level as best we can tell from the information in DEA from page i

- Current Management
  - Head Months = 1,800
  - Annual tons of forage consumed = 702 based on 26#/day per cow
  - Annual gallons of water consumed = 540,000 based on 10 gallons per day per cow
- Preferred Alternative
  - Head Months = 2,200
  - Annual tons of forage consumed = 889
  - Annual Gallons of water consumed = 684,000

The reason for this analysis is to show two of the major impacts cows – non-native herbivore has on the land to the elements of ecosystems it is functioned;

- Consuming 26 pounds of forage per day.
- Consuming 10 gallons of water per day.

Before someone gets all aggravated at us for these values, they are common knowledge and accepted values in multiple ***scientific resources*** including Holechek.

The long-term decline of deer and antelope in the west is well documented and when questioned to the reasons for that decline the FS usually makes two claims;

1. the FS provides adequate forage for wildlife.

2. there is no competition between livestock and wildlife, especially deer. Again it was interesting to read in this EA the acknowledgement of dietary overlap

Factually;

- Forage is the term used to describe grasses primarily for grazing by domestic livestock.
- We have in 35 plus years not been able to find any methodology used by the FS to support the statement to "adequate forage for wildlife".
- A cow consumes 26 pounds of plant material per day the consensus of numerous studies shows the composition of;
    - Grasses 60%
    - Forb 18%
    - Shrub 22%

- An Antelope consumes 2.4 pounds of plant material per day, the consensus of numerous studies shows the composition of there diet to be;
    - Grasses 15%
    - Forb 41%
    - Shrub 44%
- A deer consumes 3 pounds of plant material per day the consensus of numerous studies shows the composition of;
    - Grasses .08%
    - Forb 44%
    - Shrub 48%

It is quite easy to see the importance of forbs and shrubs to support deer and antelope populations.

A cow consuming 26 pounds per day;

- 22% being shrub, that equates to 5.7 pounds
- 18% being forb, that equates to 4.6 pounds

A deer consuming 3 pounds per day,

- 48% being shrub, that equates to 1.4 pounds
- 44% being forbs, that equates to 1.3 pounds

Simple math shows that the shrub and forbs consumed by a cow each day could support 4 deer &/or 5 antelope each day.

Order of magnitude for this project, at current livestock use of the area under consideration annually those cows consume;

- 302,000 pounds of shrubs
- 252,000 pounds of forbs

Comment 4-9

Also not taken into account by the DEA is the 540,000 gallons of water removed annually, nothing at all to that impact.

Comment 4-10

How can anyone make the statement that grazing of domestic livestock does not have a major impact on native wildlife ? Grade school Biology classes teach the vital importance of; food, water and hiding cover for any species.

Until proven otherwise by site specific science it is our position that grazing by non-native herbivores in ecosystems that did not historically support a big bodied bovine type animal, that use directly effects native wildlife as well as many other key elements within those systems.

If this area was historically grazed by a native big-bodied bovine such as bison, the above would not be an issue, the number of cows mimicked the number of bison. Fact is this area was not grazed by bison or any other big-bodied bovine.

The issue is, historically and currently the presence of cows is removing resources from the area of this project, those habitat types or if you wish the ecosystems that did NOT occur pre-introduction of livestock. Thus the use by livestock has and is altering the natural function of this area / these ecosystems. Pre-introduction those tons of forage and gallons of water were “used” by those systems as part of there natural function. The KNF, nor the FS per say has not presented any science to support there position that livestock grazing is a benign activity.

We again challenge and request KNF to provide site specific pier reviewed science which clearly demonstrates that grazing by domestic livestock in the area of consideration for this project does not have a detrimental impact on native wildlife.

Comment 4-11

Page 29 Table 5 - Soils Conditions

Pages 46 through 49 - Vegetation

These two sections are directly linked and must be considered at the same time

Table 5 shows

Satisfactory = 13,700 acres 71%
Impaired = 5,500 acres 28%
Also show are values for

- Current Erosion Rate
- Tolerance Erosion Rate
- Potential Erosion Rate (note there is a spelling error in this title)

However there is no explanation to which values equate to

- Slight
- Moderate
- Severe

Comment 4-12

Pages 46 through 49 have a lot of information, however it is presented in FS / biotic speak. It would be much easier to understand if the information it was presented in easy to understand tables as we have seen in other EA's;

- Veg Conditions
- Veg Trends
- Soil/Watershed Stability
- Soil/Watershed Trend
- Litter / Basel Area / Bare Soil / Rock Fragments

How can anyone draw any factual, logical conclusions to the current condition of the land with only one set of data? How can anyone tell what direction those metrics presented are moving over time, and the current view to if this area is at or moving toward long term sustainability ?

With;

- modern – enlightened livestock management started in the late 1930's, and
- AMP are to span no more than 10 years, and
- The TNF prides itself on conducting high quality monitoring

There should be a good bit of range analysis data over time, With Parkers or other methods were taken only every 10 years there should be five to six sets of data points. At the very least with the KNF current Forest Plan developed in the early 1980's there should be at least two if not three sets of this data, which would have provided some insight to the overall tends of these test plots.

Comment 4-13

Important pieces of soil and watershed information / condition not presented in the EA which are found in the TEIS's for other forests in Arizona are;

- Percent of basal area by soil type
- Percent of bare ground & rock fragments by soil type
- Amount of litter by soil type:

Notes:

- The 3 omitted items above are key to assessing;
  - Watershed health
  - Overall soil condition
  - Future potential for increases in abundance and diversity of small plants
  - Erosion hazard rating
  - Specific to Litter, this element is tied to FSH 2509.18,2.05 directing at least ½ inch of litter. Also - this stipulation of the FSH is rarely, if ever, mentioned by the FS in AMP projects.

Comment 4-14

Also not found is any information to acres determined to be capable of supporting domestic livestock grazing;

- Page 48 at #2, there is not a value in pounds per acre of annual production that determines capable to support non-native herbivore
- Acres that produce this volume of forage
- Acres that are less than one mile from reliable water – not riparian areas. As recommended to determining grazing capability by Holechek and others.

Page 47, the last three paragraphs. We are challenged to understand how the KNF can make these statements without any data from a number of large exclosures across the landscape in different ecosystems which were set up by the KNF as controlled areas, ungrazed by non-native herbivores for a long period of time allowing them to develop the natural biotic community. How does anyone know if the past, current or proposed management of domestic livestock and grazing by elk is moving the soils and small plant community toward or away from long-term sustainability of the natural plant potentials ?

Comment 4-15

Page 57 General Effects of Livestock Grazing on Wildlife Habitat

Again with the prelude of Adaptive Management and Best Management Practices,, as well as all the effort put into the forest plan currently in development, combined with the long-term decline in antelope populations we did not see any mention of a Desired Condition or a Guideline or on the off chance A Standard to the condition of the small plant community specifically for antelope.

In support of our claim to the long-term decline of antelope we offer the following data from the Arizona Game & Fish Department specific to Hunt Unit 10

Hunt Unit	Year	Fawns:100 Does	F:D increase / decrease	percent change	estimated population	population increase / decrease	population percent change
10	1988	20			1,617		
	2010	22			234		
			2	10.00%		-1,383	-85.50%

Key Points from this information;

- Since the implementation of the current forest plan the population of antelope in Hunt Unit 10 as decreased by 85.50%
- The Fawn to Doe ratio has increased from 20 to 22, however it must be noted that fawn to doe ratio for zero population growth, a stable population is 40 fawns per 100 does, Yoakum & O'Gara and others.
- Personal communications with a large number of biologists tell they get very concerned when the F:D ratio falls below 35.

We fully understand that Hunt Unit 10 is a large area and that is not completely under the control of the KNF. Historically when the public challenges the FS to provide for specific wildlife species in an AMP they usually only do what they have to do for T & E species, claiming that the "other wildlife species" will be taken care of somewhere else.

However when the FS proposes a Vegetative Treatment such as reducing the density of small pine trees to lessen the potential of catastrophic crown fires, they diligently include prescriptions specific to protection of areas indentified for the Northern Goshawk.

Thankfully the Forest decided to keep the Antelope as a MIS. The Desired Conditions for P-J Grasslands noted on page 12 of the plan, are very impressive when compared to current and historic direction. The bullet points:

- "Understory height provides cover for pronghorn fawning, small mammals foraging and songbird nesting, typically averaging 15 inches in height, …"
- "Understory composition is within the natural range of variability and contains diverse native herbaceous plant species that provide nutrition for pronghorn and other species. Depending on soil type, ground cover typically averages 50 percent live vegetation and 50% non living vegetation, with vegetation composition averaging 40 to 60 percent grass, 10 – 30% forbs and 5 to 20% shrub."
- "Fires are typically low severity with a 0 – 35 year return interval."

All are major steps forward to getting the grassland ecosystems back to a more natural condition and natural function.

Comment 4-16

Table 6 - page 65

Type	Acres
Ponderosa pine Forest	6,262
Pinion-juniper woodland	6,566
Grassland	5,294
Wetland	35
Total	18,157

If one is to believe the accounts from the early explorers, trappers, travelers and settlers of northern Arizona to the condition of the large plant community, IE; descriptions of the Ponderosa pine and Pinion-juniper forests, which is one of the keystone supports for the current direction of elimination of catastrophic wild fire via the removal of small pine trees, 4 FRI then it is only logical that we should also believe the accounts from those same sources that antelope were commonly seen in the Ponderosa pine.

Thus from Table 6 it would follow that this entire project was a one time, "Pre Settlement", suitable antelope habitat and thus with proper management return to that condition. With the improvement in the habitat condition there should be a corresponding improvement in antelope fawn survival and thus increased populations.

Given the above proposals were good enough to put in the draft forest plan for the Public to consider, we were anticipative that these goals / Desired Conditions would be carried forward and applied on future projects were they were applicable via Adaptive Management and BMP's.

As with our comments to the proposed forest plan we are very doubtful they will ever be enacted or come to fruition. Clearly to provide the values noted for the small plant community with hiding cover and diversity of plant species is going to be all but impossible when at the same time providing adequate forage for 2,280 HM of livestock not to mention the forage needs of the other non-native herbivore in these systems, elk.

Accomplishment of the first bullet point, "Understory height provides cover for pronghorn fawning, small mammals foraging and songbird nesting, typically averaging 15 inches in height, …" this alone will be a Major Accomplishment !

The paradox being;

On one hand in order to achieve the full potential height of native grasses to provide the described and we must add the historical condition, they must be allowed to grow to maturity. Past management clearly shows they cannot be grazed by non-native herbivores.

One the other hand this proposal puts forward that this allotment can support 2,280 HM, noted but not estimated in the EA is the use of this area by elk. Factually the dietary and open water needs of elk are very comparable to those of domestic livestock

We challenge and request KNF to provide specific details for Alternatives 2, 3, &/or 4 which will insure that adequate hiding cover and forbs will be provided for antelope.

It is out hope the KNF will use this project as the first step to implementation of the proposals in the forest plan under development on page 12, noted above. r

Page 58 Forest Service Sensitive Species

Comment 4-17

In this section we find more substantial reasons to only support Alternative #1.

12 species are listed as FS Sensitive Species

Of that group 3 are not found on the area of this project

The 9 remaining will all be negatively effected by domestic livestock grazing

To this we must add the negative effects as described on page 69 to Migratory Birds.

A simple question, how will these 12 species ever be moved off the list of Sensitive Species when the projects proposed, as with this EA, continue to cause negative effects to those species ?

Socioeconomics

Page 74 - Table 8 Investment Analysis

Simply we find this table very hard to understand and the values presented do not seem to "add-up"

Our analysis is pretty straight forward and thus easy to understand

Current Stocking

Income;

- 1,800 HM @ $1.35 per month – AUM Fee = $2,435.00

Income to Yavapai County – 25% from the $2,435.00 = $607.50

Cost;

- Value from the GAO to administer Grazing program on NFS lands 2005 was = $11.32/ AUM adjust to values for 2013 = $13.53 / AUM
- 1,800 HM @ $13.53 / AUM = $24,354.00

Net Loss / Gain = -$21,924.00

Proposed Stocking

Income;

- 2,280 HM @ $1.35 per month – AUM fee = $3,078.00

Income to Yavapai County – 25% from the $3,078.00 = $769.50

Cost;

- Value from the GAO to administer Grazing program on NFS lands 2005 was = $11.32/ AUM adjust to values for 2013 = $13.53 / AUM
- Thus 2,280 HM @ $11.32 per month = $30,848.00

Net Loss / Gain = -$27,770.00

Comment 4-18

Social Economics summary;

- The actual funding to Yavapai County by the area of this project is currently $607.50 and is proposed to be $769.00 which is a minuscule amount when considering the *Present Value of Costs* as presented in Table 8 -$135,130.00 or -$152,407.00.
- the tax payers of the Untied States is subsidizing livestock grazing $12.15 per AUM this cost is just for the administration / management of the program; currently -$21,924.00 and proposed -$27,770.00.
- not considered in the EA is the costs paid by other branches of the Government as subsidies to construct other physical / tangible items such as fence and water improvements that are and will be necessary to "support" current and proposed management of domestic livestock.

Factual – relevant points;

- The budget for Coconino County for 2013 is $181,400,000.00
- The income from this project of $607.50 for current or $769.50 are miniscule and in reality have no impact to the County's financial stability.

If income to Coconino County is one of the driving forces for this project, one Alternative that should be considered is to not graze cows, which would remove the cause for past and current habitat destruction documented in this DEA and many other reports, documents including the EIS & current Forest Plan, rather the FS make in-lue payments to the County which in the end would be a positive net savings to the tax payers of the Untied States.

Comment 4-19

Page 85 Provides yet more reasons we cannot accept any of the grazing alternatives. In the 4 bullet points under the first sentence – "The Action Alternatives would result in the following advise effects;" It is all but impossible how the KNF proposes to meet the Desired Future Conditions of the current plan as well as the proposed Desired Conditions put forward to the public in its Draft Forest Plan based on the facts and information presented in the EA for this project.

In Summary, Given;

- The lack of any scientific / biotic need or benefit for the area of this project to be grazed by domestic livestock at any stocking rate or time of use, as well as
- The lack of habitat / ecosystem specific science which clearly shows the activity of the project proposed at any stocking level or time of use is not and will not be in the near future detrimental to the habitats / ecosystems of this project area, as well as
- The lack of any information be it scientific or "other" that documents the current or proposed activity is not and will not be detrimental to the long-term sustainability of this project area, as well as
- The lack of any information to the social-economic need for such an activity, and after detailed analysis the financial costs to administer this program greatly out weigh the financial income 9 to 1, as well as

Our choice of Alternatives presented is #1, no grazing by domestic livestock. We urge the KNF to continue to work with the Arizona Game and Fish Department to manage elk to population numbers that are not detrimental to native species, both plant and animal.

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.

If there are any questions, the need for more information, please contact me, 602-769-6111

Rick Erman
Member
Copies: General Distribution

Response to comment 4-1
Nowhere in the EA is it stated that the Juan Tank Allotment was grazed by domestic livestock or bison in pre-settlement times. Rangeland ecosystem analysis is conducted under the authority of the National Environmental Policy Act of 1969, the Public Rangelands Improvement Act of 1978, Federal Land Policy and Management Act, and the National Forest Management Act of 1976. The purpose of the EA is to disclose the environmental effects of each alternative considered, and it includes the environmental effects of livestock grazing. The EA also includes information on grazing capability, as well as mitigations measures and design features to provide for resource protection.

Response to comment 4-2
The purpose of the EA is to disclose effects and See Response 4-1.

Response to comment 4-3
A Forest Plan consistency check was conducted using both the existing Forest Plan, as well as the Draft Forest Plan Revision. There is a wide range of alternatives analyzed including no grazing (zero livestock), current management (150 cattle yearlong), seasonal grazing (up to 360 cattle for 6-8 months and 5 horses yearlong), and adaptive management (up to 185 cattle and 5 horses yearlong). Grazing capability for the Juan Tank allotment was based on actual field data (e.g., annual forage production) collected in 2011 and 2012. This data can be found in the Project Record, and the analysis is included in the Rangeland Management Specialist Report. As described in the EA, adaptive management is used to ensure the long-term sustainability of livestock use on the Forest.

Response to comment 4-4
Holden Lake is a naturally occurring wetland, and is not being proposed for active wetland restoration. The majority of the wetland area will be excluded from livestock grazing with the exception of the earthen tanks that were previously constructed to provide water for livestock. The current design, as shown in the EA, is expected to facilitate the improvement of vegetation and soils conditions. The effects of this action are disclosed in the Soils and Watershed Specialist Report.

Response to comment 4-5
Water rights for Holden Lake belong to the Kaibab National Forest, and any use of water by the permittee will comply with current laws and regulations. Hauling water out of the earthen tanks in Holden Lake would only occur if there is an additional need for water elsewhere.

Holden Lake occurs within the Sisters Pasture, and examples of grazing schedules (by pasture) can be found in Tables 14-16 in the EA. It is important to note that there are a total of 12 water sources in this pasture, and that not all cattle will be drinking from any one source at the same time. Proper livestock management ensures that cattle are well distributed among each pasture, and therefore acquiring water from various sources.

The effects of alternatives considered on avian species are disclosed in the Wildlife Specialist Report and Chapter 3 of the EA.

Response to comment 4-6
Compliance with mitigation measures is monitored during allotment inspections, and is conducted throughout the grazing season. Implementation monitoring is designed to ensure mitigation measures are being implemented, and effectiveness monitoring is designed to ensure the intent of the mitigation measures are being met. Refer to Chapter 4 (Monitoring) of the EA for additional information on monitoring. Mitigation measures are implemented and/or enforced by the Forest Service. If it

becomes apparent that the intent of a mitigation measure is not being met, adaptive management is invoked to develop alternative mitigations that meet the intent of resource protection.

Response to comment 4-7
Instructions, livestock numbers are authorized on an annual basis and adjusted when needed to respond to environmental conditions, including drought.

Response to comment 4-8
The EA does not identify a preferred alternative. The effects of grazing on vegetation are described in the Rangeland Management Specialist Report. The effects of grazing on wildlife species are described in the Wildlife Specialists Report. These effects are also discussed in Chapter 3 of the EA.

Response to comment 4-9
Nearly all water sources on the Juan Tank allotment are not natural, and were constructed primarily for livestock use. However, these waters provide for both livestock and wildlife. The effects of grazing on wildlife species are described in the Wildlife Specialist Report.

Response to comment 4-10
The effects of grazing on wildlife species are described in the Wildlife Specialist Report and Chapter 3 of the EA. Adaptive management and annual operating instructions are used to mitigate the potential effects of grazing on wildlife habitat and other resources.

Response to comment 4-11
The Kaibab's Terrestrial Ecosystem Survey can be found at:
http://www.fs.usda.gov/detailfull/kaibab/landmanagement/?cid=stelprdb5138600&width=full

Slight, moderate, and severe erosion hazard ratings are defined in the Terrestrial Ecosystem Survey of the Kaibab National Forest (Brewer et al. 1991) and are included in the Soils and Watershed Specialist's Report (page 23). Erosion hazard ratings for each TES map unit are also included in the Terrestrial Ecosystem Survey of the Kaibab National Forest. It is important for the commenter to understand that erosion hazard ratings are independent of erosion rates. For example, a soil can have a severe erosion hazard rating with a low erosion rate (i.e., well below tolerance) if vegetative ground cover is sufficient to protect soil surface from raindrop impact and overland flow. Additionally, a soil can have a slight erosion hazard rating, but an erosion rate that exceeds tolerance limits. Current, potential, and tolerance erosion rates are also defined in the TES manuscript for each TES map unit.

Response to comment 4-12
Data tables showing range analysis data, grazing capability, ground cover, etc. can be found in the Rangeland Management Specialist Report.

Response to comment 4-13
See response to comment 4-11.

Soil condition field evaluations are included in Appendix C of the Soils and Watershed Specialist's Report. Table 6 in the Soils and Watershed Specialist's report summarizes the amount of vegetation (BA), litter (%) and total ground cover. The commenter is encouraged to review *all* relevant documents (i.e., TES manuscript, Soils and Watershed Specialist's Report, and the EA) in order to fully understand the affected environment and environmental consequences of this project as some of information is incorporated into the EA by reference.

Response to comment 4-14
See response to comment 4-12.

Response to comment 4-15
This is outside the scope of the project because antelope populations are managed by the Arizona Game and Fish Department. The effects of grazing on wildlife species are described in the Wildlife Specialist Report and Chapter 3 of the EA.

Response to comment 4-16
A Forest Plan consistency check was conducted using both the existing Forest Plan, as well as the revised Forest Plan. Adaptive management is used to mitigate potential impacts of grazing on wildlife habitat and other resources.

Response to comment 4-17
Regarding Forest Service Sensitive Species, the analysis states that all action alternatives may impact individuals or habitat, but would not lead to a trend toward federal listing or a loss of viability for the species or population

Response to comment 4-18
The Juan Tank Allotment is entirely within Coconino County Income for Coconino County is not a driving force of this project. Those data are displayed for informational purposes only.

Response to comment 4-19
This section of the EA explains adverse effects and their duration. Implementing any of the alternatives would result in some degree of environmental effects. Design features and mitigation measures are intended to decrease adverse effects. Any adverse effects are considered to be short-term (less than one year) and would not result in impaired long-term productivity on the allotment.

To Whom It May Concern:

Attached please find comments from the permittee Glen Reed regarding the Juan Tank Allotment EA. If you have any questions I would be happy to answer them.

Regards
Glen Reed

Comment 5-1

These are estimates of the costs that I would have if the current 12 month permit was reduced to a 6 month permit. Some of the costs can be spread over a few years and some can not. This estimate is done believing that if I am buying a permit it probably has not been used for at least 5 years and that means the fences, tanks and corrals all will need major repair before cattle can be placed on the allotment. Some of them will be able to be patched up to work for a year or 2, so some of the costs can be spread out over 2 years.

By adding 190 cows to the Jaun Tank allotment some facilities will have to be expanded like the Button corrals (barely holds 190 cows now).

Additional equipment will be required to be purchased, like another truck and trailer for hauling horses.

Additional livestock will have to be purchased, 190 cows, 10 horses, 20 bulls.

If the new permit does not have facilities to store hay on Forest Service land, then a hay barn will have to be built on Forest Service land or I would have to purchase deeded land and build the barn on it.

New permit 6 month 360 head (no deeded land)	$ 360,000
190 new cows, spread over 3 years, 77,000 ea yr	$ 228,000
Tank cleaning (first year 75,000, half of the tanks)	$ 150,000
Fence repair, complete before cattle are moved in	$ 30,000
Additional pickup/horse trailer	$ 60,000
Additional horses 10	$ 30,000
Additional bulls 20	$ 40,000

Other costs

Trucking cattle to and from new allotment every year	$ 12,000
Button corrals on Juan tank allotment expansion	$ 30,000
New barn and deeded land at new allotment if needed (40 acres)	$ 300,000

All of these estimates are very low. I pulled three ranches for sale in Arizona off the internet that have no or very low quantity of deeded land.
237 head, BLM/State, 50 deeded acres, $425,000
300 head, BLM/State, 0 deeded acres, $615,000
335 head, Forest Service, 20 deeded acres, $850,000

Response to comment 5-1
Thank you for this information. We recognize there will be additional costs associated with acquiring winter pasture/permits, buying more cattle, etc. A portion of that information is summarized and has been added to the economic report. The economic analysis is designed to give the decision maker a comparison of alternatives. The information you provided will be included in its entirety in the Project Record.

ACGA

ARIZONA CATTLE GROWERS' ASSOCIATION
1401 NORTH 24TH STREET, SUITE #4
PHOENIX, ARIZONA 85008 • (602) 267-1129
www.azcattlemensassoc.org

July 30, 2013

Williams District Ranger
Martie Schramm
742 S. Clover Rd.
Williams, AZ 86046-9122

Attn: Juan Tank Allotment

To Whom It May Concern:

The Arizona Cattle Growers' Association (ACGA) appreciates the opportunity to comment on the Environmental Assessment (EA) for the Juan Tank Allotment. ACGA is the only professional organization that is solely dedicated to representing ranch families that utilize public lands in the State of Arizona. For over 100 years we have worked with the Federal Agencies and others to maintain true multiple uses on public lands. The industry has spent thousands of dollars and time developing and implementing new techniques and technologies when it comes to rangeland health.

Comment 6-1

The Arizona Cattle Growers' Association immediately approached the Williams Ranger District once the scoping processes began back in 2012. Concerned with the direction the USFS was headed ACGA worked to bring multiple partners to the table to find a positive solution for the land, wildlife and permittee. These critical partners included the University of Arizona, Natural Resources Conservation Service, Arizona Game and Fish, and the United States Forest Service. This Coordinated Resources Management (CRMP) Team invested time and resources to develop a well-rounded plan that would address the concerns of the Forest Service while continuing the long and proven traditions of the Reed family.

Comment 6-2

Upon review of the Environmental Assessment it is disappointing that the United States Forest Service did not conduct a fair and adequate review of Alternative 4 in the document. This is especially concerning given the expertise of the CRMP Team and the work that all members including the Forest Service staff dedicated to finding the right solutions for the forest land. Even more disheartening is the United States Forest Service chose to ignore many of the recommendations given by highly qualified and specialized range staff from other organizations.

We would respectfully request that once again the USFS Staff incorporate all information and documents to properly analyze the recommendation from the CRMP Team. The original adaptive management alternative agreed to by the United States Forest Service is accompanying this letter. It is in the best interest of the landscape to renew the Juan Tank Allotment permit under Alternative 4. It is absolutely critical that Juan Tank Allotment remain a year around cattle operation. To that point the Environmental Assessment is severely lacking an accurate economic review of the lost revenue to the ranch family if any other alternative is chosen in the EA.

Comment 6-3

Comment 6-4

We would also request that the United States Forest Service give serious consideration to the econom impacts and cost developed by Mr. Reed. We believe that Mr. Reed has done adequate research a best understands the expenses that he would incur if the permit was not renewed for a full 12 month That document is also accompanying this letter for your review.

We strongly urge the USFS to incorporate all the changes and recommendations from the CRMP Tea and renew the Juan Tank Allotment under Alternative 4 with changes. If you have any questions plea do not hesitate to contact me. ACGA is ready and willing to work with the Forest Service to accomplis reasonable and workable solutions.

Regards,

Patrick Bray
Executive Vice President
Arizona Cattle Growers' Association

Attachments:

Juan Tank Allotment Proposed Coordinated Resource Management Plan:
An adaptive management alternative
CRMP Comments on Juan Tank Allotment
6 Month Permit Cost by Mr. Reed

Response to comment 6-1
The Forest Service fully supports the CRM process.

Response to comment 6-2
See response to comment 1-2. Several items that were inadvertently left out in the overall description of Alternative 4 will be included in Chapter 2.

Response to comment 6-3
See response to comment 5-1. An economic analysis was completed for this project using the Quick Silver software.

Response to comment 6-4
See response to comment 5-1.

July 30, 2013

Martie Schramm
Williams Ranger District
Kaibab National Forest
742 S. Clover Rd.
Williams, AZ 86046

Dear Ms. Schramm

Thank you for the opportunity to comment on the Juan Tank Allotment Grazing Project. These comments are submitted on behalf of Western Watersheds Project, Inc., a non-profit conservation organization based in Hailey, Idaho and with offices throughout the West. The legal notice for this action was published on June 30, 2013 in the Arizona Daily Sun.

Comment 7-1

I have a few comments about this proposal. The EA notes that under the current grazing regime, Forest Plan standards are not being met because of overgrazing. So, to solve this, the Forest Service proposes to increase the numbers of livestock but also tweak a few details, run more cows for a shorter period of time, move them around more, build some fences and other projects whose costs you don't reveal, and this will result in meeting the Forest Plan standards. Am I right?

Comment 7-2

How much will it cost? The table called "Investment Analysis" doesn't say, although maybe it is about $290,00.00? Is that table for one year or are the costs amortized over the life of the plan? Too bad it doesn't say, because it would be good to know.

Comment 7-3

What is so magical about 2280 AUMs? You have two alternatives that would increase AUMs to this number, about a 30 percent increase from what is being grazed now. Would it be possible to achieve Forest Plan standards by *reducing* livestock numbers, or is that impossible to do? Why is it that only be increasing numbers can you meet your Forest Plan? Wouldn't it be prudent to include an alternative that meets the Forest Plan by reducing numbers, since reducing numbers would also improve wildlife habitat? Do you care about wildlife habitat, or do you just care about livestock numbers more? Don't you think it would at least look a little better if you went ahead and pretended to evaluate an alternative that addresses overgrazing problems by reducing grazing, instead of increasing it?

Comment 7-4

You say that under your plan, "Rangeland monitoring would continue to occur on the allotment," but your discussion of what that monitoring is and has shown is quite sparse. What rangeland monitoring are you referring to, that would "continue to occur"? How often and how comprehensive has this monitoring been that will continue to occur?

Comment 7-5

You say the permittee is pumping water out of Holden Lake. Who has the water right for this action?

Comment 7-6

Why will it take you 6-7 years to build a wildlife viewing overlook at Holden Lake? What is going to happen in those intervening years that is going to make this possible? Why can you build any manner of fences, spring developments, pipelines, and corrals in a year but you have to wait "6-7" years for a wildlife viewing overlook? Are you saving up for it? Are you sure that in 2020 anyone is going to remember that you made this promise? How will they know? Is it going on some kind of calendar? How much will the kiosk cost? I'll go on record now to say that I don't think this thing will ever be built and I don't think anyone in the Forest Service thinks it will be built, either.

Comment 7-7

You say that if changes are needed "that fall outside the parameters of the decision resulting from this EA," they would be subject to NEPA analysis. What exactly are the "parameters of the decision?" What are you talking about?

Comment 7-8

When you say that the current alternative is not meeting Forest Plan objectives and desired future conditions, what do you mean? You do not ever explain in what way you are not meeting these requirements, you merely say you are not. Never is the Forest Service so eager to admit it is not meeting its Forest Plan unless the solution means more grazing!

Comment 7-9

Is there some reason that you don't tally up the amount of soil that is in "impaired" condition? What is that reason? Do you believe that it is an unimportant detail that about 25 percent of the area in this allotment is in impaired condition? Sometimes this document reads as if it were designed to justify more grazing rather than to evaluate the landscape in an objective manner. It seems like a more objective document that was designed to analyze the landscape in a balanced manner rather than put forth partisan arguments for more grazing would include information like how much of the area is impaired, and maybe include a discussion for why these areas are impaired.

You say that "large amounts of sediment" are being moved in a streamcourse, and you blame it on the fact that there is a Ponderosa pine forest in the vicinity. EA at 30. Can you elaborate? Is there something about Ponderosa pine forests that causes downstream erosion? Do livestock ever cause erosion?

Comment 7-10

On page 35 you mention, for the first time, that in addition to the 2280 AUMs to be grazed under your proposed alternative, **you also intend to graze up to 1,200 sheep**. Is there some reason you didn't mention this detail back in the description of the alternatives? Are you sure it is legal to simply start grazing 1200 sheep on an allotment? How come you don't evaluate the effects of increasing livestock grazing not just through an additional 30 percent of livestock, but also of 1200 sheep? Is this also an unimportant detail in your plan?

You say that controlling Japanese brome "would improve approximately 5,000 acres of TES map units currently in impaired condition." Does this mean that by grazing

Comment 7-10

your 1200 sheep these units will move out of the "impaired" category? Is that what you are saying? Or are you only saying that some other feature would be improved by grazing 1200 sheep. Are there any downsides to grazing 1200 sheep? Your EA does not mention any potential downsides. I had heard somewhere that there can be downsides to grazing 1200 sheep in desert environments, but according to your EA the only effect of sheep grazing seems to be "improved ecosystem stability and resilience" and that "soil productivity would be improved through reduced nonnative plant populations and improved vegetative cover of desirable native species." EA at 36. If sheep grazing is so beneficial to soil productivity and vegetative cover, why don't you do more of it?

Comment 7-11

You say that you will "minimize cumulative adverse effects of invasive and noxious weeds" "in accordance with the FEIS for Integrated Treatement of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests." What does this mean exactly? When you say you will act in accordance with some other document, it doesn't really convey any information. What does that other document say you will do? What are you going to be doing here, on this allotment? Since the whole Japanese brome problem, which is a pretty bad problem, arose from the grazing program, don't you think you owe the public a discussion about what you are doing to prevent future problems like this? I think you owe the public more than simply a statement that you are going to follow some other document.

Comment 7-12

In your vegetation monitoring section you say that you do not read clusters that are "heavily grazed." Why is that? Wouldn't your monitoring information be more reliable if you monitored places that were grazed?

You also have discarded monitoring sites because "they no longer represent key areas." What does this mean? Are livestock no longer grazing there, or are they grazing there too much?

Comment 7-13

You say you have monitoring data going back to 1958, but you only discuss monitoring data from 1994 and 2011. Why is this?

Comment 7-14

You also say that climate is "one of the major contributing factor, if not the primary factor, affecting range condition and trend." Wouldn't the presence of commercial livestock grazing be also be a contributing factor?

Comment 7-15

You say that the recommendation is to leave 50 percent of utilization for site protection, 25 percent for livestock, and 25 percent for wildlife. Then you say that since you are leaving 60 percent after moving pastures, you are meeting the standard. Are you sure that is a true statement? What if wildlife eat their 25 percent *after* the cows leave? In fact, isn't that likely what will happen? In that case, your cows eat 40 percent, livestock eat another 25, and what is left is 35 percent, not 50. Why is it that everything in this document seems to side with more grazing, even the errors? Are you absolutely sure this is an unbiased EA that is not being prepared to justify a decision that has already been made? Because honestly, it feels like you are justifying a decision already made, or at least mostly made. It almost seems as if you have already decided to graze more cows

Comment 7-15

here, plus maybe a lot of sheep, and writing an EA to justify that decision.

Comment 7-16

You say that Alternative 3, your proposed action, does not result in a decline of vegetative condition because it implements adaptive management. But didn't the old plan also implement adaptive management? Why is the new adaptive management more magic than the old adaptive management, especially seeing as it has to deal with 30 percent more cows plus 1200 sheep?

Comment 7-17

For sensitive species you repeated say that (1) you don't know if they are present, (2) they are affected by livestock grazing, (3) even if they are present and destroyed by the cows and sheep, there would be no effect on the species. Isn't there a piece missing here, like how you are able to draw this conclusion? Wouldn't there need to be a discussion of the other known areas of these species and how the Juan Tank area is unimportant to their survival in order for your repeated conclusion to be logically true? Why don't you include that? Again, it almost seems like you don't really care about whether these statements are true, you just know you have to make them in order to get the document done so you can graze more cows.

Comment 7-18

You say that all of your action alternatives "would result in continued negative effects to pronghorn." How about fashioning an alternative that does not do this? Are cows more important than pronghorn, or are they less important?

I think you should be a little bit more straightforward about what the public is getting along with its approximately $3,000.00 per year, particularly given that it is *paying* many times that just for the pleasure of having its antelope habitat on a continuing decline, its wetlands pumped dry, fences and cows littering the landscape, wildlife habitat impaired, and soil and vegetation damaged. In fact, I think it is your job to be honest and thorough about those costs so that people can evaluate them and think about and debate the merits of these proposals. I think the Forest Service is not an administrative arm of the ranching industry but a public agency that should be owed some respect. Concomitantly, it should show respect for its calling and responsibilities. I don't think this EA measures up. I don't think this is an EA that anybody can be proud of and I think you should write a new one.

Please send us the final EA and Decision Notice. See that the final decision complies with the Forest Plan, NEPA, the Clean Water Act, and federal law.

Sincerely,

Erik Ryberg
Attorney for Western Watersheds Project

Response to comment 7-1
The EA does not state that "under the current grazing regime, Forest Plan standards are not being met because of overgrazing". The presence of Japanese brome in the Juan Tank Pasture is the driver for the "need to change" current management. It is believed that changes in livestock management (e.g., livestock distribution and timing) will address this need for change, and reverse downward trends. In addition, adaptive management will also be incorporated to allow flexibility in livestock management to ensure that the allotment is maintaining or moving towards desired conditions.

Response to comment 7-2
An economic analysis is included in Chapter 3 of the EA. The economic analysis period is 10 years, which has been clarified in the EA.

Response to comment 7-3
2,280 AUMs (190 cattle) is what is currently permitted for the Juan Tank Allotment. 1,800 AUMs (150 cattle) is considered current management (i.e., average use in the past 3-5 years). The environmental effects of both 2,280 and 1,800 AUMs are described in Chapter 3 of the EA. The analysis of Alternative 1 examines the effects of no grazing.

Response to comment 7-4
Detailed information on range condition and monitoring data can be found in the range specialist report. The EA discloses how often monitoring is expected to occur, and at what level of intensity. Frequent inspections are done throughout the year as livestock move from pasture to pasture, and/or are within a pasture. Long term trend transects are read on intervals of up to 15 years, but can be read more often if a need is identified. The monitoring method currently in use is very intensive and collects the following data: forage production, ground cover, frequency, species composition and canopy cover. These data were collected on the Juan Tank allotment in 2011-2012, and is included in the project record.

Response to comment 7-5
Water rights for Holden Lake belong to the Kaibab National Forest, and water use by the permittee will be compliant with relevant laws and regulations.

Response to comment 7-6
The timeframes indicated are broad estimates for construction of the range improvements, as well as the kiosk at Holden Lake. Implementation of these projects is dependent on budgets and staffing. The Forest Service will work with partners and volunteer groups to construct the kiosk.

The proposed range improvements are likely to be funded through the Range Betterment Program, where 50% of the receipts of grazing fees collected on a Forest are returned to that Forest for such projects.

Response to comment 7-7
This Environmental Assessment analyzed certain actions related to grazing on the Juan Tank Allotment (i.e. the "parameters of the decision" or the scope of the analysis). If new information becomes available and/or if monitoring shows that the purpose of and need for action outlined in Chapter 1 of the EA are not being met by actions that fall within the scope of this analysis, new analysis would be conducted to explore alternative means of meeting the purpose and need and addressing any changed circumstances.

Response to comment 7-8
The presence of Japanese brome in the Juan Tank Pasture is the driver for the "need to change" current management. It is believed that current management will not adequately address the downward trends attributed to Japanese brome, and therefore not meet Forest Plan objectives.

Response to comment 7-9
A comprehensive review of soils currently in impaired condition, the reasons for impairment, acreages impaired, and spatial locations/distributions of impaired soils are included in the Soils and Watershed Specialist's Report. Figure 1 in the Soils and Watershed Specialist's Report depicts the locations of all impaired soils in the Juan Tank Allotment. Table 3 in the Soils and Watershed Specialist's Report summarizes soil condition classes in the Juan Tank Allotment and their associated acreages. Figures 2 through 7 depict soil conditions observed during field investigations and provide reasons for impaired soil conditions.

Response to comment 7-10
Cultural control of noxious weeds via sheep grazing is being proposed to control Japanese brome. Targeted grazing of non-native annual grasses in the spring months while native grasses are generally dormant can facilitate the native plant community by suppressing the growth and proliferation of Japanese brome. In turn, facilitating native plants can result in a more resistant community that can combat non-native annuals through direct competition. Sheep grazing at the onset of spring growth of Japanese brome will be part of an Integrated Pest Management plan designed to control the infested area. The environmental effects of cultural control (i.e., sheep grazing) in addition to cattle grazing has been analyzed for alternatives 3 & 4 and was clarified for several resources in Chapter 3 of the EA.

Response to comment 7-11
As stated in Chapter 1 of the EA, past juniper treatments are believed to be when Japanese brome was introduced in seed mixes. We believe that timing of grazing under the current management regime has facilitated the expansion of Japanese brome, which is why we have identified a need to deviate from current management.

The said FEIS authorizes the use of herbicides and biological control agents (primarily insects) to combat noxious weeds on the Kaibab National Forest. The cultural control method (i.e., sheep grazing) proposed in this EA will be used in conjunction with methods authorized in the FEIS to develop an Integrated Pest Management plan that allows managers to develop a multifaceted plan to control Japanese brome on the Juan Tank allotment.

Response to comment 7-12
Clusters 2 and 3 were not read due to high utilization. The monitoring method used for this analysis is designed to measure annual forage production, ground cover, species composition, and woody species canopy cover. Because most of these attributes cannot accurately be determined when high vegetation utilization has occurred, these transects were not read. Repeat photography was conducted at these sites to determine trend.

Regarding sites that no longer represent Key Areas, many long-term monitoring sites on the Kaibab National Forest were established in the 1950s, and have since been altered by the construction of fences and roads, tree encroachment, etc. Two sites on the Juan Tank allotment were altered due to these types of activities. Cluster 5 no longer represents a key area because of the heavy tree

encroachment and C7 no longer represents a key area because a road was built going through the middle of the site.

Response to comment 7-13
An environmental assessment was conducted in 1994-95 on the Juan Tank Allotment, and it disclosed monitoring data up to that point. The current EA for Juan Tank therefore focused on data collected post 1995. Further, we are most interested in how current management is affecting the environment, and the 1994 and 2011 datasets provide the best comparison to determine whether the Juan Tank allotment is maintaining or moving towards the desired conditions. The current EA did summarize trend for all transects and all years. Detailed information can be found in the Rangeland Management Specialist Report.

Response to comment 7-14
Climate can affect range condition and trend, as can livestock grazing. The effects of livestock grazing are described in Chapter 3 of the EA.

Response to comment 7-15
This utilization rate is based on recommendations from; Galt, D., F. Molinar, J. Navarro, J. Joseph, and J. Holecheck. 2000. Grazing Capacity and Stocking Rate. Rangelands, 22(6):6-11. Utilization is measured at the end of the growing season to account for both livestock and wildlife. If it appears that utilization is exceeding the 40% allowable use guideline, adaptive management will be used to adjust livestock numbers, and the following year's annual operating instructions will be modified to ensure that the over-utilization is corrected.

Response to comment 7-16
The downward trend was identified during vegetation monitoring that occurred in 2011-2012. Alternative 3 incorporates rangeland improvements that will allow flexibility in livestock management, which are expected to reverse the downward trends. The environmental effects of both 150 cattle, as well as up to 180 cattle in conjunction with cultural weeds management are described in Chapter 3 of the EA.

Response to comment 7-17
The comment is specific to Forest Service Sensitive plant species. The Botany Specialist Reports states that: **1**) "Although grazing may negatively affect individuals or populations should they exist on the allotment and be grazed or trampled by livestock, it is unlikely that it would result in a loss of viability or distribution throughout the analysis area of the sensitive species because no known populations occur within the Juan Tank Allotment boundary, and would not move these species toward Federal listing under the Endangered Species Act"; and **2**) "Although grazing may negatively affect Mt. Dellenbaugh sandwort individuals or populations should they be grazed or trampled by livestock, it is unlikely that it would result in a loss of viability or distribution throughout the analysis area of the sensitive species because only a single occurrence has been documented near the Juan Tank Allotment boundary, and would not move the species toward Federal listing under the Endangered Species Act." These conclusions are based on the absence or limited number of plant occurrences, and professional opinion.

The effects to Forest Service Sensitive Wildlife Species are described in the Wildlife Specialist Report.

Response to comment 7-18

The Wildlife Specialist Report states “Alternatives 2, 3, and 4 would not affect habitat quantity but would result in continued negative effects to pronghorn habitat quality within the grassland indicator habitat in the project area. The Wildlife Specialist Report also states “The Implementation of Alternatives 2, 3, and 4 would not result in changes to Forest-wide habitat or population trends for pronghorn.”

July 10, 2013

District Ranger
Williams Ranger District, Kaibab National Forest
742 S Clover Rd
Williams, AZ 86046
RE: Juan Tank Environmental Analysis Comment(s)

Dear District Ranger,

Comment 8-1

We recognize the hard work it took to publish this Environmental Analysis document and congratulate you and your team for keeping this issue as a priority. However, multiple members of the Coordinated Resource Management Group were disconcerted with the published results of Alternative Four. We feel that the substance of this alternative is missing valuable information and does not represent the group's analysis, and there is not any information that points people to see the groups work in its entirety. There is a stark difference between Alternative 3 and 4 formatting. This issue has been addressed in comments below (see #6).

Below are comments, questions or concerns in regards to the Juan Tank Environmental Analysis. They are mostly in sequential order.

Comment 8-2

1. Page 3, last sentence states that 5,000 acres of Japanese brome have been mapped in the Juan Tank Pasture.

   REPLY: We request that this sentence be rewritten to accurately show that the 5000 acres of Japanese brome is in reality X percent of the 5000 acres is actually occupied by Japanese brome.

Comment 8-3

2. Page 9, last paragraph states alternative 4 was developed out of economic concerns.

   REPLY: We request that economic and ecological concerns be added as reasoning for the development of Alternative 4.

Comment 8-4

3. Page 11, second paragraph under alternative 2 – Re-authorize a term graze permit of up to 150 cattle.

   REPLY: The permittee grazed 190 head in 2012 (permitted numbers). We request under alternative 2 that re-authorization should be depicted as 190 head in document wording and associated tables.

Comment 8-5

4. Page 12, Alternative 3, Authorization, first bullet point states: A Term Grazing Permit would authorize seasonal grazing for 360 cattle….

   REPLY: We request a cost analysis be developed to depict the associated costs of moving from year-long to season long grazing (e.g. Cost associated with increase of cattle, the need for another allotment, associated cost of trucking, fence repair, additional equipment and labor to name a few).

Comment 8-6

5. Page 13, fourth bullet point Integrated Pest Management Plan….

   REPLY 1. This paragraph does not include the use of biological, herbicide, disking, seeding.
   REPLY 2. The soils and vegetation reports identify the use of "up to 1,200 sheep" to target Japanese brome for Alternative 3 – Modified Proposed Action (pages 35 & 51), while the

Comment 8-7

Wildlife Report only shows the use of "up to 1,200 sheep" to target brome only in Alternative 4 – Adaptive Management (multiple pages 60 – 69). We request that Alternatives 3 &4 be analyzed the same.

Comment 8-8

6. Page 17, Alternative 4.

REPLY: This alternative does not resemble the submitted Coordinated Resource Management Planning Groups Proposed Alternative. We request that all common attributes between alternatives 3 & 4 should be listed and formatted in the same fashion. In addition, we request the following be added:

a. Authorization: We request the following items be added: i. Authorization Section: item numbers 1-5 (minus Tables with the exception of Table #5, as it depicts a summary of animal forage balance in addition to grazing schedule). 1. Number 5 in proposed CRMP Alternative regarding utilization. This statement as proposed by the team has been amended and can be seen in its entirety in the re-submitted "Proposed Coordinated Resource Management Plan: An Adaptive Management Alternative."

b. Structural Improvement Section: item numbers 1-7 (minus Tables). i. No time frames were developed under Structures section for alternative 4.

c. Monitoring Section: item numbers 1-4.

d. Adaptive Management Section in proposed CRMP Alternative including example tables provided.

7. Page 17, Structural Improvements states: This trial could last for up to 3 grazing periods….

Comment 8-9

REPLY 1. Is this the same as 3 years?

REPLY 2. We request that time frames be taken out and base changes to improvement on a combination of professional opinion and monitoring data.

8. Page 18, BMP for Livestock Grazing, bullet #2.

Comment 8-10

REPLY: We request that the term "enough" be defined within this EA in relation to soil health.

9. Page 20, Table 3, Column 3, Row 2, 3, 7,8.

Comment 8-11

REPLY: We request a change from No to Yes for Current Management (Alternative 2). The current management has accounted for maintaining or moving areas toward Forest Plan Desired Conditions based on the following.

i. Current Management is treating brome with targeted grazing,

ii. Current Management grazing capacity is well within limits (80 – 90% of capacity according to FS Data),

iii. Under Current Management floral diversity remains moderate to high, percent surface composition is stable – trending upward and percent vegetative ground Page **2** of **3** cover is close to natural when compared to TES (Tables 2-4 respectively. Proposed Coordinated Resource Management Plan: An Adaptive Management Alternative. Submitted to Kaibab Forest Service 01/2013 and amended 07/2013).

iv. Current Management has already closed FR124 through the use of boulders,

Comment 8-11

v. Cross country travel is currently authorized under current management.
vi. Herbicide plots to determine efficacy on brome have been implemented,
vii. Changes in AOI to address brome and native grasses have been implemented.
viii. Can the Holden Lake wetland exclosure be implemented under a wildlife categorical exclusion?

Thank you, and we look forward to your response.
/s/
Coordinated Resource Management Group for Juan Tank Allotment
Mr. Iric Burden – Natural Resource Conservation Service
Dr. Doug Tolleson – University of Arizona Agricultural Extension Service
Mr. Steve Cassady – Department of Arizona Game & Fish
Mr. Patrick Bray – Arizona Cattle Growers Association
Mr. Glen Reed – Juan Tank Allotment Permittee
Please direct correspondence to the following address:
NRCS
Attn: Iric Burden
1585 S. Plaza Way
Flagstaff, AZ 86001
or
iric.burden@az.usda.gov

Response to comment 8-1
See response to comment 1-2.

Response to comment 8-2
Language has been clarified to state the range of frequency of Japanese brome in the Juan Tank Pasture.

Response to comment 8-3
We have added "ecological" to this sentence; however, the scoping comment response from the permittee indicated that economics was his main concern with the proposed action.

Response to comment 8-4
Our billing records and Annual Operating Instructions indicate that in 2012, 190 head were authorized but 25 head were removed on May 15, 2012, and an additional 15 head removed on October 15, 2012; each reduction was based on resource concerns. This is supported by a request for credit by the permittee for the unused portion of 2012 permitted use (credit for grazing fees).

Actual use for calendar year 2012 was: 190 head from January 1 through May 14; 165 head from May 15 through October 14; and 150 head from October 15 through December 31.

Response to comment 8-5
See response 6-2.

Response to comment 8-6
Integrated Pest Management by definition includes biological, cultural, mechanical, and chemical control. Although the terms 'seeding and disking' weren't specifically used, it is implied.

Response to comment 8-7
The Wildlife Specialist report did analyze the use of sheep in Alternatives 3 and 4.

Response to comment 8-8
See response to comments 1-2 and 7-6. Timeframes for construction of structural improvements were provided as a requirement of NEPA.

Response to comment 8-9
Grazing periods would be considered the same as a grazing year.

Response to comment 8-10
The term "enough" vegetative ground cover refers to "tolerance" level of vegetative ground cover, below which the risk of accelerated soil erosion increases. Conservative allowable use would maintain vegetative ground cover at levels sufficient to prevent accelerated soil erosion that would result in a long-term loss of soil productivity.

Response to comment 8-11
Table 3, Row 7 (page 20) will be changed to a "Yes" as the Travel Management Rule (TMR) closed the road going into Holden Lake and the access has been blocked by boulders. Rows 2, 3, and 8 will remain as is. Our resource specialists do not believe that current management will maintain or move the area toward Forest Plan objectives because it does not adequately nor sufficiently address the Japanese brome problem (as supported by research), long term (rows 2 and 8). Row 3 will remain a "No" because the current grazing permit was issued prior to TMR implementation and analysis.

Appendix G: Environmental Assessment Errata Sheet

This appendix documents updates or corrections made to the Environmental Assessment (EA) during finalization of the document. These changes were made in response to public comment and/or as a result of internal review. Additionally, a number of typographical errors were corrected and minor changes in wording made throughout the document. These modifications do not change the analysis and are not reflected in this errata sheet.

1. **Page 3, last two sentences, the following language was added to clarify the discussion of Japanese brome infestation in the Juan Tank Allotment:**

   "An affected area (gross area) is defined as the total area of a polygon drawn around the population (Final EIS for Integrated Treatment of Noxious or Invasive Weeds 2005). The frequency of Japanese brome in the affected area (how often it occurred in a transect) ranges from 25-94 percent in concentrated stands of brome."

2. **Page 11, first paragraph under "Alternative 2 – Current Management" was modified to clarify determination of current management. It now reads:**

   "The Forest Service Grazing Permit Administration Handbook (FSH 2209.13) states that current management should be analyzed in detail as an alternative to the proposed action (Chapter 92.31). Current management is defined as "…a combination of the current permit and how the current permit has been administered through the [allotment management plan] and [annual operating instructions], for at least 3-5 years (3-5 years is a minimum, longer periods of 10 years or more may also be utilized…), in order to meet resource management objectives" (R3 supplement to FSH 2209.13, chapter 92.31). The current grazing permit allows up to 190 adult cattle (2,280 animal unit months, AUMs). Average use from 1995 through 2012 has been approximately 146 cattle yearlong (1,752 AUMs)."

3. **Pages 12–15: Description of Alternative 3 – Modified Proposed Action reorganized to improve clarity and flow.**

4. **Page 13, first bullet (describing Integrated Pest Management): updated to clarify that up to 1,200 sheep could be used to address Japanese brome under Alternative 3. In the Draft EA, this was not made clear until later in the document.**

5. **Pages 15–18: Description of Alternative 4 – Adaptive Management updated to include information regarding authorization and structural improvements that was omitted in the Draft EA. Also clarifies that up to 1,200 sheep could be used to address Japanese brome under Alternative 4.**

6. **Page 23, Table 3: Footnotes added to clarify permitted numbers under alternatives 2, 3, and 4. The table now reads:**

Table 17. Livestock grazing statistics by alternative.

Grazing Statistic	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Season of use	None	Yearlong	Seasonal	Yearlong
Months of livestock use	0	12	6-8	12
Number of cattle permitted	0	150[1]	245-360[2]	185[2]
Number of horses permitted	0	0	5	5
Animal Unit Months (AUMs)	0	1,800	2,280	2,280
Utilization guideline	N/A	40%	40%	40%

[1]Although the current grazing permit allows up to 190 adult cattle, 150 was used to analyze current management based on actual use since 1995 and the trend in declining numbers since 1995.

[2]These represent maximum numbers. Actual numbers may be less in a given year due to climatic, forage, and economic conditions.

7. Page 24, Table 4: Table edited to remove information presented in previous tables. The table now reads:

Table 18. Alternative comparison by management need.

Management Need	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Authorize livestock grazing	No	Yes	Yes	Yes
Allotment is managed in a manner that maintains and/or moves the area toward Forest Plan desired conditions	No	No	Yes	Yes
Prioritizes treatment of Japanese brome	No	No	Yes	Yes
Holden Lake wetland excluded	No	No	Yes	Yes
Road access to Holden Lake from FR 124 eliminated	N/A	Yes	Yes	Yes
Motorized cross-country travel authorized for maintenance of range improvements	N/A	No	Yes	Yes

8. Pages 47–48, the description of past monitoring in the first four paragraphs under Vegetation: Affected Environment was clarified in response to comments. These paragraphs now read:

"Eight permanent vegetation monitoring transects were established on the Juan Tank Allotment in 1958 using the Parker 3-Step method (Parker 1954); another was established in

1963, and one more in 1984. Vegetation Condition and Trend was assessed for the Juan Tank Allotment using these monitoring locations. All locations were converted to the Pace Quadrat Frequency method and one-tenth acre canopy cover plots in 2011. The change in the monitoring methods was necessary to obtain baseline vegetation data that correlates with data presented in the Kaibab National Forest Terrestrial Ecosystem Survey (Ruyle and Dyess 2009).

"In 2011, Pace Quadrat Frequency (i.e., ground cover, canopy cover, species occurrence, frequency, relative species composition, and forage production) measurements were conducted at sites 1, 4, 8, 9, and 10. Additional forage production data was collected at five sites: three historic pace transect sites (# 7, 15, 17), the Button Exclosure, and a ponderosa pine unit. Repeat photography dating back the transect establishment date was also conducted at all 10 sites. In 2012, Clusters 8 and 9 were read again to assess any change in Japanese brome populations. Cluster 6 was also read in 2012.Trend was summarized for the 10 permanent monitoring locations based on data collected in 2011, as well as the historical data that has been collected from these sites and is summarized in the following three paragraphs. Detailed information on these sites can be found in the range specialist report. Historical data prior to the 2011 readings exists for years 1958, 1984, and 1993/94. Units of measure for this analysis include species diversity, species abundance, ground cover, and soil conditions (e.g., evidence of erosion).

"Clusters 1, 3, 4, 8, and 10 showed an upward or static trend between the 1994 and 2011 readings, because the attributes listed above (e.g., species diversity, ground cover, etc.) have either improved or they have not changed.

"Clusters 2, 5, 6, 7, and 9 showed a downward trend between the 1994 and 2011 readings because of reduced vegetative ground cover, presence of Japanese brome, and/or increasing juniper size and density. Juniper thinning at Clusters 2, 5, and 6 would likely reverse the downward trends. A reduction of Japanese brome on Cluster 9 should reverse the downward trend. Cluster 7 (established in 1958) no longer represents an appropriate key area due to the close proximity to a pasture fence/gate and Forest Service Road 124."

9. **Pages 52–54, sections discussing direct and indirect effects of alternatives 3 and 4: these sections were reorganized to better track effects common to alternatives 3 and 4.**

10. **Pages 55-59, Noxious Weeds: this section was added to support the analysis.**

11. **Page 74, Pronghorn: error corrected regarding dietary overlap between cattle and pronghorn. Now reads:**

"Because cattle and pronghorn are ungulates there is dietary overlap and the two compete for forage. Between 80-90% of the pronghorn's diet is forbs, but they also rely heavily on browse in time of less rain and when snow covers the ground (Brown and Ockenfels 2007). Because cattle also consume forbs when available and browse in time of less rain and when snow covers the ground, there is competition for food between cattle and pronghorn. Vegetation height is also important for pronghorn fawning cover, and livestock grazing reduces vegetation height and thus cover, which could reduce pronghorn fawn survival."

12. Page 80, Effects to the Permittee: section added in response to comments.

13. Pages 88–89, Direct and Indirect Effects of Alternative 3 and Alternative 4 [on heritage resources]: section updated to include analysis of effects of sheep grazing as part of Integrated Pest Management.