Chapter 4

Environmental Consequences

INTRODUCTION

This chapter forms the scientific and analytic basis for the comparison of potential environmental consequences between alternatives. The effects analysis is based on existing information in the Forest Plan, Landscape Analysis efforts, project specific resource reports, scientific literature, field measurements, and professional judgment. The planning record for this project contains all project specific information, including resource reports and results from field investigations. The record also includes information resulting from public involvement efforts. For this chapter, the analysis reports were consolidated and summarized.

This chapter is organized by issues. Under each issue, we describe the estimated effects common to the alternatives or those unique to a particular alternative. In Chapter III, we described the existing condition, which provides the baseline for understanding the potential effects. This chapter discloses all significant or potentially significant effects, including direct, indirect and cumulative effects. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative effects result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

UNAVOIDABLE ADVERSE EFFECTS

Implementation of any action alternative would cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced, mitigated or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific practices was designed to eliminate or reduce adverse consequences. The application of Forest Plan standards and guidelines, standard grazing permit clauses, project-specific mitigation measures, and monitoring are all intended to further limit the extent, severity, and duration of

potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects will occur. The purpose of this chapter is to fully disclose these effects.

AVAILABLE INFORMATION

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs and communities. The ecological relationships taking place in a large land area is complex, and knowledge of those relationships is still a developing science. The biology of wildlife and plant species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, and communities is the subject matter of an inexact science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences. New or improved information would be unlikely to reverse or nullify these understood relationships.

ISSUES

Issue 1: Effects on Threatened, Endangered, Proposed, and Sensitive Species (TEPS), as well as other species of concern

Terrestrial
Direct and indirect effects common to all alternatives

Habitat

Maintaining all vegetation complexes in good ecological condition is crucial for providing effective wildlife habitat. Watersheds and vegetation communities that are not functioning properly, or functioning at risk, provide less than optimal conditions for wildlife.

Utilization, stubble height, stocking rates, and stream bank trampling guidelines for alternatives A and B are intended to maintain or improve upland range and riparian habitat for all wildlife. Deferred and rest rotation pastures will provide undisturbed habitat where wildlife should not be displaced by cattle or additional human activities associated with livestock management. In addition, over 40% of the project area is not used by domestic livestock due to distance from water, steep slopes, inaccessibility and/or insufficient amounts of forage for cattle.

In 1950 approximately 50% of the available forage on suitable cattle grazing lands within the Roaring Fork allotment was set aside for elk, moose, deer and antelope (Roaring Fork AMP 1975). The AMP stated that it appears wildlife use only a portion of the available forage. A large amount of forage is also accessible to wildlife that is not accessible to domestic livestock; thus it appears ample forage is available for wildlife on this allotment. The majority of this allotment is crucial wildlife winter range.

Fences needed for livestock management can impact distribution and migration of wildlife unless properly designed. Two especially important wildlife migration corridors occur along Bacon Ridge/Bacon Creek and within the Moose-Gypsum area. Fencing guidelines are intended to minimize negative impacts to migrating wildlife from fences. Abandon fences in disrepair can cause safety hazards for both humans and wildlife. These fences are being removed when opportunity arises.

Most sensitive plant species listed have low to moderate risk from cattle grazing due to either their limited high elevation range (10,000 to 12,000 feet, mostly on Osborn, Big Sheep, and Gypsum Mountains adjacent to the project area) or microsite habitats that cattle typically avoid such as talus and gravel fields. Some sensitive plant species are located within the Kendall Warm Springs exclosure and thus are not influenced by cattle (Payson's bladderpod). Greenland primrose occurs near the Upper Green River. Due to its occurrence in wet meadows along the river, it is vulnerable to trampling damage and changes in hydrologic function.

The primary habitat elements for TEP, sensitive and MIS species, are as follows:
1. Recovery guidelines and goals for T and E species (specifically grizzly bear, lynx, wolf, and bald eagles).
2. Large carnivore interactions with livestock and humans (specifically grizzly bears, black bears, and wolves).
3. Effects of livestock use within riparian/wetland areas on amphibians and their habitat.
4. Impacts of livestock grazing on trumpeter swans and their nesting habitat.
5. Impacts of livestock grazing, livestock improvements (i.e. fences, water development, etc), and the associated human use on wildlife movement and migration corridors.
6. Impacts of livestock grazing on crucial ranges and the availability of "native" winter forage for elk and moose.

Discussion

1. Under any alternative, recovery guidelines for threatened and endangered species will be met as is required by law. "Critical" habitat has not been identified for any of the T and E species occurring, or potentially occurring, within the project area. Potential impacts by species will be detailed in the Biological Assessment submitted to U.S. Fish and Wildlife Service for concurrence. Possible impacts by species are outlined below. Mitigation measures are also discussed.

2. Large carnivores will interact with humans under any alternative. Interactions with livestock will occur in alternatives A and B and are discussed below.

Potential impacts for elements 3-6 will vary by alternative and are discussed below.

Environmental Consequences Specific to Alternative A- Grazing as Currently Permitted (No Action)

4 Environmental Consequences

Forest Plan compliance

Alternative A will be in compliance with Forest Plan guidance for terrestrial wildlife species.

Direct and indirect effects

Overall, it appears current livestock stocking levels are in balance with wildlife needs under the existing condition. There are isolated locations that are not meeting FP standards and guidelines that have been discussed in Chapter 3. For example, there are concerns with livestock management within the GRL elk winter feedground. Under the existing management it is difficult to keep cattle from grazing on the feed ground and thus removing potential winter elk forage. In addition, predator pressure (specifically grizzly bear and wolf) can cause livestock to congregate and/or move into unplanned areas.

Neotropical Migrant Birds (NTMB). Under this alternative the amount of habitat available for livestock grazing would remain the same as it has since about 1975. It appears NTMB needs are being met under the existing condition given the large size of the project area, extensive and well distributed water sources, a diverse mosaic of available vegetation/habitat types, and large percent of the project area that is not accessible for domestic livestock grazing, thereby available for NTMB without any grazing impacts.

Primary Habitat Elements:

#2. Livestock, humans, grizzly bears and wolves will have potential conflicts under this alternative. Improper disposal of dead livestock and wildlife, improper storage of human and livestock feed, as well as bear/wolf predation on livestock may result in more human/predator and livestock/predator encounters. Livestock grazing and the associated human use will result in several impacts to these large predators including displacement, changes in habitat availability and use, plus potential removal or relocation. The presence of these large predators will in turn have impacts on livestock and permittees including increased workloads, livestock being displaced by predator activity, and increased livestock losses. Mitigation measures are currently in place for food storage and carcass disposal but will be updated under Alternative A.
Grizzly bear adult females and subadult males are more likely to be habituated to humans because they tend to forage closer to humans. Adult males often preempt the more secure sites (Mattson 1986). Adult and subadult males are more likely to prey on livestock. Thus, predicted impacts from Alternative A will most likely affect adult and subadult males. Documented bear/livestock conflicts in the project area since 1996 support this prediction as conflicts have predominantly been with subadult and adult males.

#3 and 4. Grazing impacts to riparian areas, amphibians, and trumpeter swan would potentially be greatest under Alternative A. Specifically this would result from following the less stringent standards and guidelines established in the Forest Plan compared to Alternative B (implementation of additional stubble height, stream bank disturbance/trampling, and ground cover guidelines). However, there are no apparent population or habitat trends for

these species within the project area that can be tied directly to grazing impacts under current conditions.

#5. Impacts to wildlife movement and migration corridors will remain constant under Alternative A. Abandon fences will be removed as opportunities arise. Fencing guidelines intended to minimize negative impacts to migrating wildlife will be followed.

#6. Availability and condition of "native" winter range and crucial ranges will remain constant. Existing conditions for vegetation described in Chapter 3 indicate sufficient amounts of forage are available for ungulates year round.

Environmental Consequences Specific to Alternative B - Grazing with Management Modifications (Proposed Action)

Forest Plan compliance

Alternative B will be in compliance with Forest Plan guidance for terrestrial wildlife species.

Direct and indirect effects

Under this alternative, additional mitigation and monitoring is established over that outlined for Alternative A. When implemented, this mitigation should maintain or improve upland, riparian and watershed conditions. This should maintain or improve wildlife habitat in general, but especially for amphibians and trumpeter swan. Additional deferred and rest rotation pastures will provide undisturbed habitat where animals should not be displaced by cattle or additional human activities associated with livestock management.

This alternative is compliant with the EO 13186 for Neotropical Migrant Birds (NTMB) because the analysis meets our obligation as defined under the January 16, 2001 MOU between the USDA-FS and USDI-FWS designed to complement EO 13186. As required under this MOU, this alternative: (1) Identifies management practices that may affect high priority species as defined in the MOU and Partners in Flight, (2) develops conservation measures to avoid or minimize impacts to migratory birds. Under this alternative vegetation management objectives would be more closely monitored. Over time adequate habitat conditions would be assured in areas that would continue to be grazed by livestock. Management practices and conservation measures, by species, are contained in the project record.

It appears that proposed livestock stocking levels are in balance with wildlife needs within crucial ranges and near the feed ground. Alternative B specifies that no more than incidental livestock use (0-5%) will be allowed within the feed ground. In addition, more restrictive stubble height standards will be in effect within the riparian zones near the feedground. Therefore, grazing impacts to the feedground should be reduced.

Fences needed for livestock management can impact distribution and migration of wildlife unless properly designed. Two especially important wildlife migration corridors occur along Bacon Ridge/Bacon Creek and within the Moose-Gypsum area. Fencing guidelines are designed to minimize negative impacts to migrating wildlife.

Primary Habitat Elements:

#2. Livestock, humans, grizzly bears and wolves will have potential conflicts under this alternative. Improper disposal of dead livestock and wildlife, improper storage of human and livestock feed, as well as bear/wolf predation on livestock may result in more human/predator and livestock/predator encounters. Livestock grazing and the associated human use will result in several impacts to these large predators including displacement, changes in habitat availability and use, plus potential removal or relocation. The presence of these large predators will in turn have impacts on livestock and permittees including increased workloads, livestock being displaced by predator activity, and increased livestock losses. Mitigation measures are currently in place for food storage and carcass disposal but will be updated under Alternative B.

Grizzly bear adult females and subadult males are more likely to be habituated to humans because they tend to forage closer to humans. Adult males often preempt the more secure sites (Mattson 1986). Adult and subadult males are more likely to prey on livestock. Thus, predicted impacts from Alternative B will most likely affect adult and subadult males. Documented bear/livestock conflicts in the project area since 1996 support this prediction as conflicts have predominantly been with subadult and adult males.

#3 and 4. Grazing impacts to riparian areas, amphibians, and trumpeter swan would potentially be lessened under Alternative B versus Alternative A. Specifically this would result from following more stringent mitigation than is required by standards and guidelines established in the Forest Plan. This includes implementation of additional stubble height, stream bank trampling, and ground cover guidelines.

#5. Impacts to wildlife movement and migration corridors will remain constant under Alternative B. Abandon fences will be removed as opportunities arise. Fencing guidelines are designed to minimize negative impacts to migrating wildlife will be followed for new or rebuilt fences.

#6. Availability and condition of "native" winter range and crucial ranges will be maintained or improved. Additional monitoring will be conducted on crucial ranges. Existing conditions for vegetation described in Chapter 3 indicate sufficient amounts of forage are available for ungulates year round.

Environmental Consequences of Alternative C- No Grazing By Domestic Livestock

Forest Plan compliance

Alternative C is in compliance with Forest Plan guidance for terrestrial wildlife species.

Alternative C Description

Under Alternative C, domestic livestock grazing on all six allotments within the project area would be phased out over the next five years, as current term grazing permits expire. This

would result in a reduction of 46,100 AUMs currently authorized for the six allotments. This alternative was developed to compare the effects of removing grazing by domestic cattle on riparian function, TES species viability, and socio-economics. There would be no need for applying livestock grazing standards and guidelines to this portion of the National Forest. Forest Plan standards and guidelines for forage utilization would still exist for wildlife and recreational stock.

Approximately 76 miles of existing interior fence, 2 water developments, 4 rider cabins/facilities, and 9 water crossings (culverts, bridges, etc.) would be removed. Approximately 5.5 miles of allotment boundary fences would remain and maintenance responsibilities would revert to bordering allotment permittees and/or private landowners. (NOTE: These numbers only reflect range improvements maintained by Term Grazing Permittees on the six allotments covered by this NEPA document.)

Direct and indirect effects

Wildlife use of this area is significant. In general, periodic disturbances, such as fire, insects, disease, and weather related disturbances (wind, flooding, drought, etc) naturally maintain a mosaic of vegetative and structural conditions for a variety of wildlife. Periodic disturbances often result in early seral communities. Because post disturbance landscape is typically patchy, rather than homogenous, it still provides suitable habitat for species dependent on late seral and climax communities. Native wildlife species have evolved with these disturbances.

This alternative is compliant with the EO 13186 because the analysis meets our obligation as defined under the January 16, 2001 MOU between the USDA-FS and USDI-FWS designed to complement EO 13186. As required under this MOU, this alternative: (1) Identifies management practices that may affect high priority species as defined in the MOU and Partners in Flight, (2) develops conservation measures to avoid or minimize impacts to migratory birds. Under this alternative no livestock grazing would occur. Benefits would be expected for several high priority species, especially those associated with riparian and aspen habitats.

Primary Habitat Elements:

2. Large carnivore interactions with humans (specifically grizzly bears, black bears, and wolves) would continue. Removal of livestock would reduce large carnivore/livestock interactions to recreational livestock and thus lessen the possibility of displacement or removal of resident large carnivores specifically due to livestock conflicts.

3. Potential effects of livestock use within riparian/wetland areas on amphibians and their habitat would be eliminated.

4. Impacts of livestock grazing on trumpeter swans and their nesting habitat would be eliminated.

5. Impacts of livestock grazing, livestock improvements (i.e. fences, water development, etc), and the associated human use on wildlife movement and migration corridors would significantly reduce or eliminated.

6. Impacts of livestock grazing on crucial ranges would be eliminated and the availability of "native" winter forage for elk and moose would increase. The GRL feed ground would continue to be utilized to reduce potential elk impacts on private lands.

Table 4-1 Qualitative comparison of effects to wildlife habitat components by alternative

Habitat component	Alternative A	Alternative B	Alternative C
Recovery goals met: grizzly bear	Yes, with mitigation	Yes, with mitigation	Yes, with mitigation
Recovery goals met: bald eagle	Yes, with mitigation	Yes, with mitigation	Yes, with mitigation
Recovery goals met: grey wolf	Yes, with mitigation	Yes, with mitigation	Yes, with mitigation
Compliance with LCAS	Yes	Yes	Yes
Carnivore/livestock/human incident potential	High	High	Moderate
Amphibian habitat	Potential impacts	Potential impacts lessen via stubble height and other riparian/streambank guidelines	No potential impacts from grazing
Trumpeter swan nesting	Potential impacts	Potential impacts lessen via stubble height and other riparian/streambank guidelines	No potential impacts from grazing
Availability of "native" winter range for elk and moose	Yes, with mitigation	Yes, improved with mitigation	Yes
Wildlife movements, habitat security, and cover	Short and long-term reduction from potential habitat due to human use, livestock grazing and cumulative effects	Short and long-term reduction from potential habitat due to human use, increased fencing, livestock grazing and cumulative effects. Less potential impacts than Alt A due to more stringent utilization, stubble height, & ground cover, standards plus additional deferred and rest rotation pastures.	Stable and/or increasing trend long-term from existing habitat; impacted by natural disturbances and ongoing human uses

Cumulative Effects

Impacts to wildlife species due to management activities or landscape changes are scale and organism dependent. Consequently, to be meaningful, cumulative effects analyses should be conducted at a scale relevant to each organism. For purposes of this analysis, the Upper Green Basin will serve as the cumulative effects project area. This area is roughly 292,500 acres (457 sq. mi.) in size. The watershed boundaries are used because topographic features and drainages tend to determine movements of many wildlife species and often correspond to seasonal home ranges. This area relates more to species' actual use of a landscape rather than a geographic boundary. These watersheds also encompass a portion of the known range size of resident lynx, for example. Cumulative impacts are evaluated in terms of the extent to which they have the potential to affect important source habitats and key habitat components. Past, present and reasonably foreseeable future activities are summarized in Table 4-2.

Table 4-2
Past, present and future activities occurring within the Upper Green watersheds

Project/Activity	Year/Season	Location and Affected Area
Timber harvest	historic	Tie hack areas, various locations
Timber harvest	1960's forward	Past harvest, 7700 acres Kinky Creek road construction timber clearing
Timber harvest	planned	Moose-gyp proposed sales Post and poles
Prescribed and wildland fire	Ongoing/ planned	Wildland fire, 1100 acres existing. Proposed Pinyon Ridge prescribed fire (aspen, sage) Proposed Moose-Gyp prescribed fire (aspen, sage)
Fuel reduction	planned	Urban interface fuel treatments, Red Cliff Bible Camp
Fire suppression	Ongoing	Entire area
Firewood gathering	Ongoing	Entire area
Christmas tree cutting	Ongoing	Entire area
Livestock grazing	Ongoing	Entire area; both cattle and sheep
Livestock improvements	Ongoing	Entire area; fences, water developments, cattle guards, etc. In addition, there are abandon fences that are a safety hazard for humans and wildlife and should be removed.
Predator control	Ongoing	Entire area; especially coyotes, bear, and wolf
Noxious weed control	Ongoing	Various locations throughout project area; both biological and chemical

Table 4-2 (continued)
Past, present and future activities occurring within the Upper Green watersheds

Project/Activity	Year/Season	Location and Affected Area
Recreation; developed, dispersed, backcountry	Ongoing	Entire watershed; both summer and winter; motorized and non-motorized
Hunting, outfitting, black bear baiting	Ongoing	Entire area
Road maintenance and use	Ongoing	Entire area outside wilderness
Road density/FP guidelines	Ongoing	Road density exceeds FP guidelines in several areas (management area 46/Kinky Creek and management area 72/Upper Green); mostly within DFC 12, crucial wildlife ranges
Road decommissioning	Summer 2002	Fish Creek Area, 8 miles
Kinky Creek Road Construction	Planned	Construction and reconstruction; access to Darwin Ranch
Green River Lake road reconstruction	Planned	
Impacts to crucial wildlife ranges	ongoing	Road densities exceeding FP standards snowmachine use, Travel Plan violations, antler gathering, potential overlap of cattle grazing season with elk calving
Green River Lakes feed ground	Winter season	

Total existing disturbed acres, approximately 8800 acres (5% of the project area; 3% of the cumulative effects area).

Wildfire constitutes the single most prevalent landscape disturbance type in the Rocky Mountains (Gruell 1983). Having evolved over time to incorporate such disturbances as wildfires into their life-history strategies (Hansen et al. 1991), species' traits and behavior allow wildlife populations to persist in the face of large-scale; stand replacement fires (Weaver et al. 1996). Resilience of wildlife species at the metapopulation (Hanski et al. 1991), population, or individual level vary according to the scale, intensity, and duration of a fire, and the extent and frequency of similar fire events within an animals home range or habitat over time.

Human presence and human-induced changes can directly impact wildlife species and displace individuals, reduce suitable habitat, and affect animal behavior. Direct and indirect impacts of human use on wildlife can include direct mortality/road kill, displacement,

habituation to humans, greater vulnerability to human-caused mortality/poaching/recreational shooting, habitat fragmentation, habitat loss, reduced habitat quality, establishment and spread of noxious weeds, dispersal of pathogens, vehicle noise, chemical contamination, increased predator access, increased access and harassment by dogs or other domestic animals, removal of snags and nest trees for fuel wood, soil and vegetation disturbance, degraded water quality, degraded aquatic habitats, and increased sedimentation and erosion (Gucinski et al 2000, IGBC 1987, Wisdom et al 2000, Trombulak and Frissell 1999).

Livestock grazing has disturbance potential in non-forested habitat types. Standards, guidelines, and mitigation have been designed specifically for this project area to minimize this disturbance potential both in the uplands and riparian areas.

Wide-ranging carnivores – The major issues facing the long-term persistence of wide ranging carnivores (grizzly bear, gray wolf, lynx, wolverine, fisher, and pine marten) include the need for large tracts of remote country away from humans, maintenance of adequate prey base, and conservation of mosaic of appropriate seral stages (Witmer et al. 1998, Wisdom et al. 2000).

Human disturbance – Wide-ranging carnivores need large tracts of remote country away from humans because mortality for many of these species is directly related to human interactions. Mortalities resulting from trapping, poaching, and vehicle collisions all increase with increasing road density because roads facilitate access. As a result of past development, there are approximately 256 miles of open road in the project area, with an overall density of 1mi/sq mi. Large portions of the watersheds are within roadless areas. Overall road density at the watershed scale is moderate and all roads are dirt/gravel; hence the risk of road-related mortalities is low. The proposed livestock grazing in any alternative will not result in a net change in open road density and thus should not change the long-term human use patterns in the area. Thus, no habitat loss as a consequence of added road use and associated activity outside of the project area would occur.

Bear and wolves commonly come into conflict with humans over livestock. In Wyoming, most wolf mortalities since the reintroduction have been attributable to humans (USFWS et al. 2003). Six cattle grazing allotments are being considered for this analysis. An additional four sheep allotments are within the same general area and will be considered under cumulative effects in the Biological Assessment submitted to USFWS. Additional cattle allotments border the project area to the north and south. Significant predator losses have occurred from wolf and bear both within and outside the project area. In addition, large predators can influence cattle movements and distribution.

Adequate prey base – The grizzly bear, wolf, and wolverine all depend to varying degrees on healthy ungulate populations. The project area provides winter, transition, parturition and summer habitat for elk, moose and mule deer as well as important migration corridors. Elk, moose and deer, forest and large carnivores are highly mobile and respond quickly to large scale disturbances such as fire, or smaller scale disturbances such as timber harvest and livestock grazing, by moving to adjacent areas (Lyon et al. 2000) or expanding their range to encompass burned, unburned, harvested, and pristine areas. Ungrazed “security” areas are

available in the adjacent Bridger and Gros Ventre wilderness areas as well as within the project area.

Availability of winter range is often the limiting factor for ungulate populations. The project area is considered winter range for elk and moose. In compliance with the Forest Plan (USFS 1990) various grazing utilization standards will be implemented with the different alternatives, thus grazing should not contribute additional impacts to important ungulate ranges. Stocking rates in important wildlife areas (Roaring Fork allotment) are low to provide additional wildlife forage. Key monitoring areas have been established in areas of high expected use by both cattle and wildlife. In addition, large areas of winter, summer, and transition range are also available adjacent to, but outside, these allotments.

Maintenance of suitable habitat – Fire suppression, timber harvest, and natural disturbance have and will continue to alter the amount and distribution of suitable habitat. Depending on the key habitat features required by a species, these activities have had both beneficial and negative impacts. 7700 acres of past harvest (GIS past harvest layer) and 1100 acres of wildland fire, amounting to 3% of the watersheds and 5% of the project area, has occurred. Fragmentation models of various timber harvest patterns suggest that the forested nature of a landscape can be maintained until 30% of the area is in an open condition (Franklin and Forman 1987). This figure is consistent with recent research showing pine marten use declines with increasing fragmentation, reaching zero when approximately 35% of the landscape is open (Hargis et al. 1999), and with the conservation measures for lynx, which direct that no more than 30% of the landscape be in an unsuitable condition. Different disturbance levels proposed via various alternatives, should have little, if any, negative impacts to forest dependent species.

Table 4-3
Threatened, endangered, and proposed species known or suspected to occur within the influence area of the proposed action

Status	Name	Status *
Threatened:	Grizzly bear (Ursus arctos horribilis)	K
	Bald eagle (Haliaetus leucocephalus)	K
	Canada lynx (Lynx canadensis)	K
Endangered:	Kendall Warm Springs Dace (Rhinichthys osculus thermalis)	K
	Bonytail chub (Gila elegans)	NS
	Colorado pikeminnow (Ptychocheilus lucius)	NS
	Humpback chub (Gila cypha)	NS
	Razorback sucker (Xyrauchen texanus)	NS
Experimental	Gray wolf (Canis lupus)	K
Proposed	Mountain plover (Charadrius montanus)	NS

*__Status Key:__ K = known, S = suspected in area of influence of proposed action, NS = not suspected in area of influence of proposed action.

Grizzly bear

Direct impacts of the proposed action would include impacts to individual bears as a result of management actions associated with livestock conflicts, and habitat displacement as a result of human activities associated with grazing. Displacement of bears could occur with livestock riders' movements (and their dogs) to check livestock, maintain structures, and around livestock cow camps. State and Federal management actions could include harassment or aversive conditioning, trapping and releasing on site, trapping and relocating, and trapping and removing from the population.

Recommendations from the Guidelines for grizzly bear control actions in response to livestock depredations are presented in Table 4-4a. Generally, these procedures involve a two-strike policy for males and a three-strike policy for females prior to consideration for removal. However, the Management guidelines (Table 4-4b) to address nuisance bears on cattle allotments outside Yellowstone Grizzly Bear Recovery Zone in Wyoming (USFWS 1999) gives greater latitude to remove a bear from the population. This may result in more

bears being taken out of the population outside the recovery area, if livestock depredations occur.

Table 4-4a
Recommendations from the Guidelines for grizzly bear control actions in response to livestock depredations (IGBC 1986).

AGE/SEX CLASS	OFFENSE		
	First	Second	Third
Females:			
Orphaned Cub	release on site		
Cub	relocate	relocate	**remove**
Yearling	relocate	relocate	**remove**
Subadult	relocate	relocate	**remove**
Prime Adult w/ Young	relocate	relocate	**remove adult**
Old Adult	relocate	**remove**	
Old Adult w/ Young	relocate	relocate	**remove adult**
Males:			
Orphaned Cub	relocate		
Cub	relocate	relocate	**remove**
Yearling	relocate	remove	
Subadult	relocate	**remove**	
Prime Adult	relocate	**remove**	
Old Adult	**remove**		

Table 4-4b
Management guidelines to address nuisance bears on cattle allotments outside Yellowstone Grizzly Bear Recovery Zone in Wyoming (USFWS 1999).

Continue to use traditional management approaches which include:

Investigate reported losses and gather evidence in the field to determine as accurately as possible: are grizzly bears responsible for cattle losses, number, age, sex and reproductive status of involved bears, bears' method of and time of killing, possible travel routes and possible daybeds.

Make comparisons of evidence gathered with previous capture records, current radio-telemetry locations, and notes of past depredation characteristics to determine the bear(s) identity.

When practical, attempt to deter depredating bears with barricade lights, Zon guns, and other deterrent devices.

Relocate or remove captured bears according to the Interagency Grizzly Bear Guidelines and U.S. Code of Federal Regulations.

If:

Verified cattle losses, attributable to the same bear, continue for more than 30 days, *or*

Depredations continue after five verified bear-killed cattle have been documented during the current grazing system by the same bear, *and*

Traditional management approaches (i.e., trapping or deterring) have been unsuccessful, *and*

The Bear Management Officer (BMO) or other field personnel (WGFD), Trophy Game Coordinator, and Grizzly Bear Recovery Coordinator (USFWS) believe the probability to trap or otherwise deter the bear is low,

Then WGFD field personnel may continue with traditional management approaches or lethally remove the bear by techniques other than trapping.... Lethal control will be contingent upon the BMO or other field personnel, to the best of their ability and supported by evidence, to properly identify the depredating bear. It also will be dependent on the availability of a safe and humane opportunity to remove the bear

Male grizzly bears previously captured within and near the project area and relocated could return and continue predation on sheep and cattle. If Guideline recommendations for nuisance bears are followed (Table 4-4a), these repeat offenders, will be removed from the population. In addition, as the Yellowstone bear population expands other bears may utilize the area or be affected by livestock operations. These bears could be subject to harassment, trapping, human/bear conflicts, and/or possible accidental handling death.

Indirect impacts associated with the proposed action could include: 1) Conditioning of bears to livestock as prey and subsequent conflicts and associated management actions outside of the project area, 2) the loss of reproductive potential for bears removed from the population, and 3) potential disturbance to grizzly bear social systems and declines in foraging efficiency, reproductive potential, and survival associated with relocating bears.

The short-term impacts of the proposed action on grizzly bears include: 1) the displacement of individual bears from bear habitat, as a result of human activities associated with the allotments, 2) disruptions to behavior, social systems, and activity patterns as a result of trapping, handling, and relocating bears, and 3) the potential for short-term declines in reproductive potential as a result of trapping, handling, and relocating bears.

The long-term impacts of the proposed action on grizzly bears are primarily related to the loss of individual bears and their reproductive potential due to any removals that may occur, and the effects of this on the long-term viability of the Yellowstone population.

Conservation measures already in place, plus any additional recommendations in the Biological Assessment or USFWS concurrence letter should reduce the possibility of human/bear conflicts, bear predation on livestock and/or bear relocations and removal for Alternatives A and B.

Several issues could increase the cumulative impacts to bears across the ecosystem in the future. These include:

- Loss of habitat through habitat fragmentation and disturbance from:

1. Private land development
2. Increased roads and associated recreation
3. Recreation increasing on and off current and future roads and trails,
4. Oil and gas leasing causing habitat fragmentation and increasing access to previously less used areas
5. Increased fire and insect damage potential of advanced seral stage vegetation (e.g., blister rust in whitebark pine; increased insect damage to drought weakened trees)
6. Noxious weed populations and potential spread of these populations

- Mortality risks increasing from:

1. Private land development and more potential to run into conflicts with people on those private lands
2. Hunter-grizzly bear conflicts (self-defense)
3. Grazing operations on surrounding federal, state and private lands
4. Human health and safety
5. Black bear baiting causing grizzlies to be shot via mistaken identity and/or habituation to human food sources.

- Reduced food sources from:

1. The control of brucellosis in bison and elk, which could result in significant, if not short-term, reductions in ungulate densities
2. Competition for prey species with wolves and other increasing large predator populations
3. Whitebark pine nuts (blister rust disease)
4. Ongoing drought

Summary

Impacts of Alternatives A or B on grizzly bears could include:

- the loss of habitat due to the presence of livestock and associated human activities in otherwise available grizzly bear habitat;
- impacts to individual bears as a result of trapping, handling, relocating, or removing bears, including changing behavior and activity patterns, and reducing foraging efficiency, reproductive potential, and survival, and;
- impacts to the Yellowstone population as a result of trapping, handling, relocating, or removing bears, including changing behavior and activity patterns, and reducing foraging efficiency, reproductive potential, and survival.

Bald eagle

There is one known occupied bald eagle nest site located north of Dollar Lake on the Upper Green allotment. There is a second nest adjacent to the allotment located on the southern end of the Lower Green River Lake. The project area also supports migrant and wintering birds depending on availability of open water and foraging opportunities. Input from Kendall Warm Springs often keeps a large stretch of the Green River ice-free winter long. Fish, waterfowl, and carrion are the most abundant food sources.

The nest on Dollar Lake was established with existing levels of disturbance. Human disturbance appears above what is usual for other nests in the Greater Yellowstone Area. Most of this disturbance is related to recreation activities. Nest production has remained high, however. Although cattle and grazing related human activities could flush birds from the nest or other perch trees, no change is expected in bald eagle nesting activity or changes to the adjacent habitat as a result of any grazing alternative.

Cumulative impacts would include those associated with the proposed action combined with other impacts on the GYA bald eagle population. Currently, the most significant threat bald eagles in the ecosystem face is the development of private lands in nesting habitat (Greater Yellowstone Bald Eagle Working Group 1996). Increasing levels of visitation and recreation also threatens nesting habitat security.

Summary

Implementation of Alternative A or B will have little impact on local or regional bald eagle populations.

Canada lynx

As directed by the LCAS, effects analysis for lynx is done by LAU whose boundaries do not match the allotment boundaries being considered for this project. The following table shows lynx habitat by allotment:

Table 4-5
Lynx Habitat by allotment

ALLOTMENT	Total Acres	Suitable lynx habitat (%)
Badger	7300	6675 (92%)
Beaver-Twin	22300	14,852 (67%)
Kendall (administration pasture)	59	0
Noble Pastures	760	249 (33%)
Roaring Fork	8300	4396 (52%)
Upper Green	123900	71,767 (57%)
Kinky Creek	6200	4482 (72%)
Wagon Creek	240	62 (34%)
totals	169,000	102,845 (60%)

Disturbance calculations: Total project area: 169,000 acres. Past timber harvest (FW layer) 7700 acres; past fire 1100 acres. Suitable lynx habitat: 103,000 acres or approximately 60% of the project area. 8800 acres disturbed is approximately 9% of the suitable lynx habitat within these allotments. Disturbance by LAU is considerably less.

Direct effects
In general, lynx habitat does not overlap high and moderate expected use areas for cattle. The greatest potential habitat overlap would be within aspen. Potential direct impacts to lynx or lynx habitat are low.

Indirect effects
Cattle grazing could impact habitat for lynx prey species that occur in open habitats. Potential prey species would include snowshoe hare, ground squirrels, and other small mammals. Potential impacts are low.

The LCAS (2000) lists several guidelines directly or indirectly linked to livestock grazing. These are:

- *E. (S2) Manage grazing in aspen stands to ensure sprouting and sprout survival sufficient to perpetuate the long-term viability of the clones (LCAS p. 7-11).*

- *E. (S3) Within the elevational ranges that encompass forested lynx habitat, shrubsteppe habitats should be considered as integral to the lynx habitat matrix and should be manage to maintain or achieve mid seral or higher condition (LCAS p. 7-11).*
- *(S3) Evaluate the potential importance of shrub-steppe habitats in providing landscape connectivity between blocks of lynx habitat (LACS p. 7-14). Ties to E. (S3) above.*
- *E. (S4) Within lynx habitat, manage livestock grazing in riparian areas and willow carrs to maintain or achieve mid seral or higher condition to provide cover and forage for prey species (LCAS p. 7-11).*
- *(S1) Predator control activities, including trapping or poisoning on domestic livestock allotments will be conducted by WS personnel in accordance with FWS recommendations established through Section 7 (LACS p. 7-12).*

Existing and proposed monitoring and guidelines in Alternatives A and B addresses the above direction as it relates to livestock grazing. A detailed analysis is contained in the Biological Assessment. Direct, indirect, and cumulative effects are predicted to be low for Alternatives A or B.

Gray wolf

Direct impacts from Alternative A or B would include impacts to individual wolves as a result of management actions associated with livestock conflicts. Management actions could include harassment or aversive conditioning, trapping and relocating, or trapping and removing from the population. Wolf depredation on domestic livestock has occurred throughout their coexistence, and is the primary reason for their extirpation in much of the Rocky Mountain area (Bangs et al. 1994).

Indirect impacts associated with the proposed grazing could include: 1) conditioning of wolves to livestock as prey and subsequent conflicts and associated management actions outside of the project area, 2) the loss of reproductive potential for wolves removed from the population (especially the loss of alpha adults), 3) potential disturbance to wolf social systems and declines in foraging efficiency, reproductive potential, and pack dissolution, possibly resulting in additional conflicts, 4) competition for prey with grizzly bears and other increasing large predators, and 5) displacement of elk by cattle.

Short term impacts would include impacts to individual wolves as a result of management actions associated with livestock conflicts, and habitat displacement as a result of human activities associated with grazing. Management actions could include harassment or aversive conditioning, trapping and relocating, and, trapping and removing from the population.

We expect wolf predation will occur on cattle within these allotments under Alternative A or B, and that wolves will be removed/euthanized as a result of this predation. In 2003, 3 wolves located within the project area were euthanized for cattle depredations. Wolves have been removed from adjacent sheep allotments in past years.

Long-term impacts of proposed grazing are primarily related to the loss of individual wolves and their reproductive potential due to any removals that may occur, and the effects of this on the long-term viability of wolves in the Yellowstone Recovery Area. Habitat loss and

displacement also occurs from other factors mentioned in the grizzly bear section, as well as increasing mortality risks. Since it is legal to shoot coyotes on the National Forest, there could be increased mortality risks to wolves through mistaken identity. There may also be displacement of wolves during the hunting season, as large numbers of hunters move into areas with relatively little use during the rest of the year. This also occurs on surrounding state, federal, and private lands.

Summary

The primary effects on wolves from Alternatives A or B are management actions taken against wolves following depredation(s) of domestic livestock. Therefore, domestic livestock presence within known wolf range possesses inherent risk.

Regardless of management efforts and permittee actions, lethal control of wolves in response to depredation on legally present domestic livestock on Forest Service managed lands remains a possibility. Notwithstanding recent and anticipated control measures, the Yellowstone population has reached recovery goals.

Table 4-6 Summary of potential effects to sensitive species for grazing alternatives A and B

Species	Status *	Potential effects**
Fish:		
Colorado River cutthroat trout (Oncorhynchus clarki pleuriticus)	K	See fish section
Snake River fine spotted cutthroat trout (Oncorhynchus clarki ssp)	K	See fish section
Wildlife:		
Spotted Frog (*Rana pretiosa*)	K	MIIH
Common loon (*Gavia immer)*	K	NI
Harlequin duck (*Histrionicus histrionicus*)	S	NI
Trumpeter Swan (Cyngus buccinator)	K	MIIH
Boreal owl (*Aegolius funereus*)	S	NI
Flammulated owl (*Otus flammeolus*)	S	NI
Three-toed woodpecker (*Picoides tridactylus)*	K	NI
Townsend's big-eared bat (*Plecotus townsendii)*	NS	NI
Wolverine (*Gulo gulo)*	K	NI
Fisher (*Martes pinnanti)*	NS	NI
Northern Goshawk (*Accipiter gentilis)*	K	NI
Great gray owl (*Strix nebulosa*)	K	NI
Spotted Bat (*Euderma maculatum*)	NS	NI
Peregrine Falcon (*Falco pergrinus*)	K	NI
Greater sage-grouse (*Centrocercus urophsianus*)	K	MIIH
Pigmy rabbit *(Brachylagus idahoensis*)	NS	NI
Known Plants:		
Payson's milkvetch *(Astragalus paysonii)*	K	NI
Seaside sedge *(Carex incurviformis)*	K	NI
Boreal draba *(Draba borealis)*	K	MIIH
Wooly fleabane *(Erigeron lanatus)*	K	NI
Narrowleaf goldenweed *(Haplopappus macronema var. linearis)*	K	NI
Payson's bladderpod *(Lesquerella paysonii)*	K	MIIH
Naked-stemmed parrya *(Parrya nudicaulis)*	K	NI
Greenland primrose *(Primula egaliksensis)*	K	MIIH
Weber's saw-wort *(Saussurea weberi)*	K	NI

***Status Key:** K = known; S = suspected in area of influence of proposed action; NS = not suspected in area of influence of proposed action.

****Potential effect:** NI = no impact; MIIH = may impact individual or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species; WIFV = will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species; BI = beneficial impact.

As discussed above, no impacts are expected from grazing alternative A or B to forest dependent sensitive species: boreal owl, flammulated owl, three-toed woodpecker, wolverine, fisher, northern goshawk, or great gray owl. No impacts are expected to the Forest Plan MIS forest dependent species, pine marten.

Other plant species that are designated as Sensitive, but are not known to occur in the project area include: pink agoseris, sweet-flowered rock jasmine, soft aster, meadow milkvetch, starveling milkvetch, black and purple sedge, Wyoming tansymustard, rockcress draba, Slickspot peppergrass and creeping twinpod. These species could occur in suitable habitat, but have not been located during existing surveys. There will be "No Impact" on these species.

Utilization, stubble height, stocking rates, and stream bank trampling guidelines for alternatives A and B are intended to maintain or improve rangeland and riparian habitat for trumpeter swan and spotted frogs. Deferred and rest rotation pastures will provide undisturbed habitat where animals will not be disturbed or displaced by cattle or additional human activities associated with livestock management.

No impacts are anticipated to aquatic dependent species such as the common loon and harlequin duck.

Minimal impacts are expected to Forest Plan MIS/sensitive species, Brewer's sparrow or greater sage-grouse, sagebrush obligates. Upland utilization and ground cover standards are designed to maintain or enhance grass/sage habitats. No sage treatment is proposed as part of this analysis. In addition, deferred and rest rotation pastures will provide undisturbed habitat where birds will not be disturbed or displaced by cattle or additional human activities associated with livestock management.

Fisheries and TES Fish Species Environmental Consequences

Introduction

Environmental effects upon fisheries were determined based upon expected responses of stream channels according to the alternative and its mitigation measures. To compare the environmental effects by alternative, therefore, assumptions and generalizations were made to quantify effects upon fisheries. Key assumptions in this analysis are:

- Effective compliance with mitigation measures during the period of time necessary for hydrologic recovery (assumed to be 5 to 10 years).

- Critical areas recovery would likely reflect upward trends in adjacent stream reaches. Exceptions may include use of fences to exclude critical areas from livestock use.
- Short and long term impacts are not differentiated because short-term (2 years) sediment delivery to streams can have long-term impacts to aquatic resources. This assumption is based upon the length of time required (possibly decades) for stream systems to move sediment (Bunte and McDonald 1999), stream bank natural recovery rates (Platts 1983), and fish population responses to changed habitat conditions (Platts 1981).

Magnitudes of Effects to Fisheries

Table 4-7
Magnitudes of potential adverse livestock grazing effects to fisheries.

Magnitude of Effects			
Alternative	**A**	**B**	**C**
Effects	**Greatest** →		**Least**

Kendall Warm Springs Dace

Alternatives A and B

Generally, continued grazing within the Upper Green River allotments would not change the existing conditions within Kendall Warm Springs or surrounding fenced area. Fence enclosure would be maintained to prevent cattle from trampling stream banks, removing streamside vegetation, and chemical enrichment of waters containing Kendall Warm Springs dace.

Alternative C

Without livestock grazing in the vicinity of Kendall Warm Springs, a fence to exclude livestock from the spring area would be unnecessary. Selection of Alternative C would result in removal of about 2 miles of fence. Risks to Kendall Warm Springs dace by cattle would be removed.

Colorado pikeminnow, humpback chub, bonytail, and razorback sucker

Alternatives A and B are considered to be historic water depletions, since increases in livestock numbers over current allowed use is not proposed. According to a USFWS Biological Opinion on 'Elimination of Fees for Water Depletions of 100 acre-feet or less from the Upper Colorado River Basin' (USFWS 1997, amended May 2000), impacts on endangered fish due to project depletions of less than 100 ac-ft/year are offset by recovery actions accomplished by the Upper Colorado River Basin Endangered Fish Recovery Implementation Program and do not require the project proponent to pay a depletion charge.

Upper Green River allotment complex would not exceed the 100 acre-feet and would not be required to pay annual depletion feet (Table 1). [1]

Water depletion assumptions and calculations:

Cattle water consumption rates:

Mature cow and bulls = 10 gallons per day
Yearlings = 10 gallons per day
Cow calf pair (animal unit) = 12 gallons per day

Acre Foot = 325,851 gallons

Table 4-8
Annual estimated water consumption by permitted livestock in the Upper Green River allotments for Alternatives A and B.

Allotment	Season	Permitted Cow/Calf	Other Type	Days	Water Depletion (Acre Feet)
Badger Creek	07/01-09/30	157		90	0.5
Beaver-Twin Creeks	07/15-10/15	662	33 bulls	90	2.3
Noble Pastures	06/14-09/20	314	110 yearling	110	1.7
Roaring Fork	06/16-10/15	170		121	0.8
Gypsum Pastures	06/16-10/15	2,000		121	8.9
Mud-Fish Pastures	06/16-10/15	2,800		121	12.5
Mosquito Pastures	06/16-10/15	1,800		121	8.0
Tosi-Tepee Pastures	06/16-10/15	1,000		121	4.5
Wagon Creek	07/15-10/15	26		93	0.1
TOTALS		8,929			39.3

Total estimated water usage for Alternatives A and B could be as high as 39 ac-ft per year. No water would be required for Alternative C because livestock grazing of cattle would not be permitted on NFS lands.

[1] The USFWS has the responsibility to review biological assessment(s) and inform the Deciding Official as to the necessary requirements that will offset depletion impacts. If new depletions were to exceed 100 ac-ft, then a one-time depletion charge would be assessed to project proponent ($15.68/ac-ft for FY2003) to offset depletion impacts.

Coldwater Fishes and Aquatic Habitat

Focal stream reaches represent those channel segments that are most sensitive to disturbance, or have unique or irreplaceable aquatic resource values. Most of the focal stream segments chosen for analysis were low gradient segments that generally represent the highest fisheries production in terms of spawning, rearing, and adult habitat. Those chosen for sampling and analysis do not represent stream conditions across the entire allotment or pasture. A key assumption in this analysis is by managing the focal areas to meet aquatic objectives, less sensitive aquatic habitats would be expected to meet or exceed objectives. However, there may be situations where livestock management to limit use in focal areas would result in over-use in adjacent areas.

Protocols for measuring stream parameters within focal areas followed those described by Kershner, Henderson, and Archer (2002)[2]. Primary stream channel measurement was bank stability, which was further categorized by vegetated or non-vegetated stable, vegetated or non-vegetated unstable. For this analysis, trampling, bank shear, cumulative failure, and historical disturbance were aggregated and categorized as bank disturbance. Field observations noted domestic livestock had caused the majority of current years' bank disturbance. Several other stream measures were collected in support of this analysis and are included in the project record.
Critical area sample sites were located with GPS to the nearest 12 meters (See Alternative B map Chapter 2). The critical areas listed were established by the ID Team primarily within the focal areas described in the Fisheries sections

The definition of a critical area is; an area in need of special management consideration due to their unique characteristics or their unique sensitivity to disturbance. They are areas that do not currently meet desired future conditions for one or more resource area. Critical areas are different from key areas because they aren't intended to represent a larger area or to sensitive to changes in single management action. The causative factors may or may not be easy to identify. Generally, it is difficult or impossible to quantify the role that each causative factor plays in retarding attainment of desired future conditions.

Table 4-9 displays sample results within critical areas on streams in the Upper Green River allotments analysis. Clear Creek is included as a reference of a stream segment not grazed by domestic livestock. The comparison between disturbance and stability indicates large variability in bank stability however it appears that bank stability decreases with increasing disturbance. Some of this variability may be explained by differences between sample locations in soil type, stream gradient, vegetation, and sampling error. There are a wide range of soil and geologic types within the project area and Clear Creek is located upon one of the most stable types for natural streambank stability, this makes its use a conservative estimate of natural conditions.

Objectives

[2] Effectiveness monitoring protocols may be viewed and downloaded from the internet at the following address: http://www.fs.fed.us/biology/fishecology/emp/strProto02.pdf

For streams supporting populations of trout, greater than 90 percent of natural bank stability is the desired future condition. These desired future conditions and objectives were based upon interpretation of the Forest Plan Standard and Guidelines, data from reference streams within the project area, and the scientific literature. Reference streams include Clear Creek.

Alternative A

Generally, in grazed areas, stream channels contain more fine sediment, stream banks are more unstable, banks are less undercut, and summer water temperatures are higher than is the case for streams in un-grazed areas. Cumulatively, these conditions result in reduced salmonid populations (Platts 1991). Using stream bank stability as an indicator of aquatic habitat health, four of the twenty-one samples exceeded the 90 percent stream bank stability objective (Table 4-9). Percent of natural stream bank stability for the remaining 17 samples ranged as low as 40 percent stable stream banks.

There have been substantial improvements in rangeland and stream conditions on public lands over the past 100 years (Ohmart 1996). However, within the past 10 to 20 years, gazing management within the Upper Green River allotments has not changed substantially. Current management under existing Allotment Management plans (completed in 1970's) have not resulted in meeting stream channel objectives in 17 of the 22 critical areas sampled during this analysis. However a number of the critical areas that do not meet the objectives have multiple causative factors such as road crossings that have not been hardened, fence line and stream crossing. The four critical areas, which do meet the bank stability objective, may be more a result of stream channel resiliency than grazing management; as there is no evidence that these areas are managed differently than those that are not meeting objectives. Therefore, implementation of Alternative A will result in maintaining current degraded habitat conditions and reduced salmonid populations in these critical areas assuming no changes in grazing management. It is unlikely that the stream bank stability desired future conditions on these critical areas would be met by implementing Alternative A.

Table 4-9
Percent bank disturbance and stability for critical areas within Upper Green River allotments and pastures. Bank disturbance combines current and historic measurements.

Allotment	Pasture	Creek	Critical Area Sample Number	Percentage of Natural Streambank Stability*	**Managed for Native** Cutthroat
REFERENCE STREAM	**None**	**Clear Creek**	**1**	91(actual measurement)	No
Beaver-Twin	None	Big Twin	5	75	No
Beaver-Twin	None	Little Twin	10	82	No
Beaver-Twin	None	North Beaver	8	100	No
Beaver-Twin	None	Rock	--	--	Yes
Badger Creek	None	Big Twin	12	77	No
Wagon Creek	None	Wagon	20	55	No
Noble Pastures	Number 1	Tosi	9	54	No
Roaring Fork	None	Roaring Fork	2	75	No
Upper Green: Gypsum Unit	Lower	Gypsum	14	70	No
Upper Green: Gypsum Unit	Upper	Gypsum	17	74	No
Upper Green: Mosquito Unit	NE Pasture	Wagon	21	40	No
Upper Green: Mosquito Unit	NW Pasture	Wagon	16	70	No
Upper Green: Mosquito Unit	SE Pasture	Wagon	15	46	No
Upper Green: Mud-Fish Unit	Mud Lk. East	Roaring Fork	7	97	No
Upper Green: Mud-Fish Unit	Mud Lk. West	Crow Creek	4	100	No
Upper Green: Mud-Fish Unit	Fish Creek	S. Fork Fish	18	53	Yes
Upper Green: Mud-Fish Unit	Fish Creek	S. Fork Fish	13	64	Yes
Upper Green:: Tepee-Tosi Unit	Upper Tepee	Tepee	19	42	Yes
Upper Green: Tepee-Tosi Unit	Upper Tepee	Tepee	3	82	Yes
Upper Green: Tepee-Tosi Unit	Upper Tosi	Tepee	6	62	Yes
Upper Green: Tepee-Tosi Unit	Lower Tosi	Tosi	11	70	Yes
Upper Green: Tepee-Tosi Unit	Kinky	Kinky	22	99	No

*Numbers are a weighted percentage based upon using Clear Creek as the natural condition.

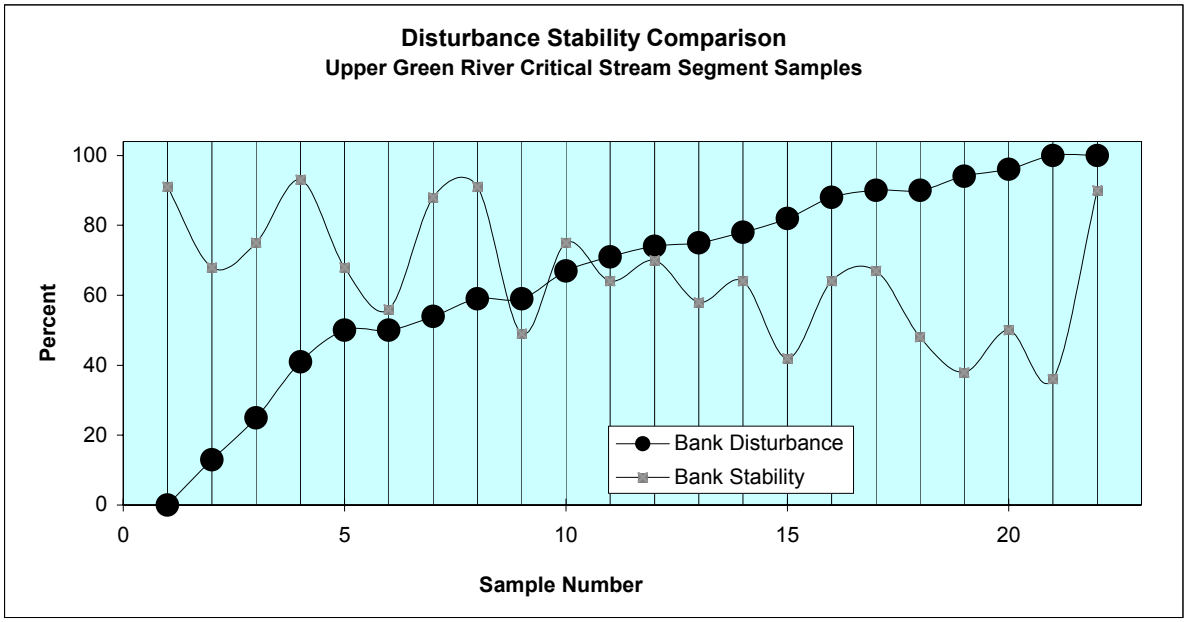
Finespotted Snake River cutthroat trout (SRC) population in South Fork Fish Creek is identified as depressed (USDA Forest Service 1998). Degraded fish habitat conditions were documented in the two critical stream segments with stream bank stability at 53 and 64 percent and bank disturbance at 75 and 90 percent. Implementation of Alternative A will result in maintaining current degraded conditions and high risk to this population, based upon simplified habitat and little hydrologic complexity[3]. Therefore, selection of Alternative A will impact individuals or habitat.

Colorado River cutthroat trout (CRC) in Tepee Creek are considered to be at high risk of extinction based upon the small population size, isolation in a small headwater stream, the presence of non-native trout populations, and degraded habitat conditions. Degraded habitat conditions were documented in the three critical areas with stream bank stability at 42, 82 and 62 percent and bank disturbance at 58, 25 and 94 percent. Implementation of Alternative A will result in maintaining current degraded conditions within the critical area and high risk to this population. Streambank disturbance is a measure of the livestock induced alterations and is categorized as shearing, cumulative shearing/failure, trampling, cattle crossing, or historic shearing. The purpose is to measure the amount of livestock induced streambank disturbance and other disturbance at any given time. Stability is a measure of the streambank's susceptibility to erosion. It incorporates all natural and management related impacts to the streambank. Streambank disturbance helps determine when to move the livestock during any given season, while streambank stability helps us evaluate if we are effective in maintaining healthy resilient streambanks.

Therefore, selection of Alternative A will impact individuals or habitat.

[3] Risk levels are subjective based upon interpretations of available data and understanding of metapopulation dynamics of native cutthroat trout populations within the project area. For additional information on risk assessment, see Rieman et al. (1993).

Figure 4-1
Stream bank disturbance compared to bank stability in critical stream areas within



Colorado River cutthroat trout (CRC) in Rock Creek are considered to be at high risk of extinction based upon the small population size, isolation in a small headwater stream, and the presence of non-native trout populations. However, habitat conditions were not considered degraded, based upon stream channel measurements in 1989 and field review in 2002. Implementation of Alternative A will result in maintaining current habitat conditions assuming no change in grazing management. Therefore, selection of Alternative A is not likely to impact individuals or habitat in Rock Creek, although a high risk of extinction from factors other than grazing remains present.

Alternative B

In order to minimize impacts as described for Alternative A, the following utilization levels along stream banks are incorpoated (Table 4-10). Criteria for establishing recommended utilization levels included existing stream bank stability, presence or absence of native cutthroat trout populations, historical and current year stream bank disturbance by ungulates.

Table 4-10
Stubble height along green line and visible trampling of stream banks within critical areas of the Upper Green River Allotments.

Stream Name	Allotment	Pasture	Critical Area Sample No.	Maximum Percent Bank Trampling	Minimum Green Line Stubble Height (in)
Big Twin Creek	Beaver-Twin	None	5	≤20	4
Little Twin Creek	Beaver-Twin	None	10	≤20	4
North Beaver Creek	Beaver-Twin	None	8	≤20	4
Rock Creek	Beaver-Twin	None		≤10	4
Big Twin Creek	Badger	None	12	≤20	4
Wagon Creek	Wagon	None	20	≤20	6
Tosi Creek	Noble Pastures	1	9	≤20	6
Roaring Fork	Roaring Fork	None	2	≤20	4
Gypsum Creek	Gypsum	Lower	14	≤20	6
Gypsum Creek	Gypsum	Upper	17	≤20	6
Wagon Creek	Mosquito	NE Pasture	21	≤20	6
Wagon Creek	Mosquito	NW Pasture	16	≤20	4
Wagon Creek	Mosquito	SE Pasture	15	≤20	6
Roaring Fork	Mud-Fish	Mud East	7	≤20	6
Crow Creek	Mud-Fish	Mud West	4	≤20	4
SF Fish Creek	Mud-Fish	Fish Cr	18	≤10	6
SF Fish Creek	Mud-Fish	Fish Cr	13	≤10	6
Tepee Creek	Tepee-Tosi	Upper Tepee	19	≤10	6
Tepee Creek	Tepee-Tosi	Upper Tepee	3	≤10	6
Tepee Creek	Tepee-Tosi	Upper Tosi	6	≤10	6
Tosi Creek	Tepee-Tosi	Lower Tosi	11	≤10	6
Kinky Creek	Tepee-Tosi	Kinky	22	≤20	4

The level of use within these critical areas is the most important consideration to meet aquatic objectives (Clary and Webster 1989). If Alternative B mitigation measures to meet objectives are not successful, then through adaptive management additional protective measures may be instituted. These may include establishing key species residual vegetation height along the green line, allowable stream bank disturbance levels, and various periods of total rest. Each critical stream segment would be expected to have a different livestock use prescription based upon current stream channel condition, current grazing intensity and strategy, and sensitivity or resiliency of stream channel segment. Residual vegetation height along the green line is one common utilization measure to manage livestock with the objectives to provide sufficient vegetation to maintain plant vigor, bank protection, and sediment entrapment. Clary and Webster (1989) recommend a 4 to 6 inch stubble height where grazing is allowed in riparian areas, and stubble heights greater than 6 inches required in critical fisheries habitats or easily eroded stream banks. Winward (Pers. Com.) and, Clary and Webster (1989) also suggest establishing trampling disturbance threshold as another means of managing livestock to control accelerated streambank erosion. Complete rest may

be needed to recover some degraded areas. Amount of rest depends on site conditions but general recommendations are 5 or more years (Shultz and Leininger 1990, Skovlin 1985, Rickard and Cushing 1982).

Assuming changes in allotment management results in meeting streambank stability objectives stated above, implementation of Alternative B would result in improvement of current degraded habitat conditions and increased salmonid populations within the project area. However, the response time expected from alternative implementation to projected habitat improvement and fish population response may be ten years or more (Platts 1981).

Finespotted Snake River cutthroat trout (SRC) population in South Fork Fish Creek is currently identified as depressed (USDA Forest Service 1999). Critical stream segments documented degraded habitat conditions with stream bank stability at 53 and 64 percent and bank disturbance at 75 and 90 percent, respectively. Implementation of Alternative B would result in improvement of current degraded habitat conditions and increased salmonid populations. However, the response time expected from alternative implementation to projected habitat improvement and fish population response may be ten years or more. Therefore, selection of Alternative B will impact individuals or habitat with a consequence that during the next ten years, the action may contribute to a trend towards Federal listing or cause a loss of viability to the Gros Ventre River subbasin population, though not the species. Once habitat objectives are met, the action is not likely to contribute to a trend towards Federal listing or cause a loss of viability to the Gros Ventre River subbasin population, though not the species.

Colorado River cutthroat trout (CRC) in Tepee Creek are considered to be at high risk of extinction based upon the small population size, isolation in a small headwater stream, the presence of non-native trout populations, and degraded habitat conditions. Critical stream segments documented degraded habitat conditions with stream bank stability at 42, 82, and 62 percent and bank disturbance at 58, 25 and 94 percent, respectively. Implementation of Alternative B would result in improvement of current degraded habitat conditions and increased salmonid populations. However, the response time expected from alternative implementation to projected habitat improvement and fish population response may be ten years or more. Therefore, selection of Alternative B will impact individuals or habitat with a consequence that during the next ten years, the loss of this population will contribute to a trend towards Federal listing for this species, and cause a loss of viability to the Upper Green River subbasin population and species. Once habitat objectives are met, the action is not likely to contribute to a trend towards Federal listing or cause a loss of viability to the Gros Ventre River subbasin population, though not the species.

Colorado River cutthroat trout (CRC) in Rock Creek are considered to be at high risk of extinction based upon the small population size, isolation in a small headwater stream, and the presence of non-native trout populations. However, habitat conditions are not considered degraded, based upon stream channel measurements in 1989 and field review in 2002. Implementation of Alternative B will result in maintaining current habitat conditions assuming no change in grazing management. Therefore, selection of Alternative B is not

likely to impact individuals or habitat in Rock Creek, although a high risk of extinction from factors other than grazing remains present.

Alternative C

Rangeland and aquatic systems evolved with ungulate grazing by deer, elk, moose, and bison (Mack and Thompson 1982). It has been hypothesized that current livestock management emulates these natural use patterns (Thomas 1991) and livestock grazing is necessary to maintain landscape vegetation patterns and watershed health. While elk and bison herds would have tended to create high level of disturbance in relatively localized areas, these use patterns may not have occurred each year or in the same locations, allowing rest and recovery. This pattern of use might be characterized as high intensity and periodic disturbances. Domestic livestock are managed to graze the same ground each year (allotments and pastures) creating more chronic impacts within riparian areas (Wuerthner 1997). Implementation of a rest rotation or rotational grazing may reduce these potential effects. Even though domestic livestock grazing might occur at a lower intensity than native ungulates, cattle tend to remain near streams (Makie 1970). This pattern of management does not allow the periodic rest necessary for vegetation recovery (Platts and Nelson 1985). Chronic habitat degradation reduces the ability of small headwater streams to recover; and native cutthroat trout populations and other dependent organisms at high risk of extinction continue to exhibit depressed populations.

Scientific literature provides abundant documentation of the positive effects on stream habitat conditions and fish population responses upon eliminating streamside grazing of domestic cattle (Knapp and Mathews 1996, Platts 1981, Myers and Swanson 1995, Overton et al. 1994). Local examples also show dramatic habitat improvement once stream bank disturbance from livestock is removed. For example, Klondike Creek in Noble Pastures allotment (pasture #4) maintains bank stability at 95 percent, compared to 70 percent of natural banks stability in adjacent Tosi Creek (pasture #1). Bank stability is 75 percent within exclosure on Tepee Creek in comparison to 42 percent of natural bank stability above exclosure (Table 2). Fish populations increase in response to improved stream habitat once livestock grazing is removed. Platts (1981) reported fish densities were more than ten times higher in lightly grazed or no grazing in comparison to heavily grazed stream sections. Knapp and Mathews (1996) found a significant difference in fish populations between grazed and ungrazed areas. It is highly probable that the desired conditions and habitat objectives listed for Upper Green Allotments would be met by implementing Alternative C. Therefore, implementation of Alternative C will result in improving current degraded habitat conditions and increasing salmonid populations within the project area

Direct effects to finespotted Snake River and Colorado River cutthroat trout populations would be increased population size and resiliency because of improved habitat conditions. Therefore, selection of Alternative C will beneficially impact individuals or habitat with a consequence that there would be increased populations and the action would not contribute to a trend towards Federal listing for these species, nor cause a loss of viability to the subbasin populations or species.

Cumulative Effects

Geographic Scope

Project impact zone for this analysis is the watershed level (5th level hydrologic unit code). Watershed level analysis was chosen for two reasons: First, the potential for contributed stream sediment to travel downstream and reduce aquatic habitat production. Second, it is likely that migratory forms of fish may travel up and downstream at the watershed scale and possibly throughout the subbasin.

Analysis Time Frame

One hundred years into the future – representing a period spanning several generations for the salmonid species present within the project area, time frame relevant to forest management, and the delayed response time of aquatic habitats to forest management activities.

Identified Other Actions - Past, Present, and Foreseeable Future Actions

Existing conditions are the result of past and ongoing management activities such as forest roads, fisheries management, forest and rangeland management. An emphasis upon roads is due to cumulative human use, and roads' contribution to the disruption of hydrologic function and increase sediment delivery to streams. Roads provide access, and the activities that accompany access magnify their negative effects on aquatic habitats. Activities associated with roads within the project area include fishing, recreation, timber harvest, livestock grazing, and agriculture. Roads also provide an avenue for stocking non-native fishes.

The interdisciplinary team identified 40 past and present ground disturbing activities, and a number of reasonably foreseeable future ground disturbing activities. Given the nature of these activities, the primary cumulative impact to aquatic habitat and fish populations can be summarized into the following four categories:

- Historical and current livestock grazing;
- Past, present and future forest roads management;
- Past introductions of non-native fish species; and
- Future watershed restoration.

Livestock grazing records in the Beaver-Twin and Roaring Fork allotments indicate that the numbers of cattle were at least double the number of permitted cattle today. In the Upper Green allotments, records show that prior to 1925 there was 5 times the number of cattle upon the range than grazed today (see Range Vegetation section in this EA). Past effects on streams include reduced stream productivity from high percentage of bank erosion; high sediment delivery to streams; decreased pool frequency, depth, and size; loss of riparian vegetation and fish cover; and increased water temperatures. During this time of high livestock densities, and presumably highly degraded fish habitats, non-native trout species

were transported to headwater streams throughout the Upper Green (Behnke 1992). Hybridization with rainbow and other cutthroat species and replacement by brook and brown trout virtually eliminated the Colorado River cutthroat trout. Finespotted Snake River cutthroat trout have managed to resist hybridization and competition from non-native trout introductions (Behnke 1992).

Erosion can be expected from forest roads that are not adequately maintained (i.e. ditches, rutted and dished surface) (Tysdal et.al 1999, Kennedy 1997). Sediment delivery to streams from roads can mask the effects from livestock grazing sources (Myers and Swanson 1995). Watershed assessment (USDA 1999) and stream crossing assessments[4] indicates the high density of roads and numerous stream crossings within the project area are impacting aquatic resources. Road densities greater than one mile per square mile has been correlated with reduced salmonid populations (Dunham and Rieman 1999, Thompson and Lee 2000). Causal relationships between road density and fish populations are sediment delivery to streams with resulting loss of habitat and reduced embryo survival; population isolation and fragmentation from migration barriers at road crossings; and introductions of non-native fish species. Stream crossing assessment data suggests that over 80 percent of the road crossings in the Bridger-Teton National Forest are point sources of sediment delivery to streams.

The following section summarizes the expected cumulative effects by watershed based upon existing conditions and expected response to changes in land management and corresponding changes in fish habitat and fish populations.

Fish Creek Watershed

Finespotted Snake River cutthroat trout populations are considered depressed within this watershed because of the past management activities and their resulting effects on aquatic habitat.[5] Primary impacts to populations are loss of habitat due to livestock grazing and roads. Road densities and number of stream crossings exceed 1 per square mile within the subwatersheds contained in the Upper Green Allotment (Table 4-11). Foreseeable future projects identified for this watershed include road restoration. Estimated 70 miles of road have been closed since 1996; roads restoration is planned in the foreseeable future..

Expected cumulative impacts to aquatic habitats with implementation of Alternative A will result in maintaining current degraded conditions and high risk to this SRC population. Some improvement by reducing sediment delivery could be expected as a result of road closures and reducing erosion at stream crossings. However, response by fish populations would be insignificant in relation to existing conditions and the minor amount of watershed improvements planned. There would be expected improved fish habitat conditions with implementation of Alternative B along with planned road restoration. However, projected time for improved stream habitat conditions under mitigated grazing could be 10 to 20 years. Fish population trends are expected to reflect this delay in hydrologic recovery and will remain at high risk until habitat is recovered. Implementation of Alternative C along with watershed restoration projects would result in the quickest recovery of habitat and

[4] Stream Crossing Inventory data on file.
[5] Inland West Watershed Initiative assessment available in project file.

resulting fish populations. Fish population response may take 5 to 10 years before responding to improved aquatic habitat and hydrologic function following removal of livestock (Shultz and Leininger 1990, Skovlin 1985, Rickard and Cushing 1982).

Upper Gros Ventre Watershed

Only a small portion of Upper Gros Ventre watershed overlaps with the Upper Green River allotments - about 9 square miles. The headwaters of Kinky Creek, a non-fish bearing stream, are contained within the allotments. The finespotted Snake River cutthroat trout populations in the Upper Gros Ventre watershed were considered strong. Strength of these populations may be a reflection of the low road density and low number of stream crossings (Table 4-11.).

Table 4-11
Summary of road densities in miles per square mile within the project area displayed by watershed

Watershed Name	HUC 5	Area within project area (sq.mi.)	Road Miles (Density)*
Fish Creek	1704010204	52	53 (1.0)
Upper Gros Ventre	1704010205	14	6 (0.4)
Roaring Fork	1404010117	75	68 (0.9)
Big Twin Creek	14040101	112	114 (1.0)
Middle Beaver Creek	1404010103	14	10 (0.7)

* Includes open and closed roads for hydrologic interpretations; not to be used for evaluating Forest Plan road density standard.

Fire is receiving much greater emphasis as a management tool at an equivalent of the watershed scale. Fire has been used extensively in the Gros Ventre subbasin, at a small scale (<500 ac/yr), since the 1970's. There is currently one prescribed fire proposed in the Slate Creek watershed within the subbasin. The Gros Ventre wilderness is currently covered by a wildland fire use plan which would manage naturally ignited fires to meet resource objectives; an additional wildland fire use plan for the remainder of the subbasin is to be completed in the near future.

Considering the small amount of project area within the watershed, implementation of Alternatives A, B, or C is not likely to contribute significantly to cumulative effects. Implementation of Alternative C would have the most beneficial cumulative effect to aquatic resources.

Green River – Roaring Fork Watershed

This watershed encompasses the Upper Green River above the confluence with Tosi Creek (Figure 4). Road densities and number of stream crossings are at 0.9 miles per square mile in the roaded subwatersheds (eastern half). Past projects include 30 miles of road decommissioning since 1996 (Table 4). There is an estimated 15 miles of road planned for decommissioning in the foreseeable future.

There is currently one prescribed fire project proposed of 16,000+ acres to improve wildlife habitat along the Green River below Pinyon Ridge. The Bridger Wilderness is currently covered by a wildland fire use plan which would manage naturally ignited fires to meet resource objectives; an additional wildland fire use plan for the remainder of the subbasin is to be completed in the near future. Tradeoffs between vegetation management and fire are not simple. It is possible that short-term rates of erosion and sediment delivery after a fire may be larger than effects of roads and degraded riparian areas. After fire, effects to vegetation and watersheds influencing hydrologic and temperature regimes and erosion may persist for years, perhaps decades. However, the long-term legacy can be important. Fire and the associated hydrologic effects can be characterized as "pulsed" disturbances (Yount and Niemi 1990) as opposed to more chronic or "press" effects linked to permanent road networks and degraded riparian habitats as a result of grazing. Fish population characteristics that provide for resilience in the face of such events, however, likely depend on large, well connected, and spatially complex habitats.

Expected cumulative impacts to aquatic habitats with implementation of Alternative A will result in maintaining current degraded conditions. There is no risk to CRC or SRC populations since this watershed contains neither. Some improvement to aquatic habitats by reducing sediment delivery could be expected as a result of road closures, reducing erosion at stream crossings, and increasing fire intervals. However, response by fish populations would be insignificant in relation to existing conditions and minor amount of watershed improvements planned. There would be expected improved fish habitat conditions with implementation of Alternative B along with planned road restoration. However, projected time for improved stream habitat conditions under mitigated grazing could be 10 to 20 years. Fish population trends are expected to reflect this delay in hydrologic recovery and will remain at current condition until habitat is recovered. Implementation of Alternative C along with watershed restoration projects would result in the quickest recovery of habitat and resulting fish populations. Fish population response may take 5 to 10 years before responding to improved aquatic habitat and hydrologic function following removal of livestock (Shultz and Leininger 1990, Skovlin 1985, Rickard and Cushing 1982).

Green River – Big Twin Creek Watershed

This watershed encompasses the Upper Green River north of the confluence with Middle Beaver Creek; major drainages include Tosi Creek, Gypsum Creek, Twin Creeks, North Beaver Creek, and the Green River (Figure 5). Private lands cover approximately 20% of this watershed in the southern end. Road densities and stream crossings exceed 1 mile per square mile in portions of the roaded subwatersheds (Gypsum Creek, Lime Creek, Twin Creeks)(Table 4.). Rock Creek headwaters have no roads and contain a remnant pure CRC population. Tosi and Tepee Creek subwatershed also contains a small population of CRC but roads, stream crossings, livestock grazing, and presence of non-native trout has resulted in depressed population at high risk of extinction. Past projects include road closures of estimated 50 miles, including road closure along Rock Creek in 1996. Foreseeable future projects in Gypsum Creek subwatersheds include vegetation treatment (timber harvest and prescribed fire) and watershed restoration along existing roads. Fuel reduction, wildlife habitat improvements, and watershed function restoration is the goal of the proposed

Gypsum Creek vegetation treatment area. Over 50 point and non-point source sediment sources were identified in 2002 for future watershed restoration projects.

Expected cumulative impacts to aquatic habitats with implementation of Alternative A will result in maintaining current degraded conditions and high risk to CRC population in Tepee Creek. Some improvement by reducing sediment delivery could be expected as a result of road closures and reducing erosion at stream crossings. However, response by fish populations would be insignificant in relation to existing conditions and minor amount of watershed improvements planned. There would be expected improved fish habitat conditions with implementation of Alternative B along with planned road restoration. However, projected time for improved stream habitat conditions under mitigated grazing could be 10 to 20 years. Fish population trends are expected to reflect this delay in hydrologic recovery and will remain at current condition until habitat is recovered. Implementation of Alternative C along with watershed restoration projects would result in the quickest recovery of habitat and resulting fish populations. Fish population response may take 5 to 10 years before responding to improved aquatic habitat and hydrologic function following removal of livestock (Shultz and Leininger 1990, Skovlin 1985, Rickard and Cushing 1982).

Middle Beaver Creek Watershed

This watershed includes the Upper Green River and tributaries between North and South Beaver Creeks (Figure 6). Approximately 14 % (20 sq. mi) Middle Beaver Creek watershed overlaps with the Upper Green River allotments. Private lands cover approximately 40% of this watershed. Beaver Creek contains remnant populations of CRC, but are isolated from streams within the allotments (North Beaver Creek and Miner Creek) by migration barriers and presence of non-native trout in these streams. Past projects include road closures of estimated 30 miles since 1996. Past timber harvest, high road densities, and livestock grazing are the main cumulative impacts to aquatic resources and fish populations. Road densities and stream crossings do not exceed 1 per square mile in all subwatersheds with the project area (Table 4). There is currently no future road decommissioning plans or prescribed fire proposed in this watershed.

Considering the relative small amount of project area within the watershed and the large amount of private land ownership, implementation of Alternatives A, B, or C is not likely to contribute significantly to cumulative effects. Implementation of Alternative C would have the most beneficial cumulative effect to aquatic resources. Watershed restoration opportunities to improve aquatic habitat (i.e. restoration of roads, stream crossings, etc) should be pursued to minimize potential cumulative effects and to meet Forest Plan goals and objectives.

Issue 2: Riparian and Aquatic Conditions

Because fisheries and their habitats are so inter-dependant with this issue many of the effects for this issue are displayed above in the Fisheries section of Issue 1.

Hydrology and Watershed Effects Analysis

Introduction

Assumptions from the Fisheries Effects (Chapter 4) write up are carried through for the Hydrology and Watershed Effects write up. To review, these assumptions were determined based upon expected responses to stream channels once mitigation is applied. To compare the environmental effects by alternative, therefore, assumptions and generalizations were made to quantify effects upon the watershed and hydrology resources. Key assumptions in this analysis are:

- Effective compliance with mitigation measures during the period of time necessary for hydrologic recovery (assumed to be 5 to 10 years).
- Critical areas recovery would likely reflect upward trends in adjacent stream reaches. Exceptions may include use of fences to exclude critical areas from livestock use.
- Short and long term impacts are not differentiated because short-term (2 years) sediment delivery to streams can have long-term impacts to aquatic resources. This assumption is based upon the length of time required (possibly decades) for stream systems to move sediment (Bunte and McDonald 1999), stream bank natural recovery rates (Platts 1983), and fish population responses to changed habitat conditions (Platts 1981).

Table 4-12
Magnitudes of potential adverse livestock grazing effects to hydrologic function.

Magnitude of Effects			
Alternative	**A**	**B**	**C**
Effects	**Greatest** →		**Least**

Direct and Indirect Effects to the Hydrology and Watershed Resource

Alternative A

Roaring Fork Allotment: Season long grazing would continue to be permitted within this allotment. The two major drainages in this allotment are Roaring Fork and the Upper Green River.

Key sites monitored in sage/grass and willow communities in 1992-1995 and 2002 in the Roaring Fork Allotment are meeting Forest Plan Standards for ground cover. Upland ground cover appears to be in a stable to upward trend in this allotment. Alternative A will continue this stable to upward trend in the Roaring Fork Allotment.

An R1/R4 stream survey was completed for Roaring Fork from just inside the Bridger Wilderness Boundary to the confluence with the Green River in the summer of 2001. Average streambank stability for Roaring Fork in the study area is approximately 85% or 93% of natural. Average surface fines are approximately 31%. The Roaring Fork critical

area studied during the 2002 field season found stream banks to be 75% of natural streambank stability and bank disturbance to be 13%. Alternative A will continue to keep stream banks below Forest Plan Standards and Guidelines. Average surface fines are higher than outlined in the Forest Plan Objectives (20%).

Inland West Watershed Initiative (IWWI) data for the Roaring Fork Allotment indicates that all streams exhibit moderate geomorphic integrity (see chapter 3).

Photos, data from R1/R4 surveys, critical area surveys, and IWWI data indicate that channel and riparian conditions in critical areas within the Roaring Fork Allotment are degraded. Alternative A will continue this trend.

Beaver-Twin Allotment: Season long grazing would continue to be permitted within this allotment. The major drainages in this allotment are Rock, Miner, Packer, North Beaver, Little Twin, and Big Twin Creeks.

Three key sites (two sage/grass types and 1 tall forb type) were monitored in 2002. One of 3 of these sites met ground cover objectives recommended by the IDT. Upland ground cover needs improvement. Implementation of Alternative A will continue to impact ground cover in the Beaver-Twin Allotment.

Level II GAWS Surveys were conducted on all of the major streams within the Beaver-Twin Allotment Area in 1989. Streams surveyed included portions of Rock, Miner, Packer, North Beaver, Little Twin, and Big Twin Creeks.

Rock Creek is the only stream in the allotment that contains native Colorado River cutthroat trout, which is a Forest Service Sensitive Species. The majority of the channel stability rating was excellent with fish habitat good to excellent as well.

The entire Miner Creek survey was conducted within the Beaver-Twin Allotment. The channel stability was good to excellent with stream habitat in good to excellent condition as well. The entire Packer Creek survey was conducted within the Beaver-Twin Allotment. Five of the seven reaches recorded good to excellent channel stability while the remaining 2 recorded fair to poor stability. The entire North Beaver Creek survey was conducted within the Beaver-Twin Allotment. Reaches 1 and 2 were diverted and dewatered. Overall, channel stability was good to excellent.

The entire Little Twin Creek survey was conducted within the Beaver-Twin Allotment. Lower Reaches 2 through 4 had excellent channel stability while upper Reaches 5 and 6 had poor channel stability. Reaches 3, 4, and 5 of the Big Twin Creek survey were conducted within the Beaver-Twin Allotment. Results indicate that stream channel stability was good. Level II GAWS Surveys were collected in 1989. Personal communication with Kurt Nelson, Pinedale Ranger District Fisheries Biologist, verified that current conditions are similar in 2003 as to what they were in 1989.

The Beaver-Twin critical areas studied during the 2002 field season included a site on Big Twin, Little Twin, and North Beaver Creeks. Big and Little Twin Creeks did not meet the Forest Plan stream bank stability guideline. Big Twin was 75% of natural stability and Little Twin was 82% of natural stable. North Beaver Creek was meeting the Forest Plan Guideline at 100%% of the natural streambank stability. Streambank disturbance for Big Twin was 74%, Little Twin was 67%, and North Beaver Creek was 59%. Alternative A will continue to keep stream banks in a slightly impacted state. Habitat for the native Colorado River Cutthroat Trout found in Rock Creek will remain stable with the implementation of Alternative A.

IWWI data for the Beaver-Twin Allotment indicates that all streams exhibit moderate geomorphic integrity (See watershed and hydrology chapter 3 write up for explanation).

Photos, data from aquatic surveys, critical area surveys, and IWWI data indicate that channel and riparian conditions for the Beaver-Twin Allotment are above average but not meeting Forest Plan Objectives. Alternative A will continue this trend.

Noble Pastures: Rotation grazing of 314 cow calf pairs and 110 yearlings would continue to be permitted within this allotment from 6/15 to 9/20. Four irrigated pastures are managed under this rotation system. All 4 pastures will be grazed during some course of the growing season, but none of the pastures would receive season-long rest. The two major drainages in this allotment are Tosi and Klondike Creeks. Klondike Creek has been excluded from livestock grazing since 1985.

Alternative A will continue to intensively manage the Noble Pastures in a rotational grazing scheme. Pastures will continue to be irrigated and ground cover is expected to remain in acceptable condition.

In 2 separate reports from July 1992, it was evident that Tosi Creek through the Noble Pastures was severely impacted from livestock grazing. Fisheries Biologist David J. Cannon reported, “fishery habitat is poor, at about 25% of its natural potential.” He went on to say that, “Eroding banks are contributing to the large width to depth ratio.” The letter indicated lack of riparian cover, excessive stream bank erosion, and a change in green line vegetation from a willow and sedge community type to shallow root mass type. Hydrologist Alan F. Galbreath echoed the sentiments of David Cannon in his letter. Both specialists recommended changes in grazing practices. Observation indicates that streambank stability has noticeably improved on this portion of Tosi Creek over the past five years.

IWWI data for the Noble Pastures indicates that all streams exhibit moderate geomorphic integrity (See watershed and hydrology chapter 3 write up for explanation).

The Noble Pasture critical area was studied during the 2002 field season. Studies indicate that stream banks through the reach were 54% of natural streambank stability and bank trampling was 59%. This stability percentage was one of the lowest for the 22 critical areas surveyed. Alternative A will continue high streambank erosion, high width to depth ratios,

degraded riparian conditions, high summer stream temperatures, and degraded aquatic habitat. Forest Plan standards and guidelines will not be realized with the implementation of Alternative A.

Badger Creek Allotment: Season long grazing of 157 cow calf pairs would continue to be permitted within this allotment from 7/16 to 10/15. The major drainages within the Badger Creek Allotment include: Big Twin Creek, Ole Cabin Creek (a tributary to Big Twin Creek), and an unnamed tributary to Rock Creek.

IWWI data for the Badger Creek Allotment indicates that all streams exhibit moderate geomorphic integrity (see chapter 3).

A Level II GAWS Survey was conducted on Big Twin Creek in 1989. According to the survey, a high rate of bank failure exists from Ole Cabin Creek downstream for ½ mile to the allotment boundary. The report states that riparian management is needed and aquatic habitat is not meeting its potential.

The Badger Creek critical area studied during the 2002 field season found stream banks to be 77% of natural streambank stability and bank trampling to be 74%. Alternative A will continue high streambank erosion, high width to depth ratios, degraded riparian conditions, and degraded aquatic habitats. Forest Plan guidelines will not be met with the implementation of Alternative A.

Photos, data from aquatic and critical area surveys, and IWWI data indicate that channel and riparian conditions for Big Twin Creek are impacted. Alternative A will continue this trend, not moving this allotment toward PFC.

Wagon Creek Allotment: Deferred rotation grazing of 26 cow calf pairs would continue to be permitted within this allotment from 7/15 to 10/15. Three pastures are managed under this rotation system. Two of the pastures are private lands. The rotation schedule allows up to 52 cow calf pairs to graze the Forest pasture for up to 45 days during the entire season of use. The two major drainages in this allotment are Lower Wagon Creek and the Upper Green River.

An R1/R4 stream survey was completed for Wagon Creek within the Allotment Boundary in the summer of 2001. There are high amounts of fine sediments covering the stream bottom through this section of Wagon Creek. This was attributed to upstream channel disturbance. Wagon Creek through this area showed signs of grazing and stream bank trampling; disturbance from livestock was within acceptable levels to prevent aquatic habitat degradation. The Wagon Creek critical area, studied during the 2002 field season found stream banks to be at 55% of natural streambank stability and bank trampling to be 96%. Implementation of Alternative A will not result in improvement of stream bank instability in the Wagon Creek Allotment.

IWWI data for the Wagon Creek Allotment indicates that all streams exhibit moderate geomorphic integrity (see chapter 3). Photos, data from R1/R4 surveys, IWWI Data and critical area surveys indicate that Wagon Creek is not meeting Forest Plan guidelines for stream bank stability. Grazing impacts to the stream channel are occurring through bank trampling and cattle congregation. These impacts will continue with the implementation of Alternative A.

Upper Green Allotment: This Allotment consists of 4 units. Each unit has its own rotation and timing. The units are: Gypsum Creek, Mud-Fish Creek, Mosquito Lake, and Tosi-Tepee. The Upper Green River Driveway is the means by which livestock are moved to and from the units. Total permitted livestock for the Upper Green River Allotment is 7,600 cow calf pairs.

Gypsum Creek Unit of the Upper Green Allotment: This unit has a deferred rotation system and allows for 2,000 cow calf pairs from 6/16 to 10/15. Two pastures exist in the unit. They are called the Upper and Lower Gypsum Creek Pastures. Streams within the Gypsum Unit include: Upper Green River, Moose Creek, Gypsum Creek, South Fork Gypsum Creek, Dago Creek, Jim Creek, Red Creek, and Kendall Warm Springs.

Cover data collected in the Gypsum unit on key sage/grass communities during 1992-1995 are meeting objectives for ground cover that were established by the IDT. Upland ground cover appears to be in a stable to upward trend in this allotment. Alternative A will continue this stable to upward trend in the Gypsum Unit.

Two critical areas were studied during the 2002 field season. The two areas were on Lower and Upper Gypsum Creeks. The critical area on Lower Gypsum Creek found stream banks to be at 70% of natural streambank stability and bank disturbance to be 78%. The critical area on Upper Gypsum Creek found stream banks to be at 74% of natural streambank stability and bank trampling to be 90%.

IWWI data for the Gypsum Creek Allotment indicates that all streams exhibit moderate geomorphic integrity (see chapter 3).

Photos, critical area surveys, and IWWI Data indicate that channel and riparian conditions for the Gypsum Unit are impacted. Alternative A will continue this trend.

Mud-Fish Creek Unit: This unit has a deferred rotation system and allows for 2,800 cow calf pairs from 6/16 to 10/15. Three pastures exist within the unit. They are: Mud Lake East, Mud Lake West, and Fish Creek. Streams within the Mud-Fish Creek Unit include: Upper Green River, lower Roaring Fork, east fork Crow Creek, main stem Crow Creek, Sidewinder Creek, South Fork Fish Creek, Raspberry and Strawberry Creeks.

Upland key sites monitored in sage/grass communities in 1992-1995 and 2001 in the Mud-Fish Creek Unit are meeting ground cover objectives recommended by the IDT. Upland ground cover appears to be in a stable to upward trend in this allotment. Alternative A will continue this stable to upward trend in the Mud-Fish Creek Unit.

An R1/R4 stream survey was completed for lower Roaring Fork from the Allotment Boundary downstream to the confluence with the Green River in the summer of 2001. Average natural streambank stability for Roaring Fork in the study area is approximately 79%. Average surface fines in the area are approximately 49%. The critical areas studied during the 2002 field season were: lower Roaring Fork, Crow Creek, and 2 in the South Fork Fish Creek. The study found that stream banks in the lower Roaring Fork critical area were at97% of natural streambank stability with bank trampling at 54%. Stream banks in the Crow Creek critical area were at100% of natural streambank stability with 41% bank disturbance and those in the South Fork Fish Creek critical area were at53 and 64% of natural streambank stability with bank disturbance of 90 and 75%. Alternative A will continue to keep stream banks within Forest Plan Guidelines for lower Roaring Fork and Crow Creek. Implementation of Alternative A will continue to impact stream banks/ stream channels in the South Fork Fish Creek drainage, not moving the Pasture toward PFC.

IWWI data for the Mud Lake-Fish Creek Allotment indicates that all streams exhibit moderate geomorphic integrity (see chapter 3).

Photos, data from R1/R4 surveys, critical area surveys, and IWWI data indicate that minor impacts exist in the channel and riparian areas for lower Roaring Fork and Crow Creek. Conditions in the South Fork Fish Creek are impacted and will continue to remain impacted with the implementation of Alternative A.

Mosquito Lake Unit: This unit has a rest rotation system and allows 1,800 cow calf pairs from 6/16 to 10/15. Four pastures exist within the unit. They are: Mosquito Lake East SE, Mosquito Lake SW, Mosquito Lake NW, and Mosquito Lake NE. The major stream within the Mosquito Lake Unit is Wagon Creek.

Cover data collected in key sage/grass communities during 1992-1995 and 2001 in the Mosquito Lake Unit are meeting ground cover objectives established by the IDT. Upland ground cover appears to be acceptable in this allotment. Alternative A will continue this acceptable trend in the Mud-Fish Creek Unit.

An R1/R4 stream survey was completed for Wagon Creek within the Allotment Boundary in the summer of 2001. There are high amounts of fine sediments covering the stream

bottom. Wagon Creek exhibited signs of heavy grazing and stream bank trampling. Average bank stability through the reach was at 60% of natural. Width to depth ratios were increased above what a system in PFC should be. The Wagon Creek critical areas studied during the 2002 field season found stream banks to be at 40, 70, and 46% of natural streambank stability. Bank disturbance for these critical areas are 100, 88, and 82% respectively. Implementation of Alternative A could result in stream bank instability, increase width to depth ratios, degrade riparian systems, and overall continue the degradation of aquatic habitats in Wagon Creek.

Photos, data from R1/R4 surveys and critical area surveys indicate that channel and riparian conditions for Wagon Creek are not meeting Forest Plan standards and guidelines for stream bank stability and aquatic habitat. Alternative A will continue this trend.

Tosi-Tepee Unit: This unit has a rotational grazing system for 1,000 cow calf pairs from 6/16 to 10/15. Three pastures exist within the unit. They are: Lower Tosi, Upper Tepee, and Lower Tepee. Streams within the Tosi-Tepee Unit include: Tepee Creek and Upper Tosi.

Upland key sites monitored in sage/grass communities in 1992-1995 and 2001 in the Tosi-Tepee Unit are meeting Forest Plan Standards for ground cover. Upland ground cover appears to be acceptable in this allotment. Alternative A will continue this acceptable trend in the Tosi-Tepee Unit.

An aquatic habitat survey was conducted for Tepee Creek in 1990. Conditions for Tepee Creek were revisited in 1997. Streambank conditions for Tepee Creek in 1990 were at 93% of natural streambank stability. Conditions in 1997 showed that stream bank stability was reduced to 75%of natural. Width to depth ratios in 1990 were 29 while in 1997 they increased to 30. This limited data may indicate that stream bank stability is decreasing and width to depth ratios in Tepee Creek are increasing. The Tosi-Tepee critical areas are located in Upper Tepee (2 sites), Upper Tosi, Lower Tosi and Kinky Creeks. Data collected during the 2002 field season indicates stream bank stability to be to be 42 and 82% of natural for the Upper Tepee sites, 62% for the Upper Tosi site, 68% for the Lower Tosi site, and 99% for the Kinky Creek site. Bank trampling values for these sites were 94 and 25% for Upper Tepee, 50% for Upper Tosi, 71% for Lower Tosi, and 100% for Kinky Creek. Implementation of Alternative A could result in stream bank instability, increase width to depth ratios, degrade riparian systems, and overall continue the degradation of aquatic habitats in Tosi and Tepee Creeks.

IWWI data indicates that Tepee Creek exhibits low geomorphic integrity while all other streams in the allotment exhibit moderate geomorphic integrity (see chapter 3).

Photos, data from aquatic habitat surveys, critical area surveys, and IWWI data indicate that channel and riparian conditions for the Tepee-Tosi Unit are not meeting Forest Plan standards and guidelines for stream bank stability and aquatic habitat.

Alternative B

Roaring Fork Allotment: Implementation of Alternative B would change the Roaring Fork Allotment from season long grazing to deferred-rotation grazing with 3 pastures (Roaring Fork South, Roaring Fork East, and Roaring Fork West). Stocking rates would remain the same as Alternative A and utilization for the allotment would be 55%. The Roaring Fork South Allotment would only be grazed in June.

Upland ground cover within the Roaring Fork Allotment would be expected to remain stable or improve with the implementation of Alternative B. Current ground cover values are meeting objectives recommended by the IDT. The 55% upland utilization standard and grazing system change (from season long to deferred-rotation) would further improve ground cover conditions.

The average stream bank stability for Roaring Fork, as calculated from the R1/R4 survey completed in 2001, is 93%of natural. Bank stability for the critical area measured on Roaring Fork is 75% of natural. Thirteen percent of the banks in the critical area are considered disturbed. This is below the suggested percentage of less than 40 percent by Alma Winward, Region 4 Ecologist. Stream bank stability is below the Forest Plan guideline of 90%.

Photos from Roaring Fork (see Chapter 3) show that the channel type is more resistant to grazing and other disturbance. The banks appear to be in acceptable shape. Minor impacts are occurring from grazing. Platts (1991), indicates that deferred rotation grazing is an improvement over continuous season-long use in terms of stream bank stability, brushy species condition, seasonal plant regrowth and stream riparian rehabilitation potential. Utilization of 55% would be expected to improve both upland and riparian ground cover.

Beaver-Twin Creeks Allotment: Implementation of Alternative B would change the Beaver-Twin Allotment grazing management from season long grazing to deferred-rotation in the Waterdog Area of the Allotment. The Rock Creek Area of the Allotment will be in a rest rotation grazing system until it meets objectives, then it will be in a deferred grazing system, and the Twin Creek Areas of the Allotment will be in a deferred grazing system. Stocking rates would remain the same as Alternative A and utilization for the allotment would be 55%.

Upland ground cover within the Beaver-Twin Allotment would improve with the implementation of Alternative B. Current ground cover values are not meeting objectives for ground cover. The 55% upland utilization standard set for the Beaver-Twin Allotment and the change in grazing systems will improve ground cover conditions over Alternative A.

Channel stability ratings for the majority of the major streams within this allotment were good to excellent. Two reaches in Little Twin Creek and two reaches in Packer Creek had poor and fair to poor channel stability ratings respectively. Bank stability for the critical areas within the Allotment was Big Twin Creek (75%), Little Twin Creek (82%), and North Beaver Creek (100%) of natural. Bank disturbance for these critical areas was measured at 50% for Big Twin Creek, 67% for Little Twin Creek, and 59% for North Beaver Creek. This is above the suggested percentage of less than 40 percent by Alma Winward, Region 4 Ecologist. Stream bank stability is below the Forest Plan guideline of 90% for 2 of the 3 critical areas.

Platts (1991), indicates that deferred rotation, deferred and rest rotation grazing systems are an improvement over continuous season-long use in terms of stream bank stability, brushy species condition, seasonal plant regrowth and stream riparian rehabilitation potential. Utilization of 55% will improve both upland and riparian ground cover.

Alternative B will improve hydrologic and watershed conditions in the Beaver-Twin Allotment. Rock Creek is currently meeting Forest Plan standards and guidelines under the current Alternative A management scheme. Conditions in the Rock Creek watershed are expected to improve and protect habitat for the native Colorado River Cutthroat Trout with the implementation of Alternative B. Stream bank stability, width to depth ratios, and riparian conditions are expected to improve for the other rivers and stream within the Beaver-Twin Allotment with the implementation of Alternative B.

Noble Pastures: Implementation of Alternative B would change the grazing system in Noble Pastures from a rotation system to a deferred-rotation system. Greenline stubble heights would be 6 inches until Desired Future Condition (DFC) is met. At that time they would be changed to 4 inches. The Northern Pasture would have a 40% utilization standard. Stocking rates would remain the same as Alternative A.

Upland ground cover within the Noble Pastures area would improve over Alternative A with the implementation of Alternative B. Changes to the grazing system and more stringent utilization standards will improve ground cover over Alternative A.

Stream reports for Lower Tosi Creek indicate that the stream has high eroding banks and width to depth ratios. Fish habitat is poor through this reach. The critical area that was sampled through the reach in 2002 indicated that stream banks were at 54% of natural streambank stability with 59% trampling. Both results are well above acceptable levels.

Alternative B will improve the hydrology and watershed condition over Alternative A. However, stream banks, riparian and other channel parameters will not drastically improve by implementing Alternative B.

Badger Creek Allotment: Implementation of Alternative B would change the grazing system in the Badger Creek Allotment from season long grazing to deferred. Season of use would be changed every fourth year, from 7/1 through 9/30 to 7/15 through 10/14. No additional pastures would be set up. Thus, 1 of every 4 years, use will be deferred until after

seedset. Stocking rates would remain the same as Alternative A and utilization for the allotment would be 55%.

Upland ground cover within the Badger Creek Allotment would improve with the implementation of Alternative B. The deferred rotation grazing system, 55% utilization standard and deferred-use grazing system will improve upland conditions.

Condition data presented in the Alternative A discussion indicates that stream conditions along Big Twin Creek in this Allotment are not at PFC. A 1989 survey indicated high rates of bank failure are limiting Big Twin Creek from meeting its potential. The Badger Creek critical area had 77% of natural streambank stability and 74% bank trampling. Both values are above recommended levels.

Platts (1991) indicates that changing grazing from season long to deferred will only slightly improve control of cattle distribution, seasonal plant regrowth, and stream riparian rehabilitation potential. Streambank stability and brushy species condition will not be changed with the grazing system change. However, the level of utilization occurring on a site including riparian areas is the most important consideration. With the more restrictive utilization levels, this change combined with the grazing system change should improve conditions.

Wagon Creek Allotment: Implementation of Alternative B would not change the deferred-rotation grazing system. Stocking rates would remain the same as Alternative A and utilization for the allotment would be 55%.

Upland ground cover conditions within the Wagon Creek Allotment would remain stable or slightly improve with the implementation of Alternative B. None of the mitigation measures proposed are different from Alternative A, so conditions are expected to remain static.

Data from the R1/R4 stream survey indicates that high amounts of fine sediment are present through this area of Wagon Creek. The stretch is considered a depositional zone. Grazing had impacted stream banks and vegetation along the greenline. The Wagon Creek critical area had 55% of natural streambank stability and disturbance from trampling was 96%. The effects of implementing Alternative B would improve aquatic conditions over Alternative A but less than Alternative C.

Gypsum Creek Unit of the Upper Green Allotment: Implementation of Alternative B would not change the Gypsum Creek Unit deferred-rotation grazing system. Stocking rates would remain the same as Alternative A and utilization for the allotment would be 55%. If the unit is not meeting groundcover objectives, a rest-rotation grazing system would be implemented after 1 rotation.

Upland ground cover within the Gypsum Creek Unit would remain stable or slightly improve with the implementation of Alternative B. From existing data, it appears that current ground cover values are meeting objectives recommended by the IDT. The 55% upland utilization

standard set for the Gypsum Unit should already be occurring in Alternative A, so there is little difference between Alternatives A and B.

The two critical areas studied had bank stability values of 70% (Lower Gypsum Creek) and 74% (Upper Gypsum Creek) of natural and bank disturbance of 78 and 90%. Both values for each critical area are outside the recommended values for a healthy stream channel and aquatic environment. Alternative B is essentially the same alternative as Alternative A, at least for the first rotation. The 55% utilization standard is not a major change from what utilization standards have been in the past.

A stubble height of at least 6 inches will be kept along the greenline of the streams within the Upper Gypsum Creek Pasture and/or a bank trampling value of no greater than 20% will be kept. Aquatic and channel geomorphic conditions will improve over current conditions (Alternative A) with implementation of a minimum stubble height (4 or 6 inches) or bank trampling standard.

Mud-Fish Creek Unit: Implementation of Alternative B would see the Mud-Fish Creek Unit remain in a deferred-rotation system. Stocking rates would remain the same as Alternative A and the maximum utilization for the pasture would be 55%.

Upland ground cover within the Mud-Fish Creek Unit would remain stable or slightly improve with the implementation of Alternative B. From existing data, it appears that current ground cover values are meeting Forest Plan Standards. The 55% upland utilization standard set for the Mud-Fish Creek Unit is essentially the same utilization standard as Alternative A.

Lower Roaring Fork R1/R4 stream survey data indicates that bank stability is 79% of natural and average surface fines are 49%. The critical area sampled for Lower Roaring Fork indicates that bank stability is 97%of natural and bank disturbance is 54%. The critical area in Crow Creek found bank stability to be at 100%of natural and stream bank disturbance to be at 41%. The two critical areas studied in the South Fork Fish Creek had bank stability of 53 and 64% of natural respectively and bank disturbance of 90 and 75% respectively. Alternative B essentially implements what Alternative A is currently implementing. The only difference is the 55% utilization standard being put in place. The 1990 Forest Plan already calls for utilization standards to be within 50 to 65%. There is little to no difference between Alternatives A and B.

The streams in the Mud Lake East and Mud Lake West Pastures are currently being impacted as evidenced by the critical area surveys, IWWI data and cursory surveys performed by the Pinedale Ranger District Fisheries Program.

A 6 inch stubble height and/or a bank trampling threshold of no greater than 10% will be implemented for Fish Creek Pasture and a 55% utilization proposed for Alternative B.

Within the Mud Lake East and Mud Lake West Pastures have more intensive stream bank and riparian monitoring and management as well. A 4 inch stubble height and/or a bank

disturbance threshold of no greater than 20% be implemented with the deferred-rotation and 55% utilization proposed for Alternative B.

Mosquito Lake Unit: Implementation of Alternative B would see the Mosquito Lake Unit remain in a rest-rotation system. Stocking rates would remain the same as Alternative A. Utilization for the Mosquito SE Pasture will be 40% until PFC is reached and 55% thereafter. Utilization for the Mosquito NE Pasture will be 40% through one cycle. If the ground cover is meeting PFC then continue at 40%. If the ground cover is not meeting objectives then utilization will be dropped to 25%. The Mosquito NW will have a 40% utilization standard and Mosquito SW Pastures will have a utilization standard of 55%.

Upland ground cover within the Mosquito Lake Unit would improve with the implementation of Alternative B. More stringent utilization standards will improve ground cover. From existing data, it appears that current ground cover values are meeting or close to PFC. The utilization standards discussed above for the Mosquito Lake Unit would further improve ground cover conditions, improving the hydrologic function of the watersheds above Alternative A.

Stream habitat and channel data indicate that low stream bank stability, high width to depth ratios, and heavy surface fines exist in Wagon Creek within the Mosquito Lake Unit. A 6 inch stubble height and/or a bank trampling standard of no greater than 20% will be implemented for Mosquito SE Pasture.

The Mosquito SE and Mosquito NE Pastures have been severely impacted. Streambank stability results from the R1/R4 surveys were at 60% of natural streambank stability. The critical areas surveyed in the 2 pastures had stream bank stability of 40 and 46% of natural with bank disturbance being 100 and 82 percent. These values represent some of the most degraded of the critical sites measured in the Upper Green Grazing Project Area.

Tosi-Tepee Unit: Implementation of Alternative B would see the Tosi-Tepee Unit changed to a rest-rotation grazing system. Stocking rates would remain the same as Alternative A. A new pasture would be created in the Kinky Creek Area. Stocking rates would remain the same as Alternative A. Utilization for the Tosi-Tepee Unit will be 40% until PFC is reached and 55% thereafter.

Upland ground cover within the Tosi-Tepee Unit would improve with the implementation of Alternative B. More stringent utilization standards and the changed grazing system will improve ground cover. From existing data, it appears that current ground cover values are meeting or close to PFC. The utilization standards discussed above for the Tosi-Tepee Unit would further improve ground cover conditions, improving the hydrologic function of the watersheds within this allotment.

The IWWI data lists roughly Tepee Creek as having low geomorphic integrity.

Utilization standard and grazing system changes will improve the watershed condition of this unit over Alternative A. Additional measures are necessary to move stream channel conditions to PFC. A stubble height of 6 inches for all pastures except the Kinky Creek Pasture, which is set at 4 inches, will move the Allotment toward PFC. These measures, along with the change in utilization standards and grazing system will move the Unit toward PFC over Alternative A.

Alternative C

Alternative C will eliminate domesticated livestock grazing from the Upper Green River Area. Alternative C will benefit the hydrology and watershed resource of the rivers and streams of the Upper Green River grazing area above Alternatives A and B. Meehan and Platts 1978 found that ungrazed watersheds in western Colorado produced only 71 to 76 percent as much sediment as grazed watersheds. They also found that on a 40-mile segment of Bear Valley Creek in central Idaho, fish habitat was damaged more along grazed sections, primarily from bank trampling, than along ungrazed sections. Overton et al. 1994 found that ungrazed reference streams similar in parent geology, precipitation, channel type, habitat types, drainage area, and stream width had higher bank stability values and lower width-to-depth ratios than both grazed and rested management sections of Silver King Creek, California. Platts 1991, p. 393 reported in grazed areas, stream channels generally contain more fine sediment, streambanks are more unstable, banks are less undercut, and summer water temperatures are higher than is the case for streams in ungrazed areas.

Alternative C will improve upland vegetation over Alternatives A and B. Elimination of domestic livestock will increase plant biomass and reduce erosion.

A critical area was set up in Clear Creek in the Bridger Wilderness. The site was sampled during the 2002 field season. The site is lightly grazed by domesticated animals. Bank stability at the site is 91% and bank disturbance is 0%. Banks are vegetated with thick riparian sedges and forbs.

An R1/R4 Survey was also conducted on Clear Creek in 2001. Bank stability for the reference reach was between 91-94%. Roughly 50-62% of the total length of the banks in the reach were undercut, creating ample fish habitat. The reference reach indicates that bank stability of 90% can be reached and is a realistic guideline for the Bridger-Teton National Forest.

Another example of the difference between grazed and ungrazed environments on the Bridge-Teton National Forest comes from Klondike Creek in the Noble Pastures Allotment (pasture #4). Klondike Creek maintains banks stability at 95 percent, compared to 54 percent of natural bank stability in the adjacent Tosi Creek (pasture #1). Bank stability is 82 percent of natural within an exclosure on Tepee Creek in comparison to 42 percent of natural streambank stability above the exclosure.

Alternative C will improve streambank stability, riparian vegetation, width to depth ratios, fish habitat, percent fines, and other fluvial processes in all allotments above Alternatives A and B.

4 Environmental Consequences

Cumulative Effects

Project Area
All 5th level hydrologic units (HUCS) affected by the Upper Green Grazing Project.

Management Actions Occurring Within the Project Area
Cumulative effects are the effects on a resource (hydrology and watershed) when combining all management activities that impact that resource in the defined project area. Activities, other than grazing, that have occurred, are presently occurring, and will occur in the future within the Upper Green Grazing Area include: past, present, and future wild land and prescribed fire; past, present, and future road management; past, present, and future timber management; past, present, and future beaver management, and past, present, and future recreation activity.

Fire
Wildland fire has and will continue to affect the landscape of the Upper Green Project Area. The amount of wild land fire that will occur in the future is speculative. In 2002, 6,893 acres burned on the Forest. That is 0.2 % of the total acreage of the Bridger-Teton National Forest. The Pinedale Ranger District accounted for 22% of the fires on the Forest in 2002.. The 10-year average for the Forest is 5,551 acres/year while the 30-year average is 11,417 acres/year. It is assumed that the hydrology and watershed impacts from wildland fire in the future will be much the same as they are at present. Fire tends to be localized and localized watershed effects may occur depending on fire size, location, and intensity. Fire consumes vegetation, partially or completely removes ground cover, and may or may not result in the formation of hydrophobic (water repellant) soil layers depending on soil temperatures during the burn and the characteristics of the local vegetation and soils (Debano and Krammes 1966). Fires may result in increased streamflows following fires due to removal of vegetation and decreases in evapotranspiration (Helvey 1980) and, in this respect, is similar to the impacts of timber harvest or other vegetative treatments. The magnitude of impact on watershed processes is dependent on physical and biologic attributes of the individual watersheds and on the intensity of the fire. Low intensity fires, by definition, consume little of the organic material that covers and protects the soil from surface erosion. High intensity fires, at the other extreme, can consume all of the above ground vegetation and all or most of the soil organic material and litter. Such changes can greatly increase the erodibility of forest soils (Durgin 1985). Erosion rates after large or high intensity fires may be elevated above background levels by more than a factor of 200 immediately after the fire (Morris and Moses 1987), and may persist for decades following a fire in extreme cases.

A 16,000 acre prescribed fire project is planned for Pinyon Ridge at some point during the next 10 years. This will be a low intensity fire and effects will be short in duration (less than 3 years). The 16,000 acre fire is less than 1 percent of the total project area. Annual acres of wildland fire are low considering the size of the project area. It would take a catastrophic event to detrimentally effect watershed resources over the entire project area. Combining the effects of anticipated wildland and prescribed fire and livestock grazing, Alternative A will still have the greatest impact on the hydrology and watershed resource. Alternative B will

have fewer impacts than Alternative A, and more than Alternative C but will move the project area toward PFC. With Alternative B, grazing will not be allowed on burned areas until 60% ground cover has been reached. Alternative C will provide the least impact to the hydrology and watershed resource and move the project area toward PFC the fastest.

Road Management

Roads modify natural drainage networks and accelerate erosion processes; actions that result in increased stream sedimentation, degraded aquatic habitats, and altered channel morphology. Road impacts increase as they become more hydrologically connected to the natural channel network (Jones and Grant 1996). Roads and their drainage systems typically act to intercept surface and subsurface runoff and route excess runoff into the channel system (Wolf 1982; Hauge et al. 1979; Megahan 1972) resulting in both increased stream flows (Harr et al. 1975) and increased sediment delivery to streams (Wemple et al. 1996). Fine sediments can be delivered to natural streams by erosion of road surfaces as well as from unvegetated road cut and fill surfaces (Reid and Dunne 1984). Roads impact aquatic habitats by limiting fish passage through culverts at road-stream crossings (Furniss et al. 1991) and increasing fine sediment in spawning gravels, which in turn reduce dissolved oxygen levels and sub-surface stream flow and result in reduced spawning success by salmonids (Bjornn and Reiser 1991; Phillips et al. 1975).

Implementation of the travel plan will see 34% of the roads on the Pinedale Ranger District closed to motorized traffic. Seventy-one percent of the roads being closed are because of watershed, soils and riparian impacts. Motorized travel will be limited to designated roads and trails. The Kinky Creek Road Relocation Project has constructed approximately 3.6 miles of new road within the project area. The Green River Lakes Road Reconstruction Project will not add any new roads to the project area. Miscellaneous road maintenance work will improve road condition and thus improve watershed condition. More roads will be closed during the next 10 years than will be constructed within the project area. A substantial number of roads negatively impacting watershed and riparian resources will be decommissioned. The effects of roads and livestock together will see Alternative A produce the greatest impact to the hydrology and watershed resource. Alternative B will show improvement over Alternative A and move the project area toward PFC and Alternative C will provide the greatest opportunity to move watershed conditions toward PFC.

Timber Management

Timber harvest can impact streamflows by altering the water balance within a watershed or by affecting the rate at which water moves from hillsides to stream channels. Removal of vegetation in forested watersheds alters the watershed response to precipitation by reducing interception, evaporation, and transpiration and increasing water storage and runoff. Increased surface erosion and sedimentation are primarily related to surface soil disturbance by road construction, yarding, log landing construction, and burning of logging slash after timber harvest. Ground disturbance changes the physical properties of soils through compaction and soil displacement, which can lead to both increased runoff and surface soil erosion (Christner and Harr 1982; Harr 1983).

The Moose/Gypsum Vegetation treatment project will harvest timber. Firewood gathering will continue to be permitted on the district. Small urban interface fuels treatments will take place. The timber harvested within the project area will be less than 1 percent of the total project area. Alternative A will still produce more impacts than Alternatives B and C when timber and grazing impacts are combined. Alternative C will produce fewer impacts than Alternative B and will move the project area toward PFC. Alternative C will still move hydrology conditions forward at the fastest rate over Alternatives A and B.

Beaver Management

Extensive beaver trapping from 1818 to 1840 reduced the beaver population in the project area. This undoubtedly impacted the fluvial systems in the area. Beavers keep water tables high, allowing water tolerant (riparian) fauna to propagate. The extensive ponds created by beaver trap sediment and nutrients, regulating their transport through the system. When beaver dams are eliminated, stream channels typically downcut, increasing bank erosion, lowering the water table and impacting aquatic habitat and riparian health. Current management on the Bridger-Teton National Forest calls for beaver to be removed if they are affecting infrastructure (bridges, roads, etc.) or are determined to be a general nuisance (Franklin, 2003).

Regardless of beaver management, when combining the effects of beaver management and livestock, Alternative A will still produce the highest impacts to the hydrology resource. Alternative B will have fewer impacts than Alternative A and slightly more than Alternative C. Implementation of Alternative B will move the project area closer to PFC but not as fast as Alternative C will.

Recreation Management

Recreational impacts may include trampling of vegetation, vegetation removal, and soil compaction of streamside and upland sites, and may be similar in type, but of a different magnitude, than the impacts associated with livestock grazing (Clark and Gibbons 1991). Rutting may increase surface erosion associated with heavily used hiking or horse trails and off-road vehicles (ORV). Heavy use of some campsites may cause root damage in trees, resulting in reduced vigor or mortality. Over-the-snow vehicles can damage vegetation and cause ground disturbance if used when snowpacks do not provide adequate cover.

It is recognized that illegal ORV use will continue in the project area. Other recreational activities that will cause impacts are developed and dispersed recreation, snowmobile use, trail construction, and the Moose-Gypsum Recreation Project (Describe the Moose-Gypsum Recreation Project). Combining the impacts of recreation and livestock will not change that Alternative A will produce impacts above Alternatives B and C. Alternative B will move the project area toward PFC but not as timely as Alternative C will. Alternative C will impact the watershed and hydrology resource the least.

Overall Cumulative Effects

During the next 10 years, fire is expected to impact the Upper Green Project Area as it has in the past 30 years. Road impacts to hydrology and riparian systems are expected to be improved with the implementation of the Updated Forest Travel Plan. Miles of roads within

the project area are expected to be reduced. Less than 1% of the project area is expected to be harvested. Beaver populations will most likely remain stable or increase. Recreational impacts are expected to remain stable or slightly increase.

Combining the above impacts with grazing, the hydrology and watershed resource within the project area will remain stable or slightly improve with the implementation of Alternative A. Alternative B will move the project area toward PFC above Alternative A, and less than Alternative C. Alternative C, when combined with the other management activities planned for the project area, will move the hydrology and watershed resource toward PFC the fastest.

Issue 3: Social and Economic Impacts

Introduction

Continuing to authorize livestock grazing on the six allotments would help meet Forest Plan direction to support local communities and provide forage for livestock grazing. In addition, authorizing livestock grazing would support the local community and the custom and culture of domestic livestock grazing in this area.

Agriculture is one of the primary industries in Sublette County and in the state of Wyoming. A large portion of employment in the Pinedale area is related to the livestock industry. A segment of the local beef industry is dependant on the use of the National Forest for summer livestock forage when private property is used to produce hay for the cattle during the winter. Local businesses derive a portion of their income by providing goods and services to support the livestock industry. Real estate markets are influenced by sales of ranches and the availability of private agricultural lands as well as the aesthetic values associated with these relatively undeveloped areas.

Impacts to local communities can be assessed by considering whether livestock grazing on National Forest Lands will be authorized. Impacts to individual Permittees may be compared by considering the number of livestock that can be grazed, and the duration of time that the livestock may use and occupy the grazing allotments. Since livestock removal may be required at any time prior to the permitted "off date" in order to comply with grazing use requirements, the duration of time that livestock can stay on the allotment depends largely on the Permittees effectiveness in managing the livestock to comply with those grazing requirements. Permittee effectiveness can be highly variable as a result of differing financial resources, personal commitment, and available labor pools. Therefore a more accurate measurement of impacts to individual Permittees is the relative amount of resources, including both personal labor and financial investment that they must expend to keep their livestock on the allotment for the full grazing season.

Examples of some efforts that are required of permittees include such things as maintaining range improvements, moving livestock from natural congregation areas to reduce impacts in those areas, monitoring vegetation to ensure compliance with forage use standards, moving livestock from one pasture to another, observing pastures that are scheduled for rest to insure that livestock don't use them, placing salt strategically in order to draw livestock away from

congregating areas, and removing dead livestock from popular use areas in order to reduce conflicts between predators and recreationists.

Assumptions

For the two alternatives that authorize livestock grazing, it is possible to meet all of the mitigation requirements associated with the alternative, and graze for the full permitted season of use, provided enough time, financial resources and labor are expended by the Permittees. This assumption is supported by grazing capacity information that indicates enough forage is produced on the allotment for livestock, wildlife, and watershed needs. Examples of variables that might change this assumption would include severe drought, wildfire, or large increases in wildlife populations. In reality, the Permittees could make a financial decision at some point that the additional costs to properly manage the livestock were greater than the benefits of keeping the livestock on the allotment. They might then choose to remove the livestock from the allotment prior to their required "off date", rather than expending additional effort to control livestock use. In either case, they would be required to implement the mitigation measures described under each alternative as well as the other requirements to graze livestock on National Forest System Lands. For this analysis to be most meaningful, we will compare the relative amount of effort that it would take to meet mitigation measures prescribed in each alternative.

Direct and indirect effects of implementing Alternative A (no action)

Implementation of Alternative A would not change livestock grazing as currently authorized. Agriculture related employment, spending, and effects on the real estate market and other impacts to the local community would not be expected to change as a result of continuing to authorize livestock grazing as described in this alternative (see CH2). No changes in the local custom and culture of domestic livestock grazing would be expected.

Local communities, agriculture, and local customs will continue to be influenced by a number of dynamic factors such as fuel costs, labor costs, feed costs, and cattle prices. These changes may alter many of the current conditions that are outlined in Chapter 3; however, the effects of implementing this alternative would not be expected to change the local communities.

Permittees would continue to conduct domestic livestock grazing and associated activities on the National Forest. The level of effort that would be required to stay in compliance with grazing requirements would not change as a result of implementing this alternative. Changes in livestock grazing may come about as a result of compliance with laws that affect activities on National Forest Lands such as the Endangered Species Act. These changes would be expected regardless of whether Alternative A is implemented. Implementation of this alternative would not be expected to cause a change to the current situation as it affects local permittees.

Cumulative effects of implementing Alternative A

The interdisciplinary team identified approximately 40 past and present management activities and a number of reasonably foreseeable future activities. Given the nature of these

activities, the primary cumulative impact to permittees and local communities can be summarized into the following categories:

- Agriculture's past, present and future influences on local communities
- Additional livestock grazing restrictions associated with compliance with the Endangered Species Act and other environmental laws

Agriculture's influence on the local communities would not be expected to change as a result of implementing alternative A. Future additional livestock grazing use restrictions may increase the amount of effort and costs that permittees would have to bear in order to continue to graze their livestock, however, no change in the number of livestock authorized to graze in this area would be expected.

Direct and indirect effects of implementing Alternative B

Implementation of Alternative B would not change the permitted livestock numbers or duration of grazing as currently authorized. Agriculture related employment, spending, and effects on the real estate market and other impacts to the local community would not be expected to change measurably as a result of continuing to authorize livestock grazing as described in this alternative (see CH2). Changes in the local custom and culture of domestic livestock grazing would not be expected, as livestock grazing would still be authorized on National Forest System Lands.

Local communities, agriculture, and local customs will continue to be influenced by a number of dynamic factors such as fuel costs, labor costs, feed costs, and cattle prices. These changes may alter many of the current conditions that are outlined in Chapter 3. However, the effects of implementing this alternative would not be expected to change the local communities.

Permittees would continue to conduct domestic livestock grazing and associated activities on the National Forest. The permittees would need to monitor the vegetation and move cattle away from natural congregation areas more frequently. Implementation of this alternative would be expected to increase the level of effort that is required of Permittees in order to meet the additional grazing use and occupancy requirements and mitigation measures as outlined in Chapter 2.

Cumulative effects of implementing alternative B

The financial success of businesses such as ranching operations is affected by a multitude of factors. Those ranches that are in danger of financial failure would be expected to be most affected by the increased level of effort that would be necessary to comply with the mitigation measures outlined in this alternative. It would be difficult, if not impossible to determine whether this is the case for any of the permittees that graze their livestock on the allotments considered in this analysis. It is assumed that there is the possibility that these additional requirements, when added to the other financial challenges inherent in small business operation, may contribute to the failure of the individual ranch. This in turn, could affect local real estate markets. The likelihood of individual ranch failures would be greater under alternative B than under alternative A because while alternative A requires financial

and personal efforts to stay in compliance with management requirements, a number of additional requirements are prescribed in alternative B. Effects to local communities and agriculture would be limited because of the limited numbers of ranchers directly affected by this alternative; however the level of risk to communities would be greater under this alternative than under alternative A since ranch failure has a greater potential under alternative B than alternative A.

Direct and indirect effects of implementing Alternative C

Implementation of Alternative C would phase-out livestock grazing as currently authorized in the project area. Agriculture related employment, spending, and effects on the real estate market and other impacts to the local community may be expected to change as a result of discontinuing livestock grazing as described in this alternative. Changes in the local custom and culture of domestic livestock grazing may be expected, as livestock grazing would not be authorized on National Forest System Lands in the project area.

Local communities, agriculture, and local customs will continue to be influenced by a number of dynamic factors. These changes may alter many of the current conditions that are outlined in Chapter 3. The effects of implementing this alternative could change the local communities if a number of the Permittees were unable to continue raising livestock on their private land as a result of no longer being able to use the forage resources on National Forest System lands in the project area.

Cumulative effects of implementing alternative C

Under this scenario it is more likely that the local ranches that depend on their Permitted grazing use on the affected grazing allotments could fail. It is also more likely that real estate markets could be affected by more ranches being put up for sale. Real estate markets in the local area might be affected, but affects outside the local area would be unlikely. Cumulative effects to individual ranchers and local communities would be greater under this alternative than under alternatives A and B, which authorize livestock grazing.

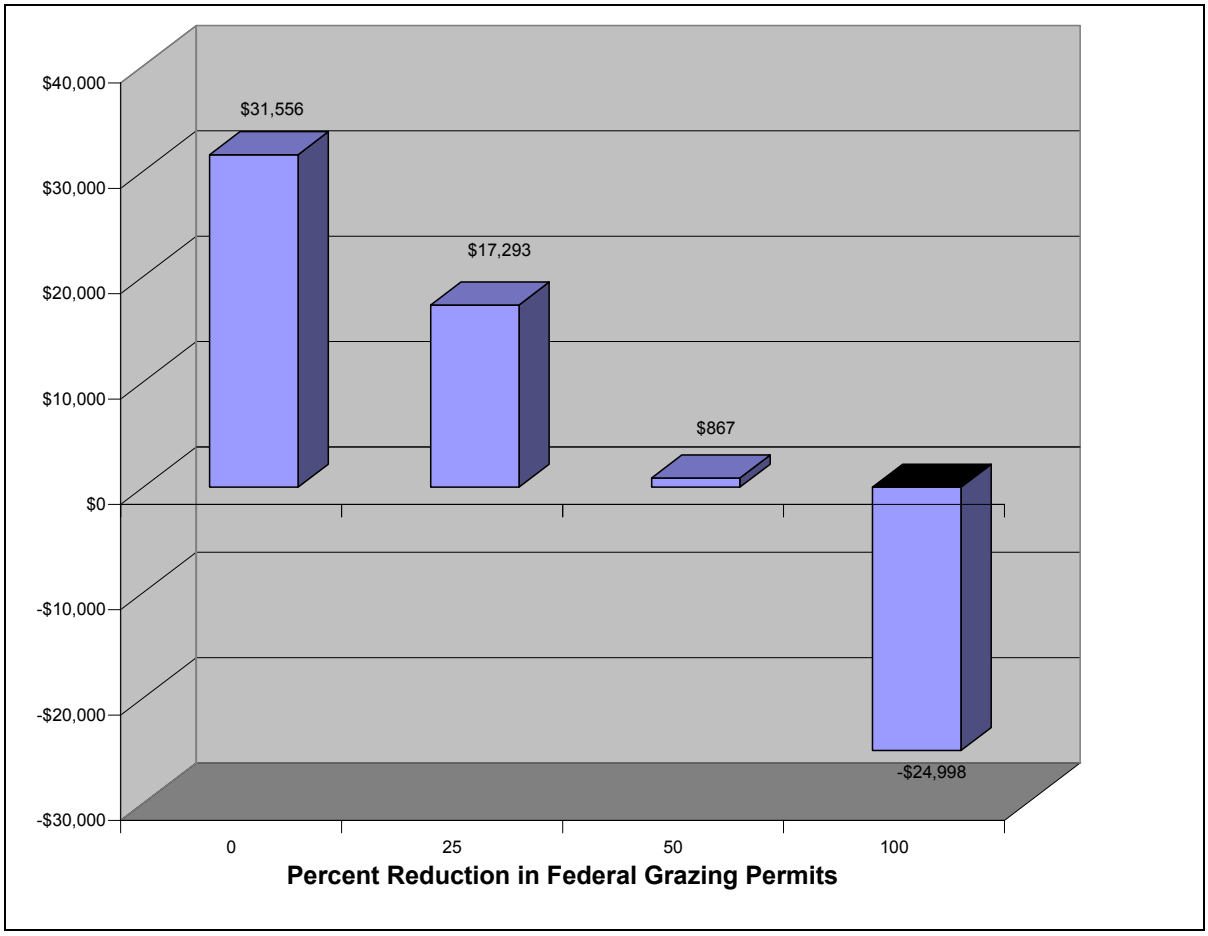


Figure 4-2. Average annual net cash income reduction for a federal land ranching operation with reductions in federal grazing permits. (Taylor, 2003)

Issue 4: Rangeland Function

Introduction

In order to disclose the environmental effects of livestock grazing, it is necessary first to put those effects into perspective. Numerous laws, regulations, and policies govern the use and administration of rangeland resources on National Forest System lands. National laws and regulations have also been interpreted for implementation in Forest Service Manuals, Handbooks, and Regional Guides. All grazing activities authorized under permit must comply with these laws, regulations, and policies, which are intended to provide general guidance for the implementation of grazing practices and for the protection of rangeland-related resources.

Although management direction for rangeland resources would vary by alternative, direction for all alternatives has been developed to maintain or improve rangeland conditions on National Forest System lands. Rangeland resource goals and objectives have been designed to achieve desired rangeland conditions over the long-term and to maintain or restore sustainable levels of forage production, livestock use, and ecosystem functions and processes. Rangeland standards and guidelines have been designed to protect upland and

riparian vegetation, as well as other resources that could be adversely affected by livestock grazing activities. Management direction for other resource programs, such as vegetation, soil, water, riparian, aquatic, wildlife, and recreation, provides additional guidance and resource protection in an integrated manner. As natural resource sciences result in better understanding of the effects of livestock grazing, practices that were once designed to maintain or improve range vegetation may have to be modified to achieve desired conditions.

The project area has been grazed by domestic livestock since the late 1800's. Fewer livestock are grazed today than the numbers present after the turn of the 20th century (see Chapter 3 historic and current grazing) Analysis of available livestock forage was conducted in the 1950's to late 1960's. These range analyses indicated that enough forage was available for the number of livestock currently grazed, while leaving adequate forage for wildlife and residual biomass for watershed health. The shortcomings of these analyses were that livestock did not use the forage equally, and while criteria were built in to consider the fact that livestock were more likely to use the forage in gentle terrain near water, the areas and forage species most desirable to livestock were often overused before the livestock were forced to seek the other forage that was available to them. In order to reduce this problem, range improvements were helpful to encourage livestock to use areas that they wouldn't naturally seek out, or to concentrate livestock in smaller use areas in order to distribute the use more evenly. These efforts helped, but weren't entirely successful in preventing overuse of more sensitive areas. More recent management actions such as implementing rotational grazing on most allotments, providing for periods of rest from grazing, or establishing use limits on key species in key areas and requiring livestock removal prior to exceeding use standards have been successful when range managers and livestock grazing permittees have been diligent in following the use limits. With these management changes, environmental effects are largely limited to the most sensitive sites such as the key and critical areas defined in Chapter 3 and identified by resource specialists. Improved management of key and critical areas and restoration of some critical areas would further limit environmental effects of livestock grazing.

The Forest Plan is a programmatic document that allocates resources, sometimes among competing uses. The Forest Plan specifically authorizes livestock grazing as a valid use in this area. If any stock use is permitted, some environmental effects will be sustained. These may include displacement of soil and vegetation in stream crossing areas, on fencelines, around water developments, and in salting areas. These soil and vegetation effects may retard or prevent complete recovery of hydrologic systems. Generally these effects are limited to small areas, where this is not the case, it is likely that monitoring of key areas would reveal more widespread effects.

Assumptions

- Effective compliance with mitigation measures.
- Effective placement of key areas to reflect changes in vegetation. (Note: key areas may be changed by ID Team if monitoring indicates that they are not effective.)

Livestock grazing has contributed to changes in vegetation in the project area. The vegetation changes caused by livestock grazing are generally limited to species composition changes within vegetation communities rather than broad changes in vegetation/formation categories outlined in Chapter 3. Undesirable changes in vegetation may be lessened or avoided by limiting the amount of vegetation that is used by livestock. This may be accomplished by establishing proper use standards, and removing livestock from an area prior to exceeding these standards. Proper use is defined as a degree of utilization/stubble height of current year's growth, which, if continued, will achieve management objectives established to maintain or improve the long-term productivity of the site.

Adaptive management

The forage utilization, stubble height standards, range improvements and other mitigations that are included as part of the two alternatives that authorize grazing, are surrogate standards that are designed to achieve a desired future condition. New information may indicate that differing standards or practices may be more appropriate, more effective in achieving the desired future condition, or more effective in meeting a variety of objectives. In these cases, the decision maker may prescribe a new method for meeting desired conditions. By definition, substituting a more effective or more appropriate practice or standard would not be expected to significantly increase the environmental effects of the alternative. The social and economic effects of implementing a more effective mitigation measure might cause the permittees to expend additional effort in order to stay in compliance with the new requirement.

The alternatives may be compared by describing the expected progress toward meeting desired conditions for groundcover.

Direct and indirect effects of implementing alternative A

Under alternative A the vegetative conditions on 2 key areas that are significantly less than desired (based upon 80% probability with 1degree of freedom) would be expected to continue with their current trend, which could be improving, declining, or staying the same. The vegetative conditions on 19 key areas of the allotment that are essentially at or exceeding desired future condition would remain in desired condition because the livestock grazing management that resulted in those conditions would not be altered. No progress toward restoration of critical areas would be expected as a result of implementing this alternative.

Direct and indirect effects of implementing alternative B

The mitigation measures associated with this alternative include range improvements that are designed to reduce livestock grazing in sensitive areas or to assist with implementation of rotational grazing strategies. In addition, grazing use or streambank trampling standards would be implemented in order to improve ground cover or streambank characteristics. Recent scientific literature is full of examples of improvement in vegetation, hydrology, and stream systems as a result of limiting livestock use. Because of the variability of natural systems and the inability to control all variables in a real life situation such as livestock grazing in the Upper Green River project area, no single conclusion has been drawn regarding the appropriate use standard for a specific situation.

One recent paper which was prepared as a guidance document for planning riparian grazing procedures on National Forests of this Intermountain Region of the Forest Service suggests that the level of utilization occurring on a site, including riparian areas, is the most important consideration in grazing management (Clary & Webster, 1989). The authors of this study provide a general recommendation that 4-6" of stubble vegetation remain on all streamside areas at the end of the growing season to provide sufficient herbaceous forage biomass to meet the requirements of plant vigor, bank protection and sediment entrapment. While they go on to say that special situations, such as critical fisheries or easily eroded streambanks may require stubble heights of greater than 6 inches; more recent information suggests that in situations where streambanks need additional protection beyond that provided by limiting use to a stubble height of 6", some form of monitoring of streambank alteration in addition to residual stubble height would be appropriate (grazing module, 2000). Through adaptive management a streambank alteration standard would then be implemented such as a streambank disturbance or trampling limit. This has been done for many of the critical areas within the project.

Additional scientific literature that supports adoption of a 4-6" end-of-season stubble height to improve riparian areas include the following: (Clary & Leininger, 2000) in which the authors recommended a 10 cm (approx. 4") residual stubble height as a starting point for improved riparian grazing management. Clary and Kinney 2002 concluded that there were no differences between the no-grazing and moderate-grazing (designed to represent the total impact the cattle would have while grazing foliage to a 10-cm height) treatments for change in stream width, bank angle, bank retreat, or root biomass. In another study Clary and Kinney concluded that most measurements of streamside variables moved closer to those beneficial for salmonid fisheries when pastures were grazed to a 10 cm stubble height, virtually all measurements improved when pastures were grazed to a 14 cm (approximately 5 ½ ") stubble height [Riparian – Fisheries Habitat Responses to Late Spring Cattle Grazing]. Elmore (1988) suggested that 3 to 4 inches of stubble height would maintain plant vigor, provide streambank protection, and aid in deposition of sediments to rebuild degraded streambanks. Meyers (1989) evaluated 34 grazing systems in place for 10-20 years. Vigorous woody plant growth and at least 6 inches of residual herbaceous plant height at the end of the growing/grazing season typified the riparian areas in excellent, good, or rapidly improving condition. This residual plant cover appeared to provide adequate streambank protection and sediment entrapment during high streamflow periods.

With these recommendations and findings in mind, vegetation on all key sites should improve, because the mitigation measures associated with this alternative are designed to improve vegetation as well as hydrologic and stream function. Critical areas would be expected to improve because of reduced livestock use and efforts to restore damaged areas. Improvement would be more rapid than under alternative A, less rapid than under alternative C.

Direct and indirect effects of implementing alternative C

All key sites would be expected to have relatively rapid improvement, faster than B. Critical areas would be expected to improve as livestock would not contribute to the effects that may be caused by other resources. However, without restoration, some critical areas would not be

expected to completely heal, because causative factors other than livestock grazing would not be expected to change (recreation trailing, vehicle crossings). Those critical areas associated with livestock fences and livestock trailing would improve.

Cumulative effects - Past, Present, and Reasonable foreseeable Future Actions

The interdisciplinary team identified approximately 40 past and present management activities and a number of reasonably foreseeable future activities. Given the nature of these activities, the primary cumulative impact to rangeland vegetation can be summarized into the following categories:

- Historical and current livestock grazing;
- Past, present, and future vegetation management activities including prescribed burning.

Historical grazing practices resulted in more environmental effects to vegetation since historical numbers of livestock were higher and management considerations were not focused on high use areas. Past fire management was largely confined to fire suppression, the primary effect to rangeland vegetation was to reduce the diversity of age classes in the sagebrush overstory.

Cumulative effects of implementing alternative A

Since Forest Plan standards for livestock grazing use would be followed, the alternative would address effects to vegetation in key areas. Vegetation in some critical areas may decline, but the acreage of affected vegetation would be minimal, resulting in insignificant impacts to rangeland vegetation as a whole. Future prescribed burns and other fire management activities would be designed to restore or otherwise minimize impacts on range vegetation.

The existing vegetation conditions described in chapter 3 indicate that the majority of the project area contains vegetation that contributes to properly functioning rangeland and watershed condition. Impacts associated with livestock grazing were historically greater due to higher numbers of livestock. Reasonably foreseeable future activities would be designed to minimize impacts. Therefore, the magnitude and extent of environmental effects do not exceed, nor are they expected to exceed, the capacity of the resource to sustain itself.

Cumulative effects of implementing alternative B

Cumulative impacts to range vegetation would be similar to those in alternative A, except that effects to vegetation in critical areas would be designed to improve these areas. Alternative B would include a prescription for additional protection from cattle use in prescribed burn areas prior to recovery of those areas, thus fewer cumulative impacts would be expected with this alternative than under alternative A.

The existing vegetation conditions described in chapter 3 indicate that the majority of the project area contains vegetation that contributes to properly functioning rangeland and

watershed condition. Alternative B is designed to improve the vegetation and other resources that are not currently in properly functioning condition. Impacts associated with livestock grazing were historically greater due to higher numbers of livestock. Reasonably foreseeable future activities would be designed to provide additional resource protections. Therefore, the magnitude and extent of environmental effects do not exceed, nor are they expected to exceed, the capacity of the resource to sustain itself.

Cumulative effects of implementing alternative C

Implementation of this alternative would be expected to show improvement in rangeland vegetation in all key and critical areas, with the exception of the critical areas that sustain impacts that are primarily caused by activities other than grazing. Fire management activities would result in the least impacts under alternative C, since livestock would not contribute to environmental effects on prescribed burn areas. The magnitude and extent of environmental effects do not exceed, nor are they expected to exceed, the capacity of the resource to sustain itself.

Other Environmental Considerations

Soils Environmental Consequences

Over 40% of the project area is not used by domestic livestock due to distance from water, steep slopes, inaccessibility and/or insufficient amounts of forage for cattle. Many of the soils that are at risk or high hazard soils are within the 40% already determined to be unused by livestock. The environmental effects associated soils are already addressed in Riparian and Aquatic Conditions issue since these are primarily watershed scale concerns.

Evaluation Criteria

Compaction – measurements of more than 15% increase in bulk density or a 10% reduction in total porosity. Visual evidence includes coarse platy structure, difficulty in digging, horizontal roots and or ruts without berms.

Displacement – measurements of the removal of the forest floor and more than 1” of the surface layer. Visual evidence includes soil in piles or subsoil at the surface.

Puddling – measurements of macropore space reduction of 50% or more. Visual evidence includes presence of ruts with berms and/or spherical soil pores.

Erosion – measurements of soil loss is < 2Tons/Acre/year for deep soils and <1T/A/year for shallow soils. Visual evidence includes presence of rills, pedestaling of plants, and deposition of soil or loss of plant cover.

Alternative A: Grazing as Currently Permitted (No Action)

Under this alternative, detrimental soil effects would be expected to continue. Compaction and erosion would continue.

Alternative B: Grazing with Management Modification (Proposed Action)

This alternative would improve soil quality by providing opportunities for incorporating monitoring techniques into allotment management plans.

Alternative C: No Grazing by Domestic Livestock

Under this alternative, soil quality would gradually improve.

HERITAGE RESOURCES

The following discussion and analysis are based on the Heritage Resources Report for the Upper Green River Area Rangeland Project Decision prepared for the Wyoming State Historic Preservation Office (SHPO) on October 4, 2002. Applicable direction is also contained in Chapter 4 of the Forest Plan (p.142).

Environmental Consequences

Direct and Indirect Effects

The following direct, indirect, and cumulative effects to heritage resources are common to both action alternatives. The effects for the no-action alternative would not include those described below that result from the presence of livestock and associated management activities.

Direct effects of livestock grazing on heritage resources have been known to occur on archeological sites, and have been observed on a limited number of prehistoric sites in the project area. These effects include impacts to sites matrices (e.g., soil, buried fire pits) and impacts to artifacts and other cultural remains. Direct impacts include chiseling in damp and/or sandy soils and sloughing and collapse of stream banks. Fire pits and other archeological features that are exposed in road cuts or on the surface of a site can be trampled and destroyed by livestock as they move across these site areas. Livestock also have the potential for impacting historic structures if they congregate around these structures in great numbers. Studies in areas where cattle are highly aggregated suggest that trampling can cause impacts to artifacts and features through breakage and horizontal and vertical movement of artifacts and soil. However where cattle grazing activities are not intense, such as across well managed and healthy pastures with low utilization rates, occasional use would not be considered significant and impacts would not exist.

Indirect effects involve the removal of vegetation and trampling induced compaction that leads to a reduction in infiltration rates and subsequent increase runoff that causes sheet erosion. The loss of vegetation can cause the loss of artifact context through down slope transportation, stream bank destabilization, and increased visibility of surface materials and subsequent unauthorized artifact collection.

Implementing mitigation and monitoring requirements identified in Chapter 2 would reduce direct and indirect effects to heritage resources from livestock grazing and associated activities.

Cumulative Effects

It has been observed that the primary impacts to archeological sites on the Bridger-Teton National Forest results from intensive human activity, such as two track roads, constructed roads, trails, dispersed recreation activity, and development. When these activities occur on or near significant archeological sites, the result is often exposed subsurface soil deposits. These exposed sites are then susceptible to further damage from erosion processes, human activity, as well as livestock grazing activities. Although livestock grazing impacts are not usually the primary contributor to this impact, livestock and their management can contribute to the overall effects to heritage resources. As the Upper Green River area continues to receive increased human activity, there will be an increase in the cumulative effects to heritage resources in the area.

RECREATION, TRANSPORTATION, VISUAL RESOURCES, WILDERNESS

Alternative A - Grazing as Currently Permitted (No-Action)

Under this alternative, livestock grazing and its associated affects to physical conditions and conflicts related to recreation, transportation, visual quality, and wilderness would continue, although no significant impacts to these resources have been identified to date.

Alternative B - Grazing with Management Modifications (Proposed Action)

Under this alternative, livestock grazing would be allowed to continue, but associated effects to recreation, transportation, visual quality, and wilderness would improve due to added mitigations that would improve allotment management practices and conditions within the six allotments. Conflicts between visitors and livestock would continue but would be reduced from Alternative A. Strategies to dispose of livestock carcasses, and improve herding to keep cattle from congregating at critical sites would be required with this alternative. Effectiveness of mitigation measures would be monitored and adaptive management practices would be initiated to further improve conditions within the six allotments.

Alternative C - No Grazing by Domestic Livestock

Under this alternative, livestock grazing would be phased out over the next five years as current permits expire. Of the three alternatives, this alternative would have the most beneficial effects to recreation, transportation, visual quality, and wilderness. Conflicts between visitors and livestock, and livestock impacts to recreation, transportation, visual quality, and wilderness would discontinue when the grazing permits expired. However, existing conditions relating to impacted sites would not be corrected with this alternative, and much of the available funding for monitoring vegetative health and treatment of vegetative communities would be discontinued, while recreational stock and wildlife would continue to graze within the project area.

Table 4-13
Summary of Effects to Recreation, Transportation, Visual Quality, and Wilderness by Alternative.

Existing Condition	Alternative A (No Change)	Alternative B (Proposed Action)	Alternative C (No Grazing)
1. Visitors are occasionally displaced from dispersed campsites due to presence of cattle, manure, or trampled vegetation caused by livestock.	Existing condition would continue without noticeable improvement.	Existing condition would improve through implementation of mitigation measures and monitoring program.	Visitors would not be displaced from dispersed campsites by livestock, or their associated impacts.
2. Cattle congregate along FS Road 600 and 650, causing resource impacts and safety concerns for motorists along these roads.	Existing condition would continue without noticeable improvement.	Existing condition would improve through implementation of mitigation measures and monitoring program.	Safety concerns and resource impacts caused by cattle on roads would be eliminated. Resource conditions along roads would improve over time.
3. Cattle and recreational stock are causing impacts to streambanks and trails, causing sedimentation at stream crossings.	Existing condition would continue without noticeable improvement.	Existing condition would improve through implementation of mitigation measures..	Impacts from cattle would discontinue but impacts from recreational stock would continue. Conditions would not improve significantly at problem sites because mitigation measures (hardening of sites) would not be implemented.

Table 4-13 (continued)
Summary of Effects to Recreation, Transportation, Visual Quality, and Wilderness by Alternative.

Existing Condition	Alternative A (No Change)	Alternative B (Proposed Action)	Alternative C (No Grazing)
4. Visual Quality is impacted by cattle in several areas due to trampled vegetation, barren sites, trampled stream banks, and high concentrations of cattle at critical view sites.	Existing condition would continue without noticeable improvement.	Existing condition would improve through implementation of mitigation measures, such as implementation of utilization standards that improve vegetative conditions.	Visual Quality would improve over time.
5. Livestock improvements (fences, etc.) may be displacing visitors from dispersed sites and pose safety concern to visitors and wildlife if not properly maintained.	Existing condition would continue without noticeable improvement.	Existing condition would improv due to improved management of improvements and removal of non-functioning facilities.	Improvements would be removed when permits expire. No visitors would be displaced by improvements and concern for visitor safety and wildlife safety would be eliminated.
6. Conflicts regarding forage availability for livestock, recreational stock, and wildlife are occurring in Water Dog Lakes, causing visual and vegetative health concerns.	Existing condition would continue without noticeable improvement. Livestock, recreational stock, and wildlife could overutilize this area.	Existing condition would improve for the vegetative condition. Forage availability would improve for livestock, wildlife, and non-outfitted recreational stock use. Forage for outfitter stock would not be available.	Conflicts would be eliminated because forage would be available for recreational stock use and wildlife only.

Table 4-13 (continued)
Summary of Effects to Recreation, Transportation, Visual Quality, and Wilderness by Alternative.

Existing Condition	Alternative A (No Change)	Alternative B (Proposed Action)	Alternative C (No Grazing)
7. Cattle carcasses near popular recreation sites and trails, especially at Water Dog Lakes, are visually obtrusive and have high potential to draw grizzly bears, posing increased safety concern for visitors.	Existing condition would continue without noticeable improvement. Cattle death due to larkspur poisoning would continue to occur at Water Dog Lake, which will continue to impact visitors and may continue to lead to temporary closures of this area. This will impact outfitters who depend upon use of this area for their livelihood.	Existing condition would improve through implementation of mitigation measures, such as changes in use to minimize the potential for larkspur poisoning of cattle, which will reduce the number of cattle carcasses in this area.	This condition would be eliminated because no cattle would exist on the allotments.
8. Some salting sites are encouraging cattle congregation on South Fork of Gypsum Creek, causing trampled vegetation within riparian sites.	Salt sites would be required to be moved to meet Forest Plan standards. This would result in improved conditions for this area.	Same effect as Alternative A.	Salting would be eliminated. Salting sites might require rehabilitation in some locations.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) 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."

The Federal Land Policy Management Act (FLPMA), as amended by the Public Rangelands Improvement Act, allows for allotment management plans (AMP) to be included in grazing permits at the discretion of the Secretary of Agricultural [43 USC 1752d, as amended by 92 Stat. 1803 (1978)]. The Secretary of Agriculture has elected to exercise this discretion, and has delegated his authority to issue regulations in the area to the Chief of the Forest Service (36 CFR 222.1 and 222.2). An allotment management plan is defined in FLPMA as a document, prepared in consultation with lessees or permittees, that applies to livestock operations on public lands, and (1) prescribes the manner in and extent to which livestock operations would be conducted in order to meet multiple use, sustained-yield, economic, and other needs and objectives, (2) describes range improvements to be installed and maintained, and (3) contains such other provisions relating to livestock grazing and other objectives found by the Secretary to be consistent with provisions of FLPMA.

Public Law 109-19, otherwise known as the "Recissions Act," was passed on July 27, 1995. This Act requires that each Forest establish and adhere to a schedule for the completion of a National Environmental Policy Act (NEPA) analysis and decision on all allotments on the National Forest System units. Upon completion of the scheduled NEPA analysis and decision, the terms and conditions of existing grazing permits would be modified or re-issued, if necessary, to conform to such NEPA analysis.

National Historic Preservation Act - All actions and mitigation comply with the National Historic Preservation Act in consultation with the Wyoming State Historic Preservation Officer. Consultation with the appropriate tribes has been conducted on all threatened, sensitive sites or traditional heritage properties. Heritage resource specialists have inventoried areas with a high probability of containing heritage resources where any ground disturbing activities are proposed. Impacts to significant heritage sites have been avoided, minimized, or mitigated.

Executive Order 13007 (American Indian sacred sites) – Executive Order 13007 directs federal agencies to accommodate access to and ceremonial use of American Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites. This project will not affect access or ceremonial use of American Indian sacred sites.

Endangered Species Act and Forest Service Sensitive Species - A Biological Assessment for all Threatened and Endangered potentially inhabiting the project area is contained in the project record. However, if the Threatened and Endangered Species list is updated and includes a species that is present and has habitat within the project area, then a new assessment may need to be conducted. A Biological Evaluation for all sensitive species, or their habitat, potentially inhabiting the project area is contained in within Chapters 3 and 4 of the document. The Forest Plan contains standards and guidelines applicable to designated sensitive species, which are incorporated into the project design.

National Forest Management Act (NFMA) - This project incorporates all applicable Forest Plan forest-wide standards and guidelines and Management Area prescriptions as they apply to the project area, and are consistent with Forest Plan goals and objectives. All required interagency review and coordination will be accomplished; new or revised measures resulting from this review would be incorporated. The Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Application of Forest Plan direction for this project ensures compliance at the project level.

Clean Water Act - The design of all activities in the proposed action is in accordance with Forest Plan standards and guidelines, Best Management Practices (refer to: Wyoming Department of Environmental Quality, Grazing Best Management Practices, Wyoming Non-point Source Management Plan, (March. 1997) and applicable Forest Service manual direction (FSM 2532.02, Water Quality Management). Monitoring and evaluation of the implementation and effectiveness of Forest Plan standards and guidelines and BMPs will

occur. Project activities are expected to meet or exceed all applicable State of Wyoming water quality standards.

Clean Air Act of 1977 (as amended) - Emissions anticipated from the implementation of any project alternative would be of short duration and designed to comply with the State of Wyoming ambient air quality standards.

Executive Order 11990 (wetlands) - Soil moisture regimes and vegetation on some wetlands may have been altered by past grazing. However, the affected wetlands meet Corps of Engineers wetland classification and still function as wetlands in the ecosystem. Further effects to wetlands are minimized through the application of specific BMPs.

Executive Order 12898 (environmental justice) - Implementation of any project alternative is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Executive Order 13112 (invasive species) - Implementation of any alternative will use existing integrated pest management strategies to prevent the introduction of invasive species, such as noxious weeds, and will not authorize or carry out actions that are likely to cause the introduction or spread of invasive species.

Executive Order 12962 (aquatic systems and recreational fisheries) – Executive order 12962 directs federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. With the application of Forest Plan Standards and Guidelines, including those for riparian areas, no significant adverse affects to aquatic systems would likely occur.

Executive Order 11988 (floodplains) – Executive Order 11988 directs all federal agencies to take action to avoid, to the extent possible, the long and short term impacts accosiated with the occupancy and modification of floodplains. With the application of Forest Plan Standards and Guidelines, including those for riparian areas, and BMP's effects on have been minimized to the extent possible.

Effects on Civil Rights, Women, and Minorities – This project will not cause adverse impacts to civil rights, women, or minorities.