

Chapter 4

Environmental Consequences

ENVIRONMENTAL CONSEQUENCES

This chapter describes environmental consequences that may result from implementing each of the four alternatives described in Chapter Two. The purpose of this chapter is to analyze and disclose potential impacts of the various alternatives on the human environment. The proposed action for this Environmental Assessment (EA) is the Bureau of Land Management's (BLM's) selection of an alternative on which future grazing use actions would be based.

The potential consequences of each alternative are described in this chapter as impacts using the same order of eight resource topics (e.g. Soil and Water Resources, Vegetation, Livestock Grazing, Wildlife/Fisheries Habitat, etc.) presented in Chapter Three. Identical organization for Chapters Three and Four allows the reader to compare existing resource conditions to potential impacts for the same resources.

INTRODUCTION

The human environment is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. Environmental consequences are usually described as being direct or indirect. 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. Indirect effects may be induced changes. Effects include ecological, aesthetic, historic, cultural, economic, social, or health. Effects include both beneficial and negative effects.

ASSUMPTIONS

The assumptions listed below, and for each resource in the following section, are disclosed to provide a basis for the conclusions reached in this chapter. Assumptions common to all alternatives and all resources are listed below, whereas assumptions unique to specific resources are listed immediately following the impact analysis for that resource.

1. Impacts are assessed in the short-term, mid-term and at the long-term. The short-term is defined as 2008-2012, the time period in which the allotment management plan (AMP) begins to be implemented. The mid-term is defined as 2013-2017, the time period in which the AMP could be fully implemented and each use area and pasture would have gone through at least one full cycle of the proposed grazing systems. The long-term is 2018-2027, the time period in which objectives of the selected alternative and AMP could be reached.
2. For analysis purposes, the procedure used for quantifying economic impacts for all alternatives is based on a regional input/output model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. This model, known as IMPLAN, was calibrated to represent the local conditions found in Fremont County.
3. Sporadic grazing use on uplands is generally not considered as having an impact on most cultural resources, therefore it has not been considered in the cultural resources sections of the environmental consequences. Factors which cause intensified grazing use on uplands are addressed through standard cultural resource protection measures listed in Chapter 2.
4. All four alternatives would allow for extensive permit (60 percent cattle and 70 percent sheep) nonuse, which has been authorized in the allotment over the past nine (1999-2007) years, to continue in the short-term to allow for drought recovery. The GMCA grazing permittees who have been taking substantial levels of nonuse for four or more consecutive years, for reasons of "personal convenience", would be able to continue to have their active AUMs authorized for nonuse in the short-term in accordance with 43 Code of Federal Regulations (CFR) 4130.2(g). This regulation states: "Temporary nonuse ... may be approved by the authorized officer if such use is determined to be in conformance with applicable land use plans, AMP or other activity plans and the provisions of subpart 4180 of this part." The provision found at 43CFR 4130.3-2(f) may also be applicable in maintaining plan conformance by directing temporary non-use for additional time for protection of resources. Therefore, if circumstances conform to

the above language, and the field manager has data or evidence and/or has signed an agreement with the permittee(s) supporting temporary non-use beyond the three-year period, BLM would continue to honor those plans or agreements made in good faith. In the meantime, the BLM would continue to monitor and gather information in order to support any decisions it may make which might affect active grazing preference. The objective of this policy is to provide protection of the rangeland resource as discussed in the GMCA mission statement and goals and objectives in Chapter One.

5. Another assumption for this EA is taken from a recent study of rest and deferred-rotation grazing systems in the Western U.S. Briske et al. (2008), have found that “Rest and deferment during periods of minimal plant growth; associated with low soil water availability or temperature extremes, limit the potential for positive vegetation responses. Rest periods that coincide with limited plant growth convey minimal benefit to plants so that the impacts of increased grazing pressure during short grazing periods may not be offset during subsequent rest periods. Conditions of limited and erratic precipitation are the rule, rather than the exception, on most rangelands throughout the West.”

EFFECTS COMMON TO ALL ALTERNATIVES

WILDERNESS STUDY AREAS AND WILD AND SCENIC RIVER

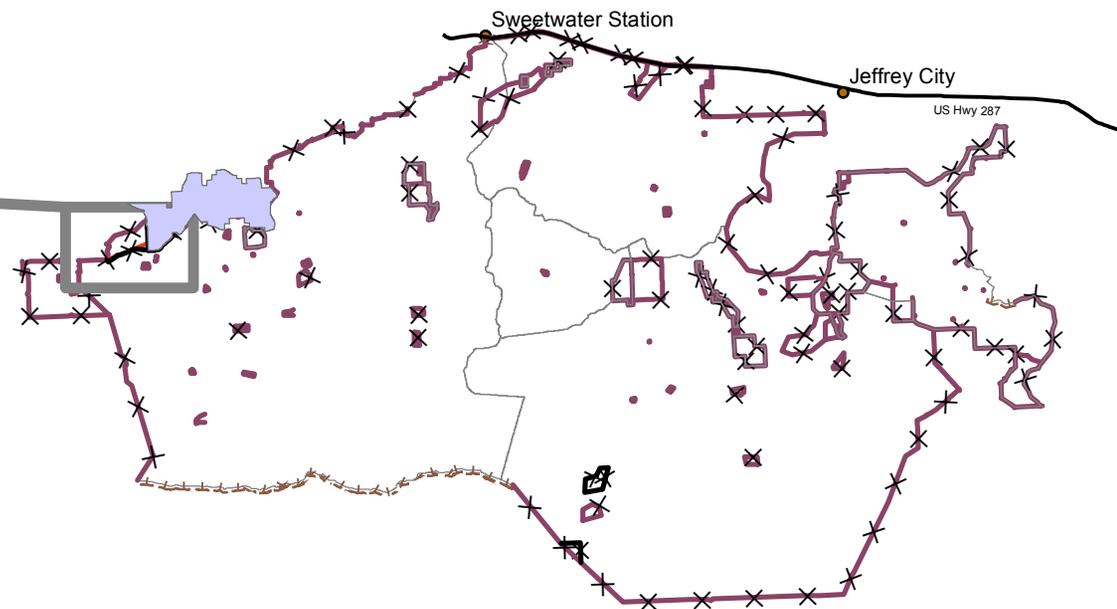
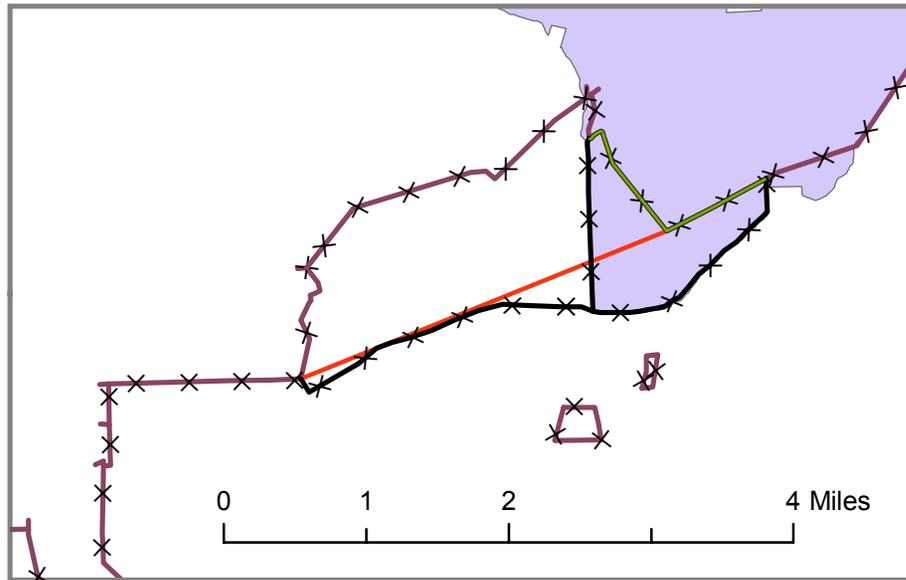
All alternatives propose a riparian pasture in the Wilson Bar area of the Sweetwater River. This section of the river is outside of the Sweetwater Canyon Wilderness Study Area (WSA). The fence was proposed in the 1999 decision with an alignment that had potential to: a) negatively impact the scenic quality of the WSA, b) cause fragmentation of the WSA by fences, c) constitute a grazing system dependent improvement that would be hard to remove if the area became a wilderness area, and d) constitute a range improvement that does not result in an improved condition in the WSA. For all the above reasons the alignment of the proposed Wilson Bar fence has been changed.

In order to connect the Wilson Bar Fence to the WSA riparian pasture it was necessary to realign the existing WSA pasture fence to the WSA boundary. This allows other fences to connect to the WSA fence in a manner that does not segment portions of the WSA. The proposed realignment is reflected in Map 4-1. Approximately 490 acres of the WSA contained within the GMCA would be included into the WSA riparian pasture after the fence is realigned along the boundary of the WSA (see Map 4-2). This realignment would occur in the Granite Creek area of the allotment and parallel an existing road in the area.

The stressors as a result of the above actions common to all alternatives are 1) relocating approximately 2.5 miles of the WSA fencing, and 2) facilitating positive rest and eventual controlled grazing on upstream (non-WSA) segments of the Sweetwater River.

Table 4-1 displays the expected impacts from the redesigned Wilson Bar Riparian Pasture. The changes made to the Wilson Bar Riparian Pasture and proposed realignment of the WSA riparian pasture would benefit the majority of the analyzed elements of the WSA resource. Most impacts associated with the simple presence of a fence would not represent a change from the existing environment, due to the fact that there is no net increase in the number or miles of fence. In addition, the area of the WSA fenced from the GMCA allotment would increase, which would facilitate rest and/or a more controlled grazing management strategy. Water quality of the Sweetwater River would improve as a result of better grazing management in the upstream Wilson Bar area, as well as the currently unfenced portions of Granite Creek within the WSA boundary.

Map 4-1: Range Project Proposals with WSA Mitigation All Alternatives

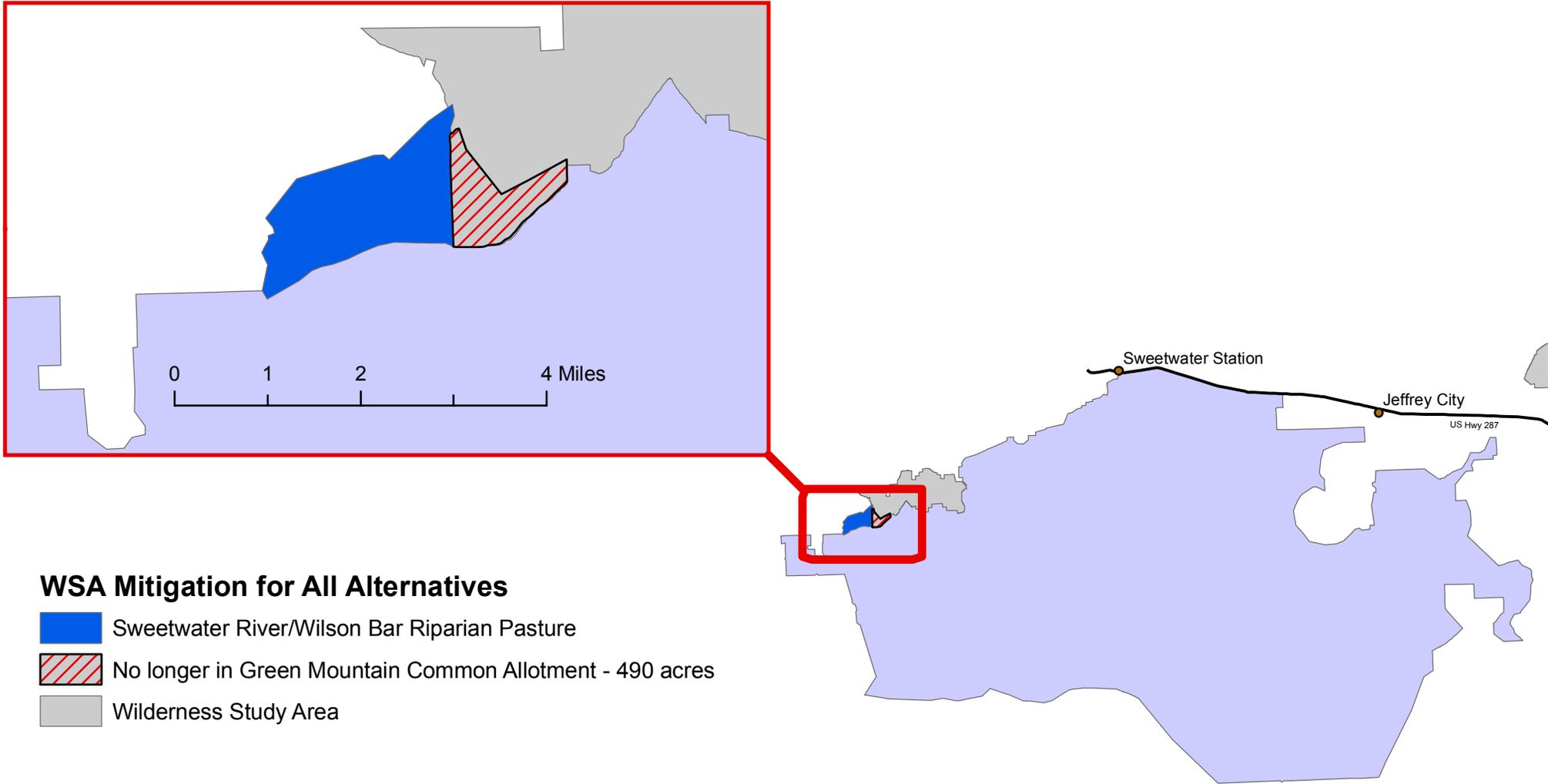


-  Wilderness Study Area
-  Proposed New Fences
-  Original Proposal - WSA Encroachment
-  Remove Existing Fence
-  Existing Fences
-  Cyclone Rim (un-fenced)



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Map 4.2: Wilderness Study Area Mitigation All Alternatives



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Table 4-1. Predicted Impacts to Wilderness Values As A Result Of the Proposed Wilson Bar Riparian Pasture and WSA Pasture Fence Relocation

Wilderness Value Indicator	Impact Description	Will the Impact Exceed Maximum Allowable Standard
Visual Resource	Low-moderate contrast	Further Analysis Below
Naturalness and Solitude		
Human Activity	No net increase	No
Wildlife presence	No loss or reduction in the presence or distribution of wildlife. Decreased evidence of livestock.	No
Facilities	No net increase in facilities	No
Pristine areas	No pristine areas impacted	No
Planning	Action meets all existing planning decisions	No
Primitive Recreation		
Recreation opportunities	No change in recreation setting results in no change to the availability of recreation opportunities	No
Natural appearing environment	Slight changes to the natural appearing environment would occur in the relocation area.	No
Special feature	Not present in the area proposed for the fence realignment. No anticipated impacts to the special features from the fence realignment	No
Surface Water	Overall surface water quality in the WSA would be enhanced by better grazing management on upstream portions of the river.	No
Vegetation		
Ecological Site Inventory	No change to the vegetation of the WSA is anticipated from the fence	No
Vegetation Utilization	Vegetation utilization would be reduced as a result of the fence relocation	No
Threatened or endangered plants	Plants do not exist within WSA	No
Plant Vigor	Plant vigor would increase in area of the WSA currently not fenced from the GMCA.	No
Wildlife		
Threatened or endangered animals	No threatened or endangered animals occupy the WSA	No
Wildlife habitat	No net change to wildlife habitat within the WSA would result.	No
Population	No wildlife populations would be reduced	No
Diversity	Population diversity would not be impacted. This is a result of a lack of impact to wildlife habitats and existing populations.	

VISUAL RESOURCES

The realignment of the fence to the WSA boundary would result in the fence paralleling a main access route running along the southern extent of the WSA. The proposed fence relocation is not a new visual impact; however the distance from the key observation point (in this case the access road) would decrease. Decreasing observation distance increases the level of project contrast with the existing landscape. The fence relocation would impact the observer’s view shed for approximately 2.5-2.75 miles. Since the fence would be paralleling an existing road (an existing linear visual impact) the level of change to the characteristic landscape would not be as conspicuous had the

area been un-impacted by human modifications. Based on the contrast rating system the level of visual impact from the fence would increase in this area to a moderate level. This intensity of impact is above the IMPs maximum allowable standard. Altering the fence realignment location to the south of the access road would reduce the level of impact to the WSA visual resource (as viewed from the access road). This small change would have a profound reduction in visual impacts for the simple reason that the viewer's attention is focused toward the WSA features and away from the fence line.

ALTERNATIVE ONE

EFFECTS ON SOIL AND WATER RESOURCES (Alternative One)

Introduction

Soil and water quality are closely tied to the adequacy of vegetative cover and type. Commonly used erosion and sediment yield equations all depend upon accurate assessments of soil cover for making good estimates. Vegetative cover is the one factor that a land manager can control most directly. Slopes, climates, soil physical features, and soil textures are little affected by management changes.

Soil Resources

This alternative would continue with the currently prescribed five use areas for the GMCA. Within the five use areas, herding and deferred-rotation grazing systems are expected to increase the use of vegetation on uplands, thereby alleviating most of the heavy hot-season use that presently occurs in the riparian areas. Monitoring of grazing would be frequent and sensitive enough to detect significant changes. Implementation of this alternative would not adversely impact soil potential in the uplands. With use levels of riparian vegetation expected to be moderate to heavy only within a rotation period, a fair chance of improvement from present conditions is expected, depending upon effective herding and proper stocking rates (Platts, 1990). For the immediate future, conditions of low seral stage riparian areas that have lost their soil fertility would remain the same, and current trends would continue. Those riparian areas that still retain their inherent soil fertility would show improvement, but it would take several decades under this strategy to note visual improvement.

Impacts in the uplands from bunched, herded livestock on the brittle brush component (i.e., sagebrush, rabbitbrush, bitterbrush, etc.) would be manifest as broken, trampled bushes, which would decrease the height of the plant community and leave an increased amount of plant litter (i.e., stem pieces and leaves) on the soil surface. This should favor a shift in the plant community to herbaceous species (and conceivably weedy species too) in localized heavily impacted areas. With a decrease in the height of the plant community, one can expect less snow catch on these areas and greater exposure to wind erosion. The increased litter can increase resistance to water erosion in the short term, but as wind and surface runoff moves this surface litter around, bare soil would be exposed to water erosion. On sandy soils, such as those in the Happy Springs Use Area and the sand dunes south of Green Mountain, loss of these shrubs would lead to the initiation of accelerated wind erosion.

This alternative in 1999 originally proposed 48 miles of riparian enclosure fence, 68 new water sources, and the placement of salt at least one-half mile from water to aid in the distribution of livestock, along with intensive herding. With the 68 new water sources originally proposed under this alternative, at least one new upland salt location would be a necessary aid in drawing livestock to the uplands. One new sacrifice area would be created at each salt block location. The sacrifice areas associated with the existing salt block locations are generally not as large as those associated with water sources, but some amount of bare, compacted soil is expected to develop around each one.

A combination of seven riparian pastures, (five completed and two not yet built) would be constructed and maintained on important riparian zones. These riparian pastures would be used by livestock either in the spring or fall period. The effects would be variable, but if properly managed, improvement in vegetative expression would be expected to occur over a period of several normal precipitation years. The functional integrity of the riparian systems would however, take longer to restore. This is because achieving functional integrity involves not just

establishing proper amounts of vegetative cover, but also attaining the proper mix of native species to form a stable, resilient plant community with root masses that can withstand normal flood events and protect bank soils. Proper vegetation establishment is crucial to create the stream channel geometry (i.e., channel shape) necessary to carry normal flows and withstand flood events without contributing abnormal sediment loads that could lead to impaired water quality.

The Affected Environment section of this document describes the local climate: growing seasons are very short, winters are long, and average annual temperatures are rather cold and precipitation in the growing season is undependable. These are not the conditions for rapid establishment of the proper kinds and amounts of cover for riparian zones. The nature of the climate in the area, combined with the amounts and kinds of vegetative community, will also determine how long it will take to establish proper stream channel geometry to accommodate normal flows and floods. Experience with similar riparian pastures in the allotment has shown that a decade or more may be required to restore a degraded riparian zone. Formerly wet soils that have undergone salinization (i.e., experienced lowered water tables through gully erosion and where topsoil has been lost through wind and water erosion and salts have been deposited at the surface through capillary action) are not expected to be restored under any management scenario.

Several drought and management-dependent soil erosion scenarios that would likely occur over time are stated below:

1) Average or heavy precipitation year with below-average vegetative growth: This scenario would yield the highest soil losses (i.e., erosion). The unfavorable vegetative growth could be due to a number of factors, such as the lingering effects of prior drought years, grazing use in the wrong season, too much grazing use/vegetation trampling, or precipitation that comes too late.

During these high periods of erosion, soil loss tolerances would be exceeded. When this happens, the rate of soil formation is exceeded by the rate of soil loss. With relatively thin surface horizons (layers), seemingly small erosional losses would result in the decrease of a site's potential to produce its characteristic vegetation. A site's susceptibility to invasion by noxious weeds would thus increase.

2) Average precipitation year with average or better vegetative growth (i.e., normal years): Soil erosion rates would not exceed soil formation rates, and the ability of the soil to produce its characteristic vegetation would be maintained.

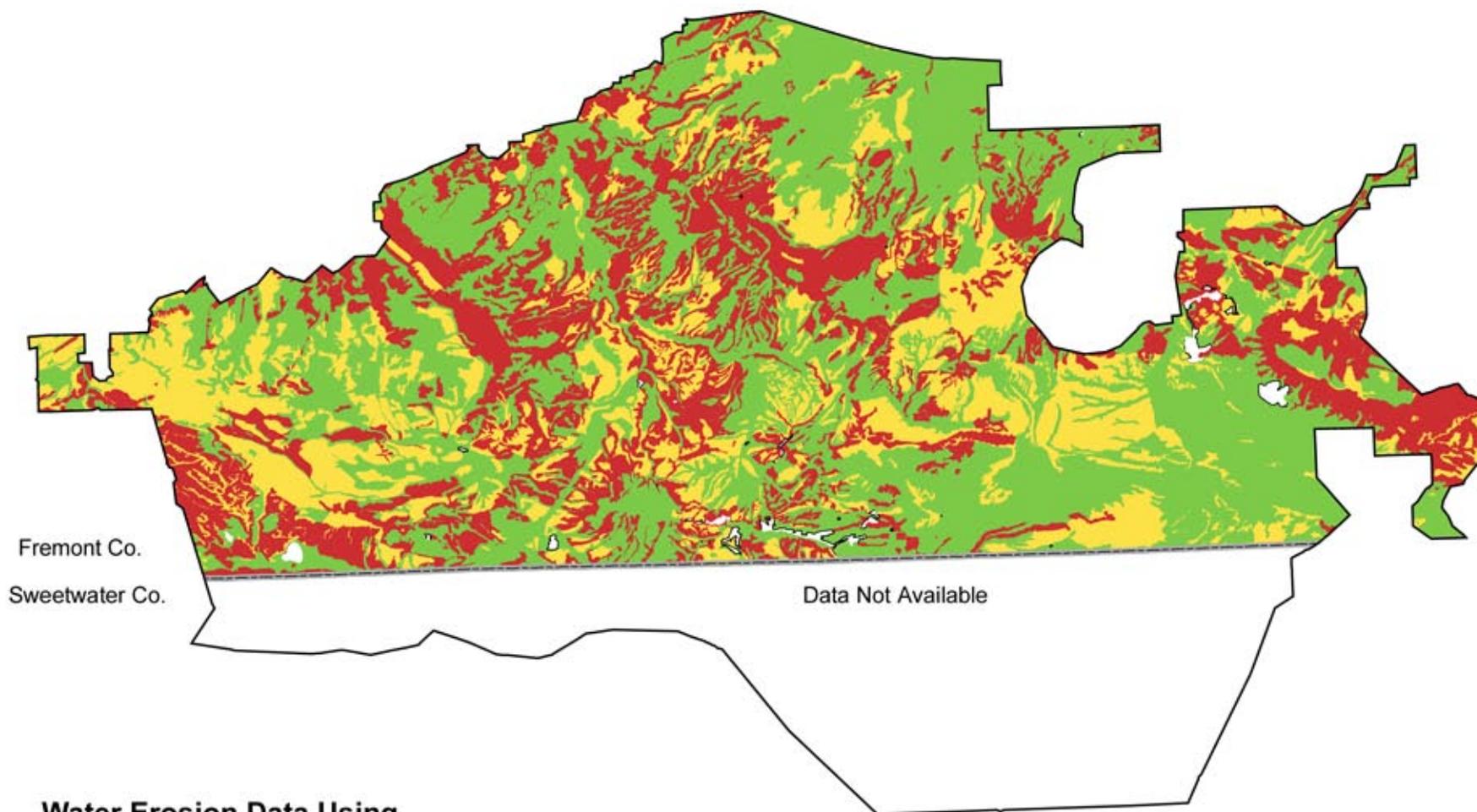
3) Unfavorable precipitation year with below-average vegetative growth: In such circumstances, erosion rates would not extensively exceed soil formation rates; however, with unfavorable vegetative growth, the erosive effects of average storms would be enhanced.

4) Unfavorable precipitation year with at least average vegetative growth: These years do not often occur, but they would yield the lowest soil erosion rates. Low overall precipitation years with adequate precipitation during the growing season would fit this scenario. The wetter soils of riparian areas would also fit this situation.

Over time, all of the scenarios above could happen regardless of which alternative is chosen. However, the grazing management changes under Alternatives One, Three, and Four would best ameliorate the effects of droughts on soils and their dependent vegetation, as well as the erosive effects of abnormally rainy years.

Map 4-3, Water Erosion Potential, and Map 4-4, Wind Erosion Potential, both illustrate that if a management scenario decreases soil cover too much in the uplands, accelerated wind erosion can result. Areas of currently stabilized sand dunes to the south of Green Mountain and medium-textured soils high in very fine sand, fine sand, and silt-size particles, like those in the Crooks Gap area, can become active and suffer erosional losses, consequently decreasing the potential of these sites. In the less-sandy areas, water erosion in the form of new and more frequent rills and gullies would result. Any increase in erosion rates should be negligible and not affect soil fertility.

Map 4-3: Water Erosion Data

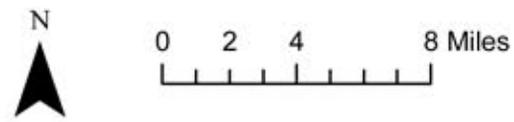


Fremont Co.
Sweetwater Co.

Data Not Available

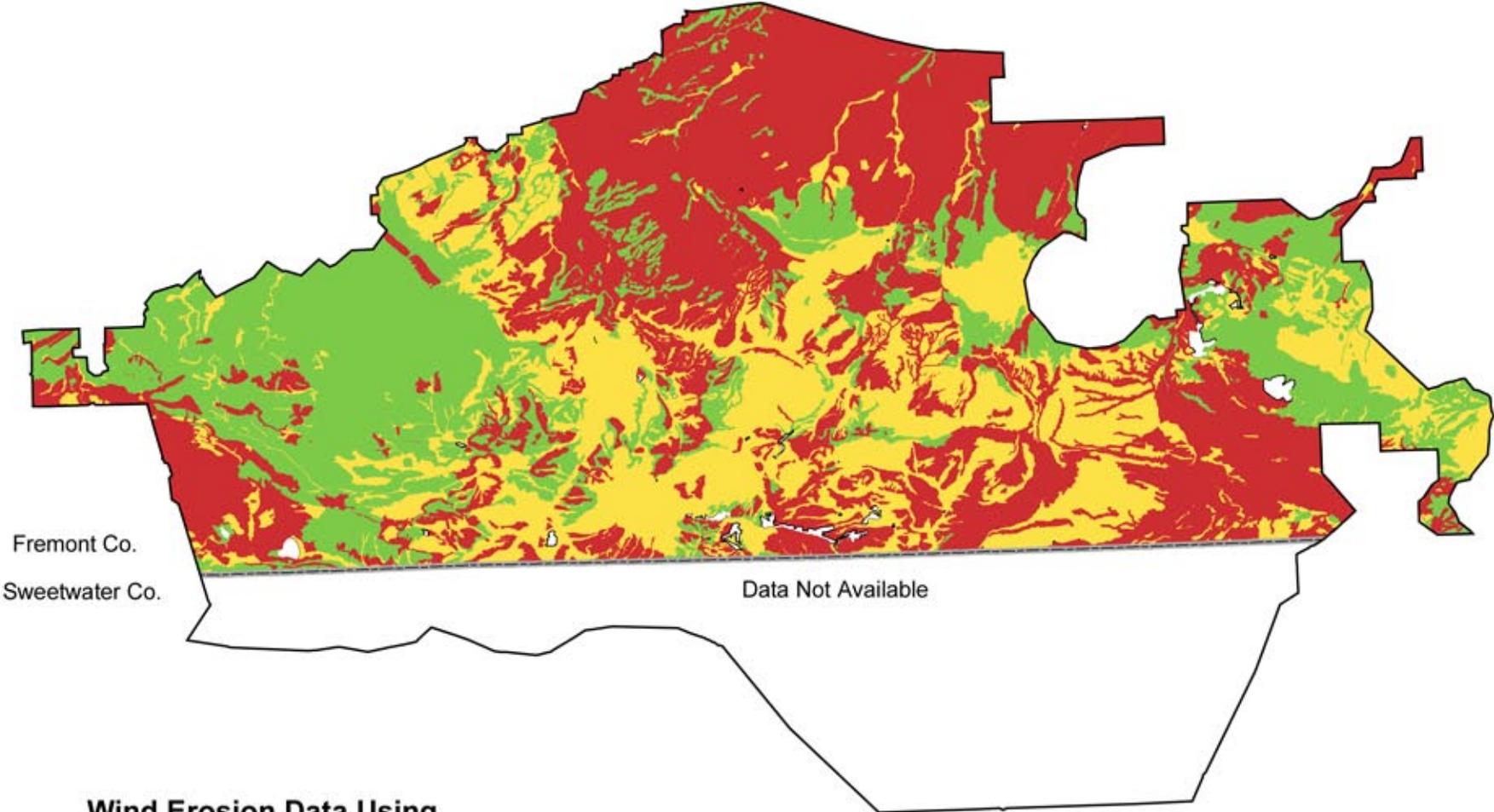
Water Erosion Data Using SSURGO for Fremont County

- Severe
- Moderate
- Slight
- Not Available



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Map 4-4: Wind Erosion Data



Wind Erosion Data Using SSURGO for Fremont County

- Severe
- Moderate
- Slight
- Not Available



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The use level identified under Alternative One should successfully maintain soil productivity and prevent unacceptable erosion rates, even with below-average precipitation. Alternative One would achieve the desired results within a 10-20 year timeframe. However, the success of this alternative depends not only on the development of new water sources in the uplands, but also on livestock herding in both the riparian and upland areas.

Short-term (one to five years) erosional impacts in the uplands would only be noticeable in areas impacted by new livestock water sources (sacrifice areas). With careful project planning, the acreage of heavy use and soil compaction would be minimized.

In the short-term, changes to the present condition of lowlands (i.e., riparian areas) would only be apparent, in spring development exclosures and riparian pastures that would be constructed. In the exclosures and pastures, increases in vegetative/litter cover and vegetative height would lower erosion rates and contribute increased amounts of organic matter to the soil. Both water and nutrient storage of these sites would improve, as would water quality.

In the long-term (after 10 years), even though increased upland use is part of the management strategy in this alternative, the pasture rotation strategy would allow for enough rest in the uplands to maintain adequate soil cover to buffer the erosive effects of wind and precipitation. The rotation should also allow enough time to alleviate the annual soil compaction that can occur due to animal traffic under moist conditions.

Water Resources

The expected impacts to water resources from Alternative One would also apply to Alternatives Three and Four, with some minor variations primarily related to specific water development projects, fences, spring exclosures, riparian pastures, and livestock management strategies. Soil erosion rates, especially those of the lowlands, would be the largest contributing factors to water quality.

The uplands are generally lightly used, and with the proposed livestock management under Alternative One, they are not expected to deteriorate. Therefore, erosion rates and sediment yield from the uplands should not significantly change in both the short and long term.

Long term changes expected in the riparian areas are: increased plant species diversity, ground cover, bank stability, and vegetation height; as well as, alleviated soil compaction in riparian areas and the transition zones between them and adjacent uplands. Except in spring exclosures and riparian pastures, the current conditions of the lowlands are not expected to change in the short term.

Seven riparian pastures (five completed and two not yet built) would be built around some of the important riparian zones. These riparian pastures would initially be given three to ten years of rest. Livestock use would then be restricted to spring and fall periods. With the elimination of livestock and wild horse damage to stream banks and adjacent areas and with the restoration of the functional integrity of the riparian systems, improvements in water quality would occur.

As desirable amounts and kinds of vegetation are restored to the riparian areas through controlled livestock management, acceptable erosion levels would result in tolerable sediment yields. Improved water quality and soil moisture, along with creek and spring water yields reaching into the summer and fall seasons, are expected to occur in the long term; except in areas of stabilized sand dunes and locations where weedy species may establish.

Droughts have occurred in the past and will continue to occur in the future. Alternative One would optimize multiple uses while protecting and enhancing water quality.

Impacts to water resources outside of exclosures and riparian pastures would be directly attributable to the effectiveness of the herding; water quality should be enhanced.

There are currently 133 acres of land experiencing impacts from livestock (i.e., sacrifice areas) and project

developments (e.g., springs, wells, fences, and reservoirs) since the implementation of the 1999 Green Mountain Common Allotment Final Decision.

EFFECTS ON VEGETATION RESOURCES (Alternative One)

Vegetation - General

This section discusses generalized principles of plant growth in relation to the impacts of the various grazing treatments, followed by summaries of short and long-term impacts by use area for this alternative. The vegetation section concludes with a discussion of range improvement impacts on vegetation.

Estimates of vegetation impacts as a result of implementation of the alternatives are based upon vegetation studies and professional judgment. Although the vegetation studies were not performed within the allotment, they are believed to be applicable to the GMCA. It should be noted, however, that the predicted impacts are the best estimates of what would happen, and are not to be interpreted as certainties. The monitoring studies described in Chapter Two are designed to detect the actual vegetative impacts of the selected alternative. If the desired results are not being achieved, then the allotment management plan (AMP) and grazing systems would be revised as necessary.

Grazing Management

Defoliation of a plant by grazing reduces the photosynthetic capability of the plant. The leaves are the food factory. Rate of plant regrowth following grazing is dependent on the amount of leaf area remaining for photosynthesis and the availability of active axillary buds to initiate new tillers. Roots anchor the plants to the soil, take up water and nutrients, and if healthy, enable the plant to survive stress from drought, cold, heat, and grazing. Root growth is dependent upon the energy provided from photosynthesis. Healthy plant roots are essential for soil stability and erosion control, especially in riparian areas (USDA-NRCS, 1997).

Impacts to vegetation caused by grazing vary according to the vegetative stage of growth or dormancy. Defoliation of plants during susceptible periods can reduce the ability of plants to maintain growth and vigor (Buwai and Trlica, 1977). The time of defoliation is very important in determining the ability of the plant to recover. The most detrimental time of defoliation occurs during active growth when carbohydrate reserves are being used to produce herbage. McCarty and Price (Stoddart, Smith, and Box, 1975) identified two critical periods in the growth of forage grasses: (1) the period of active reproduction, from flower-stalk formation to and including seed ripening; and (2) the initiation of the normal carbohydrate-storage period.

Garrison (1972) stated that fall and winter seasons are the least detrimental periods for utilization of shrubs. Late spring and the middle of the growing season, when the carbohydrate reserves are the lowest, are the most damaging periods of use. Trlica and Cook (1971) found that most shrub species defoliated by clipping about May 10 or July 1 had significantly smaller food reserves by the fall season than did unclipped plants. Defoliation during the first part of April had less impact on food reserves than May or July defoliation.

Under Alternative One, each pasture in the GMCA would receive a rest period or deferment from livestock grazing during portions of the growing period. Deferring grazing use during the growing period is very important to the plant, in terms of carbohydrate reserve levels. The carbohydrate reserves are used during periods of rapid herbage growth, such as initial growth, subsequent regrowth, and for respiration and slight growth during the winter (Cook 1976; and Priestly from Coyne and Cook, 1970). Allowing growth without grazing pressure during portions of the growing period would allow the plant to have available ample carbohydrate reserves for normal growth and development. Not grazing during portions of the growing season would allow an increase in vigor, production, seed production, root growth/replacement and litter accumulation.

Livestock grazing occurs in all use areas and upland pastures (except Alkali Creek Sheep Use Area) during the summer growing period (Treatments A, B, D, and E). The seasonal grazing system in the Alkali Creek Sheep Use Area would result in sheep grazing from April 1 through June 15 and November 1 through December 31 each year. This spring sheep grazing has historically taken place near East Alkali Creek, on approximately 4,600 acres. The historical fall use would continue with the implementation of this alternative. Concentration of the fall sheep use in the use area would result in the decline of the vegetative vigor, production, and litter accumulation in the areas of overlap with spring sheep use. The remaining portions of the use area (approximately 16,600 acres) would be expected to improve in production, litter accumulation, vigor, and seed production (see Table 4-2).

Table 4-2. Predicted Short-term Impacts on Vegetation

Use Area name	Grazing System	Short-term Impacts of Grazing Treatment
Arapahoe (184,156 acres)	Four-pasture deferred-rotation system with season-long winter sheep grazing. Three treatments.	
Antelope Hills-Picket Lake (190,641 acres)	Treatment A: Graze from May 15 until seed ripe of key species (August 1), then rest until winter grazing (Nov. 1)	Graze: Vigor, seed production, litter accumulation reduced. Rest: Vigor and litter accumulation increased. Some seedling establishment.
	Treatment B: Rest until seed ripe of key species (August 1), then graze to trample seed into soil until October 31.	Rest: Vigor, seed production increased. Litter accumulation increased. Seedling establishment increased. Graze: Vigor, litter accumulation reduced. Trampling of seeds increased.
	Treatment C: Graze season-long through the winter (November 1-March 31)	Vigor and litter accumulation reduced.
Happy Springs (71,338 acres)	Three-pasture deferred-rotation grazing system with season-long winter sheep grazing in two pastures. Three treatments Treatment B: Rest until seed ripe of key species (July 15-August 1), then graze to trample seed into soil until October 31.	Rest: Vigor, seed production, litter accumulation reduced. Seedling establishment increased. Graze: Vigor, litter accumulation reduced. Trampling of seeds.
	Treatment C: Graze season-long through the winter (November 1-March 31). Treatment D: Graze season-long through the summer (July 16-September 15)	Vigor and litter accumulation, seed production reduced Vigor and litter accumulation, seed production reduced.
Green Mountain (36,830 acres)	Three-pasture seasonal grazing system. Four treatments.	
	Treatment A: Graze from May 15 until seed ripe of key species (August 1), then rest until winter grazing (Nov. 1). Treatment E: Graze October 1 through January 15. Rest from August 15 through October 1. Treatment G: Graze December 15 to March 31. Rest from April 1 to December 15.	Graze: Vigor, seed production, litter accumulation reduced. Rest: Vigor, litter accumulation increased. Some seedling establishment. Graze: Vigor and litter accumulation reduced. Rest: Vigor, litter accumulation, seedling establishment increased. Graze: Vigor and litter accumulation reduced. Rest: Vigor, seed production, seedling establishment, litter accumulation increased.
Alkali Creek Sheep (21,174 acres)	Treatment F: Rest summer long.	Rest: Vigor, litter accumulation, seedling establishment, seed production increased.
Long Slough (4,488 acres)	Treatment H: Rest summer long. Graze spring (May 1-June 15) or fall (October 1-October 31)	Rest: Vigor, litter accumulation, seedling establishment, seed production increased.

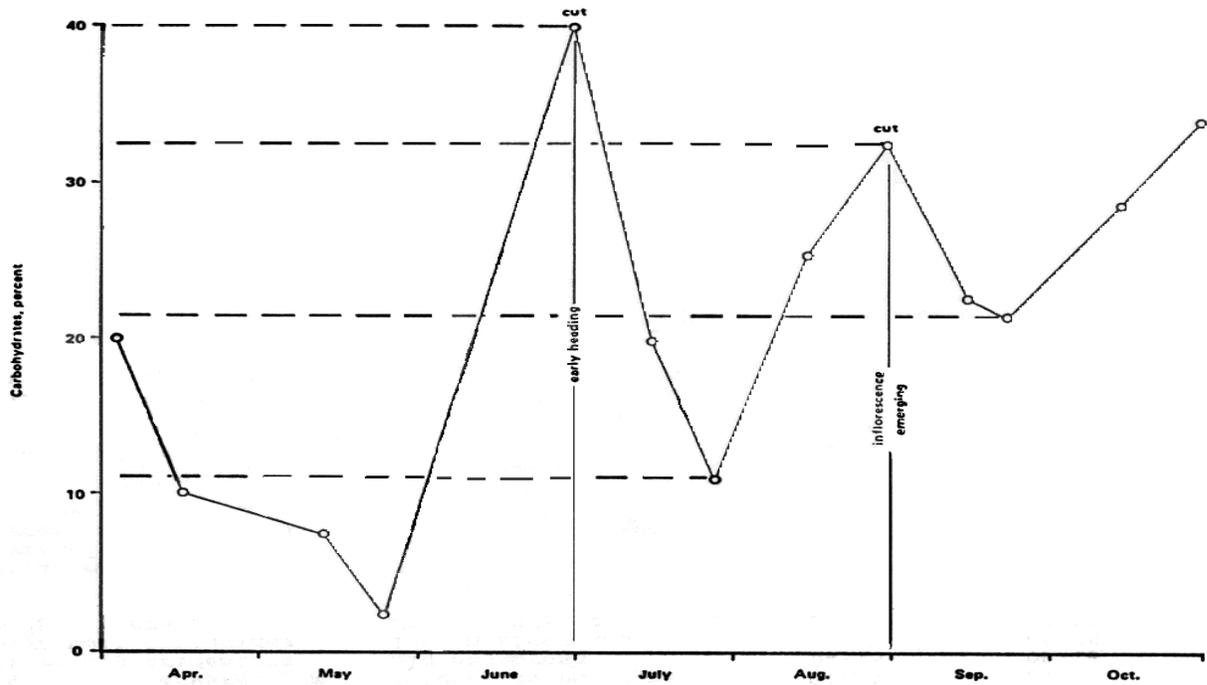
Spring and summer grazing by livestock would also occur in the Picket Lake and Daley Lake Pastures in the Antelope Hills-Picket Lake Use Area, Lost Creek and Eagles Nest Draw Pastures of the Arapahoe Use Area, Haypress Creek and Warm Springs Pastures of the Happy Springs Use Area, and the Sheep Creek Pasture of the Green Mountain Use Area (Treatments A and B). The turnout dates would alternate from May 1-15 one year to June 16-July 1 (August 1) the next year. This would allow time in alternate years for normal plant growth to occur during the growing season before livestock grazing begins. From April 1 to May 1-15, the allotment, except for the pasture the sheep are grazing, would receive rest from livestock grazing. Rest during this period of time is critical to the vegetation in order to begin growth (refer to Table 4-3, Phenology of Key Forage Species by Use Area).

Table 4-3. Phenology of Key Forage Species by Use Area

Use Area	Species	Common Names	Start Growth Date	Flowering Date	Seed Ripe Date	Average Range Readiness Date
Arapahoe	<i>Agropyron dasystachyum</i>	Thickspike wheatgrass	04-25 04-25	07-05 06-15	07-20 07-05	06-07
	<i>Oryzopsis hymenoides</i>	Indian ricegrass Big sagebrush	04-15	09-15	10-15	
	<i>Artemisia tridentata</i>					
Happy Springs	<i>Agropyron dasystachyum</i>	Thickspike wheatgrass	04-25 04-15	07-05 09-15	07-20 10-15	06-07
	<i>Artemisia tridentata</i>	Big sagebrush Indian ricegrass	04-25 04-20	06-25 06-20	07-10 07-10	
	<i>Oryzopsis hymenoides</i>	Needle-and-thread grass				
	<i>Stipa comata</i>					
Antelope Hills/ Picket Lake	<i>Atriplex nuttallii</i>	Nuttall saltbush	04-15	07-01	08-01	06-07
	<i>Ceratooides lanata</i>	Winterfat	04-15			
Green Mountain (Sheep Creek Pasture)	<i>Agropyron dasystachyum</i>	Thickspike wheatgrass	04-25 04-15	07-05 09-15	07-20 10-15	06-07
	<i>Artemisia tridentata</i>	Big sagebrush Indian ricegrass	04-25 04-20	06-25 06-20	07-10 07-10	
	<i>Oryzopsis hymenoides</i>	Needle-and-thread grass	04-20	07-01	07-15	
	<i>Stipa comata</i>	Bluebunch				
	<i>Agropyron spicatum</i>	wheatgrass				

Coincident with the beginning of growth at the end of the dormant season is a decline in stored carbohydrates (refer to Figure 4-1, Time of Defoliation Related to Carbohydrate Reserves and Figure 4-2 Relationship Between Grazing and Root Growth (Crider 1955)). The length of time during which stored foods are being depleted with the onset of growth may be as little as a few days in grasses (White 1973 from Stoddart, Smith, and Box 1975) or as much as months in some desert shrubs (Coynes and Cook 1970). The period ends when food manufactured by the newly-formed leaves exceeds the needs for metabolism and growth (Stoddart, Smith, and Box 1975). If grazing takes place during this time, the growth of the new leaves would be disrupted and would cause a delay in the replenishment of the food reserves.

Figure 4-1. Time of Defoliation Related to Carbohydrate Reserves



TIME OF DEFOLIATION RELATED TO CARBOHYDRATE RESERVE *

*Stoddart, Smith, and Box (1975)

Figure 4-2. Relationship Between Grazing and Root Growth (Crider 1955)

Relationship between grazing and root growth (Crider 1955)

	Top reduction	Single clipping
	90%	No root growth for 17 days. 60 percent of root growth on 33rd day.
	80%	No root growth for 12 days. 96 percent of root growth on 33rd day.
	70%	Approximately 48 percent of root growth after 17 days. 159 percent root growth on 33rd day.
	60%	Approximately 55 percent of root growth after 5 days. 192 percent root growth on 33rd day.
	50%	Averaged a 3 percent root growth stoppage for 14 days. 223 percent root growth on 33rd day.
	30%	117 percent root growth on 3rd day. 250 percent root growth on 33rd day.
	0%	129 percent root growth on 3rd day. 338 percent root growth on 33rd day.

Grazing during the growing season is considered detrimental to the vegetation, because it removes portions of the plant necessary in the synthesis of carbohydrates and by forcing the plant to deplete its carbohydrate reserves through regrowth. Preventing livestock from grazing the pasture the same time each year should allow the vegetation to recover. However, rest and deferment during periods of minimal plant growth, associated with low soil water availability or temperature extremes, limit the potential for positive vegetation responses. Rest periods that coincide with limited plant growth convey minimal benefit to plants, so that the impacts of increased grazing pressure during short grazing periods may not be offset during subsequent rest periods (Briske et al., 2008).

The entire Green Mountain Use Area would receive a rest from livestock grazing from April 1 to May 1 to allow for growth of the vegetation. The absence of grazing would allow production of new leaves, which are vital in replenishing the depleted food reserves.

Spring-early summer cattle grazing (from May 1 or 15 to August 1) would occur in two pastures within the Arapahoe, Happy Springs, Green Mountain and Antelope-Hills Use Areas (treatment A) while the third and fourth pastures would be deferred (treatment B) until August 1. The entire allotment would be grazed from August 1 to October 31 (refer to Long Term Annual Grazing Treatments Table 4-6). This grazing system allows each pasture to be deferred for two months of the growing season on every third or fourth year (Treatment B). The deferment is important to the vegetation, in order to allow the plants an entire growing season without grazing pressure to improve vigor, seed production, root growth/replacement and litter accumulation.

Grazing during the fall, winter (treatments E, F, H and J), or dormant season is considered to be the least detrimental to the vegetation. Cook and Stoddart (1963) concluded that desert ranges are best adapted to winter grazing. Although there would be plant mortality and loss of crown cover (Cook and Stoddart 1963), the loss is expected to

be less than the plants' yearly growth.

However, cattle and sheep must be herded and moved frequently enough to avoid heavy to severe utilization in important wildlife habitat areas. Severe fall and winter defoliation of late season regrowth has been shown to reduce grass density and herbage production the following year (Manske 1998), because with late-season defoliation, plants are unable to replenish adequate amounts of reserve carbohydrates to support active growth (Coyne et al. 1995).

Despite some short-term detrimental effects due to periodic grazing during the growing season (i.e., two of every three or four years in the Arapahoe, Happy Springs, Green Mountain, and Antelope Hills-Picket Lake Use Areas), the overall beneficial effects of the grazing system on upland vegetation would more than offset these short-term impacts because: (1) the majority of the upland GMCA is in good or fair condition (see Table 4-4, Forage Condition and Table 4-5, Apparent Trend Summary), (2) grazing use would be deferred during the initial vegetation growing season, (3) the level of grazing use would be dispersed to areas which are presently receiving only light use, and (4) grazing would be kept at a level well below average annual growth.

Table 4-4. Forage Condition and Apparent Trend Summary (% Acres)¹

Allotment (Year)	Good	Fair	Poor	Unsampled
Old Green Mountain (1978)	47%	36%	2%	15%
Old Seven Lakes (1976)*	7%	88%	5%	0%
Old Seven Lakes (1976)**	6%	89%	5%	0%

*Cattle Forage Condition

**Sheep Forage Condition

Table 4-5. Apparent Trend in Forage/Soil Surface Condition (% Acres)¹

Allotment (Year)	Improving	Static	Declining	Unsampled
Old Green Mountain (1978)	66%	17%	1%	16%
Old Seven Lakes (1976)	2%	96%	2%	0%

¹1976 BLM Seven Lakes Planning Unit Resource Analysis and 1978 BLM Sweetwater Planning Unit Resource Analysis.

Upland Vegetation

Long-term impacts in the upland range of the three-pasture or four-pasture deferred-rotation grazing systems would be: slightly increased vegetation production due to the increased seedling establishment; improved vigor and root growth/replacement; increased litter accumulation; and increased percent composition of grass and forb key species.

A study by Gibbens and Fisser (1975) in the Red Desert region (in which 40 percent of GMCA is located) on a two-pasture deferred-rotation grazing system found that plant composition, calculated as a percentage by species of the total vegetation cover, would result in a relative increase in the grasses and forbs.

In this same study, a two pasture deferred-grazing system showed an increase in grass cover of 31 percent outside of a control, while the grass cover increase from 1967 to 1971 inside the control was 25 percent. Therefore, a net increase of grass cover from 1967 to 1971 of 6 percent was a result of the two-pasture deferred grazing system. Shrub cover change from 1967 to 1971 outside the enclosure was a decrease of 11 percent, while inside the enclosure was an increase of 34 percent. These results indicate that a two-pasture deferred grazing system should cause a reduction of shrub cover when compared to the absence of grazing. It is estimated that the proposed three-pasture or four pasture deferred-rotation grazing systems in the southern portion (Red Desert Region) of GMCA would decrease shrub cover by 10 percent.

The proposed three-pasture seasonal grazing system in the Happy Springs Use Area is expected to have these long-term impacts: improved vigor and root growth/replacement of vegetation species; increased litter accumulation; increased seed production and seedling establishment; and increased production.

Grazing in the Arapahoe and Happy Springs Use Areas would take place during the summer and winter months (refer to Table 4-6, Long Term Annual Grazing Treatments and Table 4-8, Acres Per Grazing Treatment Through One Complete Grazing Cycle). Winter grazing, which would comprise about 10 percent of the livestock grazing use, is least detrimental to the vegetation (Garrison 1972, Blaisdell and Holmgren 1984, Masters, et al. 1996a). Adverse impacts such as decreased litter and seedling establishment, created by grazing from May 1 through July 15 in the East Alkali Creek, Bare Ring Butte, and Crooks Mountain Pastures, would be detrimental in the area of the summer sheep use.

Table 4-6. Long-Term Annual Grazing Treatments (Alternative One)

Use Area/Pasture	Year 1	Year 2	Year 3	Year 4
Antelope Hills/Picket Lake				
Granite Creek-Rocks	L-M	L-M	L-M	L-M
Alkali Creek	L-M	L-M	L-M	L-M
Picket Lake	A-L-M	B-L-M	A-L-M	B-L-M
Daley Lake	B-L-M	A-L-M	B-L-M	A-L-M
Arapahoe				
Bare Ring Butte	J-N	E-N	J-N	E-N
East Alkali Creek	E-N	J-N	E-N	J-N
Eagles Nest Draw	A-F-N	B-H-N	A-F-N	B-H-N
Lost Creek	B-H-N	A-F-N	B-H-N	A-F-N
Happy Springs				
Haypress Creek	A-N	J-N	A-N	J-N
Warm Springs	J-N	A-N	J-N	A-N
Crooks Mountain	D-N	D-N	D-N	D-N
Green Mountain				
Sheep Creek	A-J-N	A-J-N	A-J-N	A-J-N
Stratton Rim	I-N	I-N	I-N	I-N
Willow Creek	D-N	D-N	D-N	D-N
Green Mountain	D-N	D-N	D-N	D-N
Alkali Creek Sheep	C-G-J-H	C-G-J-H	C-G-J-H	C-G-J-H

Table 4-7. GMCA Riparian Management Pastures

Use Area/Pasture	Year 1	Year 2	Year 3	Year 4
Long Slough	I-G-O	J-G-O	I-G-O	J-G-O
Crooks Creek/Bare Ring Slough ¹	I-G	I-G	I-G	I-G
W. Fork Crooks Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Lost Creek ²	I-G	G-J	I-G	G-J
Ice Slough	G-J-O	G-I-O	G-J-O	G-I-O
Warm Springs Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Sweetwater River ¹	I-G-O	I-G-O	I-G-O	I-G-O

¹Willow plant communities present within riparian management pasture.

²Ten years of rest would be required before livestock grazing is authorized.

* Pasture not yet completed

Treatment G: Rest summer-long (June 16 through September 15). Under this treatment, the Alkali Creek Sheep and Long Slough Use Areas/Pastures would not be grazed by sheep or cattle during the hot season for riparian area improvement.

Treatment I: Graze season-long through the spring (May 1 or May 15 through June 15). This treatment would be

used with cattle in the Long Slough Use Area/Pasture and the Stratton Rim Pasture within the Green Mountain Use Area during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation in the fall.

Treatment J: Graze September 16 or October 1 through October 31 or November 15. This fall season treatment would be used by cattle in the Long Slough Use Area/Pasture and other riparian pastures without willow plant communities. This fall season treatment would also be used by cattle and sheep in the upland pastures of the Arapahoe, Happy Springs, Antelope Hills-Picket Lake, and Green Mountain Use Areas during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation after the fall grazing season.

Treatment O: Rest yearlong, for one to three years, to initiate the recovery process on degraded riparian areas within the Ice Slough, Long Slough, Warm Springs Creek, Sweetwater River, and West Fork Crooks Creek Riparian Management Pastures.

The increase in livestock grazing use during the winter from sheep (no increase would be expected from wildlife or wild horses), would not be significant enough to be detrimental to the vegetation resource over the long-term. Reduction of growing season grazing intensity would improve vigor of vegetation species and increase production in the long-term (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998).

The Lost Creek drainage would be expected to improve in condition and production over the long-term, as a result of the riparian management pasture and the deferred-rotation grazing system (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998). Over the entire Lost Creek and Eagles Nest Draw Pastures, the production and condition would be expected to improve slightly, due to the change in distribution of livestock, wildlife, and wild horses from water developments. As mentioned previously, the winter season is considered to be the least detrimental to the vegetation in terms of grazing. Winter is considered to be the least detrimental period of utilization for shrubs (Garrison 1972, Blaisdell and Holmgren 1984). The lack of grazing pressure during the growing period would allow the vegetation to improve in terms of vigor, seed production, seedling establishment, and litter accumulation.

Concentration of livestock, wildlife, and wild horses in areas offering shelter during winter storms is not considered detrimental to the vegetation in the long-term, because there are numerous locations offering protection throughout the Arapahoe, Antelope Hills-Picket Lake and Happy Springs Use Areas. The deferment of grazing during the spring and summer months would also allow the vegetation to recover from the depletion of carbohydrate reserve levels from winter grazing. A slight increase in forage production over the entire GMCA would be expected from continued implementation of this alternative in the long-term.

Areas which are favored as sheep bed grounds would be expected to receive excessive grazing pressure. This alternative requires the sheep operators (Stan & Linda Cole and W.S. Baldwin during the initial and interim phases) to move the sheep bed grounds 1.5 miles every week. The exception to this would be in the Picket Lake and Daley Lake Pastures of the Antelope Hills-Picket Lake Use Area and the Lost Creek and Eagles Nest Draw Pastures of the Arapahoe Use Area. In these areas, three miles of movement is required. Areas which have been historically-favored bed grounds, such as areas near water or which offer protection from adverse weather, would have the vegetation completely removed or damaged so severely that recovery would be impossible. An area of approximately one to three acres per bed ground would be expected to be impacted. Based on field observations from the 1999-2007 grazing seasons, the continued heavy grazing of the sheep bed grounds would be detrimental to the localized upland vegetation in the long-term. The deferred-rotation grazing has not allowed the vegetation on these sites to recover from these short periods of heavy grazing. The long-term increase in livestock grazing use proposed under this alternative (50% of permitted use) would increase the grazing intensity on these localized sites above the 1999-2006 use levels (37% of permitted use).

Table 4-8. Acres per Grazing Treatment through One Complete Grazing Cycle (Alternative One)

Treatment	Public Land Acres			
	Year 1	Year 2	Year 3	Year 4
A	114,749	122,049	114,749	122,049
B	78,386	83,536	78,386	83,536
C	18,215	18,215	18,215	18,215
D	38,299	38,299	38,299	38,299
E	37,709	36,796	37,709	36,796
F	38,658	43,330	38,658	43,330
G	36,174	36,174	36,174	36,174
H	61,545	56,873	61,545	56,873
I	19,096	11,875	19,096	11,875
J	99,490	91,802	99,490	91,802
K	0	0	0	0
L	158,232	158,232	158,232	158,232
M	158,232	158,232	158,232	158,232
N	260,269	260,269	260,269	260,269
O	6,661	6,661	6,661	6,661

*The totals for each year are greater than the acreage of the allotment because some pastures receive more than one treatment per year.

Range Improvements

Table 4-9 shows that approximately 133 surface acres have been disturbed (as of December 2007) by the construction, maintenance, and continued existence of the range improvements from previous implementation of this alternative (1999 Final Decision).

Table 4-9. Surface Acres Disturbed as a Result of the Implementation of Alternative One Actual Range Improvements Constructed* (December 2007)

Type of Improvement	Number of Units	Acres Disturbed per Unit	Total Acres Disturbed
Spring development	8	2.6	20.8
Three-Wire fence (Use Area/Pasture boundary)	3.7 miles	1.5/miles	5.55
Riparian pasture fence	38.4 miles	1.5/miles	57.06
Cattleguard	5	0	0
Water well development	23	1.8	41.4
Reservoir reconstruction	1	4.0	4.0
Exclosure	3	.2 on fenceline	.6 on fenceline

(Artesian wells/wetland fenced)		.9 inside permanent enclosure	2.7 inside permanent enclosure
Pipeline	13.3miles	.1/miles	1.33
		TOTAL	133.4
*See Appendix 19 for rationale.			

Construction of the remaining proposed range improvements would remove approximately 60 acres from production. Table 4-10 lists the total acres disturbed by each type of range improvement, and the total acres that would be disturbed under this alternative. The range improvements disturbing the major proportion of the acres would be the spring developments (31 acres), riparian pasture fences (14 acres), water wells (7 acres), and reservoirs (8 acres). The overall impact to the vegetation within the GMCA as a result of range improvement construction would be minor.

Table 4-10. Surface Acres Disturbed as a Result of Implementing Alternative One Long-Term (Remaining) Proposed Range Improvements*

Type of Improvement	Number of Units	Acres Disturbed per Unit	Total Acres Disturbed
Spring development	12+	2.6	31.2
Three-Wire fence (Use Area/Pasture boundary)	0 miles	1.5/miles	0
Riparian pasture fence	9.0 miles	1.5/miles	13.5
Cattleguard	3	0	0
Water well (existing) development	4	1.8	7.2
Reservoir reconstruction	2	4.0	8.0
Exclosure (Artesian wells/wetland fenced)	0	.2 on fenceline .9 inside permanent enclosure	0 on fenceline 0 inside permanent enclosure
Pipeline	0 miles	.1/miles	0
		TOTAL	59.9
*See Appendix 19 for rationale.			

Even though fences are beneficial in the management of livestock, they do cause impacts from trailing of livestock, wildlife, and wild horses along the fences. This would result in the deterioration of the vigor of plants due to over-grazing and trampling. Use of motorized vehicles for fence maintenance would also lead to a reduction in vigor of

vegetation. Another impact of the trailing of livestock and wildlife along a fence would be the removal of vegetation through trampling and compaction of the soil. This would cause adverse growing conditions. A change in composition of the vegetative species could occur in areas somewhat away from a fence; however, these impacts would be less noticeable. Heavy to severe grazing would cause a decrease in the preferred species and an increase in the less-preferred species.

The existing fence on the southern boundary of the GMCA would concentrate summer cattle use on the north side of the fence, near the proposed Lost Creek Riparian Pasture. Forage in the areas of concentration would be removed through livestock consumption and trampling. The grazing would result in the decline of preferred species and an increase in the less-preferred forage species. The overall production, seed production, vigor, condition, and trend of the vegetation would decline in the areas of concentration.

Impacts created through the development of a spring or water well would include: removal of vegetation, changes in composition, and decrease in vigor of plants. Use of the development by livestock would result in removal of vegetation immediately around the water trough, a circle roughly 50 yards in radius. Sacrifice areas would occur adjacent to the spring source and each of the water wells. Total disturbed area would be 2.6 acres for the spring development and 1.8 acres per water well development (Table 4-10). Vegetation would be removed mainly by livestock trampling. These areas would be mostly devoid of vegetation and would remain in that disturbed condition due to the continual use of the water trough. It is anticipated that there would be a decrease in the vigor of the vegetative species immediately surrounding the sacrifice area. The vigor decrease would come about from the dust on the plants, the partial trampling of vegetation by livestock, and the heavy to severe grazing which commonly takes place around water sources.

The development of water wells would improve the distribution of livestock over the entire GMCA, thus promoting a more even utilization of the forage. Proper utilization of the forage is important in maintaining or improving the vegetative vigor, production, or range condition (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984). Properly-placed water developments, combined with the proposed grazing systems, would pull the livestock from the overused existing natural water sources such as Crooks Creek and Lost Creek, allowing these areas to improve in vigor and production.

Heavy to severe grazing is marked by a disappearance of preferred plants, or of those plants physiologically less-resistant to grazing. Less-preferred or more resistant plants may survive and replace the removed plants (Stoddart, Smith, and Box 1975). This would eventually lead to a change in composition. Continued grazing would cause an influx of species, called invaders, which are not part of the natural plant communities. The invaders would be mobile annuals, but later would encourage the establishment of herbaceous or woody perennials of low value (Stoddart, Smith, and Box 1975).

Any place which has the existing vegetation removed provides an opportunity for other plants to begin growth. The construction, maintenance, and use of the various proposed projects may cause enough disturbance to permit increased numbers of poisonous plants to invade the site. For example, halogeton (*Halogeton glomeratus*) is a poisonous annual often found on disturbed sites. The amount of trampling and utilization of the vegetation would decrease as the distance from water increased.

Summary

Short-term detrimental impacts under summer grazing (treatments A, B, D, E, L, M, and N) would include reductions in plant vigor, litter accumulation, and seed production. Short-term detrimental impacts from fall and winter grazing (treatments B, E, F, H, and J) would be reductions in plant vigor and litter accumulation. The summer-long rest and year-long rest (treatments G and O) treatment would increase vigor, litter accumulation, seedling establishment, and seed production for the Alkali Creek Sheep Use Area and seven riparian management pastures. Rest periods, which comprise part of treatments A and B, would enhance vegetation by increasing vigor, root growth/replacement, seed production, and litter accumulation of vegetation. The short-term impacts, such as increased vigor and seedling establishment, which would benefit the vegetation, are considered nearly equivalent to those which would be detrimental. This is due to the slight increase in grazing use above the 1980-2006 level

(Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The proposed long term use level (34,830 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) is 60 percent of the long-term average available livestock forage shown in Table 3-8, Present Allotment Production. Blaisdell and Holmgren recommended the basic stocking level on Intermountain salt-desert rangelands at 75 percent of the long-term average forage production, because of the normal inability to adjust animal numbers to the wide variations in forage yield. This recommendation is based on long term forage (1935-1974) production on moderately-grazed (11 acres per AUM) salt desert rangeland. This recommendation provided adequate forage, except in years when production was extremely low. The proposed long term use level (34,830 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) would be an average stocking rate of 13.4 acres per AUM on the public land within GMCA. The last nine years (1999-2007) of below average precipitation have required lower livestock use levels to manage for rangeland health standards and provide for drought recovery. The next five years would be required for drought recovery.

Under this alternative, the upland (away from present livestock water sources) areas within the Arapahoe, Antelope Hills-Picket Lake, Green Mountain, and Happy Springs Use Areas, would receive in the long term a 66 percent increase in grazing use over the 1999-2006 recent use levels, due to additional forage availability as a result of increased distribution of livestock through range improvements. The area within the Picket Lake, Daly Lake, Lost Creek and Eagles Nest Draw Pastures (formerly Seven Lakes Incommon Allotment), which is approximately 40 percent of the GMCA (refer to Appendix 10), would receive most of this increased grazing use. This increased livestock grazing intensity, combined with the grazing systems, would result in the vegetation of the upland areas maintaining or slightly declining in vigor, root growth/replacement, production, seed production, and litter accumulation (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The upland and lowland areas within the Alkali Creek Sheep Use Area and Long Slough Pasture would improve in vigor, root growth/replacement, production, seedling establishment, seed production, and litter accumulation due to the rest from grazing during the summer growing season.

Continued implementation of this alternative would result in a long-term slight increase in production (USDI-BLM 1979, Blaisdell and Holmgren 1984). Also, by 2027, it is expected that there would be static trend in upland range condition, and a static to improving trend in those riparian areas outside riparian management pastures within the Antelope Hills-Picket Lake Use Area. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were only rated as fair for improving stream and riparian habitats (refer to Appendix 20). However, the proposed modification to the GMCA deferred-rotation grazing system, which limits the summer grazing period to 30-31 days each for Granite Creek-Rocks and Alkali Creek Pastures of the Antelope Hills-Picket Lake Use Area, would allow for long-term improvement (Myers 1989, Masters et al. 1996b, Mosley, et al. 1997, Clary and Webster 1989, Clary and Webster 1990, USDI-BLM 1998).

Construction of the remaining proposed range improvements would cause the loss of approximately 60 acres from production. Major impacts to the vegetation would be the removal of vegetation in the vicinity of the water troughs and the decrease in vigor of the vegetation, through trampling and heavy grazing by livestock, wild horses, and wildlife along fences.

Overall, the impacts upon vegetation by continued implementation of this alternative are: (1) a static to slight increase in the percent composition of those vegetation species that are more desirable forage for livestock, wild horses, and wildlife (i.e., grasses, forbs, saltbush, and winterfat would increase relative to big sagebrush); (2) a slight increase in plant vigor, root growth/replacement, seed production, litter accumulation and production; (3) a static-to-upward trend in the condition class on the upland areas adjacent to water sources and on an estimated 76 percent of the public land riparian areas in the allotment; and (4) a stable trend in live vegetation cover (USDI-BLM-1979)(Holechek et al. 1998).

Wetland-Riparian Vegetation

Since implementation of current management, riparian habitats which have been excluded from livestock grazing

(one-acre spring development/enhancement exclosures) have shown the most dramatic improvement. Vegetative structure and plant species diversity has increased to near-potential over the last eight years. On most sites, upland plant species have been replaced by mesic (water-loving) riparian plant species. As conditions have improved, additional vegetation has overhung stream banks, resulting in lowered water temperatures. Increased amounts of vegetation have also resulted in reduction of shearing or sloughing of stream bank soils. Exclusion from livestock grazing has also improved plant vigor, resulting in the expansion of the riparian area towards its potential extent. This expansion has increased the ability of these riparian areas to capture sediment on the upper banks, before it reaches the stream.

Riparian habitats occurring in those riparian pastures already constructed (see Appendix 21) have shown mixed levels of improvement, depending upon how long they have been in use. The West Fork Crooks Creek, Ice Slough, and Warm Springs riparian pastures have had the quickest timeframe for recovery, due to three years of rest from livestock grazing. The Long Slough Riparian Pasture has also improved, but at a slightly slower rate than the three previously mentioned riparian pastures. All riparian habitats in these riparian pastures are expected to move from their current low seral plant stage, to mid-seral or better within 10 years following full implementation. Spring-only grazing in the Long Slough Riparian Pasture would enable the existing riparian vegetation adequate time for vegetative regrowth and for the establishment of additional riparian vegetation on areas that have been encroached upon by upland plant species. The remaining riparian pastures would be used only in the spring or fall, and would also see improvement of the herbaceous riparian component. The current trend of upland species encroaching into the riparian areas would be reversed, and more mesic species would occur in these riparian areas.

Riparian habitats occurring in the Picket Lake and Daley Lake Pastures of the Antelope Hills/Picket Lake Use Area would be expected to remain static as a result of a 45 or 60-day grazing period. Three additional water wells in the area would improve livestock distribution away from riparian habitats, but increased stocking levels would offset this improvement.

Riparian habitats in the Green Mountain, Arapahoe, and Happy Springs Use Areas would generally remain static, or would trend slightly upward from existing conditions. The lower stocking rates included in Alternative One would decrease utilization of riparian plant species. Platts (1990) reports that proper stocking rates are critical in order for deferred-rotation grazing treatments to be successful in improving riparian habitats. Intensive livestock management (rotational grazing, herding, and additional upland waters) along with decreased numbers of livestock would help reduce impacts and provide enough residual vegetation needed for riparian improvement. This would occur on approximately three fourths of the acres of riparian habitat in these use areas.

Riparian habitats occurring in the Alkali Sheep Use Area would be expected to improve slightly, as a result of spring-fall-winter grazing by sheep. No willow riparian habitats occur in this pasture, so fall grazing would not have an impact on willows. During the spring, lush, cool-season forage occurs in the uplands, reducing utilization of riparian plants. Fall grazing by sheep in this use area would have less impact on riparian plants, because the plants have been able to complete their storage of carbohydrates; thus, they are coarser and less-likely to be grazed by sheep. Winter sheep and cattle use would not have any effect on herbaceous vegetation and stream banks, due to the dormancy of vegetation and frozen stream banks. During the winter period, livestock dispersal away from riparian areas is expected to be greatest, in turn; this would maintain adequate herbaceous vegetation cover on riparian areas.

EFFECTS ON LIVESTOCK GRAZING (Alternative One)

A long-term increase of approximately 6,500 AUMs available for use (above the 1999-2006 average) is expected as a result of continued implementation of this alternative. By 2027, it is projected that there would be an improvement in upland range condition of at least one-half condition class. This would result in fewer acres in early seral (poor) condition; fewer acres in mid seral (fair) condition; more acres in late seral (good) condition; and more acres in potential natural community (excellent) range condition. Improvement in upland forage conditions in the long-term would account for a slight increase in dual use (cattle and sheep) AUMs (USDI-BLM, 1979). Also, by 2027, it is expected that there would be a static-to-improving trend in those riparian areas outside riparian management pastures within the Antelope Hills-Picket Lake Use Area (approximately 1,485 acres which is a 76 percent of the total public land riparian acres) and a static to slightly declining trend in those riparian areas outside

the riparian management pastures within the Happy Springs, Green Mountain, and Arapahoe Use Areas (approximately 480 acres or 24 percent of the total public land riparian acres). For example, a riparian area in proper functioning condition would continue in proper functioning condition. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were rated as fair for improving stream and riparian habitat (refer to Appendix 20). However, the proposed modification to the deferred-rotation grazing system, which limits the summer grazing period to 30-31 days each for Granite Creek-Rocks and Alkali Creek Pastures of the Antelope Hills-Picket Lake Use Area, would allow for long-term improvement (Myers 1989, Masters et al. 1996b, Mosley, et al. 1997, Clary and Webster 1989, Clary and Webster 1990, USDI-BLM 1998).

This alternative would not enable two grazing permittees to convert 1,325 winter sheep AUMs to 689 summer cattle AUMs and 5,194 (former Seven Lakes) to 4,940 (former Green Mountain) summer sheep AUMs to 5,017-4,158 summer cattle AUMs, as the water developments become operational. Further, the two permittees, Stan and Linda Cole and W.S. Baldwin, would not experience an increase in the value of their base property to which their federal grazing permits are attached over the short-term, because there would be no sheep to cattle conversions authorized under this alternative. In effect, this alternative would not change the current level of economic viability of these two livestock operations. However, it would provide for the extensive (60 percent for cattle) nonuse, which has been authorized in the allotment over the past nine years, to continue in the short-term to allow for drought recovery.

This alternative would not change the performance of individual animals but should increase the number of cattle (approximately 1,080 head) above the 1999-2006 average by full implementation of the AMP in the long-term.

Table 4-11 lists the proposed (remaining) range improvements and their estimated project construction and installation costs at approximately \$113,860 to \$134,550. The estimated construction costs would range from \$0.24 to \$0.29 per public land acre or \$2.40 to \$2.84 per public land AUM. Table 4-12 shows estimated maintenance costs for the proposed (remaining) range improvements at \$3,390 per year. Table 4-13 shows long term estimated maintenance costs for the actual range improvements that have been constructed (as of December 2007) at \$10,540 per year. The total long term maintenance costs are estimated at \$13,930 per year.

**Table 4-11. Construction and Labor Requirements
Proposed (Remaining) Range Improvement Projects under Alternative One**

Year	Project	Units/Miles	Cost ¹	Total
	Three-wire (Use Area/Pasture Boundary)	0 miles	\$4,840 mile	\$ 0
2-5	Riparian Pasture Fencing (1 Pasture/Year)	9 miles	\$4,840 mile(barbed)	\$43,560
			\$2,541 mile(permanent electric)	\$ 22,870
2-5	Cattleguards (1 each/Year)	0 3	\$3,207 2-lane-24'	\$ 0
			\$1,694 1-lane-12'	\$ 5,080
2-5	Spring Development (Includes Fencing) (3 Each/Year)	12+	\$ 3,630 each	\$ 43,560+
2-5	Reservoir Construction	2	\$ 7,261 each	\$ 14,520
	Water Well Development (new)	0	\$31,462 each	\$ 0
2	Water Well Development (existing)	1	\$ 9,680 each	\$ 9,680
1-3	Water Well Development (existing)	3	\$ 6,050 each	\$ 18,150
	Water Pipelines (0 miles/year)	0 miles	\$ 7,624 mile	\$ 0
	Exclosure (Artesian Wells Wetland Fencing)	0 miles	\$ 4,840 mile	\$ 0
	TOTAL (Barbed Wire Fence)		(\$0.29/public land acre)	\$134,550
	TOTAL (Permanent Electric Fence)		(\$0.24/public land acre)	\$113,860

¹ Cost information on file in the Lander Field Office.

**Table 4-12. Estimated Maintenance Costs
Proposed (Remaining) Range Improvements under Alternative One**

Type of Improvement	Number of Units	Annual Maintenance Cost/Unit ¹	Total Annual Maintenance Cost	Estimated Life of Improvements
Springs	12+	\$121	\$1,450	20+ Years
Wells	4	242	970	20+
Pipelines	0 (miles)	61	0	20+
Reservoirs	2	120	240	20+
Three-wire Fence	0 (miles)	61	0	20+
Riparian Pasture Fence	9 (miles)	61	550	20+
Cattleguards	3	61	180	20+
Exclosure Fence	0 (miles)	61	0	20+
Total:			\$3,390	

¹ Cost information on file in the Lander Field Office.

**Table 4-13. Estimated Maintenance Costs
Actual Range Improvement Constructed (December, 2007)**

Type of Improvement	Number of Units	Annual Maintenance Cost/Unit ¹	Total Annual Maintenance Cost	Estimated Life of Improvements
Springs	8	\$121	\$970	20+ Years
Wells	23	242	5,570	20+
Pipelines	13.3 (miles)	61	810	20+
Reservoirs	1	120	120	20+
Three-wire Fence	3.7 (miles)	61	230	20+
Riparian Pasture Fence	38.4 (miles)	61	2,340	20+
Cattleguards	5	61	300	20+
Exclosure Fence	3.3 (miles)	61	200	20+
Total:			\$10,540	

¹ Cost information on file in the Lander Field Office.

Under this alternative, it is proposed these improvements would be completed by the end of year five (2012), and would be funded 50 percent by the BLM (out of range betterment funds) and 50 percent by the grazing permittees and other cooperators. The maintenance responsibility of the proposed projects would be assigned to individual grazing permittees or a formally recognized permittee grazing association, depending on the type and location of the project. These projects would be designed to solve the water and livestock distribution problems present in the allotment. In addition, the proposed (remaining) riparian management pasture and (completed) upland pasture fencing projects would allow livestock to be managed so that 22 percent (439 acres) of the public land riparian areas and 15 percent of the upland range would be improved, both in the short and long-term.

It is expected that there would be a static-to- improving trend in those riparian areas outside riparian management pastures within the Antelope Hills-Picket Lake Use Area (approximately 1,485 acres and 76 percent of the public land total), and a static to slightly declining trend in those riparian areas outside the riparian management pastures within the Happy Springs, Green Mountain, and Arapahoe Use Areas (approximately 480 acres or 24 percent of the public land total). Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were rated as fair for improving stream and riparian habitat (refer to Appendix 6).

The proposed (remaining) water developments listed in Table 4-11 would enable cattle to graze more of the allotment, making approximately an additional 6,500 summer cattle AUMs available (above the 1999-2006 authorized use level). This would allow an estimated authorized increase of 1,080 cattle and increased income potential for the grazing permittees in the long-term.

Additional herding would be needed to keep the cattle within the prescribed use areas and pastures. A description of the herding needed to implement the proposed grazing systems is listed in the Description of the Alternative One and Management Actions Common to All Alternatives. A moderate to intensive level of cattle herding would be required under this alternative. Five to six seasonal riders with the associated higher labor costs discussed in Effects on Socioeconomics may be necessary to accomplish effective herding. Sheep herding would also be required. It is estimated that the sheep herding would necessitate hiring three herders with the associated costs discussed in Effects on Socioeconomics.

The range improvement projects proposed in Table 4-11 would improve the distribution of cattle and sheep grazing. Nevertheless, experience has shown that cattle have congregated and stayed around water sources or spring developments in a rested or deferred pasture or riparian management pasture when effective herding has not occurred. The proposed (continued) herding in the allotment would prevent most problems of this nature, provided the cattle are closely monitored and controlled by the permittees.

Livestock operators in the allotment should benefit from proposed pasture and riparian management fencing and use area/pasture rotation because their cattle would be confined in a smaller area than presently. Although moving cattle during the summer (July-August) from one pasture to the other would result in temporarily reduced weight gains until the cattle adjust to their new range, cattle would be limited to an area of approximately one-half to one-third the size of the area they can now graze. This should increase the probability of a cow being bred (USDI-BLM, 1979).

EFFECTS ON WILDLIFE/FISHERIES HABITAT AND SPECIAL STATUS SPECIES

Nongame Wildlife and Game Birds

Nongame wildlife and game bird habitat conditions have improved the most in those one-acre spring development/enhancement exclosures constructed over the last eight years. Within these exclosures, exclusion from livestock grazing has increased plant diversity, the variety of plant age classes, and the structure in plant communities. This has resulted in a likely increase in the abundance and species diversity of nongame wildlife. Improved habitat conditions have undoubtedly enhanced animal population stability for many of these species, by diminishing the effects of climate on population size. Riparian-dependent, nongame wildlife in the remaining portions of the allotment have likely benefited to varying extents, depending upon the vegetation response within each exclosure.

Habitat conditions within the five completed riparian pastures (of seven planned) have also improved to varying degrees, depending upon how long they were rested before the resumption of grazing, the level of use each year, and the dependability of continued water flow during recent drought years. Although this improvement may not have been as dramatic as that in the spring exclosures, these pastures have likely provided a much greater benefit to nongame wildlife and other species, owing to the greater number of acres involved.

Herding would be used to properly distribute livestock throughout the allotment so that excessive, long-term use of riparian areas does not occur, and riparian habitat quality in areas outside exclosures and riparian pastures could be expected to improve slightly over time.

Big Game

Continued development of range improvement projects under Alternative One would cause a variety of impacts to big game. The completion of 48 miles of fence (see Appendix 21) would have some impact upon the movements of pronghorn antelope and mule deer. Pronghorn would be affected more than any other species, especially as they move to their winter ranges near Ice Slough, Lost Creek, and areas outside the allotment. The Crooks Creek

Riparian Pasture and the 2.5 miles of fence proposed to be constructed on the south side of Green Mountain to create the Green Mountain Use Area would have the greatest impact on pronghorn movements. Although the design and construction of all fences would be as wildlife friendly (designed to facilitate the movement of big game animals) as possible, fences of this type only function as such under optimum conditions. Animals that are too young, too weak from lack of forage, or otherwise impeded by snowfall, are more hindered by fences and, as a result, tend to use up much-needed energy reserves in attempting to find a way through. Nevertheless, the riparian pastures created by these fences do provide foraging areas free of livestock for those big game animals that are able to get inside them.

Likewise, wells previously drilled and equipped (and planned for the future) tend to concentrate large numbers of livestock around the water source. This in turn creates a sacrifice area of up to five acres around the well that is denuded of forage and compacted so as to be unproductive in the future (for both livestock and big game). Also, big game animals (primarily elk and mule deer) tend to avoid areas in which domestic livestock concentrate. These impacts notwithstanding, such wells may provide water for big game where it was previously unavailable.

With the expected distribution of livestock through herding and additional water developments, big game species will be able to utilize ungrazed pastures prior to livestock movement. This will provide big game the opportunity for greater selectivity in those areas free of livestock disturbance. Both mule deer and elk prefer to avoid cattle and sheep, if possible. Big game use of the Alkali Sheep Use Area would be expected during the summer period when livestock are not present. Another benefit would be improvement of herbaceous riparian vegetation, due to the lack of hot season livestock grazing.

Fall cattle and sheep grazing and winter sheep grazing may prevent improvement on important pronghorn and mule deer winter habitats near Ice Slough, Lost Creek, and the base of Crooks Mountain. Browse species important to wintering pronghorn and mule deer are most palatable to cattle and sheep during the fall and winter seasons.

Moose habitat conditions, especially those associated with willow riparian habitats, would be improved the most. These willow habitats are associated with the Sweetwater River Riparian Pasture (when constructed). Moose habitat in other portions of the allotment is not likely to receive much improvement.

Fisheries

The impacts to riparian habitats from this alternative relate directly to fisheries and cold water trout habitat. The Sweetwater River Riparian Pasture would provide the best opportunities for improvement of trout and nongame fisheries. Nongame fisheries would be improved in the West Fork Crooks Creek. Improvements in riparian habitats within the GMCA would improve both trout and nongame fisheries waters outside the allotment (e.g., Sweetwater River). Improvements to fisheries in these streams would result from an increase in residual vegetation available to not only protect stream banks from erosion, but to also reduce sediment from entering the stream, which smothers trout eggs and eliminates over-wintering habitat. Additional stream bank vegetation would also provide cover to the water column of the stream by both herbaceous and woody species (i.e., willows, cottonwood, and aspen). This would provide hiding cover, and would also help maintain cooler water temperatures to support trout throughout the summer period when water temperatures can limit trout survival.

Special Status Species

None of the actions proposed under any of the alternatives are likely to affect any federally threatened or endangered species that may occur in the allotment. Prior to the authorization of surface-disturbing activities, a threatened or endangered species review would be conducted to determine if any adverse, site-specific effects would occur. If the review indicates that a “may affect” situation would occur for any listed species, consultation with the U.S. Fish and Wildlife Service (USFWS) would be initiated.

Chapter Three of this document (Affected Environment) mentions three federally listed species to be analyzed for potential adverse effects. They are the Ute ladies'-tresses, blowout penstemon, and those species affected by Platte River depletion.

Although potential habitat for the Ute_ladies' tresses occurs within certain parts of the allotment, there would likely be no adverse effect to this species for the following reasons: 1) This species has never been documented in Wyoming at elevations above 5,500 ft.; the lowest elevation in the GMCA is approximately 6,400 ft.; 2) The Ute ladies' tresses require moist soils near perennial water; at the lowest elevation there is no perennial water; 3) this species requires non-alkaline soils; the soils at the lowest elevation are alkaline; and 4) any new surface-disturbing activities planned under any of the alternatives would be subject to a separate, site-specific NEPA review.

A small amount of suitable habitat for the blowout penstemon has been identified within the GMCA. However, there would likely be no adverse effect to this species for these reasons: 1) suitable habitat locations within the GMCA have been surveyed, and no populations have been documented; 2) if present in the GMCA, the species is unlikely to be grazed by livestock because it is not a preferred forage plant, and also because livestock typically do not graze in its sparsely vegetated, sandy habitat; and 3) any new surface-disturbing activities planned under any of the alternatives would be subject to a separate, site-specific NEPA review.

Any future water developments proposed in the allotment under Alternative One would be subject to review (and possible consultation) under the Platte River Recovery Implementation Program, effective January 1, 2007.

Of the thirty BLM Sensitive plant and animal species carried forward from Chapter Three for consideration, impacts would vary widely, depending upon what effect livestock grazing and associated range improvements had on their respective habitat needs. Under Alternative One, impacts to bat species, such as the long-eared myotis and the spotted bat, would be mostly positive. Since these bats are insectivores, a gradual improvement of riparian vegetation through better livestock distribution would likely increase insect populations and, increase foraging opportunities. Likewise, water developments associated with Alternative One could benefit bats by providing additional water sources.

The dwarf shrew, like the bats mentioned above, is primarily an insectivore. Improvement of riparian habitat, therefore, would likewise benefit this species, as would additional water developments.

The white-tailed prairie dog evolved alongside large grazing ungulates such as bison and elk; thus, it is unlikely to be impacted by the continuation of livestock grazing. Moreover, none of the alternatives considered in this document permit the removal of prairie dogs without BLM authorization.

Although undocumented occurrences of the swift fox have been reported in the GMCA (as mentioned in Chapter 3), it is likely that their populations in the GMCA are low. If they occur at all, they are not likely to be impacted by this alternative, because large-scale habitat type conversions are not being proposed. Predator control measures designed to eliminate coyotes that might accidentally harm the swift fox are not authorized in any of the alternatives being considered.

The primary threat to pygmy rabbit habitat associated with livestock grazing is the removal of dense sagebrush to improve forage for cattle (Keinath, D. A. and McGee, 2004). Alternative One allows for vegetation treatments to modify existing plant communities, but any such treatments would be subject to site-specific evaluation and NEPA analysis. Consequently, adverse impacts to pygmy rabbit habitat are not expected to occur.

Impacts to the mountain plover resulting from Alternative One would likely be mixed. Plover habitat tends to be maintained in areas that are repeatedly overgrazed, such as pipeline rights-of-way. However, this is a ground-nesting species, and individual nests could be trampled as a result of concentrations of livestock (i.e., herding or around water developments). Plover habitat generally does not occur near riparian areas, so riparian pastures or enclosures already constructed or planned would have little impact on this species. It is unlikely that there would be any adverse impacts to mountain plover habitat from Alternative One.

The northern goshawk, a forest-dwelling raptor, is most threatened by removal of the mature forests it requires for nesting and foraging (Smith and Keinath, 2004). No such habitat conversion is proposed in any of the alternatives considered, so this type of impact would not occur. However, Smith and Keinath also found that excessive grazing in aspen stands and riparian communities could alter habitat complexity, thus reducing prey base. Proper livestock

distribution through herding will prevent such overgrazing, so adverse impacts upon this species are unlikely to arise from Alternative One.

Other raptors such as the ferruginous hawk and peregrine falcon are threatened by fragmentation or disturbance of habitat. Although the former species is frequently seen in the GMCA, the latter is not known to occur there, probably because little habitat suitable for nesting is available. As the peregrine falcon nests in cliffs, its nests are not susceptible to trampling by livestock. However, this is not the case with the ferruginous hawk which often places its nest on the ground on a hilltop. On occasion, such nests are trampled and whatever eggs they contain are lost. Otherwise, habitat conversion is not being proposed in any alternative, so the likelihood of impact to these species is low.

The greater sage-grouse can be negatively impacted throughout various stages of its life cycle by livestock grazing and associated range improvements. Placement of fences or water development facilities that provide perches for raptors within sight of a lek can lead to excessive predation of breeding sage-grouse. Fences may also cause hazards to grouse flying to and from the lek. Concentrations of livestock during herding and near water developments can disrupt strutting (if too close to a lek) during the breeding season and cause direct trampling of nests during the nesting period. Reduction of residual stubble height by livestock grazing below six inches may contribute to increased nest predation by reducing concealment of the eggs and young (Gregg et al., 1994). Overgrazing of riparian areas may diminish the quality of brood-rearing habitat. Connelly et al. (2000) found that sage-grouse preferred areas with high plant species richness, moisture, and taller grasses and forbs during the brood-rearing portion of their life cycle. Water developments, although providing water where none existed before, tend to attract sage-grouse predators, increase potential for accidental drowning, and have been associated with the spread of the West Nile virus (WNV), which is almost always fatal in sage-grouse.

Any additional range improvements constructed under Alternative One would be subject to site-specific NEPA analysis and evaluated as to their potential impact on sage-grouse habitat. Whenever possible, future water developments would be located away from leks and suitable nesting habitat. With the improved livestock distribution from herding and additional water developments, residual stubble heights should be easier to manage, and improved riparian habitat should provide better brood-rearing habitat.

As riparian conditions gradually improve due to the continued implementation of herding, water developments, and riparian enclosures and pastures, habitat for species known to utilize riparian areas, such as the long-billed curlew, Northern leopard frog, Great Basin spadefoot, spotted frog, and boreal toad, is likely to improve also. However, the curlew, a ground-nesting bird species, can suffer nest and egg loss from trampling in areas of heavy livestock grazing (Dark-Smiley and Keinath, 2004). As a result, negative impacts may occur during periods of livestock concentration (i.e., turnout and herding).

The burrowing owl in Wyoming is closely associated with the prairie dog, because burrowing owls often use prairie dog burrows for roosting, nesting, and escape cover for their young after they have fledged. Lantz et al. (2004) found that this species prefers areas of high burrow densities for “satellite burrows” around a central nesting burrow. They also found that burrowing owls select sites where the grass has been closely clipped (i.e., by bison, prairie dogs, domestic cattle, etc.) so as to provide greater visibility. Burrowing owls are most threatened by conversion of suitable habitat to other purposes (Lantz et al., 2004). None of the alternatives considered here include proposals for habitat type conversions so the burrowing owl is not likely to be negatively impacted by Alternative One.

Shrub-nesting species such as the sage thrasher, loggerhead shrike, Brewer’s sparrow, and sage sparrow are all most negatively impacted by loss of suitable habitat, through extensive fragmentation, modification, or conversion to other purposes. None of the alternatives considered here include proposals for such actions, so these species are not likely to be negatively impacted by Alternative One, nor any of the other alternatives.

Impacts to the meadow pussytoes would be slightly negative under Alternative One. As vegetation conditions improve in riparian areas, the number of individual plants (meadow pussytoes) would likely be diminished. However, sufficient suitable habitat should remain to prevent a trend toward federal listing.

The remaining BLM sensitive plants considered in this section include: Porter's sagebrush, Nelson's milkvetch, Cedar Rim thistle, Fremont bladderpod, Beaver Rim phlox, Rocky Mountain twinpod, persistent sepal yellowcress, and Shoshonea. Of these eight species, none have been documented in the GMCA. They are discussed here because computer modeling suggests that suitable habitat for these eight plants may occur within the allotment. These species evolved with large grazing animals such as bison and elk, so it is unlikely that Alternative One's livestock grazing would contribute to the need for federal listing.

EFFECTS ON WILD HORSES (Alternative One)

In the 1999 Decision, this alternative allowed for a change in season of use for sheep (spring summer, fall to yearlong), implementation of an allotment management plan, and the prediction of higher levels of cattle use than the long-term average. A partial conversion in the season of use for sheep occurred (7 month season to year round use). Higher levels of cattle use did not occur, and BLM's incomplete and less than fully successful implementation of the AMP prevented the predicted improvements in riparian vegetation from occurring. Those riparian areas that were fenced did improve. However, the drought that has persisted from 2000 through 2007 has severely depressed vegetative responses. Wild horse numbers were reduced to the lower limits of the AML for all three Herd Management Areas (HMAs) beginning in 2003 through 2006. Fertility control was also implemented on both the Antelope Hills/Cyclone Rim HMA, as well as the Green Mountain HMA.

Under this alternative, the predicted higher use levels by cattle would have created more competition between wild horses and cattle for available forage and water. The yearlong conversion to sheep under this alternative would also create competition for forage and water during crucial wintering periods when horses experience extreme environmental stress.

The extensive pasture and riparian fencing described under this alternative would be detrimental to the free-roaming character of the wild horse herds within this allotment. Any pasture fencing within the herd area boundaries would impede the natural movement of wild horses within the herd areas; the Ice Slough Riparian Fence that was constructed under this alternative is of particular interest. The Ice Slough area has been identified as a crucial wintering area for wild horses in the Crooks Mountain HMA. However, the wild horses in this HMA prefer to use this area for winter feed and water; thus, fencing the area would adversely impact the wild horses within this HMA by displacing them to areas outside the recognized HMA.

A possible mitigation of this problem would be to make the Ice Slough riparian fence a two- or three-wire electric fence that would be completely removed on or about September 15, promoting riparian area healing and allowing for fall-winter use of the area by wild horses. This area was previously fenced with a three-wire electric fence in 2000, yet it is not let down until late October (originally recommended to be completely removed). The observed behavior has been that wild horses do not use the area as extensively as in the past; this could be due to the open winters of the drought, or also because the fence is not taken down until sometime in late October. Horses have reacted negatively to the fence being down on the ground, and have also been observed avoiding the occasion to cross the wires on the ground. The vegetation within Ice Slough has been improved by the grazing prescription applied (five years of rest followed by limited spring or fall grazing since); however, this has been of little use to the wild horses, due to those reasons previously mentioned.

The West Fork of Crooks Creek Riparian Fence would also be detrimental to wild horses in the Green Mountain HMA. Wild horses from this area use the West Fork of Crooks Creek not only to water, but also to escape from inclement weather. Fencing of this area would also isolate the Green Mountain HMA, thereby reducing the interchange of horses from the Crooks Mountain HMA and, consequently, lowering the genetic variability within both HMAs.

Development of additional water may cause wild horse management problems, such as horses roaming outside of recognized herd areas, or the expansion of or changes in current herd boundaries. The implementation of grazing management would cause horses to move away from the herding activity. The grazing management may also shift livestock use from riparian areas to upland range areas, thereby creating forage competition with favored wild horse use areas.

There are some positive benefits to the development of water and to the implementation of grazing management. For one, organized grazing management tends to improve the overall forage base over time; as a result, wild horses would be provided with a steadily improving forage base. Similarly, water development would also provide for a more stable water supply.

It is estimated that the visitor days to the Green Mountain HMA would be reduced by approximately one-third, or possibly 30-40 visitor days per year. This would be in response to impacts that could negatively impact the population. A lost opportunity for the development of a wild horse viewing loop would occur in the Green Mountain HMA, due to the extensive fencing.

EFFECTS ON CULTURAL RESOURCES (Alternative One)

Prehistoric Sites

Due to the large size of the GMCA, only a small percentage of the allotment has been inventoried for cultural resources. A number of prehistoric cultural resource sites are known to be undergoing adverse effects (as defined in the NHPA and Wyoming State Protocol) from grazing-related effects, but mostly it remains unknown as to how many sites are suffering impacts.

Prehistoric sites are often located near natural water sources and riparian areas; similarly, livestock tend to congregate in these same areas. The different alternatives, with their differing levels of impacts to natural water sources/riparian areas, can be individually analyzed for effects to prehistoric cultural resources.

Alternative One is projected to have detrimental effects to prehistoric sites along riparian areas in the short term, and beneficial effects in the long term. This is because erosion, livestock congregation, and trampling would continue until this alternative's grazing/herding systems begin to have desired effects. The key to this alternative having an eventual beneficial effect on cultural resources is active livestock herding. When herding is successfully implemented, then prehistoric sites along riparian areas would slowly recover from the effects of erosion, livestock congregation and trampling. In the short term (1-5 years), as Alternative One begins to be implemented, known and not-yet-discovered prehistoric sites along riparian areas would continue to degrade. In the mid-term (5-10 years), as Alternative One's new projects and grazing systems take effect, the negative effects to these sites would diminish and may, in a few cases, disappear. In the longer term (10+ years), effects to prehistoric sites would begin to be positive, as positive conditions at prehistoric sites (lack of erosion and livestock concentration) outweigh previous conditions. Eleven significant prehistoric sites are known to be affected under this alternative.

Undiscovered sites along riparian zones affected by this alternative are predicted to number approximately 600. Estimates on the number of undiscovered prehistoric sites located along riparian zones within the GMCA were made based on the parameters discussed below.

Two types of riparian habitats were analyzed to help determine prehistoric site densities. Proper Functioning Condition (PFC) data, compiled by BLM over the last decade, was analyzed to calculate the number of miles of riparian vegetation on BLM-administered lands within the allotment. Map data on springs located on BLM-administered lands was also researched to detect other types of riparian habitats within the allotment.

Next, archeological files from the SHPO and BLM were analyzed to (a) determine the number of known sites near springs and along riparian zones, and (b) determine the amount of cultural resource inventories that have taken place within those zones. After the data was compiled, it was then possible to project the number of undiscovered prehistoric sites near streams and springs within the GMCA (Table 4-14).

Table 4-14. Number of Prehistoric Sites Predicted to Occur within Riparian Habitat on the GMCA

Streams	Quantity	Springs	Quantity
Miles of PFC inventoried for cultural resources	5.25	Number of springs inventoried for cultural resources	20
Cultural resource sites discovered during inventories	22	Number of inventoried springs with cultural resource sites	10
Sites/mile(s) of PFC inventoried	4	% of inventoried springs with sites	50%
Miles of PFC within GMCA	136	Estimated number of springs within GMCA	100
Projected number of not-yet-discovered sites along streams within GMCA	544	Projected number of not-yet-discovered sites associated with springs within GMCA	50

Table 4-15 describes the number of cultural sites affected by the implementation of Alternative One.

Table 4-15. Prehistoric Sites along Riparian Areas within the GMCA Affected by Alternative One

	Known Affected Prehistoric Sites	Not-Yet-Discovered Affected Prehistoric Sites (Predicted)
Short-term effects (1-5 years)	11 sites adversely affected (as defined in the NHPA and Wyoming State Protocol)	600 (predicted) sites adversely affected (as defined in the NHPA and Wyoming State Protocol)
Mid-term effects (5-10 years)	11 sites neutrally affected	600 (predicted) sites neutrally affected
Long-term effects (10+ years)	11 sites beneficially affected	600 (predicted) sites beneficially affected

Historic Trails and Sites

Alternative One is projected to have detrimental effects to National Historic Trails and historic sites along riparian areas in the short term, and beneficial effects in the long term (see Table 4-16). This is because erosion, livestock congregation, and trampling would continue until this alternative's grazing systems begin to have desired effects. In the short term (1-5 years), as the Alternative begins to be implemented, five riparian area crossings of the Seminoe Cutoff National Historic Trail, and a site associated with the Seminoe Cutoff (Immigrant Spring) would continue to degrade. In the mid-term (5-10 years), as this alternative's new projects and grazing/herding systems begin to take effect, the degrading effects to these trail crossings and sites would diminish and may disappear. In the longer term (10+ years), effects to National Historic Trails and historic sites would begin to be positive, as positive conditions at these locations (reductions in erosion and livestock concentration) outweigh previous conditions.

No new fence or water developments are planned in the vicinity of the OMCPE Trail, the Seminoe Cutoff, or the Rawlins-Fort Washakie Stage Trail under this alternative, so no new development-related effects are expected.

Table 4-16. Historic Trails and Sites Along Riparian Areas Within the GMCA Affected by Alternative One

	Known Affected Historic Trails	Known Affected Historic Sites
Short-term effects (1-5 years)	Five crossings of the Seminoe Cutoff NHT. Five total adverse effects (as defined in the NHPA and Wyoming State Protocol)	One historic site adversely affected (as defined in the NHPA and Wyoming State Protocol)
Mid-term effects (5-10 years)	Five crossings of the Seminoe Cutoff NHT neutrally affected	One historic site neutrally affected
Long-term effects (10+ years)	Five crossings of the Seminoe Cutoff NHT beneficially affected	One historic site beneficially affected

As shown in the following table, it is projected that this alternative’s long-term impacts would cause fewer impacts to prehistoric sites, National Historic Trails, other historic trails, and historic sites than Alternatives Two and Four, and would cause the same number of impacts to these resources as Alternative Three.

Table 4-17. Comparison of Long-Term Effects on Cultural Resources by Alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Adverse Effects (as defined in the NHPA and Wyoming State Protocol) to Known Prehistoric Sites	0	11	0	0
Adverse Effects to Not-Yet-Discovered Prehistoric Sites	0	600 (predicted)	0	0
Adverse Effects to National Historic Trails	0	5	0	0
Adverse Effects to Historic Sites	0	1	0	0
Adverse Effects to Statewide-Significant Historic Trails	0	2	0	1

EFFECTS ON RECREATION, VISUAL RESOURCES AND OPEN SPACE (Alternative One)

Range improvements and actions authorized under this alternative would not alter the recreation settings as documented in the affected environment. Since there is no change to the recreation setting, there would also be no change to the recreational activities, experiences, and benefits available or realized by recreationists within the area. This alternative would not alter the unique large unfenced area documented in the affected environment, thus allowing for the agency to maintain the future option of managing this quality for the public

General Public Big Game Recreation Feature

Alternative One would not alter the recreation setting of the feature, nor the available recreational experiences and benefits. Since this alternative is based on intensive livestock herding, the alternative would slowly enhance or improve the habitat and availability of big game animals. Since the alternative proposes a deferred grazing system the amount of residual forage left for wildlife under Alternative One would be high on uplands and low in riparian areas in all pastures except those used before the end of the growing season. In addition, it is anticipated that wet irrigated meadows and riparian systems, important habitat areas for big game animals, would improve slowly over a 20-40 year time period. The above impacts would interfere with the realization of experiences and benefits in the short term; but in the long-term, these impacts would recover due to intensive herding, the successful implementation of a deferred rotation grazing system, and utilization/management triggers.

Continental Divide National Scenic Trail Special Recreation Management Area

Alternative One would not alter the general setting of the feature, nor the recreation experiences and benefits.

Therefore, it is anticipated that few to no impacts would occur as a result of the implementation of this alternative.

Under Alternative One, livestock encounters along the CDNST would continue to be high around riparian areas and dispersed campsites adjacent to riparian areas. Since Alternative One is based on the successful implementation of an intensive herding and a deferred rotation grazing system, hiker encounters with livestock would be reduced in the long term as herding efforts become more successful. In the short term Alternative One would not reduce experience inhibiting encounters with livestock for visitors who recreate in pastures that contain cattle or have recently contained cattle. Inhibiting encounters could include livestock: in or near camp, in riparian areas, on or near trails, in meadows, manure in camp, tracks in riparian areas, trampled areas, and odors (Wallace et al 1996). These impacts could be slightly offset by a) the increase in upland vegetation expression and b) reduced negative livestock encounters in deferred pastures and pastures exhibiting substantial recovery/re-growth. It is important to point out that the nature of traveling along the CDNST requires hikers to stay close to riparian areas; therefore grazing alternatives (such as alternative one) that propose extensive herding to improve riparian vegetation would likely result in an enhanced visitor experience and reduced encounters with livestock.

Green Mountain Recreation Feature

No impacts to recreation settings and experiences and benefits opportunities are anticipated in the Green Mountain Recreation Feature under this alternative.

National Historic Trail Recreation Special Recreation Management Area

No impacts to recreation settings and resulting experiences and benefits are anticipated along the National Historic Trail under this alternative. The annual loss of the movement and color contrast components (key factors in drawing a visitor's attention to the landscape) rendered in riparian vegetation would continue under proposed deferred rotational grazing system proposed for Alternative One. Sanderson, et. al., (1986) found that customer or visitor preference for a landscape decreased, as grazing intensity increased. Long term recovery of this element in riparian areas would be slow-moderate, due to the lack of rest and increased stocking levels. These impacts would be offset due to the expected increase in upland plant expression and vigor. In addition impacts discussed above would be less noticeable during periods of deferment or in pastures that demonstrate re-growth and recovery.

EFFECTS ON WILDERNESS STUDY AREAS AND WILD AND SCENIC RIVERS (Alternative One)

Table 4-18 contains a discussion of each WSA value/required data element for analysis, and determines whether the level of impact from the action exceeds maximum allowable standards, as directed by the Interim Management Policy for Lands under Wilderness Review.

Table 4-18. Predicted Impacts to Wilderness Values as a Result of Implementing Alternative One

Wilderness value Indicator	Impact description	Will the Impact Exceed Maximum Allowable Standard
Visual Resource	Full implementation of Alternative one would continue the slight change to the visual resource documented in the affected environment. Moderate loss of the vegetation component in the Willow and Mormon Creek riparian system would continue to inhibit or reduce the movement element created by these taller grasses. Prior to the grazing season (especially during the pasture's deferment period) this change would be less obvious to the casual observer. Since this alternative proposes herding, use triggers, and deferment, recovery of the resource impacts (discussed above) would occur over the long term.	No
Naturalness and Solitude		
Human Activity	Increased operator presence, due to increased activity associated with locating and herding/moving livestock would occur during time periods when the cattle are in the Granite Creek Rocks Pasture. This increase would occur mostly in the unfenced portion of the WSA around the Willow Creek area. Overall the level of human activity would increase for a short time in a small area of the WSA; therefore this slight change would likely not be noticeable to visitors.	No
Wildlife Presence	Based on the slow increase in stocking rates and the level of active livestock herding proposed for Alternative 1 it is anticipated that the subsequent evidence of livestock increase would continue to occur at a similar level to that documented in the affected environment. The Willow Creek area is a primitive access point to the WSA; therefore the increase in the evidence of livestock would be most noticeable to visitors utilizing this access.	No
Primitive Recreation		
Recreation Opportunities	Alternative One proposes no new projects in the WSA. Additionally, the main feature of the WSA is unaffected by livestock grazing resulting from this AMP. The above factors would ensure no change to the recreation setting and therefore no change to the corresponding opportunities of the WSA	No
Natural Appearing Environment	Slight reduction in the naturalness component of the recreation setting would occur in heavier used riparian area. This reduction is a result of poor riparian functionality and increased presence of livestock. In the long term, the full implementation of the alternative would increase riparian functionality and reduce visitor encounters with livestock in turn recovering this setting over a 20-40 year period.	No
Special Feature	No changes to the Sweetwater canyon corridor would occur as a result of this alternative	No

Surface Water	Within the WSA fence water quality is expected to be good due to the years of rest and subsequent controlled grazing this has received; also, the WDEQ has monitored and assessed the Sweetwater River and removed it from the impaired water body list within the past ten years. Outside the fence this alternative relies on herding to prevent over use of the riparian zones. In the long term plant vigor and production is expected to increase. As more extensive root systems develop, increased water infiltration and retention, through increasing the organic matter content of these soils, can be expected.	No
Vegetation		
Ecological Site Inventory	No lowering in seral condition would result from this alternative. Stubble height and utilization triggers for livestock removal help managers work toward an upward trend.	No
Vegetation Utilization	Key riparian sites are to be grazed at 50% early in summer, and at 30 to 40 % if season will run to September 1. Upland areas receive less than 50% utilization.	No
Plant Vigor	No long term decrease in plant vigor would result from this alternative. Stubble height and utilization triggers for livestock removal would help managers slowly improve riparian and upland range conditions.	No
Wildlife		
Wildlife habitat	With improved livestock distribution accomplished by herding, riparian habitat should improve incrementally over time, and upland habitat could be expected to improve slightly or remain static.	No
Population	With increased stocking rates proposed under Alternative 1, wildlife populations are likely to remain static or possibly decline due to competition for forage.	No
Diversity	With improved habitat conditions, diversity of plant and non-game animal species would be expected to increase slightly over time.	No

CUMULATIVE IMPACTS (Alternative One)

Soil and Vegetation Resources

There are currently 133 acres undergoing impacts from livestock (i.e., sacrifice areas) and/or project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 EA. There remain 18 water projects and 9 miles of riparian fence still to be completed under this alternative. These new projects would create roughly 60 additional acres of sacrifice areas.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in this alternative. An estimated \$3,390 of additional maintenance costs would occur upon completion of the proposed remaining range improvement projects by 2018.

Wildlife/Fisheries Habitat and Special Status Species

Additional fencing in the GMCA, in combination with fencing proposals in the Rawlins Field Office to improve livestock management south of the allotment, could negatively impact antelope movements of the Red Desert Antelope Herd, as they move to crucial winter habitats near Rawlins and Interstate 80. Antelope would continue to

be able to migrate to these crucial winter habitats, but new fencing could slow migration or change migration patterns.

The 1999 Green Mountain EA determined that vegetation removal, trampling, and soil compaction near proposed water developments in the GMCA combined with natural gas developments in the vicinity of Wamsutter would remove approximately 190 acres of forage for the Red Desert Antelope Herd. Moreover, the proposed Pappy Draw Coal Bed Natural Gas pilot project and the Devon CO₂ gas pipeline is expected to remove an additional 265 acres of both antelope and sage-grouse habitat for up to 30 years.

At the present time, there are two existing uranium mining districts and four additional areas of uranium exploration within the GMCA. No plans of development have been proposed for these resources so acres of habitat loss from mining activities are, as yet, undetermined.

Additional range improvements to be constructed under this alternative, combined with habitat loss and modifications from proposed (and potential) energy developments and utility corridors, will increase the cumulative impacts to sage-grouse habitat in the GMCA south of Crooks and Green Mountains.

Wild Horses

Additional pasture and riparian fencing would impede and change the natural movement of horses throughout the herd areas. Fencing could also prevent horses from moving to open areas that are blown free of snow during winter months; this could cause stress and winter die-offs that have previously not occurred. The conversions of summer sheep and spring-summer-fall cattle to yearlong sheep and yearlong cattle would create competition for forage and water during wintering periods when horses experience extreme environmental stress.

Cultural Resources

Long-term reductions in trampling and congregation near natural water sources and riparian areas would decrease impacts to cultural resources, causing a positive trend in their long-term survival.

Recreation and Visual Resources

As a result of actions planned under Alternative One and the mitigation developed to reduce impacts, livestock grazing on the allotment will not contribute to the trends documented in the affected environment. Therefore, cumulative impacts to the recreation setting and the available/realized experiences and benefits will occur at a similar rate to that documented in the affected environment.

Off site Impacts to the Recreation Interest Areas

Since Alternative One maintains the existing setting and outcomes for the general allotment, there will be no offsite impacts to the recreation features as a whole. Alternative One maintains the distinct niche represented by the setting of the GMCA.

Wilderness Study Area and Wild and Scenic Rivers

Since this alternative relies on extensive herding, utilization triggers, and a deferred rotation, the intensity of impacts as a result of Alternative One are anticipated to be light. In addition no offsite impacts to the Sweetwater WSA and WSR as a whole unit are anticipated. No impacts exceed maximum allowable standards as identified in the Interim Management Policy for Lands under Wilderness Review. As a result of the above findings, cumulative impacts to the WSA and WSR are anticipated to occur at a rate similar to the trends documented in the affected environment.

RESIDUAL IMPACTS (Alternative One)

Soil and Vegetation Resources

In about one to two decades, changes are anticipated for lowlands, as the upland water sources are developed, as livestock rotations are implemented in the use areas, and as more of the grazing use is shifted to the uplands. Lowlands would also show increases in vegetative and litter cover, as well as vegetative height. This would result in lower erosion rates and would contribute increased amounts of organic matter to the soil. Water quality and the storage of water and nutrients would also be enhanced by increased organic matter inputs to the lowland soils.

The residual impact to soils and vegetation would create approximately 60 new acres of sacrifice areas around constructed water developments, as shown in Table 4-9. Vegetation would be removed mainly by trampling, and somewhat by livestock and wildlife consumption. These areas would be mostly devoid of vegetation, with some compacted soils, and would remain in poor condition due to the continual use of the water source. It is believed that there would be a decrease in the vigor of the vegetative species immediately adjacent to the sacrifice area. The vigor decrease would come about from the dust on the plants, soil compaction by livestock when soils are moist, the trampling and resulting mechanical damage of vegetation by livestock, and the heavy grazing which commonly takes place around water sources. Trailing would cause the removal of vegetation, through trampling and compaction of the soil. Higher erosion rates would also ensue on these areas devoid of vegetation. Rill and gully initiation would occur on the sloping locations over time. Sandy soils would be prone to scouring by wind. The denuded, compacted, and heavily used areas would also be the most prone to weed establishment.

The residual impact to soils and vegetation from this alternative would be to create approximately 60 new acres of sacrifice areas, associated with the new construction of nine miles of riparian fence, 12 spring developments, four wells, and two reservoirs.

Riparian soils currently supporting low seral stage plant communities occurring outside of spring development or enhancement enclosures, riparian pastures, and special riparian grazing treatment pastures, would be maintained in their current seral stage or trend slightly downward. This would occur on approximately 229 acres (11 percent) of the riparian soils in the allotment classified as being in a low seral stage (non-functional PFC). Often, the most degraded areas will not come back, as too much soil fertility has already been lost; however, the greatest chances for improvement can be found in those mid-seral systems that account for about 70 percent of riparian soils in the allotment; these lowland areas are not severely degraded, and still retain some inherent soil fertility. Enhancing these mid-seral systems and keeping them from falling into lower seral conditions will benefit the largest amount of riparian/wetland areas in the long term.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in this alternative. An estimated total \$3,390 of additional maintenance costs would occur upon completion of the proposed remaining range improvement projects by 2018. An estimated combined total \$13,930 of additional maintenance costs would accrue in the long term (2018-2027).

Wildlife/Fisheries Habitat and Threatened and Endangered Species

Approximately 480 acres of public land riparian habitat occurring outside special riparian management areas would be maintained in less-than-desirable conditions for sage-grouse brood rearing and nongame wildlife habitat. Reduced vegetative cover and lower production of forbs and insects would contribute to these conditions.

Increased distribution of pronghorn antelope and, to a lesser extent, mule deer, would occur as a result of additional waters being developed in areas that currently have no water.

Wild Horses

Development of range improvements will change distribution patterns, and draw wild horses into areas that were previously not used. Implementation of any grazing management other than season-long grazing would tend to improve the forage base over time. This would provide a better forage base for wild horses than currently exists.

Cultural Resources

Due the decrease in livestock grazing impacts and the resultant decreases in erosion, damage, and disruption to cultural resources, improvements to the condition of prehistoric sites, the OMCPE Trail, and the Seminole Cutoff will slowly occur.

Recreation and Visual Resources

This alternative heavily relies on the successful implementation of herding, utilization triggers, and a deferred rotation grazing system. Therefore impacts to recreation are light and can be mitigated. No residual impacts to the

recreational setting or experiences and benefits are anticipated as a result of the implementation of this alternative.

Wilderness Study Areas and Wild and Scenic Rivers

The indirect and direct impacts documented in Alternative One do not exceed maximum allowable standards as identified in the Interim Management Policy For Lands Under Wilderness Review. In addition, this level of impact does not exceed impact standards for the WSR resource. Therefore, residual impacts to the WSA and WSR resource will be slight as a result of Alternative One. As long as portions of the WSA and WSR resource are unfenced from the GMCA, slight impacts such as those documented in the affected environment will continue. This impact is somewhat offset by the location of the WSA fence and its low level of contrast with the characteristic landscape.

ALTERNATIVE 2

EFFECTS ON SOIL AND WATER RESOURCES (Alternative Two)

Soil Resources

This alternative has the most variation and complexity. Six proposed allotments would subdivide the GMCA under this alternative. Ninety four miles of new fencing, 22 miles of new pipelines and 39 new water sources are proposed to aid in the management and containment of livestock with little to no herding. There would be potentially heavy use levels in the long term, with a 50 percent increase (over the 1980-2006 levels) in livestock numbers, especially in the riparian zones. With the 39 new water sources proposed under this alternative, one may conservatively assume that at least one new upland salt location will be necessary near each new water source to aid in drawing livestock into the uplands. One new sacrifice area will be created at each salt block location. The sacrifice areas associated with existing salt block locations are generally not as large as those areas associated with water sources, but some amount of bare, compacted soil is expected to develop around each salt block location. This alternative is proposing to locate salt no closer than one-half mile from water sources.

Of the proposed subdivision of the allotment, one-half of the six new allotments would operate under a deferred-rotation grazing strategy. The Haypress Allotment would operate under a three-pasture rest-rotation, and the Happy Springs and Alkali Creek Sheep Allotments would operate under a continuous season-long grazing prescription.

A combination of seven riparian pastures, (five completed and two proposed) would be constructed and maintained on important riparian zones. These riparian pastures would be used by livestock either in the spring or in the fall. The effects would be variable, however, improvement in vegetative expression would be expected to occur over a period of several normal precipitation years. Functional integrity of the riparian systems will take longer to restore.

Mixed results are expected within the pastures of the three deferred-rotation grazing allotments. In some pastures, depending on the season, the potential to increase use of vegetation on the uplands exists. This would reduce the heavy hot-season use that presently occurs in the riparian areas year after year. However, drought and/or ineffective livestock grazing control can make achieving desirable future land health conditions difficult. This alternative relies primarily on fences for livestock control. Without intensive herding efforts, deferred-rotation grazing systems are not expected to improve riparian and nearby upland transition zone conditions substantially in either the short or long term.

Haypress Allotment

This rest-rotation grazing allotment would be most valuable at providing single-year (or possibly two years of) drought relief. Two of the three pastures would have the riparian area grazing during the hot season for too long a time to expect short or long-term improvements. With this grazing system, grass seedling establishment in the uplands would have a better chance of success than other grazing strategies employed in the other allotments. Soil resources should benefit from expected increases in vegetative cover and litter.

Happy Springs Allotment

Happy Springs Allotment would be divided into two pastures, with little or no herding to keep livestock off riparian zones. Livestock would still congregate in riparian areas, especially during the hot season. These riparian areas

would not be expected to improve. This grazing strategy typically does not favor riparian vegetation health or restoration of functional integrity. Upland soils further from water are expected to show increased levels of fertility due to improved plant vigor and litter accumulation. A slight increase in vegetative cover would reduce the potential for erosion.

Alkali Creek Sheep Allotment

The Alkali Creek Sheep Allotment would be grazed annually in the spring and fall periods. With deferment from grazing during the summer growing season, the lowland soils are expected to benefit from increases in soil fertility and protective vegetative cover. Upland areas further from water are expected to show moderate levels of improvement.

Double-grazing could occur in dry years along East Alkali Creek; this grazing strategy has not worked well with cattle grazing in allotments to the north of this area. Riparian areas along East Alkali Creek and adjacent transition zones to the uplands are not expected to improve with double grazing.

The proposed new projects for the six new allotments are expected to result in the creation of 147 acres of disturbance associated with new maintenance roads along fences, and another 72 acres of sacrifice areas for the new water sources. In the far western part of the allotment, 1.5 miles of fence are proposed to be reconstructed, with modification for a water gap (on private land) below Mud Springs. The spring occurs on BLM-administered public lands, and it would be fenced into what essentially serves as a fall gathering pasture, consisting of approximately 160 acres of private land and 40 acres of BLM-administered public lands. In the small gathering pasture, use levels are expected to be moderate for average years. With no spring or hot summer season use, the riparian conditions, and therefore soil and vegetation conditions, in the gathering pasture are expected to improve in both the short and, especially, long term.

Map 4-3, Water Erosion Potential, and Map 4-4, Wind Erosion Potential, both illustrate that if a management scenario decreases soil cover too much in the uplands, accelerated wind erosion can result. Areas of currently stabilized sand dunes to the south of Green Mountain, and medium-textured soils high in very fine sand, fine sand, and silt-size particles can become active and suffer erosional losses, consequently decreasing the potential of these sites. In the less-sandy areas, water erosion in the form of new and more frequent rills and gullies would result.

This alternative relies primarily on fences for livestock control. Without intensive herding efforts, deferred-rotation grazing systems are not expected to improve riparian and nearby upland transition zone conditions substantially in either the short or long term.

Water Resources

The impacts to water resources from Alternative Two would result from expected long term heavy livestock use of riparian zones and wetlands. Minor variations, primarily related to specific water development projects, spring exclosures, riparian pastures, and livestock management strategies, would also be expected. Accelerated soil erosion, especially on the lowlands, would be the largest contributing factor to water quality.

With expected long term heavy livestock use levels riparian zone improvement cannot be expected under this alternative. Except for the Alkali Creek Sheep Allotment, the limited length of deferment would not allow for improvements in vegetation, vegetative litter, and hydrologic conditions. The cattle trails found in the transition zones and extending to the uplands would remain in their present compacted state. The cattle trails would continue to channel runoff and sediment into the riparian areas, as cattle use on the cattle trails is expected to remain heavy. Only in the proposed Haypress (rest-rotation system) Allotment and Alkali Creek Sheep Allotment might this soil compaction have a better chance to decrease over time. As a result of these new management scenarios, water quality parameters such as turbidity, total dissolved solids (TDS), and suspended sediment (SS) would improve above the current situation. Drought will, of course, act as a complicating factor for all of the allotments.

There are currently 133 acres undergoing impacts from livestock (i.e., sacrifice areas) and project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 Final

Decision.

EFFECTS ON VEGETATION RESOURCES (Alternative Two)

Vegetation – General

Refer to the General Effects on Vegetation Resources for Alternative One.

Grazing Management

Refer to Grazing Management Section in Alternative One.

Upland Vegetation

The short-term impacts in the upland range of the two-pasture, three-pasture or five-pasture deferred-rotation grazing systems would be: slightly increased vegetation production due to the increased seedling establishment, improved vigor and root growth/replacement, increased litter accumulation, and increased percent composition of grass and forb key species.

A study by Gibbens and Fisser (1975) in the Red Desert region (in which the southern portion (40 percent) of GMCA is located) on a two-pasture deferred-rotation grazing system found that plant composition, calculated as a percentage by species of the total vegetation cover, would result in a relative increase in the grasses and forbs.

In this same study, a two pasture deferred-grazing system showed an increase in grass cover of 31 percent outside of a control, while the grass cover increase from 1967 to 1971 inside the control was 25 percent. Therefore, the net increase of grass cover from 1967 to 1971 of 6 percent was a result of the two-pasture deferred grazing system. Shrub cover change from 1967 to 1971 outside the enclosure was decrease of 11percent, while inside the enclosure was an increase of 34 percent. These results indicate that a two-pasture deferred grazing system should cause a reduction of shrub cover when compared to the absence of grazing. It is estimated that the proposed two-pasture or three-pasture deferred-rotation grazing systems in the southern portion (Red Desert Region) of GMCA would decrease shrub cover 10 percent.

The proposed three-pasture rest-rotation grazing system in the proposed Haypress Allotment is expected to have these short-term impacts: improved plant vigor and root growth/replacement of vegetation species, increased litter accumulation, increased seed production and seedling establishment, and increased production.

The proposed five-pasture deferred-rotation grazing system in the proposed Green Mountain Allotment is expected to have these short-term impacts: improved plant vigor and root growth/replacement of vegetation species, increased litter accumulation, increased seed production and seedling establishment, and increased production.

Grazing in the proposed Arapahoe and Happy Springs Allotments would take place during the summer and winter months (refer to Table 4-19, Annual Grazing Treatments and Table 4-20, Acres Per Grazing Treatment Through One Complete Grazing Cycle for Alternative Two). The winter grazing season, which would receive about 10 percent of the livestock grazing use, is least detrimental to the vegetation (Garrison 1972, Blaisdell and Holmgren 1984, Masters, et al. 1996a). The adverse impacts such as decreased litter and seedling establishment created by grazing from May 1 through July 15 in the Lost Creek, Warm Springs, and West Crooks Mountain Pastures would be detrimental in the area of the summer sheep use.

Table 4-19. Alternative Two – Long-Term Annual Grazing Treatments

Use Area Pasture	Year 1	Year 2	Year 3	Year 4
Antelope Hills/Picket Lake				
Granite Creek-Rocks	L-M	L-M	L-M	L-M
Alkali Creek	L-M	L-M	L-M	L-M
Picket Lake	A-L-M	B-L-M	A-L-M	B-L-M
Arapahoe				
Eagles Nest Draw	A-F-N	B-H-N	A-F-N	B-H-N
Lost Creek	B-H-N	A-F-N	B-H-N	A-F-N
Happy Springs				
Warm Springs	A-H-N	B-H-N	A-H-N	B-H-N
West Crooks Mountain	B-F-N	A-F-N	B-F-N	A-F-N
Haypress Creek				
Haypress	A-N	P	B-N	A-N
Cottonwood (Soap Holes)	B-N	A-N	P	B-N
Wood Gulch	P	B-N	A-N	P
Green Mountain				
Sheep Creek	A-J-N	A-J-N	A-J-N	A-J-N
Stratton Rim	I-N	I-N	I-N	I-N
West Willow Creek	E-N	J-N	D-N	E-N
East Willow Creek	J-N	D-N	E-N	J-N
Green Mountain	D-N	E-N	J-N	D-N
Alkali Creek Sheep	C-G-J-H	C-G-J-H	C-G-J-H	C-G-J-H

Riparian Management Pastures (continuation of Table 4-19)

Use Area Pasture	Year 1	Year 2	Year 3	Year 4
Long Slough	I-G-O	G-O	I-G-O	G-O
Crooks Creek/Bare Ring Slough ¹	I-G	I-G	I-G	I-G
W. Fork Crooks Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Lost Creek ²	I-G	G-J	I-G	G-J
Ice Slough	G-J-O	G-J-O	G-J-O	G-J-O
Warm Springs Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Sweetwater River ¹	I-G-O	I-G-O	I-G-O	I-G-O

¹Willow plant communities present within riparian management pasture.

²Ten years of rest would be required before livestock grazing is authorized.

* Pasture not yet completed

Treatment G: Rest summer-long (June 16 through September 15). Under this treatment, the Alkali Creek Sheep and Long Slough Use Areas/Pastures would not be grazed by sheep or cattle during the hot season for riparian area improvement.

Treatment I: Graze season-long through the spring (May 1 or May 15 through June 15). This treatment would be used with cattle in the Long Slough Use Area/Pasture and the Stratton Rim Pasture within the Green Mountain Use Area during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation in the fall.

Treatment J: Graze September 16 or October 1 through October 31 or November 15. This fall season treatment would be used by cattle in the Long Slough Use Area/Pasture and the other riparian pastures without willow plant communities. This fall season treatment would also be used by cattle and sheep in the upland pastures of the Arapahoe, Happy Springs, Antelope Hills-Picket Lake, and Green Mountain Use Areas during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation after the fall grazing season.

Treatment O: Rest yearlong for one to three years to initiate the recovery process on degraded riparian areas within the Ice Slough, Long Slough, Warm Springs Creek, Sweetwater River, and West Fork Crooks Creek Riparian Management Pastures. The long term increase in livestock grazing use during the winter, from sheep (no increase would be expected from wildlife or wild horses), would not be significant enough to be detrimental to the vegetation resource over the long-term. Reduction of growing season grazing intensity would improve vigor of vegetation species and increase production in the long-term (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998).

The Lost Creek drainage would be expected to improve in condition and production over the short-term, as a result of the riparian management pasture and the deferred-rotation grazing system (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998). Over the entire Lost Creek and Eagles Nest Draw Pastures, the production and condition would be expected to improve slightly in the short term, due to the improved distribution of livestock, wildlife, and wild horses from water developments. As mentioned previously, the winter season is considered to be the least detrimental to the vegetation in terms of grazing. Winter is considered to be the least detrimental period of utilization for shrubs (Garrison 1972, Blaisdell and Holmgren 1984). The lack of grazing pressure during the growing period would allow the vegetation to improve in terms of vigor, seed production, seedling establishment, and litter accumulation.

Concentration of livestock, wildlife, and wild horses in areas offering shelter during winter storms is not considered detrimental to the vegetation in the long-term because there are numerous locations offering protection throughout the proposed Arapahoe, Antelope Hills-Picket Lake and Happy Springs Allotments, and the deferment of grazing during the spring and summer months would allow the vegetation to recover from the depletion of carbohydrate reserve levels from winter grazing. A slight increase in forage production over the entire GMCA would be expected from implementation of this alternative in the short-term.

Areas which are favored as sheep bed grounds would be expected to receive excessive grazing pressure. This alternative requires the sheep operators (Stan & Linda Cole and W.S. Baldwin during the initial and interim phases) to move the sheep bed grounds 1.5 miles every week. The exception to this would be in the Picket Lake and Alkali Creek Pastures of the proposed Antelope Hills-Picket Lake Allotment and the Lost Creek and Eagles Nest Draw Pastures of the proposed Arapahoe Allotment where three miles of movement is required. Areas which have been historically-favored bed grounds, such as areas near water or which offer protection from adverse weather, would have the vegetation completely removed or damaged so severely that recovery would be impossible. An area of approximately one to three acres per bed ground would be expected to be impacted. Based on field observations from the 1999-2007 grazing seasons, the heavy grazing of the sheep bed grounds would be detrimental to the localized upland vegetation in the long-term. The deferred-rotation grazing has not allowed the vegetation on these sites to recover from these short periods of heavy grazing. The long term increase in livestock grazing use proposed under this alternative (76% of permitted use) would double the grazing intensity on these localized sites above the 1999-2006 use levels (37% of permitted use).

Table 4-20, Alternative Two - Long-Term Acres Per Grazing Treatment Through One Complete Grazing Cycle, shows the acres of different grazing treatments that are applied through a completed four year grazing cycle. The table displays the scale these grazing treatments affect annually and through a completed rotation cycle.

**Table 4-20. Alternative Two – Long-Term
Acres Per Grazing Treatment Through One Complete Grazing Cycle**

Treatment	Public Land Acres			
	Year 1	Year 2	Year 3	Year 4
A	164,090	129,277	158,613	126,965
B	117,936	152,146	115,624	155,061
C	17,982	17,982	17,982	17,982
D	12,826	1,806	2,760	12,826
E	2,760	12,826	1,806	2,760
F	74,366	104,511	74,366	104,511
G	27,197	27,197	27,197	27,197
H	136,072	105,927	136,072	105,927
I	10,426	2,096	10,426	2,096
J	31,872	37,797	42,892	36,754
K	0	0	0	0
L	173,868	173,868	173,868	173,868
M	173,868	173,868	173,868	173,868
N	247,680	247,078	244,766	247,680
O	9,073	9,073	9,073	9,073
P	10,510	11,113	13,425	10,510

*The totals for each year are greater than the acreage of the allotment because some pastures receive more than one treatment each year.

Range Improvements

Table 4-21 depicts the estimated number of surface acres that would be disturbed as a result of the construction, maintenance, and continued existence of the proposed range improvements for this alternative.

Table 4-21. Surface Acres Disturbed as a Result of Implementing Alternative Two Long-Term Proposed Range Improvements*

Type of Improvement	Number of Units	Acres Disturbed per Unit	Total Acres Disturbed
Spring development	5+	2.6	13
Three-Wire fence (Allotment/Pasture boundary)	66 miles	1.5/miles	99
Riparian pasture fence	32 miles	1.5/miles	48
Cattleguard	17	0	0
Water well (existing) development	16	1.8	28.8
Reservoir reconstruction	2	4.0	8.0
Exclosure (Artesian wells/wetland fenced)	0	.2 on fenceline .9 inside permanent exclosure	0 on fenceline 0 inside permanent exclosure
Pipeline	22 miles	.1/miles	2.2
		TOTAL	199
*See Appendix 11 for rationale.			

Construction of the proposed range improvements would remove approximately 199 acres from production. Table 4-21 lists the total acres disturbed by each type of range improvement, and the total acres that would be disturbed under this alternative. The range improvements disturbing the major proportion of the acres would be the allotment or pasture boundary fences (99 acres), riparian pasture fences (48 acres), water wells (29 acres), and spring developments (13 acres). The overall impact to the vegetation within the GMCA as a result of range improvement construction would be small.

Even though fences are beneficial in the management of livestock, they do cause trailing of livestock, wildlife, and wild horses along the fences. This would result in the deterioration of the vigor of plants near a fence due to overgrazing and trampling. Use of motorized vehicles for fence maintenance would also lead to a reduction in vigor of vegetation. Another impact of the trailing of livestock and wildlife along a fence would be the removal of vegetation through trampling and compaction of the soil. This would cause adverse growing conditions. A change in composition of the vegetative species could occur in the immediate vicinity of the fence in areas away from the fence; however these impacts would be less noticeable. Heavy to severe grazing would cause a decrease in the preferred species and an increase in the less-preferred species.

The existing fence on the southern boundary of the GMCA would concentrate summer cattle use on the north side of the fence near the proposed Lost Creek Riparian Pasture. Forage in the areas of concentration would be removed through livestock consumption and trampling. The grazing would result in the decline of preferred species and an increase in less-preferred forage species. The overall production, seed production, vigor, condition, and trend of the

vegetation would decline in the areas of concentration.

Impacts created through the development of a spring or water well would include removal of vegetation, changes in composition, and decrease in vigor of plants. Use of the development by livestock would result in removal of vegetation immediately around the water trough, a circle roughly 50 yards in radius. Sacrifice areas would occur adjacent to the spring source and each of the water wells. Total disturbed area would be 2.6 acres for the spring development, and 1.8 acres per water well development (Table 4-21). Vegetation would be removed mainly by livestock trampling. These areas would be mostly devoid of vegetation and would remain in that disturbed condition due to the continual use of the water trough. It is anticipated that there would be a decrease in the vigor of the vegetative species immediately surrounding the sacrifice area. The vigor decrease would come about from the dust on the plants, the partial trampling of vegetation by livestock, and the heavy to severe grazing which commonly takes place around water sources.

The development of water wells would improve the distribution of livestock over the entire GMCA, thus promoting a more even utilization of the forage. Proper utilization of the forage is important in maintaining or improving the vegetative vigor, production, or range condition (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984). Properly-placed water developments, combined with the proposed grazing systems, would pull the livestock from the overused existing natural water sources, such as Crooks Creek and Lost Creek, allowing these areas to improve in vigor and production.

Heavy to severe grazing is marked by a disappearance of preferred plants or of those plants physiologically less-resistant to grazing. Less-preferred or more resistant plants may survive and replace the removed plants (Stoddart, Smith, and Box 1975). This would eventually lead to a change in composition. Continued grazing would cause an influx of species, called invaders, which are not part of the natural plant communities. The invaders would be mobile annuals, but later, would encourage the establishment of herbaceous or woody perennials of low value (Stoddart, Smith, and Box 1975).

Any place which has the existing vegetation removed provides an opportunity for other plants to begin growth. The construction, maintenance, and use of the various proposed projects may cause enough disturbances to permit increased numbers of poisonous plants to invade the site. For example, halogeton (*Halogeton glomeratus*) is a poisonous annual often found on disturbed sites. The amount of trampling and utilization of the vegetation would decrease as the distance from water increased.

Summary

Short-term detrimental impacts under summer grazing (treatments A, B, D, E, L, M, and N) would include reductions in plant vigor, litter accumulation, and seed production. Short-term detrimental impacts from fall and winter grazing (treatments B, E, F, H, and J) would be reductions in plant vigor and litter accumulation. The summer-long rest and year-long rest (treatments G, O and P) treatment would increase vigor, litter accumulation, seedling establishment, and seed production for the proposed Alkali Creek Sheep and Haypress Allotments and five riparian management pastures. Rest periods, which comprise part of treatments A and B, would enhance the vegetation by increasing vigor, root growth/replacement, seed production, and litter accumulation of the vegetation. The short-term impacts, such as increased vigor and seedling establishment would not be enough to offset those which would be detrimental in the long term. This is due to the marked increase in long term grazing use above the 1980-2006 level (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The proposed long term use level (47,015 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) is 84 percent of the long-term average available livestock forage shown in Table 3-8, Present Allotment Production. Blaisdell and Holmgren recommended the basic stocking level on Intermountain salt-desert rangelands at 75 percent of the long-term average forage production, because of the normal inability to adjust animal numbers to the wide variations in forage yield. This recommendation is based on long term forage (1935-1974) production on moderately-grazed (11 acres per AUM) salt desert rangeland. This recommendation provided adequate forage

except in years when production was extremely low.

The proposed long term use level (47,015 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) would be an average stocking rate of 10.0 acres per AUM on the public land within GMCA. The last nine years (1999-2007) of below average precipitation have required lower livestock use levels to manage for rangeland health standards and provide for drought recovery. The next five years would be required for drought recovery.

Under this alternative, the upland (away from present livestock water sources) areas within the proposed Arapahoe, Antelope Hills-Picket Lake, Green Mountain, Haypress and Happy Springs Allotments, would receive in the long term a 108 percent increase in grazing use over the 1999-2006 recent use levels, due to additional forage availability as a result of increased distribution of livestock through range improvements. The area within the Picket Lake, Alkali Creek, Lost Creek and Eagles Nest Draw Pastures (formerly Seven Lakes Incommon Allotment), which is approximately 40 percent of the GMCA (refer to Appendix 6), would receive most of this increased grazing use. This increased livestock grazing intensity, combined with the grazing systems, would result in the vegetation of the upland areas (depending on their proximity to water) maintaining or declining in vigor, root growth/replacement, production, seed production, and litter accumulation (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The upland and lowland areas within the proposed Alkali Creek Sheep Allotment and Long Slough Pasture would improve in vigor, root growth/replacement, production, seedling establishment, seed production, and litter accumulation due to the lack of grazing during the summer growing season.

Implementation of this alternative would result in a long-term slight decline in production (USDI-BLM 1979, Blaisdell and Holmgren 1984). In the long term, it is expected that there would be a static-to-declining trend in those riparian areas outside riparian management pastures within the proposed Arapahoe, Antelope Hills-Picket Lake, Green Mountain, Haypress and Happy Springs Allotments. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were only rated as fair for improving stream and riparian habitats (refer to Appendix 10).

Also, by 2027, it is expected that there would be static trend in upland range condition, a static-to-improving trend in those riparian areas outside riparian management pastures within the proposed fenced portion (approximately 26,730 acres) of the Granite Creek-Rocks Pasture of the Antelope Hills-Picket Lake Allotment. The proposed modification to the deferred-rotation grazing system, which limits the summer grazing period to 30 days would allow for long-term improvement (Myers 1989, Masters et al. 1996b, Mosley, et al. 1997, Clary and Webster 1989, Clary and Webster 1990, USDI-BLM 1998).

Construction of the proposed range improvements would cause the loss of approximately 199 acres from production. Major impacts to the vegetation would be the removal of vegetation in the vicinity of the water troughs and the decrease in vigor of the vegetation, through trampling and heavy grazing by livestock, wild horses, and wildlife along fences.

Overall, the long term impacts upon vegetation from implementation of this alternative are: (1) a static-to-slight decrease in the percent composition of those vegetation species that are more desirable forage for livestock, wild horses, and wildlife (i.e., grasses, forbs, saltbush, and winterfat would increase relative to big sagebrush); (2) a static to slight decrease in plant vigor, root growth/replacement, seed production, litter accumulation and production; (3) a static-to-downward trend in the condition class on the upland areas adjacent to water sources and on an estimated 24 percent of the public land riparian areas in the allotment; and (4) a stable trend in live vegetation cover (USDI-BLM-1979) (Holechek et al. 1998).

Wetland-Riparian Vegetation

Most of the impacts to wetland-riparian areas stem from one simple fact: If not excluded by herding or fences, domestic livestock (and, to a lesser degree, wild horses) will congregate around these areas during hot weather.

Riparian areas offer everything that livestock need: readily available drinking water, succulent forage plants, cool ground to lay on, and, often, shade. For these reasons, livestock will remain in these areas until they have consumed all the available forage, and then will move only far enough away to find something else to eat before returning. Wetland-riparian areas denuded of vegetation and trampled until they have dried out do not perform their natural functions of retaining sediment, holding back water, cooling water by shading, and providing productive habitat for wildlife.

Except for the Haypress Allotment, most of the Alkali Creek Sheep Allotment and the Granite Creek Rocks Pasture proposals discussed above, Alternative Two does not offer any means of excluding livestock from wetland-riparian areas during the hot part of the grazing season. Consequently, it is unlikely that any substantial improvement will result from this alternative. In most cases, livestock will simply spend too much time in these sensitive parts of the allotment.

EFFECTS ON LIVESTOCK GRAZING (Alternative Two)

Short Term Cattle

This alternative would provide for extensive (60 percent for cattle) nonuse, which has been authorized in the allotment over the past nine (1999-2007) years to continue in the short-term to allow for drought recovery and construction of range improvements. This policy is discussed in Assumptions for Analysis.

Interim Cattle

Under this alternative by 2017, there would be a 29 percent increase (from the 1999-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,300 to 3,000 head (refer to Appendix 15) by the end of the interim implementation period.

Under this alternative by 2017, there would be a three percent increase (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,900 to 3,000 head (refer to Appendix 15) by the end of the interim implementation period.

Long Term Cattle

Under this alternative by 2027, there would be a 94 percent increase (from the 1999-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,300 to 4,500 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Under this alternative by 2027, there would be a 55 percent increase (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,900 to 4,500 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Short Term Sheep

This alternative would not enable two grazing permittees to convert 1,325 winter sheep AUMs to 689 summer cattle AUMs and 5,194 (former Seven Lakes) to 4,940 (former Green Mountain) summer sheep AUMs to 5,017-4,158 summer cattle AUMs as the water developments become operational. Further, the two permittees, Stan and Linda

Cole and W.S. Baldwin, would not experience an increase in the value of their base property to which their federal grazing permits are attached over the short-term because there would be no livestock conversions authorized under this alternative. In the short term, this alternative would not change the current level of economic viability of these two livestock operations.

Interim Sheep

Under this alternative by 2017, there would be a 72 percent increase in yearlong sheep AUMs (from the 1999-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 1,450 to 2,500 head (refer to Appendix 5) by the end of the interim implementation period.

Under this alternative by 2017, there would be a 7 percent decrease in yearlong sheep AUMs (from the 1980-2006 average authorized sheep use) which would impact two sheep permittees by decreasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but would decrease the number of sheep from approximately 2,700 to 2,500 head (refer to Appendix 5) by the end of the interim implementation period.

Long Term Sheep

Under this alternative by 2027, there would be a 160 percent increase in yearlong sheep AUMs (from the 1999-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 1,450 to 3,800 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Under this alternative by 2027, there would be a 40 percent increase in yearlong sheep AUMs (from the 1980-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 2,700 to 3,800 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Long Term Dual Use

From implementation of this alternative, a long-term increase in AUMs is predicted. By 2027, it is expected that there would be an improvement in upland range condition of at least one-half condition class resulting in fewer acres in low seral (poor) condition; fewer acres in mid seral (fair) condition; more acres in late seral (good) condition; and more acres in potential natural community (excellent) range condition (USDI-BLM, 1979). Improvement in upland and riparian forage conditions in the long-term would result in an increase in dual use (cattle and sheep) AUMs. However, the condition of riparian areas outside the riparian management pastures (approximately 1,360 acres or 66 percent of the public land total) is expected to remain static or further decline. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were rated as fair for improving stream and riparian habitats (refer to Appendix 20).

Range Improvements

Table 4-22 lists the proposed range improvements and estimated project costs for their construction and installation at \$989,640 to \$1,063,210. Table 4-23 shows estimated maintenance costs for the proposed range improvements at \$13,075 per year. The estimated construction costs would range from \$2.11 to \$2.27 per public land acre or \$20.90 to \$22.45 per public land AUM. Under this alternative, it is proposed these improvements would be completed by the end of year 20 (2027) and would be funded 50 percent by the BLM (out of range betterment funds) and 50 percent by the grazing permittees and other cooperators. The maintenance responsibility of the proposed projects would be assigned to individual grazing permittees or a formally recognized permittee grazing association

**Table 4-22. Construction and Labor Requirements
For the Proposed Range Improvement Projects under Alternative Two**

Year	Project	Units/Miles	Cost ¹	Total
2-20	Three-wire (Use Area/Pasture Boundary)	66 miles	\$4,840 mile	\$ 319,440
2-5	Riparian Pasture Fencing (1 Pasture/Year)	32 miles	\$4,840 mile(barbed)	\$154,880
			\$2,541 mile (permanent or temporary electric)	\$ 81,310
2-20	Cattleguards (1 each/Year)	1	\$3,207 2-lane-24'	\$ 3,210
		16	\$1,694 1-lane-12'	\$ 27,100
2-10	Spring Development (Includes Fencing) (3 Each/Year)	5+	\$ 3,630 each	\$ 18,150+
4-5	Reservoir Construction	2	\$ 7,261 each	\$ 14,520
2-20	Water Well Development (new)	10	\$31,462 each	\$ 314,620
11-13	Water Well Development (existing)	2	\$ 9,680 each	\$ 19,360
3-9	Water Well Development (existing)	4	\$ 6,050 each	\$ 24,200
3-19	Water Pipelines (6) (4-5 miles/year)	22 miles	\$ 7,624 mile	\$ 167,730
	Exclosure (Artesian Wells Wetland Fencing)	0 miles	\$ 4,840 mile	\$ 0
	TOTAL (Barbed Wire Fence)		(\$2.27/public land acre)	\$1,063,210
	TOTAL (Permanent Electric Fence)		(\$2.11/public land acre)	\$989,640

¹ Cost information on file in the Lander Field Office.

Table 4-23. Estimated Maintenance of Proposed Range Improvements for Alternative Two

Type of Improvement	Number of Units	Annual Maintenance Cost/Unit ¹	Total Annual Maintenance Cost	Estimated Life of Improvements
Springs	5+	\$121	\$ 605	20+ Years
Wells	16	242	3,870	20+
Pipelines	22 (miles)	61	1,370	20+
Reservoirs	2	120	240	20+
Three-wire Fence	66 (miles)	61	4,030	20+
Riparian Pasture Fence	32 (miles)	61	1,950	20+
Cattleguards	17	61	1,040	20+
Exclosure Fence	0 (miles)	61	0	20+
		Total:	\$13,075	

¹Cost information on file in the Lander Field Office.

depending on the type and location of project. These projects would be designed to solve the water and livestock distribution problems present on the allotment. Nevertheless, the lowland (adjacent to existing waters) areas within the Arapahoe, Antelope Hills-Picket Lake, Green Mountain, and Happy Springs Use Areas would remain static or decline in vigor and condition due to the offsetting increase (51 percent from 1980-2006 average or 108 percent from 1999-2006 average) in the grazing intensity.

The proposed water developments listed in Table 4-21 would enable the cattle to graze much more of the allotment, making approximately an additional 4,000 to 13,100 summer cattle AUM's available (from the 1999-2006 authorized use levels). This would allow increases in cattle numbers both in the interim and long term, leading to an increased income potential for the grazing permittees in the interim and long-term.

Herding

Under this alternative, the permittees have requested increased flexibility, particularly related to herding cattle. All of the allotments would require moving livestock from one pasture to the next for pasture rotation. In addition, "back riding" would be required to gather remaining cattle left behind in the initial pasture move. Pasture rotation would be a phased movement of the cattle from one pasture to the next occurring over a five to eight day period. The higher level of proposed range improvements listed in Table 4-21 would be installed to make the herding program more manageable and less costly for permittees. Nevertheless, experience on GMCA has shown that cattle have congregated and stayed around water sources or spring developments in a rested or deferred pasture or riparian management pasture when effective herding has not occurred. The reduced level of herding proposed under this alternative, may prevent problems of this nature provided "range riders" monitor cattle locations and utilization levels.

Livestock operators in the allotment would benefit by the proposed pasture and riparian management fencing and use area/ pasture rotation because their cattle would be confined in a smaller area than presently. Although moving cattle during the summer (July-August) from one pasture to the other would result in temporarily reduced weight gains until the cattle adjust to their new range, cattle would be limited to an area of approximately one-half to one-third the size of the area they can now graze unrestrained. This would increase the probability of a cow being bred (USDI-BLM, 1979).

EFFECTS ON WILDLIFE/FISHERIES HABITAT AND SPECIAL STATUS SPECIES (Alternative Two)

Under Alternative Two, the GMCA would be subdivided into six new allotments. The location and distribution of livestock within these new allotments would be controlled by a combination of fences, water developments, and grazing prescriptions (rest-rotation or deferred-rotation) that would vary from allotment to allotment, depending upon permittee choice. Herding would be used only to rotate livestock from pasture to pasture. Depending upon

where and how these projects and techniques are used, impacts to wildlife and special status species would also vary across the area. Consequently, these impacts are analyzed separately according to the allotments in which they have been proposed. The proposed allotments for Alternative Two are as follows:

- 1) Happy Springs Proposal:** This proposed new allotment would lie between Crooks Mountain and Highway 287 east and south of Sweetwater Station. Eight miles of new east/west fence would divide the Happy Springs Allotment into a north and south pasture for a proposed two-pasture, deferred rotation grazing system. Two pipelines from existing wells with several water troughs are proposed.
- 2) Haypress Proposal:** The proposed Haypress Allotment would also lie between Crooks Mountain and Highway 287, but east of the proposed Happy Springs Allotment. Proposed range improvements would include 23 miles of new fence, a developed spring (also fenced), and six miles of pipeline to transport water from the spring development to at least four trough locations. These fences and water developments would provide for a three-pasture rest-rotation grazing system. Under this plan, two pastures would be grazed and a third rested each season.
- 3) Green Mountain Proposal:** The proposed Green Mountain Allotment would lie in the northeast corner of the current GMCA, south of Highway 287 and east of Crooks Creek. As such, it would occupy most of the top of Green Mountain, as well as parts of the north and south sides. Proposed range improvements include 11 miles of new fence (includes two fenced springs), four miles of pipeline, and a holding pasture. These projects would provide for a four-pasture deferred-rotation grazing system.
- 4) Arapahoe Proposal:** The proposed Arapahoe Allotment would include the area south of Crooks Mountain, east to the Field Office boundary, west to the Bison Basin road, and south into Great Divide Basin in Sweetwater County. This portion of the GMCA has fewer natural water sources than other areas, so the Arapahoe proposal includes plans to drill three new wells, re-drill and re-equip three others, develop two springs, and install two miles of pipeline to carry water from existing wells. Further proposed is a 14 mile-long north/south fence that would divide this new allotment for a two-pasture deferred-rotation grazing system.
- 5) Antelope Hills/Picket Lake Proposal:** The proposed Antelope Hills/Picket Lake Allotment would include all those areas of the GMCA west of Bison Basin Road. Included in this proposal are 23 miles of new fence, seven additional wells, five spring developments, and one new reservoir. These projects would be part of a three-pasture deferred-rotation grazing system.
- 6) Alkali Creek Sheep Proposal:** This remaining area not included in other allotment proposals lies in the approximate center of the existing GMCA in the vicinity of East Alkali Creek. It was established as a seasonal pasture for sheep in the 1999 Decision, and it is not used during the summer. No additional range improvements are proposed for this allotment.

Abundance and species diversity of nongame wildlife, game birds, fish species, special status species, and big game is dependent largely upon habitat quality. High quality habitat (as defined in Chapter Three) is characterized by having diverse age structure and plant species composition, as well as close proximity to water (riparian habitat). Consequently, the degree to which these species are impacted by the various proposals analyzed here is also largely dependent upon whether these habitat components are improved or diminished.

As most of the proposed allotments would include various combinations of range improvements, the impacts associated with these improvements are described as follows:

- 1) Fencing:** Although fences can be useful in the location and distribution of livestock or for exclusion of livestock from sensitive areas, all fences present some degree of interference to big game movement. Sheldon (2005) found that pronghorn chose their seasonal home ranges in areas of lower fence density, including wildlife friendly fence. Even wildlife friendly fences tend to cause big game animals to hesitate and expend extra energy attempting to find a way through. In situations where passage over or under a

fence is further complicated by sudden snowfall, a fence can become an insurmountable barrier to migration. Techniques such as double gates and let-down sections do not entirely mitigate impacts associated with fences.

Fences also present additional problems to sage-grouse. Sage-grouse tend to fly near the ground, and collisions with fence wire (especially electric fence wires) serve as added causes of mortality. In areas of sage-grouse breeding and nesting, fence posts provide perching raptors a vantage point from which to observe and pick off sage-grouse on the ground. As sage-grouse activity is extensive throughout the GMCA, the location of fences in avoiding sage-grouse will only partially mitigate this impact.

Lastly, fences tend to concentrate livestock in certain areas. This impact, coupled with any increase in livestock numbers, increases the likelihood of trampling or disturbing the nests of sensitive bird species such as the ferruginous hawk, sage sparrow, loggerhead shrike, Brewer's sparrow, sage thrasher, and greater sage-grouse.

2) Water developments: Water developments, which may include wells, reservoirs, and spring developments, may also be useful to distribute livestock and to provide previously unavailable water sources for wildlife. However, during hot season use, livestock tend to congregate around such water sources, compacting the soil and denuding the vegetation. Placement of a water development typically creates a sacrifice area of up to five acres. Depending upon the area, such a concentration of livestock may increase the likelihood of sage-grouse nest trampling. Water developments also tend to attract predators because they concentrate prey species (e.g., sage-grouse) in areas where they may not have been before. Lastly, water developments provide breeding habitat for mosquitoes which may carry West Nile Virus (WNV). This disease, though occasionally fatal to humans, is almost always fatal to sage-grouse and various other bird species. The placement of water developments away from preferred nesting areas will only partially mitigate these impacts. Routine use of mosquito larvicide in water developments would help mitigate the threat of WNV.

3) Pipelines: Installation of pipelines used to move water from wells or spring developments removes forage-producing plants, cover for sage-grouse and other ground-nesting species, and also produces a disturbance that will take many years to heal. Location of pipelines within existing disturbances such as roads can be used to mitigate this impact.

Nongame Wildlife and Game Birds

Happy Springs

As mentioned earlier, improvement of habitat for nongame species and game birds depends largely on improvement of riparian areas in terms of age class and plant species diversity. This new allotment would include the Ice Slough and part of the Warm Springs riparian pastures. Other riparian areas not excluded from livestock grazing would be exposed to too many days of grazing each season to achieve any substantial improvement.

Haypress

Again, improvement of habitat for nongame species and game birds depends largely on improvement of riparian areas. Although this is the only proposal for a rest-rotation system under Alternative Two, the planned three-pasture system would require two pastures to be grazed heavily each year. While a year of rest would certainly benefit unfenced riparian areas, two subsequent years of heavy grazing would tend to undo any improvement.

Green Mountain

The five-pasture rotation proposed for this allotment would provide for less-intensive (fewer days) grazing in riparian areas than would the two- and three-pasture systems. However, BLM Technical Reference 1737-14 (1997) only ranks deferred grazing as a "4" on a scale of one to ten in its potential for improving riparian areas. Without improvement of riparian habitats, wildlife and fisheries habitats farther downstream are unlikely to improve.

Arapahoe

This proposed new allotment already includes one fairly large riparian pasture (West Crooks Creek) and a number of smaller riparian protective exclosures. However, for those riparian areas that remain unfenced, the same situation would exist as in the Happy Springs proposal. A two-pasture rotation would simply have livestock grazing in riparian areas for too long of a period during the hot season to achieve any improvement in conditions.

Antelope Hills

A number of riparian areas important to nongame wildlife and waterfowl occur within this proposed new allotment. Among these are Picket, Scotty, and McKay Lakes. The largest of these natural water bodies, Picket Lake, is excluded from livestock grazing by fence. This lake is important to migrating ducks and other waterfowl species. In addition to Picket Lake, a number of other important springs and associated riparian areas throughout this proposed allotment are excluded from grazing. Riparian habitat within these exclosures continues to improve steadily. However, riparian habitat essential to nongame, game birds, and special status species is likely to improve very little under a three-pasture grazing plan for reasons already discussed.

Alkali Creek Sheep

East Alkali Creek flows through this proposed allotment. Although some improvement in riparian habitat could be expected from excluding summer sheep grazing, no boundary fencing is proposed. Because cattle may be to drift into this area from adjacent allotments, improvement of the riparian areas may not be realized from hot season rest.

Big Game

Happy Springs

The proposed eight-mile fence would subdivide an extensive area of winter/yearlong pronghorn antelope range, and it would lie across the path of antelope migrating from the area around Crooks Mountain to their crucial winter range around Ice Slough (see Map 3-6).

Haypress

The north half of this proposed allotment is mostly antelope crucial winter range. Proposed fences would lie through this range, and also across the path of antelope moving north toward it in the fall.

Green Mountain

This proposed allotment encompasses most of the Green Mountain Area of Critical Environmental Concern (ACEC), previously established because of its importance as elk and mule deer crucial winter range and elk calving habitat. Two of the fences included in this proposal bisect this ACEC in two separate areas, dividing part of the crucial winter range from elk calving areas.

Arapahoe

Most of this proposed allotment is important seasonal range for antelope and elk. Antelope use this area as far north as the Crooks and Green Mountains; they then migrate south into lower elevations at the onset of winter. Elk graze in the lower areas in the summer, and they either migrate south or winter on top of Green and Crooks Mountains (see Map 3-4). Most of the southern boundary of this proposed allotment is either unfenced or separated from the Rawlins Field Office (RFO) by a seasonal let-down fence. Under current conditions, the proposed 14-mile north/south fence would not impede migration as much as an east/west fence. However, proposals have recently been made by permittees in the RFO (Stewart Creek Allotment) to either permanently fence the boundary, or to leave the let-down fence up well into the migration period (see Cumulative Impacts).

Antelope Hills

This proposed allotment is spring-summer-fall range for antelope. At the onset of winter, those animals using the northeast part of this area migrate to the east to crucial winter range, and those animals using the south and west portions migrate to the south into the Rawlins Field Office. Much of the west part of this proposed allotment is elk crucial winter range. Moose wintering along the Sweetwater River may also use the side drainages (i.e. Granite, Mormon, and Willow Creeks). Portions of the 23 miles of new fence proposed for the Antelope Hills/Picket Lake Allotment would lie across seasonal migration routes for antelope and elk.

Alkali Creek Sheep

This proposed allotment does not include any big game crucial winter range. It is used primarily as spring-summer-fall range by the Red Desert antelope herd that migrate southward at the beginning of winter. Because there are no proposals for new fences, big game migration would not be impacted by this proposed allotment.

Fisheries

Happy Springs

All the existing natural water sources in the proposed allotment are ephemeral and do not include fisheries habitat.

Haypress

The proposed Haypress allotment includes portions of Cottonwood, Haypress, Nancy, Wood's Gulch, and O'Brian Creeks, all of which are perennial. Several of these streams are classified by the Wyoming Game and Fish Department (WGFD) as trout fisheries. Without improvement of riparian habitats, wildlife and fisheries habitats are unlikely to improve.

Green Mountain

This proposed allotment contributes to both Cottonwood Creek on the north side of Green Mountain and Crooks Creek on the south. Both streams are classified by the Wyoming Game and Fish Department (WGFD) as trout fisheries. Without improvement of riparian habitats, wildlife and fisheries habitats farther downstream are unlikely to improve.

Arapahoe

Most of this proposed allotment lies in the Lost Creek drainage which is highly ephemeral and of little importance as fishery habitat. However, certain northern portions of this area drain into either Crooks Creek or Alkali Creek - both of which are classified as trout streams by the WGFD. As mentioned above, without improvement of riparian habitats, wildlife and fisheries habitats farther downstream are unlikely to improve.

Antelope Hills

The east side of this proposed allotment contributes to the West Alkali Creek drainage, while much of the west side contributes directly to the Sweetwater River via Granite Creek, Mormon Creek, and Willow Creek (Sweetwater Canyon). Alkali, Mormon, and Willow Creeks are all classified as trout waters, as is the Sweetwater River. Again, improvement of these fisheries habitats is dependent upon improvement in riparian habitat upstream.

Alkali Creek Sheep

East Alkali Creek is a principal tributary of Alkali Creek, a designated trout stream. As previously mentioned under the discussion of the Arapahoe proposal, improvement in riparian conditions is essential to improving fisheries habitat.

Special Status Species

Happy Springs

This proposed allotment includes portions of four sage-grouse lek/nesting complexes and an extensive area of suitable nesting habitat. The proposed fence would lie across this nesting habitat. Some improvement in riparian habitat associated with the aforementioned riparian pastures would benefit the grouse, but these projects also include the adverse impacts described above.

Haypress

This proposed new allotment includes portions of five sage-grouse lek/nesting complexes and extensive suitable nesting habitat. The proposed west boundary fence would lie very close to two of these leks, and interior cross fencing would lie within the nesting habitat.

Green Mountain

The proposed Green Mountain Allotment does not include any known sage-grouse leks. However, suitable nesting

habitat does exist in large, open parks on the mountaintop. Being partly forested, this area is more important to such raptor species as the Northern goshawk and Cooper's hawk, as well as to bats that may roost seasonally in the trees. Generally speaking, livestock grazing does not impact enough of these species' habitat to be of concern.

Arapahoe

The proposed Arapahoe Allotment includes all or portions of 25 sage-grouse lek/nesting complexes and some of the most productive nesting areas in the Lander Field Office. The proposed 14-mile fence and at least five of the proposed water developments would fall within two miles of a lek.

In addition to sage-grouse, this proposed allotment also contains suitable habitat for sagebrush obligate species such as the pygmy rabbit, sage thrasher, loggerhead shrike, Brewer's sparrow, and sage sparrow. These species are generally not adversely impacted by moderate levels of livestock grazing, but they could be impacted by the loss of habitat that would result from water developments, pipelines, or other surface disturbance.

Antelope Hills

This proposed allotment includes all or portions of 13 sage-grouse lek/nesting complexes. Part of the proposed 23 miles of fencing will fall across one of these complexes, and at least four complexes would contain water developments. In addition to sage-grouse, this proposed allotment also contains suitable habitat for sagebrush obligate species such as the pygmy rabbit, sage thrasher, loggerhead shrike, Brewer's sparrow, and sage sparrow. As previously mentioned, these species are generally not adversely impacted by moderate levels of livestock grazing, but they could be impacted by the loss of habitat that would result from water developments, pipelines, or other surface disturbance.

Alkali Creek Sheep

The proposed Alkali Creek Sheep Allotment would include all or part of four sage-grouse lek/nesting complexes. These would not be impacted by range improvement projects, as no range improvement projects are proposed. However, improvement in riparian habitat vital to sage-grouse and other special status species is unlikely to occur.

EFFECTS ON WILD HORSES (Alternative Two)

All of the impacts described in Alternative One would also occur in Alternative Two. In addition, Alternative Two would result in more impacts to wild horses than would Alternative One. The primary difference between Alternative One and Alternative Two is the amount and type of developments. Alternative Two proposes more range improvements (water, fencing, and various grazing systems) than Alternative One, and many of these projects would impact all of the HMA's that are relatively unfenced. The impact of authorizing up to 76 percent of permitted use under this alternative (long term) would increase the competition for forage between domestic livestock and wild horses. Such high stocking levels would result in decreased herd health and vigor. A severe winter and/or drought conditions would compound this effect by increasing the potential herd mortality.

Alternative Two's minimal livestock herding would be used only to rotate livestock from pasture to pasture. Depending upon where and how these projects and techniques are used, impacts to herd management areas would also vary across the allotment. Consequently, these impacts are analyzed separately according to the HMA's in which they have been proposed.

Antelope Hills/Cyclone Rim

Two projects of particular concern in the Antelope Hills/Cyclone Rim HMA are the proposed Granite Rocks Fence and the proposed partial temporary/permanent north/south section of fence, which amounts to approximately 27 miles of new fence. These projects would trisect the Antelope Hills/Cyclone Rim HMA, preventing free movement of horses to major portions of the HMA. These fences would also concentrate horses into smaller pastures during the summer months. These projects would block the normal migration patterns and routes from summer pastures to winter ranges. During a normal year, snow depths can vary from a few inches on windblown slopes to many feet of snow in draws and ravines. Temperatures can vary from 20 to 30 degrees above zero to minus 50 or 60 degrees below zero with wind chill factors. The additional fencing within the herd area could cause the loss of 1-3 horses per year, which in the absence of these fences, would otherwise have lived. These animals would become trapped in

corners or in an area with deep snows and little forage to support them. It is also estimated that approximately once every 20 to 30 years, a very severe winter in combination with these fences, could result in the deaths of approximately 60-80 horses. This occurred in the Green Mountain HMA in the mid 1980's when horses became trapped behind the district boundary fence and could not move to winter ranges.

An indirect effect of these fences and the death of horses would be the loss of genetic diversity. Genetic diversity in this herd area has been dependent upon the interchange of genetic material from Crooks Mountain, Lost Creek and the Divide Basin HMA's. These fences would tend to isolate the herd and prevent interchange from occurring. In isolation with no genetic interchange taking place, more horses would be needed in the population to maintain genetic diversity. However, increasing the population size may not safeguard the wild horse population, as previously discussed. Wild horses have limited ability to negotiate fencing in the deep snows common to the HMA, and as a result, chances of a winter die-off would increase. Temporary fencing during the livestock use season would further restrict the wild horse's ability to roam freely within the HMA.

The proposed deferred-grazing system for this portion of the allotment could improve upland range vegetation over a long period of time. However, current evaluations of deferred-grazing systems do not improve or heal riparian habitats over time. Vegetative expression may occur every third year in the deferred fall pasture. The increased fencing and the resulting fragmentation of the herd area would diminish the wild, free-roaming character of this herd. The loss of these values would not be offset by the expected improvement of upland ranges.

Crooks Mountain

The fencing (approximately 27 miles) and proposed grazing system for the north side of Crooks Mountain is located in the heart of the Crooks Mountain Wild Horse HMA. The proposed fencing would severely limit any ability for wild horses to migrate from the summer range on Crooks Mountain north to the winter range in the Ice Slough area. This fencing would also isolate the population from interchange between the other two HMAs that ensure genetic viability for the herd. With the new fencing, the current population (65-85 adult horses) may need to be increased. However, increasing the population size may not safeguard the wild horse population, especially when the deep winter snows limit the horses' ability to negotiate fencing. This overall limitation would increase the chances of a winter die-off. The same discussion on estimated deaths and severity of winter conditions that was mentioned in the Antelope Hills/Cyclone Rim HMA applies here also. The increased fencing would have the same effects as described above in the Antelope Hills/Cyclone Rim HMA.

Green Mountain

The fencing (approximately 33 miles) and proposed grazing system for that portion of the Green Mountain Allotment that lies to the north of Crooks Creek would cut off any interchange between horses of the Crooks Mountain HMA, and would severely limit interchange with the Stewart Creek HMA. It would cut off any migration from Green Mountain proper (spring-summer-fall range) to critical winter ranges to the south and west along Crooks Creek. Wild horses have limited abilities in negotiating fences in deep snows, and fencing in these areas would increase the chances of a winter die-off. The same discussion on estimated deaths and severity of winter conditions that was mentioned in the Antelope Hills/Cyclone Rim HMA applies here also. The increased fencing would have the same effects as described above in the Antelope Hills/Cyclone Rim HMA.

Under this alternative in the long term, the wild horse numbers would decline below AML. Such a population decline would reduce visitor days as much as 90 percent. This would amount to the loss of approximately 400 visitor days among the three HMA's. Also, foregone would be the opportunity to develop any one of the three HMA's as a wild horse scenic route.

EFFECTS ON CULTURAL RESOURCES (Alternative Two)

Prehistoric Sites

Alternative Two is projected to continue and, in some years, increase the current level of impacts on natural water sources and riparian areas from intensive livestock trampling and congregation. Eleven known significant prehistoric sites would be affected under this alternative. Not-yet-discovered sites along riparian zones affected by

this alternative are predicted to number approximately 600. Alternative Two would cause direct adverse effects on these sites (as defined in the NHPA and Wyoming State Protocol) through livestock trampling and congregation impacts (see Appendix 3).

Historic Trails and Sites

Under this alternative, two new fences are proposed to cross segments of the Seminole Cutoff National Historic Trail. These fences would cause a “moderate” or “strong” contrast upon the Seminole Cutoff in two highly pristine locations; therefore, Alternative Two will cause adverse effects (as defined in the NHPA and Wyoming State Protocol) upon the Seminole Cutoff. The fences proposed in this alternative also do not conform to decisions and policies in the BLM Wyoming Oregon/Mormon Pioneer National Historic Trails Management Plan and the 1987 Lander RMP (see Appendix 3). In addition, a proposed pipeline would be built directly on a significant segment of the Rawlins-Fort Washakie Stage Trail, as would one trough. The pipeline and troughs would cause direct and visual adverse effects (as defined in the NHPA and Wyoming State Protocol) through construction and livestock trampling impacts. Alternative Two’s impacts on National Historic Trails and the Rawlins-Fort Washakie Stage Trail are shown in the following table:

Table 4-24. Historic Trails and Sites Affected by Proposed Range Projects under Alternative Two

Known Affected National Historic Trails	Two new fence crossings of the Seminole Cutoff NHT. Two total adverse effects (as defined in the NHPA and Wyoming State Protocol)
Known Affected Statewide Significant Historic Trails	2.5 miles of new pipeline and one trough installation on the Rawlins-Fort Washakie Stage Trail. Two total adverse effects (as defined in the NHPA and Wyoming State Protocol)

Alternative Two is also projected to continue and, in some years, increase the current level of impacts on natural water sources and riparian areas from intensive livestock trampling and congregation. Five riparian area crossings of the Seminole Cutoff National Historic Trail, and a site associated with the Seminole Cutoff (Immigrant Spring) are already known to be suffering from livestock trampling and congregation. Without herding or other measures to prevent intensive hot season grazing, it is projected that Alternative Two would also continue and, in some years, increase direct and visual adverse effects on these sites (as defined in the NHPA and Wyoming State Protocol) through livestock trampling and congregation impacts.

As shown in Table 4-17 (see Alternative One, Cultural Resources section), it is projected that this alternative’s long-term impacts would cause more impacts to prehistoric sites, National Historic Trails, other historic trails, and historic sites than Alternatives One, Three, and Four.

EFFECTS ON RECREATION, VISUAL RESOURCES AND OPEN SPACE (Alternative Two)

GMCA

Range improvements and actions authorized under the proposed action would alter the recreation settings discussed in the affected environment. Changes to the GMCA recreation setting resulting from the full implementation of Alternative Two include:

Short Term Setting Changes

1) Contacts with other groups - During the implementation phase of the proposed action, individuals and contract crews would be out on the allotment on a consistent basis. This would increase the occurrences of contacts with other groups in the allotment in and along travel routes to project areas. This change would compound (for a five to ten -year time period) the social setting trend documented in the affected environment.

Long Term Setting Changes

1) Remoteness Indicator - Most range improvements result in additional new roads for maintenance and access to the improvement site. These new roads would influence the remoteness character in a manner that demonstrates a setting indicative of that in a middle country physical recreation environment. As a result, those back country

settings that exist within one-half mile of or are bisected by these range improvements, along with access roads, would either no longer exist, be drastically reduced in acreage, or become fragmented. Approximately 16% of the 9313 acres of back country settings within the allotment would demonstrate this trend after the full implementation of Alternative Two.

2) Naturalness Indicator - The naturalness indicator (an important indicator to recreational experiences and benefits on the allotment) in and around the range improvement sites would demonstrate a setting indicative of that in a front country environment. This would intensify the trend documented in (back country and middle country) areas within view and adjacent to all proposed new fences and water developments. At the point in time when all the range improvements proposed under Alternative Two are implemented in the GMCA, the recreation naturalness indicator (of the Physical Setting) would shift to a front country environment; this is a change from the dominant setting. This change would occur on approximately 34% of the 299199 acres of back and middle country physical settings in the allotment

3) Evidence of Use Indicator - continued maintenance and monitoring of the range improvements proposed under alternative two would result in an evidence of use indicator (in and around these improvements) indicative of a middle country environment. All improvements within primitive or back country settings would alter the social setting around the project area to a middle country environment. These changes would compound the trends throughout the allotment. This change would be demonstrated on 15% of the 298, 988 acres displaying an evidence of use indicator indicative of primitive or back country settings.

4) Mechanized use indicator - the increase in motorized use in proximity to range improvements would also produce an administrative setting indicative of that in middle country environments. All improvements in primitive and back country administrative settings would alter the area in and around the improvement towards a middle country setting. This change would compound the trend indicated in the affected environment section. This change would occur on approximately 16% of the 9313 acres currently demonstrating a mechanized use indicator of primitive and back country settings.

The extensive amount of new fence installation throughout the allotment would remove the unique “situational attribute” documented in the affected environment. Sanderson et al 1986 found that as management activities (such as fencing) for livestock management increased visitor demand or enticement for an area decreased. Therefore, the extensive amount of new fencing proposed for this alternative would decrease visitor demand or enticement for the GMCA. This loss of a situational attribute would alter the available/realized experiences and benefits in the area. Long distance, non-motorized, cross country travel of great distance would no longer be an activity available to or a means of participating in the ‘other’ activities in the allotment. Those recreationists who travel cross country by foot would be able to negotiate the obstacles; in contrast, this change would especially limit recreationist who choose to utilize horses to recreate in the allotment. Alternative Two would remove the future management option of managing the unfenced quality for recreationist.

The impacts resulting from the general setting and situational attribute changes, as a result of range improvements/herding and management techniques, would alter the recreation experience and benefits available for customer realization within the allotment. The modification of the setting and outcome components that make the area unique would synergize with the area’s overall distance from population centers to produce a general reduction in visitor use.

The changes to setting indicated above for the general allotment would be reflected across all recreation features. The table below demonstrates the percentage of acres modified within recreation features as a result of alternative two. It is important to note that these figures are calculated based on the total area altered within the feature divided by the current availability of the setting (that is altered) within the affected feature. Therefore these figures exclusively represent the overall change to the recreation feature.

Table 4-25. Recreation Feature Percent Change in Existing Setting (acres) by Indicator

Recreation Feature Percent Change in Existing Setting (acres) by Indicator				
	Physical Indicators		Social Indicators	Administrative Indicators
Feature	Remoteness (to middle country)	Naturalness (to front country)	Evidence of use (to middle country)	Mechanized use (to middle country)
Big Game Hunting	.93%	5.26%	5.25%	.93%
CDNST	21.11%	25.78%	25.79%	20.25%
Green Mountain	.02%	9.06%	9.15%	.02%
NHT	1.99%	9.37%	9.37%	1.99%

General Public Big Game Hunting Recreation Feature

Alternative Two would alter the general setting of the recreation feature as demonstrated above. The new water developments and fences proposed under Alternative Two constitute a reduced habitat quality; in addition, the forage utilization levels and riparian area condition would remain at levels and continue trends similar to those discussed in the affected environment. As a result of setting changes and the reduction in habitat and forage quality, the General Public Big Game Hunting Recreation Feature would absorb a diminished recreation setting and reduced experience and benefit availability. Consequently, hunters who historically chose to recreate on the allotment for its distinct experiences and benefits would be forced to travel outside of the analysis area in search of their desired experiences and benefits.

Continental Divide National Scenic Trail Special Recreation Area

In addition to the general recreation setting impacts to the CDNST demonstrated above, visual impacts to the trail corridor would result from three perpendicular crossings of the trail. The change to the visual environment would meet visual resource objectives as established in the BLM LFO resource management plan; however these changes would diminish or lower the realization rate of the recreation experiences and benefits.

In the short term, Alternative Two would cause livestock encounters along the CDNST to continue to be high around riparian areas and dispersed campsites adjacent to these riparian areas. Alternative Two proposes range projects to facilitate livestock distribution and a deferred rotation grazing system. However, increased stocking rates would offset the aforementioned benefits. As a result, it is anticipated that hiker encounters with livestock would increase in the long term. Alternative Two would not reduce experience inhibiting encounters with livestock for visitors who recreate in pastures that contain cattle or have recently contained cattle. Experience inhibiting encounters could include livestock: in or near camp, in riparian areas, on or near trails, in meadows, manure in camp, tracks in riparian areas, trampled areas, and odors (Wallace et al 1996). These impacts would be slightly offset by a) the increase in upland vegetation expression and b) reduced negative livestock encounters in deferred pastures and pastures exhibiting substantial recovery/re-growth. It is important to point out that the nature (need for water) of traveling along the CDNST requires hikers to stay close to riparian areas; therefore grazing alternatives (such as Alternative Two) that do not propose extensive herding to improve riparian vegetation would likely result in increased grazing pressure in these areas and subsequent increased overall encounters with livestock.

Green Mountain Recreation Feature

Impacts to general recreation settings are anticipated in the Green Mountain Recreation Feature and therefore it is anticipated that these changes would reduce the availability of preferred activities experiences and benefits for recreationists using the area.

National Historic Trail Recreation Special Recreation Area

In addition to the general setting impacts documented above, the proposed action would alter the undeveloped nature of the Seminole Cutoff portion of the NHT, this change would result in more homogeneity in recreational

settings and experiences and benefits across the entire NHT corridor.

Alternative Two would decrease the visual quality of the vegetative component during and after use periods. In addition the construction of 3 fences that run perpendicular to the trail would introduce an unnatural/linear/symmetric human modification to the view shed. Over 20 years Alternative Two would also degrade the visual quality of the vegetative component through continued reduction of variety and contrast. The annual loss of the movement and color contrast components (key factors in drawing a visitor's attention to the landscape) rendered in riparian vegetation would continue under proposed deferred rotational grazing system proposed for Alternative Two. Sanderson et. al., (1986) found that customer or visitor preference for a landscape decreased, as grazing intensity increased. Long term recovery of this element in riparian areas would be variable: 1) the warm springs riparian exclosure area would continue upward trends, 2) the area contained within the Granite Creek Rocks Pasture fence would be static to slightly upward, and 3) the area unfenced from the general allotment would decline due to the lack of rest and herding, and increased stocking levels. These impacts would be slightly offset due to the expected increase in upland plant expression and vigor. In addition impacts discussed above would be less noticeable during periods of deferment or in pastures that demonstrate re-growth and recovery. As a result of the short term slightly degraded visual environment and the alteration of the general recreation settings, the available recreational experiences and benefits on the GMCA portion of the National Historic Trail Special Recreation Management Area would be reduced or altered.

EFFECTS ON WILDERNESS STUDY AREAS AND WILD AND SCENIC RIVERS (Alternative Two)

Table 4-26 contains a discussion of each required WSA value/data element and determines whether the level of impact from the action exceeds maximum allowable standards as directed by the Interim Management Policy for Lands under Wilderness Review.

Table 4-26. Predicted Impacts to Wilderness values as a result of Alternative Two

Wilderness Value Indicator	Impact Description	Will the Impact Exceed Maximum Allowable Standard
Visual resource	Full implementation of Alternative two would result in slight change to the visual resource. Moderate loss of the vegetation component in riparian system would result in a loss of the movement element created by these taller grasses. These impacts would be offset due to the expected increase in upland plant expression and vigor. In addition impacts discussed above would be less noticeable during periods of deferment or in pastures that demonstrate re-growth and recovery. Prior to the grazing season (especially during the pastures deferment period) this change would be less obvious to the casual observer. Long term condition of riparian vegetation would be static or declining due to the lack of rest, lack of livestock herding, lack of utilization triggers, and increased stocking levels proposed for this alternative	No if 1999 decision utilization standards are implemented.
Naturalness and Solitude		
Human Activity	Alternative 2 proposes no active herding to keep livestock away from riparian areas. Therefore the level of human activity would not change as a result of the actions authorized.	No
Wildlife Presence	Based on the increase in stocking rates and the lack of active livestock herding proposed for alternative 2 it is anticipated that the subsequent evidence of livestock (especially in riparian areas) would increase. This change would alter visitor experience on a localized level, in or near unfenced riparian areas. Further analysis below	No if 1999 decision utilization standards are implemented.
Primitive Recreation		
Recreation Opportunities	Alternative 2 proposes no new projects in the WSA, additionally the main feature of the WSA is un-affected by livestock grazing resulting from this AMP. The above factors cause no change to the recreation setting and therefore no change to the corresponding opportunities of the WSA as a whole.	No if 1999 decision utilization standards are implemented.
Natural Appearing Environment	Moderate reduction in the naturalness component of the recreation setting would occur in the riparian areas outside the Sweetwater Canyon Fence. This reduction is a result of poor riparian functionality and increased presence of livestock. In the long term the full implementation of the alternative would decrease riparian functionality and increase visitor encounters with livestock. This would impact recreation opportunities dependent on the natural appearing environment in the localized areas along unfenced riparian areas.	No if 1999 decision utilization standards are implemented.
Special feature	No changes to the Sweetwater canyon corridor would occur as a result of this alternative	No
Surface Water	Further analysis below	No
Vegetation		
Ecological Site Inventory	Decline in seral condition could result from this alternative. Without stubble height and utilization triggers for livestock	No if 1999 decision utilization standards

	removal, managers would have to use “other means” to work toward an upward trend.	are implemented.
Vegetation Utilization	This alternative does provide for monitoring of utilization. However, livestock would not be moved based on utilization standards. In order to avoid exceeding maximum allowable use levels, utilization standards in the Granite Creek Rocks Pasture would be implemented as discussed under alternative one, the existing management.	No if 1999 decision utilization standards are implemented.
Plant Vigor	A long term decrease in plant vigor could result from this alternative. Without stubble height and utilization triggers for livestock removal, managers would have to use “other means” to improve riparian and upland range conditions.	No if 1999 decision utilization standards are implemented.
Wildlife		
Wildlife habitat	Without herding to achieve distribution, livestock grazing would tend to increase in riparian habitats, causing a decline in quality. Upland habitat quality would likely remain static or trend upward slightly.	No if 1999 decision utilization standards are implemented.
Population	Because habitat quality is likely to remain static or improve incrementally, wildlife populations would also be expected to remain static.	No if 1999 decision utilization standards are implemented.
<u>Diversity</u>	Habitat diversity is greatest in riparian areas. Concentration of livestock in riparian areas is likely to cause a decline of habitat quality and a subsequent decline in species diversity.	No if 1999 decision utilization standards are implemented.

WSA resources requiring further analysis:

Primitive Recreation

Type of recreation opportunities: Since Alternative Two proposes a deferred rotation grazing system, no livestock herding, and no utilization triggers, visitors camping or recreating in unfenced WSA riparian areas would encounter livestock in several different manners: in or near dispersed camps, in riparian areas, in meadows, manure in camp, tracks in riparian areas, and odors. Johnson et al 1997 found these factors to strongly detract from the wilderness experiences.

Surface Waters

General Discussion: Within the WSA fence water quality is expected to be good due to the years of rest and subsequent controlled grazing this has received; also, the WDEQ has monitored and assessed the Sweetwater River and removed it from the impaired water body list within the past ten years. In the long term plant vigor and production is expected to increase. As more extensive root systems develop, increased water infiltration and retention can be expected. Outside the fence this alternative relies on pasture moves in a deferred grazing system to prevent over use of the riparian zones. However, the short portions of the tributary streams against the WSA boundary fence can be reasonably expected to be used more by livestock than riparian areas further from a fence. Given the short growing season, low precipitation, drought frequency of the area, and a low seral condition of these riparian zones a deferred rotation grazing system alone is not expected to improve these areas for decades.

Vegetation

Ecological Site Inventory: The proposed fence which provides greater ability to rotate season of use and to defer the pasture containing the WSA could improve seral condition over time. Potential lack of long term trend monitoring or of short term monitoring for management objectives such as utilization or stubble height combined with the highest potential stocking rate of all the alternatives, could jeopardize a stable or improving seral condition on ecological sites within the WSA.

Utilization by key species: Refer to analyses above.

Plant vigor: Refer to analyses above.

CUMULATIVE IMPACTS (Alternative Two)

Soil and Vegetation Resources

Between 1986 and 2006 there have been 307.4 miles of new fence built on the LFO. This equates to 15.37 miles of new fence construction per year. This mileage includes both enclosure fences and traditional pasture fences. This alternative currently proposes 98 miles of new pasture fences. As this alternative would rely most heavily on new fences to achieve better livestock distribution on the allotment, more fence mileage can be reasonably expected as unforeseen livestock management situations arise that can only be remedied by more fencing. Additionally, as more fences are built, more water projects would be needed as areas formerly serviced by existing water would no longer be available.

Approximately 50 acres of sacrifice areas around new water developments would be created. The vegetation would be removed mainly by trampling and somewhat by livestock and wildlife consumption. These areas would be mostly devoid of vegetation with some compacted soils and would remain in poor condition due to the continual use of the water source. It is believed that there would be a decrease in the vigor of the vegetative species immediately adjacent to the sacrifice area. The vigor decrease would come about from the dust on the plants, soil compaction by livestock soils are moist, the trampling and resulting mechanical damage of vegetation by livestock, and the heavy grazing which commonly takes place around water sources. Another 147 acres (98 miles fence x 1.5 acres trailing disturbance per mile = 147 acres) would be affected by the trailing of livestock, wild horses, and wildlife along the proposed pasture and riparian management fences. Trailing would cause the removal of vegetation through trampling and compaction of the soil. Higher erosion rates would also ensue on these areas devoid of vegetation. Rill and gully initiation would occur on the sloping locations over time. Sandy soils would be prone to scouring by wind. The denuded, compacted, and heavily-used areas would also be the locations most prone to weed establishment. The installation of water pipelines would disturb another 2 acres.

With the livestock use levels and management strategy proposed under this alternative, riparian zone improvement cannot be expected in the short or long term. Shifting away from hot season use highly benefits riparian vegetation, but under this alternative, the limited length of deferment would not suffice in allowing for improvements in vegetation, vegetative litter, and hydrologic conditions. The cattle trails found in the transition zones and extending to the uplands would remain in their present compacted state. The cattle trails would continue to channel runoff and sediment into the riparian areas, as cattle use on the cattle trails is expected to remain heavy. Two allotments, Haypress and Alkali Creek Sheep, have the potential to provide some riparian zone improvements in the long term.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in Alternative One. An estimated total \$13,075 of additional maintenance costs would occur upon completion of the proposed range improvement projects in this alternative by 2027.

Wildlife/Fisheries Habitat and Special Status Species

Additional fencing in the GMCA, in combination with fencing proposals in the Rawlins Field Office to improve livestock management south of the allotment, could negatively impact antelope movements of the Red Desert Antelope Herd as they move to crucial winter habitats near Rawlins and Interstate 80.

The cumulative impacts of habitat loss from proposed water developments coupled with energy development and the CO2 pipeline would be the same as that described under Alternative One in addition to 23 more developments, 22 miles of water pipelines, and vegetation removal from trailing along 98 miles of additional fences.

Wild Horses

The cumulative impacts of Alternative Two are the same as the cumulative impacts for Alternative One. In addition, the overall level of development of water projects and fencing that lies outside the herd areas in travel zones also virtually eliminates the travel zones, as well as any exchange of horses among the three different HMAs. The proposed level of water development within the allotment would also permanently draw wild horses into areas

that they may have only passed through - or not used at all - prior to water development. It is anticipated that at this level of development, the integrity of the historic use areas would be lost, and wild horses would be found throughout the entire allotment.

Cultural Resources

The historic character of the Seminole Cutoff National Historic Trail would be degraded.

Recreation and Visual Resources

The actions and the intensity of those actions authorized (and the developed mitigation) under Alternative Two would synergies with existing/planned actions in the allotment to compound the trends documented in the affected environment. Over a 20 year time frame the allotment would endure an irreversible (Clark 1979) urbanization of the recreation setting. This would drastically change the experiences and benefits available to recreationist on the allotment. Loss of the distinct niche represented by the settings and experiences and benefits opportunities of the GMCA would homogenize the recreation (experience and benefit) opportunities available within all recreation features. This homogenization would reduce visitor ability to recreate in the setting they desire to achieve the experiences and benefits important to the individual or group. Inevitably this impact indirectly produces visitor conflicts when recreationists are forced to use a setting where their desired experiences and benefits are not easily facilitated.

Wilderness Study Areas and Wild and Scenic Rivers

The intensity of impacts as a result of Alternative Two would exceed maximum allowable impacts for the WSA resource; these impacts would also affect the WSR resource. The impacts are on a localized level and probably could be mitigated without causing additional impacts. Potential to impact recreationists experience and benefit realization level exists, however this would occur in access areas and during the trip into the core WSA only. The area contained within the WSA and WSR does not have any known reasonable foreseeable actions that might synergies with the above impacts. In addition, no impacts to the WSA resource as a whole are anticipated as a result of the actions planned for Alternative Two.

RESIDUAL IMPACTS (Alternative Two)

Soil and Vegetation Resources

There are currently 133 acres undergoing impacts from livestock (i.e., sacrifice areas) and project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 Final Decision.

The residual impact to soils and vegetation from this alternative would be to create approximately 199 acres of sacrifice area associated with 98 miles of new fences, 23 water developments, and 22 miles water pipelines.

Approximately 50 acres of sacrifice areas around new water developments would be created. The vegetation would be removed mainly by trampling and somewhat by livestock and wildlife consumption. These areas would be mostly devoid of vegetation with some compacted soils and would remain in poor condition due to the continual use of the water source. It is believed that there would be a decrease in the vigor of the vegetative species immediately adjacent to the sacrifice area. The vigor decrease would come about from the dust on the plants, soil compaction by livestock soils are moist, the trampling and resulting mechanical damage of vegetation by livestock, and the heavy grazing which commonly takes place around water sources. Another 147 acres (28 miles fence x 1.5 acres trailing disturbance per mile = 42 acres) would be affected by the trailing of livestock, wild horses, and wildlife along the proposed pasture and riparian management fences. Trailing would cause the removal of vegetation through trampling and compaction of the soil. Higher erosion rates would also ensue on these areas devoid of vegetation. About two acres of disturbance would be created with water pipeline installation. Rill and gully initiation would occur on the sloping locations over time. Sandy soils would be prone to scouring by wind. The denuded, compacted, and heavily-used areas would also be the most prone to weed establishment.

With the livestock use levels and management strategy proposed under this alternative, riparian zone improvement cannot be expected in the long term. Shifting away from hot season use highly benefits riparian vegetation, but

under this alternative, the limited length of deferment would not suffice in allowing for improvements in vegetation, vegetative litter, and hydrologic conditions. The cattle trails found in the transition zones and extending to the uplands would remain in their present compacted state. The cattle trails would continue to channel runoff and sediment into the riparian areas, as cattle use on the cattle trails is expected to remain heavy. Two allotments, Haypress and Alkali Creek Sheep, have the potential to provide some riparian zone improvements in the long term.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in Alternative One. An estimated total \$13,075 of additional maintenance costs would occur upon completion of the proposed range improvement projects in this alternative by 2027. An estimated combined total \$23,615 of additional maintenance costs would accrue in the long term.

Wildlife/Fisheries Habitat and Special Status Species

Although let-down or removable fence sections would help mitigate the previously discussed impacts to big game movement and migration, some degree of interference with these movements would remain, even in the presence of these mitigations.

Placement of proposed water developments may aid in mitigating the disturbance to nesting and loss of habitat associated with these projects; however, they would still produce a sacrifice area, attract predators, and provide a breeding ground for mosquitoes.

Addition of larvicide to stock-watering developments would greatly decrease the threat of West Nile Virus, but it is unlikely to completely remove all mosquitoes associated with such projects. Some mosquitoes would likely remain as a residual threat.

Wild Horses

Wild horse distribution patterns and seasonal ranges would change. Integrity of the historic HMAs would also likely change.

Cultural Resources

Cultural resources in riparian zones would continue to suffer impacts and degradation. The introduction of modern impacts and intrusions upon the Seminoe Cutoff and the Rawlins-Fort Washakie Stage Trail would reduce the historical and recreational character of these trails.

Recreation and Visual Resources

The loss of the nearly undeveloped naturalness character of the allotment in addition to the removal of the un-fenced "situational attribute" constitutes a residual impact to the recreational setting and available/realized customer experiences and benefits. Alternative Two would limit future recreation management options for the allotment. In addition the setting changes resulting from this alternative that are consistent with the trend indicated in the affected environment would alter the setting in a direction that is nearly impossible to reverse (Clark 1979).

Wilderness Study Areas and Wild and Scenic Rivers

The indirect and direct impacts documented for Alternative Two do exceed maximum allowable standards as identified in the Interim Management Policy for Lands under Wilderness Review. In addition this level of impact does exceed impact standards for the WSR resource. It is anticipated that this impact would occur on a localized level around unfenced riparian areas. The developed mitigation for Alternative Two reduces the impact to the WSR and WSA resource to a level that does not exceed the maximum allowable standards. Therefore residual impacts to the WSA and WSR resource would be slight as a result of the alternative and identified mitigation. As long as portions of the WSA and WSR resource are unfenced from the GMCA slight visual and aesthetic impacts would continue in these areas. The lack of active herding proposed in this alternative would concentrate these impacts in the WSA and WSR riparian areas of Mormon and Willow creek. This impact is somewhat offset by the location of the WSA fence and its low level of contrast with the characteristic landscape. No residual impacts to the WSA and WSR resource as a whole are anticipated as a result of this alternative.

ALTERNATIVE THREE

EFFECTS ON SOIL AND WATER RESOURCES (Alternative Three)

Soil Resources

This alternative makes use of the same use areas as Alternative One, but proposes no new water developments and no net gain in fence mileage. Salt would be located no closer than one-half mile from existing water sources. Livestock numbers would be based on a carrying capacity analysis. Triggers for moving livestock would be somewhat more stringent, and this alternative's herding requirement calls for more effort on the part of the livestock operators than Alternative One.

Within Alternative Three's five proposed use areas, herding and deferred-rotation grazing systems are expected to increase livestock use on the uplands and alleviate some of the heavy use presently occurring in the riparian areas. Monitoring of grazing use would be sensitive enough to detect significant change. Implementation of this alternative would not adversely impact soil potential in the uplands. With use levels of riparian vegetation expected to be no more than moderate, a fair chance of improvement from present vegetation and litter cover conditions is expected. This expectation depends upon effective herding and proper stocking rates at carrying capacity (Platts, 1989), and very intensive management of livestock would be necessary. The conditions of riparian areas would show slow improvement over many years or decades; complicating environmental conditions (e.g. drought) can slow or negate progress for some years.

Impacts in the uplands from bunched, herded livestock would have a negative effect on the brittle shrub component (i.e., sagebrush and bitterbrush) in some areas. On sandy soils, such as those in the Happy Springs Use Area, loss of these shrubs would lead to the initiation of accelerated wind erosion.

Map 4-3, Water Erosion Potential, and Map 4-4, Wind Erosion Potential, illustrate that if a management scenario decreases soil cover too much in the uplands, accelerated wind erosion can result. Areas of currently stabilized sand dunes south of Green Mountain, and medium-textured soils high in very fine sand, fine sand, and silt-size particles, can become active and suffer erosional losses, decreasing the potential of these sites. In less-sandy areas, water erosion in the form of new and more frequent rills and gullies would result. Any increases in erosion rates should be negligible and not affect soil fertility.

The Alkali Creek Use Area is different from the others in that it would be managed for spring-fall and winter-continuous seasonal grazing of sheep. The saline soils on Alkali and East Alkali Creeks do not support willows, but do grow sedges and grasses. In the long-term, managed grazing of sheep, at levels almost one-half that of current preference and with no hot season grazing, would yield enhancements in the kinds and amounts of desirable vegetation supported by the wetland and riparian soils of this use area. Over time, this would also increase the organic matter content of and build soils in these lowland areas.

As under Alternative One, a combination of seven riparian pastures (five completed and two proposed) would be constructed and maintained on important riparian zones. These riparian pastures would be used by livestock either in the spring or fall period. The effects would be variable; but improvements in vegetative expression would be expected to occur over a period of several normal precipitation years. Functional integrity of the riparian systems would take longer to restore.

In the short-term, some improvement to the present condition of lowlands (i.e., riparian areas) would be apparent, due to the implementation of . In the riparian enclosures and pastures, increases in litter/vegetative cover and vegetative height would lower erosion rates and contribute increased amounts of organic matter to the soil. Both water and nutrient storage of these sites would be enhanced, as would water quality.

The mid-term (five to 10 years), pasture rotation strategy should allow for enough rest in the uplands to maintain adequate soil cover to buffer the erosive effects of wind and precipitation. The rotation should also allow enough time to alleviate annual soil compaction that can occur due to animal traffic under moist conditions.

Water Resources

The expected impacts to water resources from Alternative Three would also apply to Alternatives One and Four, with some minor variations primarily related to specific water development projects, spring exclosures, riparian pastures, and livestock management strategies. Soil erosion rates, especially those of the lowlands, would be the largest contributing factors to water quality.

Within this alternative's five proposed use areas and the pastures associated with each, the fate of the vegetation and rates of soil erosion, especially in and immediately adjacent to the riparian areas, would have the greatest influence on water quality. With livestock use levels under this alternative expected to be light to moderate, a slow rate of riparian zone improvement can be expected. Drought would, of course, be a complicating factor retarding progress in some years.

With the proposed managed grazing of sheep and no hot season grazing, the Alkali Creek Sheep Use Area (at levels reflecting the current carrying capacity) would yield riparian zone improvements sooner than the other use areas in the allotment. As a result of this new management scenario, water quality parameters such as turbidity, total dissolved solids (TDS), and suspended sediment (SS) would be improved above the current situation.

Seven riparian pastures (five completed and two proposed) would be built around some of the important riparian zones. Rest of these riparian pastures would occur until, such a time when the pasture meets the Standards for Rangeland Health. Livestock use would then be restricted to spring and fall periods. With the elimination of livestock and horse damage to stream banks and adjacent areas, along with the restoration of the functional integrity of the riparian systems, improvements in water quality would occur.

Deferred-rotation grazing and conservative triggers for moving livestock by herding would also be used to eliminate vegetation use on any given spot for part of the year. It would also be used to lessen impacts to riparian areas where cattle tend to congregate, especially in the summer season.

Impacts to water resources outside of exclosures and riparian pastures would be directly attributable to the effectiveness of the herding. As the livestock use on the riparian areas would be substantially decreased, water quality should be enhanced.

EFFECTS ON VEGETATION RESOURCES (Alternative Three)

Vegetation – General

Refer to the General Effects on Vegetation Resources for Alternative One.

Grazing Management

Refer to Grazing Management Section in Alternative One.

Upland Vegetation

The long-term impacts in the upland range of the three-pasture or four-pasture deferred-rotation grazing systems would be: slightly increased vegetation production, due to the increased seedling establishment, improved vigor and root growth/replacement, increased litter accumulation, and increased percent composition of grass and forb key species.

A study by Gibbens and Fisser (1975) in the Red Desert region (in which the southern portion of GMCA is located) on a two-pasture deferred-rotation grazing system found that plant composition, calculated as a percentage by species of the total vegetation cover, would result in a relative increase in the grasses and forbs.

In this same study, a two pasture deferred-grazing system showed an increase in grass cover from 1967 to 1971 of 31 percent outside of a control, while the grass cover increase inside the control was 25 percent. Therefore, the net increase of grass cover of 6 percent from 1967 to 1971 was a result of the two-pasture deferred grazing system. Shrub cover change from 1967 to 1971 outside the enclosure decreased 11percent, while inside the enclosure, it increased 34 percent. These results indicate that a two-pasture deferred grazing system should cause a reduction of shrub cover, when compared to the absence of grazing. It is estimated that the proposed three-pasture or four pasture deferred-rotation grazing systems in the southern portion (Red Desert Region) of GMCA would decrease shrub cover 10 percent.

The proposed three-pasture seasonal grazing system in the Happy Springs Use Area is expected to have these long-term impacts: improved vigor and root growth/replacement of vegetation species, increased litter accumulation, increased seed production and seedling establishment, and increased production.

Grazing in the Arapahoe and Happy Springs Use Areas would take place during the summer and winter months (refer to Table 4-27, Annual Grazing Treatments, Table 4-28, GMCA Riparian Management Pastures, and Table 4-29, Acres per Grazing Treatment through One Complete Grazing Cycle for Alternative Three). The winter grazing season, which would comprise about 10 percent of the livestock grazing use, is least detrimental to the vegetation (Garrison 1972, Blaisdell and Holmgren 1984, Masters, et al. 1996a). The adverse impacts, such as decreased litter and seedling establishment, created by grazing from May 1 through July 15 in the East Alkali Creek, Bare Ring Butte, and Crooks Mountain Pastures would be detrimental in the area of the summer sheep use.

Table 4-27. Annual Grazing Treatments under Alternative Three

Use Area Pasture	Year 1	Year 2	Year 3	Year 4
Antelope Hills/Picket Lake				
Granite Creek-Rocks	L-M	L-M	L-M	L-M
Alkali Creek	L-M	L-M	L-M	L-M
Picket Lake	A-L-M	B-L-M	A-L-M	B-L-M
Daley Lake	B-L-M	A-L-M	B-L-M	A-L-M
Arapahoe				
Bare Ring Butte	J-N	E-N	J-N	E-N
East Alkali Creek	E-N	J-N	E-N	J-N
Eagles Nest Draw	A-F-N	B-H-N	A-F-N	B-H-N
Lost Creek	B-H-N	A-F-N	B-H-N	A-F-N
Happy Springs				
Haypress Creek	A-N	J-N	A-N	J-N
Warm Springs	J-N	A-N	J-N	A-N
Crooks Mountain	D-N	D-N	D-N	D-N
Green Mountain				
Sheep Creek	A-J-N	A-J-N	A-J-N	A-J-N
Stratton Rim	I-N	I-N	I-N	I-N
Willow Creek	D-N	D-N	D-N	D-N
Green Mountain	D-N	D-N	D-N	D-N
Alkali Creek Sheep	C-G-J-H	C-G-J-H	C-G-J-H	C-G-J-H

Table 4-28. GMCA Riparian Management Pastures

Use Area Pasture	Year 1	Year 2	Year 3	Year 4
Long Slough	I-G-O	G-O	I-G-O	G-O
Crooks Creek/Bare Ring Slough ¹	I-G	I-G	I-G	I-G
W. Fork Crooks Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Lost Creek ²	I-G	G-J	I-G	G-J
Ice Slough	G-J-O	G-J-O	G-J-O	G-J-O
Warm Springs Creek	I-G-O	G-J-O	I-G-O	G-J-O
*Sweetwater River ¹	I-G-O	I-G-O	I-G-O	I-G-O

¹Willow plant communities present within riparian management pasture.

²Ten years of rest would be required before livestock grazing is authorized.

* Pasture not yet completed

Treatment G: Rest summer-long (June 16 through September 15). Under this treatment, the Alkali Creek Sheep and Long Slough Use Areas/Pastures would not be grazed by sheep or cattle during the hot season, for riparian area improvement.

Treatment I: Graze season-long through the spring (May 1 or May 15 through June 15). This treatment would be used with cattle in the Long Slough Use Area/Pasture and the Stratton Rim Pasture within the Green Mountain Use Area during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation in the fall.

Treatment J: Graze September 16 or October 1 through October 31 or November 15. This fall season treatment would be used by cattle in the Long Slough Use Area/Pasture and other riparian pastures without willow plant communities. This fall season treatment would also be used by cattle and sheep in the upland pastures of the Arapahoe, Happy Springs, Antelope Hills-Picket Lake, and Green Mountain Use Areas during the grazing year. The season of use would not exceed 31 days in the riparian pastures. Riparian pastures would be managed to maintain a minimum of a six-inch stubble height on herbaceous vegetation after the fall grazing season.

Treatment O: Rest yearlong for one to three years, to initiate the recovery process on degraded riparian areas within the Ice Slough, Long Slough, Warm Springs Creek, Sweetwater River, and West Fork Crooks Creek Riparian Management Pastures.

The increase in sheep grazing use during the winter, (no increase would be expected from wildlife or wild horses), would not be significant enough to be detrimental to the vegetation resource over the long-term. Reduction of growing season grazing intensity would improve vigor of vegetation species, and increase production in the long-term (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998).

The Lost Creek drainage would be expected to improve in condition and production over the long-term, as a result of markedly reduced livestock grazing levels, the riparian management pasture and the deferred-rotation grazing system (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998). Over the entire Lost Creek and Eagles Nest Draw Pastures, the production and condition would be expected to improve considerably, due to the distribution of livestock, wildlife, and wild horses by water developments and markedly reduced livestock grazing levels. As mentioned previously, the winter season is considered to be the least detrimental to the vegetation, in terms of grazing. Winter is also considered to be the least detrimental period of utilization for shrubs (Garrison 1972, Blaisdell and Holmgren 1984). The lack of grazing pressure during the growing period would allow the vegetation to improve in terms of vigor, seed production, seedling establishment, and litter accumulation.

Concentration of livestock, wildlife, and wild horses in areas offering shelter during winter storms is not considered

detrimental to the vegetation in the long-term, because there are numerous locations offering protection throughout the Arapahoe, Antelope Hills-Picket Lake and Happy Springs Use Areas. In addition, the deferment of grazing during the spring and summer months would allow the vegetation to recover from the depletion of carbohydrate reserve levels from winter grazing. Long term increases in forage production over the entire GMCA would be expected from this alternative.

Areas which are favored as sheep bed grounds would be expected to receive excessive grazing pressure. This alternative requires the allotment’s sheep operators (Stan & Linda Cole and W.S. Baldwin during the initial and interim phases) to move the sheep bed grounds 1.5 miles every week. The exception to this would be in the Picket Lake and Daley Lake Pastures of the Antelope Hills-Picket Lake Use Area, and the Lost Creek and Eagles Nest Draw Pastures of the Arapahoe Use Area, where three miles of movement is required. Areas which have been historically-favored bed grounds, such as areas near water or which offer protection from adverse weather, would have the vegetation completely removed, or damaged so severely that recovery would be impossible. Approximately one to three acres per bed ground would be expected to be impacted. Heavy grazing of the sheep bed grounds would not be considered detrimental to the overall vegetation in the long-term. The deferred-rotation grazing and markedly reduced livestock grazing levels should allow the vegetation to recover from these short periods of heavy grazing.

Table 4-29, Alternative Three - Long-Term Acres Per Grazing Treatment Through One Complete Grazing Cycle, shows the acres of different grazing treatments that are applied through a completed four year grazing cycle. The table displays the scale these grazing treatments affect annually, and through a completed rotation cycle.

Table 4-29. Acres per Grazing Treatment Through One Complete Grazing Cycle (Alternative Three)

Treatment	Public Land Acres			
	Year 1	Year 2	Year 3	Year 4
A	114,749	122,049	114,749	122,049
B	78,386	83,536	78,386	83,536
C	18,215	18,215	18,215	18,215
D	38,299	38,299	38,299	38,299
E	37,709	36,796	37,709	36,796
F	38,658	43,330	38,658	43,330
G	36,174	36,174	36,174	36,174
H	61,545	56,873	61,545	56,873
I	19,096	11,875	19,096	11,875
J	99,490	91,802	99,490	91,802
K	0	0	0	0
L	158,232	158,232	158,232	158,232
M	158,232	158,232	158,232	158,232
N	260,269	260,269	260,269	260,269
O	6,661	6,661	6,661	6,661

*The totals for each year are greater than the acreage of the allotment because some pastures receive more than one treatment each year.

Range Improvements

Table 4-30 depicts the estimated number of surface acres that would be disturbed as a result of the construction, maintenance, and continued existence of the proposed range improvements for this alternative.

Table 4-30. Surface Acres Disturbed as a Result of Implementing Alternative Three Long-Term Proposed Range Improvements*

TYPE IMPROVEMENT	NUMBER	ACRES DISTURBED PER UNIT	TOTAL ACRES DISTURBED
Spring development	12+	2.6	31.2
Three-Wire fence (Use Area/Pasture boundary)	0 miles	1.5/miles	0
Riparian pasture fence	9.0 miles	1.5/miles	13.5
Cattleguard	3	0	0
Water well (existing) development	4	1.8	7.2
Reservoir reconstruction	2	4.0	8.0
Exclosure (Artesian wells/wetland fenced)	0	.2 on fenceline .9 inside permanent exclosure	0 on fenceline 0 inside permanent exclosure
Pipeline	0 miles	.1/miles	0
		TOTAL	59.9
*See Appendix 11 for rationale.			

Construction of the proposed range improvements would remove approximately 60 acres from production. Table 4-30 lists the total acres disturbed by each type of range improvement and the total acres that would be disturbed under this alternative. The range improvements disturbing the major proportion of the acres would be spring developments (31 acres), riparian pasture fences (14 acres), water wells (7 acres), and reservoirs (8 acres). The overall impact to the vegetation within the GMCA, as a result of range improvement construction under this alternative, would be minor.

Even though fences are beneficial in the management of livestock, they do cause trailing of livestock, wildlife, and wild horses along the fences. This would result in the deterioration of the vigor of plants along fences, due to overgrazing and trampling. Use of motorized vehicles for fence maintenance would also lead to a reduction in vigor of vegetation. Another impact of the trailing of livestock and wildlife along a fence would be the removal of vegetation through trampling and compaction of the soil. This would cause adverse growing conditions. A change in composition of the vegetative species could occur in areas near a fence; however, these impacts would be less noticeable. Heavy to severe grazing would cause a decrease in preferred species and an increase in less-preferred species.

The existing fence on the southern boundary of the GMCA would concentrate summer cattle use on the north side of the fence, near the proposed Lost Creek Riparian Pasture. Forage in areas of concentration would be removed by livestock, through consumption and trampling. This grazing would result in the decline of the preferred species and

an increase in the less-preferred forage species. The overall production, seed production, vigor, condition, and trend of the vegetation would decline in the areas of concentration.

Impacts created through the development of a spring or water well would include removal of vegetation, changes in composition, and decrease in vigor of plants. Use of the development by livestock would result in removal of vegetation immediately around the water trough, a circle roughly 50 yards in radius. Sacrifice areas would occur adjacent to the spring source and each of the water wells. Total disturbed area would be 2.6 acres for each spring development, and 1.8 acres per water well development (Table 4-30). Vegetation would be removed mainly by livestock trampling. These areas would be mostly devoid of vegetation and would remain in that disturbed condition, due to the continual use of the water trough. It is anticipated that there would be a decrease in the vigor of the vegetative species immediately surrounding the sacrifice area. The vigor decrease would come about from: dust on the plants, partial trampling of vegetation by livestock, and heavy to severe grazing, which commonly takes place around water sources.

The development of water wells under this alternative would improve the distribution of livestock over the entire GMCA, thus promoting a more even utilization of the forage. Proper utilization of forage is important in maintaining or improving vegetative vigor, production, or range condition (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984). Properly-placed water developments, combined with the grazing systems, would pull the livestock from overused existing natural water sources, such as Crooks Creek and Lost Creek, allowing these areas to improve in vigor and production.

Heavy to severe grazing is marked by a disappearance of preferred plants or of those plants physiologically less-resistant to grazing. Less preferred or more resistant plants may survive and replace the removed plants (Stoddart, Smith, and Box 1975). This would eventually lead to a change in composition. Continued grazing would cause an influx of species, called invaders, which are not part of the natural plant communities. These invaders would be mobile annuals, but later would encourage the establishment of herbaceous or woody perennials of low value (Stoddart, Smith, and Box 1975).

Any place which has the existing vegetation removed provides an opportunity for other plants to begin growth. The construction, maintenance, and use of the various proposed projects may cause enough disturbance to permit increased numbers of poisonous plants to invade the site. For example, halogeton (*Halogeton glomeratus*) is a poisonous annual often found on disturbed sites. The amount of trampling and utilization of the vegetation would decrease, as the distance from water increased.

Summary

Short-term detrimental impacts under this alternative's summer grazing (treatments A, B, D, E, K, L, M, and N) would include reductions in plant vigor, litter accumulation, and seed production. Short-term detrimental impacts from fall and winter grazing (treatments B, E, F, H, and J) would be reductions in plant vigor and litter accumulation. The summer-long rest and year-long rest (treatments G and O) treatment would increase vigor, litter accumulation, seedling establishment, and seed production for the Alkali Creek Sheep Use Area and five riparian management pastures. Rest periods, which comprise part of treatments A and B, would enhance the vegetation, by increasing vigor, root growth/replacement, seed production, and litter accumulation of the vegetation. The resulting short-term impacts, such as increased vigor and seedling establishment, which would benefit the vegetation, are considered greater than those which would be detrimental, due to the marked decrease in grazing use below the 1980-2006 level (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The proposed long term use level (23,110 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) under Alternative Three is approximately 40 percent of the long-term average available livestock forage shown in Table 3-8, Present Allotment Production. Blaisdell and Holmgren recommended the basic stocking level on Intermountain salt-desert rangelands to be 75 percent of the long-term average forage production, because of the normal inability to adjust animal numbers to the wide variations in forage yield. This recommendation was based on long term forage (1935-1974) production on moderately-grazed (11 acres per AUM) salt desert rangeland, and provided adequate forage except in years when production was extremely low. Alternative Three's proposed long

term use level (23,110 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) would set an average stocking rate of 20.2 acres per AUM on the public land within GMCA. The last nine years (1999-2007) of below average precipitation have required lower livestock use levels, to manage for rangeland health standards and provide for drought recovery. The next five years would be needed for drought recovery.

Under this alternative, the upland (away from present livestock water sources) areas within the Arapahoe, Antelope Hills-Picket Lake, Green Mountain, and Happy Springs Use Areas would receive a 30 percent decrease in grazing use over the 1999-2006 recent use levels due to the greatly reduced livestock stocking levels. The area within the Picket Lake, Daly Lake, Lost Creek and Eagles Nest Draw Pastures (formerly Seven Lakes Incommon Allotment), which is approximately 40 percent of the GMCA (refer to Appendix 10), would receive most of this decreased grazing use and deferment. This decreased livestock grazing intensity, combined with the proposed grazing systems, would result in the vegetation of the upland areas maintaining, and in the long term, improving in vigor, root growth/replacement, production, seed production, and litter accumulation (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The upland and lowland areas within the Alkali Creek Sheep Use Area and Long Slough Pasture would improve in long term vigor, root growth/replacement, production, seedling establishment, seed production, and litter accumulation, due to the lack of grazing during the summer growing season.

From implementation of this alternative, a long-term increase in production is expected (USDI-BLM 1979, Blaisdell and Holmgren 1984). Also, by 2027, it is expected that there would be an improvement in upland range condition, and an improvement in condition in those riparian areas outside riparian management pastures within the Antelope Hills-Picket Lake Use Area. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). These systems were only rated as fair for improving stream and riparian habitats (refer to Appendix 20). However, the proposed reduction in grazing use levels, combined with the deferred-rotation grazing system, would allow for long-term improvement (Myers 1989, Masters et al. 1996b, Mosley, et al. 1997, Clary and Webster 1989, Clary and Webster 1990, USDI-BLM 1998).

Construction of the remaining proposed range improvements proposed in Alternative Three would cause the loss of approximately 60 acres from production. Major impacts to vegetation would be the removal of vegetation in the vicinity of the water troughs, and a decrease in vigor of the vegetation, through trampling and heavy grazing by livestock, wild horses, and wildlife along fences.

Overall, the impacts upon vegetation from implementation of this alternative are: (1) an increase in the percent composition of those vegetation species that are more desirable forage for livestock, wild horses, and wildlife (i.e., grasses, forbs, saltbush, and winterfat would increase relative to big sagebrush); (2) an increase in plant vigor, root growth/replacement, seed production, litter accumulation and production; (3) an improvement of at least one-half condition class on the upland areas adjacent to water sources, and on an estimated 76 percent of the public land riparian areas in the allotment; and (4) an upward trend in upland range condition, resulting in an increase of two percent in live vegetation cover (USDI-BLM-1979) (Holechek et al. 1998).

Wetland-Riparian Vegetation

This analysis of the impacts associated with Alternative Three assumes that livestock use levels in certain areas would be drastically reduced and, in some areas, eliminated to achieve healthy rangeland standards. This would occur through the use of recovery prescriptions for areas identified as not meeting objectives, and also through the strict enforcement of livestock herding requirements. This alternative contains no provisions for additional fencing (except temporary), and only water developments that benefit wildlife would be approved. The use of predetermined trigger points, based on stubble height and utilization, would be used to determine when to move livestock from pasture to pasture.

Under this alternative, improvement in plant diversity, variety of age classes, and structure in plant communities in riparian areas, would be similar to those described under Alternative One. However, that these improvements are likely to be greatly accelerated due to a substantial decrease in livestock numbers and duration of use.

Improvements would occur most rapidly in existing riparian pastures, because Alternative Three requires these to be completely rested until Standards for Healthy Rangelands are met.

EFFECTS ON LIVESTOCK GRAZING (Alternative Three)

Short Term Cattle

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of permitted AUMs has been used. Unlike the other three alternatives, Alternative Three assumes the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analysis are complete.

Under this alternative, by 2013, there would be a 34 percent decrease (from the 1999-2006 average of authorized cattle use) in spring-summer-fall cattle AUMs, which would clearly impact 18 cattle permittees, by decreasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but would decrease the number of cattle from approximately 2,300 to 1,500 head (refer to Appendix 15) by the end of the short term.

Under this alternative by 2013, there would be a 47 percent decrease (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by decreasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of cattle from approximately 2,900 to 1,500 head (refer to Appendix 15) by the end of the short term.

Interim Cattle

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of permitted AUMs has been used. Unlike, the other three alternatives, Alternative Three assumes that the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analyses are complete.

Under this alternative, by 2017, there would be a 34 percent decrease (from the 1999-2006 average authorized cattle use) in spring-summer-fall cattle AUMs, which would clearly impact 18 cattle permittees, by decreasing the number of animal units of cattle use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of cattle from approximately 2,300 to 1,500 head (refer to Appendix 15) by the end of the interim implementation period.

Under this alternative, by 2017, there would be a 47 percent decrease (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would clearly impact 18 cattle permittees, by decreasing the number of animal units of cattle use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of cattle from approximately 2,900 to 1,500 head (refer to Appendix 15) by the end of the interim implementation period.

Long Term Cattle

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of permitted AUMs has been used. Unlike, the other three alternatives, Alternative Three assumes that the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analyses are complete.

Under this alternative, by 2027, there would be a 34 percent decrease (from the 1999-2006 average authorized cattle

use) in spring-summer-fall cattle AUMs, which would clearly impact 18 cattle permittees, by decreasing the number of animal units of cattle use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of cattle from approximately 2,300 to 1,500 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Under this alternative, by 2027, there would be a 47 percent decrease (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs, which would clearly impact 18 cattle permittees, by decreasing the number of animal units of cattle use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of cattle from approximately 2,900 to 1,500 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Short Term Sheep

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of sheep permitted AUMs has been used. Unlike, the other three alternatives, Alternative Three assumes that the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analyses are complete.

Under this alternative, by 2013, there would be a 13 percent decrease (from the 1999-2006 average authorized sheep use) in yearlong sheep AUMs, which would slightly impact two sheep permittees, by decreasing the number of animal units of sheep use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 1,450 to 1,265 head (refer to Appendix 15) by the end of the short term.

Under this alternative, by 2013, there would be a 53 percent decrease (from the 1980-2006 average authorized sheep use) in yearlong sheep AUMs, which would clearly impact two sheep permittees, by decreasing the number of animal units of sheep use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 2,700 to 1,265 head (refer to Appendix 15) by the end of the short term.

This alternative would not enable two grazing permittees to convert 1,325 winter sheep AUMs to 689 summer cattle AUMs. It would also not enable these permittees to convert 5,194 (former Seven Lakes) to 4,940 (former Green Mountain) summer sheep AUMs to 5,017-4,158 summer cattle AUMs. Further, the two permittees, Stan and Linda Cole and W.S. Baldwin, would not experience an increase in the value of their base property, to which their federal grazing permits are attached over the short-term, because there would be no livestock conversions authorized under this alternative. In the short term, this alternative would not appreciably change the current level of economic viability of these two livestock operations.

Interim Sheep

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of sheep permitted AUMs has been used. Unlike, the other three alternatives, Alternative Three assumes that the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analyses are complete.

Under this alternative, by 2013, there would be a 13 percent decrease (from the 1999-2006 average authorized sheep use) in yearlong sheep AUMs, which would slightly impact two sheep permittees, by decreasing the number of animal units of sheep use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 1,450 to 1,265 head (refer to Appendix 15) by the end of the interim implementation period.

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use) in yearlong sheep AUMs, which would clearly impact two sheep permittees, by decreasing the number of animal units of sheep use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 2,700 to 1,265 head (refer to Appendix 15) by the end of the interim implementation period.

Long Term Sheep

A permanent reduction of AUMs would be determined through a detailed suitability, capability and forage production analysis. For the purposes of this analysis, a projection of approximately 25% of sheep permitted AUMs has been used. Unlike, the other three alternatives, Alternative Three assumes that the various levels of livestock AUMs (Initial, Interim and Long Term levels) would remain constant, after the suitability, capability and forage production analyses are complete.

Under this alternative, by 2027, there would be a 13 percent decrease (from the 1999-2006 average authorized sheep use) in yearlong sheep AUMs, which would slightly impact two sheep permittees, by decreasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 1,450 to 1,265 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Under this alternative, by 2027, there would be a 53 percent decrease (from the 1980-2006 average authorized sheep use) in yearlong sheep AUMs, which would clearly impact two sheep permittees, by decreasing the number of animal units of sheep use they could graze on public land within the GMCA. This alternative would not change the performance of individual animals, but would decrease the number of sheep from approximately 2,700 to 1,265 head (refer to Appendix 15) by full implementation of the AMP in the long-term.

Long Term Dual Use

From implementation of this alternative, a projected 75 percent long-term decrease in AUMs would be authorized. However, by 2027, it is expected that there would be an improvement in upland range condition of at least one-half condition class, resulting in: fewer acres in low seral (poor) condition; fewer acres in mid seral (fair) condition; more acres in late seral (good) condition; and more acres in potential natural community (excellent) range condition (USDI-BLM, 1979). Improvement in upland and riparian forage conditions, in the long-term should, result in an increase in dual use (cattle and sheep) AUMs. The condition of riparian areas outside the riparian management pastures (approximately 1,360 acres or 66 percent of the public land total) is expected to remain static in the short term, and begin to slowly improve in the interim period. This improvement (from the current situation) in vegetation cover and diversity would continue into the long term. Deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). Although these systems were only rated as fair for improving stream and riparian habitats (refer to Appendix 20), the considerably reduced grazing use levels in the short term, interim, and long term periods would accelerate the rate of riparian area recovery.

Range Improvements

Table 4-31 lists the proposed range improvements, and estimated project costs for their construction and installation at \$70,300 to \$90,990. Table 4-32 shows estimated maintenance costs for the proposed range improvements at \$1,945 per year. The estimated construction costs would range from \$0.15 to \$0.19 per public land acre, or \$1.48 to \$1.92 per public land AUM. Under this alternative, it is proposed these improvements would be completed by the end of year 6 (2013), and would be funded 50 percent by the BLM (out of range betterment funds) and 50 percent by the grazing permittees and other cooperators. The maintenance responsibility of the proposed projects would be assigned to individual grazing permittees or a formally recognized permittee grazing association, depending on the type and location of project. These projects would be designed to solve the water and livestock distribution problems present on the allotment.

The current trends and conditions of the lowland (adjacent to existing waters) areas within the Arapahoe, Antelope Hills-Picket Lake, Green Mountain, and Happy Springs Use Areas would continue in the short term, pending

completion of the proposed water developments and fencing. Completion of the proposed water developments and fencing would occur in the interim period, and these lowland areas would show improvement in plant vigor and then condition. Improvement in vegetation cover and diversity would continue into the long term. The overall improvement in condition of these lowland areas, due to periodic deferment, would be enhanced by the reduced (49 percent from 1980-2006 average or 30 percent from 1999-2006 average) grazing intensity.

Herding

Under this alternative, herding would be mandatory. Deferred-rotation grazing systems require moving livestock from one pasture to the next for pasture rotation. In addition, “back riding” would be required to gather remaining cattle left behind in the initial pasture move. Active herding would be required to take place at least five days per week. A description of the herding needed to implement the proposed grazing systems is in the Description of Alternative Three and Management Actions Common to All Alternatives (Chapter Two). A minimum of three seasonal riders, with the associated labor costs discussed in Effects on Socioeconomics, would be necessary to accomplish effective herding. Sheep herding would also be required. It is estimated that the sheep herding would necessitate hiring one to two herders, with the associated costs discussed in Effects on Socioeconomics.

The range improvement projects proposed in Table 4-31 would improve the distribution of cattle and sheep grazing. Nevertheless, experience on GMCA has shown that cattle have congregated and stayed around water sources or spring developments in a rested or deferred pasture or riparian management pasture, when effective herding has not occurred. The level of herding proposed under this alternative would prevent most problems of this nature, provided cattle locations and utilization levels are closely monitored and controlled by the “range riders”. If active daily riding were not observed more than twice in a particular use area in a grazing season, the permittee(s) using that use area would be issued a 10 percent suspension in permitted AUMs, to begin the following year and taken in animal numbers or time. This herding requirement has the potential for negative economic consequences, and could reduce the affected permittee’s revenue.

Livestock operators in the allotment should benefit from the proposed pasture and riparian management fencing and use area/pasture rotation, because their cattle would be confined in a smaller area than at present. Although moving cattle during the summer (July-August) from one pasture to the other would result in temporarily reduced weight gains until the cattle adjust to their new range, cattle would be limited to an area of approximately one-half to one-third the size of the area they can now graze. This should increase the probability of a cow being bred (USDI-BLM, 1979).

**Table 4-31. Construction and Labor Requirements under Alternative Three
For the Proposed Range Improvement Projects**

YEAR	PROJECT	UNITS/MILES	COST ¹	TOTAL
	Three-wire (Use Area/Pasture Boundary)	0 miles	\$4,840 mile	\$ 0
2-6	Riparian Pasture Fencing (1 Pasture/Year)	9 miles	\$4,840 mile(barbed)	\$43,560
			\$2,541 mile (permanent or temporary electric)	\$ 22,870
2-6	Cattleguards (1 each/Year)	0	\$3,207 2-lane-24'	\$ 0
		3	\$1,694 1-lane-12'	\$ 5,080
	Spring Development (Includes Fencing) (1 Each/Year)	0	\$ 3,630 each	\$ 0
2-5	Reservoir Reconstruction	2	\$ 7,261 each	\$ 14,520
	Water Well Development (new) (1 Each/Year)	0	\$31,462 each	\$ 0
1	Water Well Development (existing)	1	\$ 9,680 each	\$ 9,680
1-3	Water Well Development (existing) (1 Each/Year)	3	\$ 6,050 each	\$ 18,150
	Water Pipelines (0) (0 miles/year)	0 miles	\$ 7,624 mile	\$ 0
	Exclosure (Artesian Wells Wetland Fencing)	0 miles	\$ 4,840 mile	\$ 0
	TOTAL (Barbed Wire Fence)		(\$ 0.19/public land acre)	\$ 90,990
	TOTAL (Permanent Electric Fence)		(\$ 0.15/public land acre)	\$ 70,300

¹ Cost information on file in the Lander Field Office.

Table 4-32. Estimated Maintenance of Proposed Range Improvements (Alternative Three)

Improvement	Number of Units	Annual Maintenance Cost/unit¹	Total Annual Maintenance Cost	Estimated Life of Improvements
Springs	0	\$121	\$ 0	20+ years
Wells	4	242	970	20+
Pipelines	0 (miles)	61	0	20+
Reservoirs	2	120	240	20+
Three-wire fence	0 (miles)	61	0	20+
Riparian pasture Fence	9 (miles)	61	185	20+
Cattleguards	3	61	185	20+
Exclosure fence	0 (miles)	61	0	20+
		Total	\$1,945	

¹Cost information on file in the Lander Field Office.

EFFECTS ON WILDLIFE/FISHERIES HABITAT AND SPECIAL STATUS SPECIES (Alternative Three)

Nongame Wildlife and Game Birds

Nongame wildlife and game bird habitat conditions would improve most rapidly in those one-acre spring development/enhancement exclosures, and in the five completed riparian pastures (of seven planned) constructed over the last eight years. Within these exclosures, exclusion from livestock grazing will continue to increase plant diversity, variety of plant age classes, and additional structure in plant communities. The result of this improvement has likely been a corresponding increase in the abundance and species diversity of nongame wildlife. Nongame and game bird habitat outside these exclosures would improve as described in Alternative One, but would occur at a more rapid rate than Alternative One because of reduced livestock numbers and faster rotation due to trigger points.

Big Game

Under Alternative Three, impacts to big game associated with fences would be the same as those described under Alternative One. Negative impacts from wells and other water developments would probably be diminished, because these would likely be fewer in number. Whatever benefit to big game that might be provided by the addition of water sources, in areas where there was none previously, would also be diminished under this alternative.

With the expected distribution of livestock through mandatory herding, big game species would be able to utilize ungrazed pastures prior to livestock movement, as described in Alternative One. This would likewise provide big game the opportunity for greater selectivity, and would also provide areas free from livestock disturbance. Big game use of the Alkali Sheep Use Area would also be expected during the summer period, when livestock are not present. As with Alternative One, herbaceous riparian vegetation would be expected to improve, due to the lack of hot season livestock grazing, but would likely do so more quickly under Alternative Three because of reduced livestock numbers and faster rotation due to trigger points.

Because trigger points for moving livestock would be tied to browse utilization (as well as stubble height) in Alternative Three, browse species important to wintering pronghorn and mule deer would likely respond favorably, but at a slower rate than herbaceous vegetation.

Expected improvements in livestock distribution away from important wildlife habitat associated with Alternative One, would be unlikely under Alternative Three because of the reduced number of water developments predicted. Likewise, any increase in the availability of suitable habitat that would result in a slight redistribution of pronghorn and mule deer (i.e., east of Lost Creek and the area between Crooks Mountain and U.S. Highway 287) would also be unlikely to occur. An improvement in moose habitat conditions, especially those associated with willow riparian

habitats along the Sweetwater River and Crooks Creek Riparian Pastures, would be similar to that described in Alternative One, but would occur at a faster rate under Alternative Three.

Fisheries

Improvements in trout and nongame fisheries under Alternative Three would be the same as those described under Alternative One, but would likely occur sooner, owing to reduced livestock numbers and faster rotation.

Special Status Species

Chapter 3 of this document (Affected Environment) mentioned three federally listed species to be analyzed for potential adverse effects. They were the Ute ladies' tresses, blowout penstemon, and those species affected by Platte River depletion.

Although potential habitat for the Ute ladies' tresses occurs within certain parts of the allotment, there would likely be no adverse effect to this species for the following reasons: 1) this species has never been documented in Wyoming at elevations above 5,500 ft.; the lowest elevation in the GMCA is approximately 6,400 ft.; 2) this species requires moist soils near perennial water; at the lowest elevation there is no perennial water; 3) this species requires non-alkaline soils; the soils at the lowest elevation are alkaline; and 4) any new surface-disturbing activities planned under any of the alternatives would be subject to a separate site-specific NEPA review.

A small amount of suitable habitat for the blowout penstemon has been identified within the GMCA. However, there would likely be no adverse effect to this species for the following reasons: 1) suitable habitat locations within the GMCA have been surveyed, and no populations of this species have been documented; 2) if present in the GMCA, the species is unlikely to be grazed by livestock, because it is not a preferred forage plant, and because livestock typically do not graze in its sparsely vegetated, sandy habitat; and 3) any new surface-disturbing activities planned under any of the alternatives would be subject to a separate site-specific NEPA review.

Any future water developments proposed in the allotment under Alternative One would be subject to review (and possible consultation) under the Platte River Recovery Implementation Program, effective January 1, 2007.

Of the thirty BLM Sensitive plant and animal species carried forward from Chapter Three for consideration, impacts from Alternative Three should be the same as those described under Alternative One, with the following exceptions: 1) improvement of mountain plover and burrowing owl habitat from possible localized overgrazing would not occur; 2) sage-grouse would not be adversely impacted by range improvements, and stubble height trigger points in Alternative Three (for moving livestock) should provide adequate residual stubble for concealment of nests in the following spring; 3) a rapid improvement in riparian conditions due to drastically reduced livestock grazing would provide much improved sage-grouse brood-rearing habitat; and 4) there would be less likelihood of trampling or disturbance of the nests of sensitive ground-nesting or shrub-nesting bird species.

EFFECTS ON WILD HORSES (Alternative Three)

This alternative would have very little impact on the existing situation within the wild horse HMAs. This alternative assumes fewer livestock numbers, no new fencing, and no net increase in water developments. Livestock would be moved by herding, and a decreased number in livestock would provide more forage and less competition for wild horses; however, herding of livestock would be an activity that wild horses would shy away from, and would in turn leave the area in which the herding would occur. Additionally, with this alternative, it can be expected that forage conditions would improve over the current situation. This could equate to better herd health and better forage conditions during winter months, when horses experience stress from cold conditions.

Having no new fencing would allow for wild horse travel zones between herd areas to remain open; as a result, genetic interchange among the herd areas would remain stable. Migration within HMAs would also allow for optimum movement/escape during periods of stress. However, temporary fencing could be approved on a seasonal basis in this alternative. This could cause temporary shifts in spring-summer-fall movement patterns and migration.

Alternative Three's absence of additional water developments would help maintain the integrity of the historic wild horse use areas within the HMAs. No loss of wild horse visitor days would occur in this alternative, and the opportunity to develop a wild horse viewing loop in any one of the three HMAs would still be available.

EFFECTS ON CULTURAL RESOURCES (Alternative Three)

Prehistoric Sites

Alternative Three is projected to have beneficial effects to prehistoric sites along riparian areas, in both the short term and in the long term, because erosion, livestock congregation, and trampling would be reduced until Proper Functioning Condition (PFC) standards are met. Eleven known significant prehistoric sites would be affected under this alternative, and would be beneficially affected as positive conditions at prehistoric sites (reductions of erosion and livestock concentration) outweigh previous negative conditions.

Not-yet-discovered prehistoric sites along riparian zones would also be beneficially affected by this alternative. The conditions at these sites, predicted to number approximately 600 (see Table 4-16), would improve, as positive conditions such as reductions of erosion and livestock concentration outweigh previous negative conditions.

Historic Trails and Sites

Alternative Three is projected to have beneficial effects to National Historic Trails and historic sites along riparian areas, in both the short term and in the long term. This is because erosion, livestock congregation, and trampling would be reduced until Proper Functioning Condition (PFC) standards are met. Five riparian area crossings of the Seminole Cutoff National Historic Trail, and a site associated with the Seminole Cutoff (Immigrant Spring), would be beneficially affected, as positive conditions at these locations (reductions in erosion and livestock concentration) outweigh previous negative conditions.

No fence or water developments are planned in the vicinity of the OMCPE Trail, the Seminole Cutoff, or the Rawlins-Fort Washakie Stage Trail under this alternative, so no new development-related effects are expected.

As shown in Table 4-17 (see Alternative One, Cultural Resources section), it is projected that this alternative's long-term impacts would cause fewer impacts to prehistoric sites, National Historic Trails, other historic trails, and historic sites than Alternatives Two and Four, and would cause the same number of impacts to these resources as Alternative One.

EFFECTS ON RECREATION, VISUAL RESOURCES AND OPEN SPACE (Alternative Three)

Range improvements authorized under this alternative would not alter the recreation settings as documented in the affected environment. Since there is no change to the recreation setting, there would also be no change to the recreational experiences and benefits available or realized by recreationists within the area. This alternative would not alter the unique "situational attribute" documented in the affected environment allowing for the agency to maintain the future option of managing this quality for recreationists.

General Public Big Game Hunting Recreation Feature

Alternative Three would not alter the general setting of this feature, nor the available recreational experiences and benefits. This alternative would enhance or improve the habitat and availability of big game animals. Forage utilization under Alternative Three is low (with excess forage being left for wildlife) in addition proper functioning condition of most riparian systems (critical wildlife habitat) would demonstrate an upward trend. If these trends continue over the next 20 years the General Public Big Game Recreation Feature would demonstrate an enhanced recreational setting and experiences and benefits.

Continental Divide National Scenic Trail Special Recreation Management Area

Alternative Three would not alter the general setting of this feature, nor the available recreation experiences and benefits. Therefore, little to no impacts are anticipated as a result of this alternative to the CDNST settings and the areas recreational experiences and benefits.

The decreased stocking rates proposed to be implemented under Alternative Three would result in reduced livestock aesthetic impacts (cattle defecation, hummocking, etc.) and water quality impacts. It is also anticipated that the implementation of this alternative would enhance the quality of the unfenced CDNST water sources.

Green Mountain Recreation Feature

No impacts to recreation settings and available experiences and benefits are anticipated in the Green Mountain Recreation Feature.

National Historic Trail Special Recreation Management Area

No impact to the recreation setting and the available experiences and benefits are anticipated as a result of this alternative along the National Historic Trail.

Visual Resources

Alternative Three would benefit the visual quality of the vegetative component, through increases in variety and contrast. Increases in vegetation would eventually recover the movement and color contrast components (key factors in drawing visitors' attention to the landscape) rendered in the vegetation. In turn, the recreation setting and available experiences and benefits would also be enhanced, as a result of the benefits rendered to the visual quality of the historic trail landscape.

Open Space

The reduction in AUMs under Alternative Three would likely cause some permittees to leave the ranching business and to sell private lands within their ranching operations. Some of those private ranch lands are surrounded by or adjacent to BLM-administered public lands within the GMCA. Others are located within view of US Route 287, one of the main tourist routes to the National Parks and a major thoroughfare for the area's residents. The potential for the development of rural subdivisions in and near the GMCA would likewise increase as a result of the sale of these private lands. The development of rural subdivisions in the area would decrease the amount of open space related to the allotment and nearby agriculture lands. The potential effects of rural subdivision development would be comparable to, or greater than, the loss of open space associated with the development of the Pappy Draw Oil Field and, unlike mineral developments, would be permanent with unmitigated long term impacts to wildlife, recreation, visual resources and other resource values.

The area where these rural subdivisions could occur have been identified in a report entitled "Strategic Ranchland in the Rocky Mountain West" written in 2000 by American Farmland Trust (AFT), the Center of the American Trust, and the Nature Conservancy. Those lands lie between Sweetwater Station and Muddy Gap Junction in the Sweetwater River Valley. Several ranches owned by GMCA permittees that are currently identified as "Strategic Ranchland at Risk" appear on the map that accompanies this report.

EFFECTS ON WILDERNESS STUDY AREAS AND WILD AND SCENIC RIVERS (Alternative Three)

The table below contains a discussion of each required WSA value/data element and determines whether the level of impact from the action exceeds maximum allowable standards, as directed by the Interim Management Policy for Lands under Wilderness Review.

Table 4-33. Predicted Impacts to Wilderness Values as a Result of Implementing Alternative Three

Wilderness Value Indicator	Impact Description	Will the Impact Exceed Maximum Allowable Standard
Visual Resource	Full implementation of Alternative Three would result in increases in the vegetation component in the riparian systems, in turn returning the movement element created by these taller grasses. Recovery of this element would occur quickly, due to the large reduction in stocking rates, use level triggers, and the herding requirements.	No
Naturalness and Solitude		
Human Activity	Human Activity would slightly increase, due to herding requirements proposed for this alternative	No
Wildlife presence	Since wildlife forage would be increased in this alternative, the probability of increased wildlife occupation is high. In addition, the level of livestock evidence would be reduced as a result of reduced stocking levels.	No
Primitive Recreation		
Recreation Opportunities	Alternative Three proposes no new projects in the WSA. Additionally, the main feature of the WSA is unaffected by livestock grazing resulting from this AMP. The above factors cause no change to the recreation setting, and therefore no change to the corresponding opportunities of the WSA. In addition, it is anticipated that Alternative Three would enhance visitor experiences in the area of the WSA contained within the GMCA.	No
Natural Appearing Environment	Enhancement of the naturalness component of the recreation setting would occur in the riparian areas outside the Sweetwater Canyon Fence. This enhancement would be a result of the reduced stocking rate and utilization triggers proposed for this alternative. In the long term, the full implementation of the alternative would increase riparian functionality and reduce the presence of livestock.	No
Special feature		
Surface Water	Within the WSA fence, water quality is expected to be good, due to the years of rest and subsequent controlled grazing it has received. Also, the WDEQ has monitored and assessed the Sweetwater River, and removed it from the impaired water body list within the past ten years. Outside the fence, this alternative relies on herding to prevent over-use of the riparian zones. In the long term, plant vigor and production is expected to increase. As more extensive root systems develop, increased water infiltration and retention, through increasing the organic matter content of these soils, can be expected.	No
Vegetation		
Ecological Site Inventory	No lowering in seral condition would result from this alternative. Stubble height and utilization triggers for livestock removal, increased herding, stocking rates based on suitability and capability, plus "recovery prescriptions," would help managers work toward an upward trend.	No

Vegetation Utilization	This alternative provides for monitoring of utilization and livestock would be moved based on utilization standards. In order to meet the standards contained in the IMP, utilization objectives within the WSA would have to be 50 percent.	No
Plant Vigor	No long term decrease in plant vigor would result from this alternative. Stubble height and utilization triggers for livestock removal would help managers improve riparian and upland range conditions.	No
Threatened or endangered plants	Same as Alternative One.	No
Wildlife		
Wildlife habitat	Because Alternative Three includes a substantial reduction in livestock numbers and stricter vegetation objectives, habitat (both riparian and upland) would likely improve dramatically.	No
Population	As habitat conditions improve, wildlife populations (especially plants and non-game) are also likely to increase.	No
Diversity	Improved habitat conditions (especially riparian) are likely to cause increased plant and animal diversity.	No

CUMULATIVE IMPACTS (Alternative Three)

Soil and Vegetation Resources

There are currently 133 acres undergoing impacts from livestock (i.e., sacrifice areas) and/or project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 Final Decision. No new water developments are proposed in this alternative. There would be no net gain in the amount of fences on the entire GMCA under Alternative Three. No additional impacts from livestock management projects are expected to arise from this alternative.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in Alternative One. An estimated total \$1,945 of additional maintenance costs would occur upon completion of the proposed remaining range improvement projects by 2018.

Wildlife/Fisheries Habitat and Special Status Species

Alternative Three's lack of additional permanent fencing in the GMCA would offset any impacts associated with the Rawlins Field Office's fencing proposals to improve livestock management south of the allotment. The Rawlins proposals could negatively impact the Red Desert Antelope Herd's movement to crucial winter habitats near Rawlins and Interstate 80. Antelope would continue to be able to migrate to these crucial winter habitats under this alternative, but with fewer obstacles that could change migration patterns or slow migration.

The cumulative impacts of habitat loss from proposed water developments coupled with energy development and the CO2 pipeline would be the same as that described under Alternative One.

A general improvement in both riparian and upland sage-grouse habitat, resulting from the mandatory stubble height and utilization requirements of Alternative Three, would tend to offset continued loss or fragmentation of sage-grouse habitat associated with energy development activities in the vicinity of the GMCA.

Wild Horses

Cumulative impacts from temporary fencing could occur. Impact intensity would depend on how much temporary fencing is authorized, and where the temporary fencing is located. Each individual project would add to the cumulative impacts.

Cultural Resources

Reductions in trampling and congregation impacts near natural water sources and riparian area would decrease impacts to cultural resources, and would lead to a positive trend in their long-term survival.

Recreation and Visual Resources

As a result of actions planned under Alternative Three and the mitigation developed to reduce recreational impacts, livestock grazing on the allotment would not contribute to the trends documented in the affected environment. Therefore, cumulative impacts to the recreation setting and the available/realized experiences and benefits would occur at a similar rate to that documented in the affected environment.

Off site impacts to the Recreation Features

Since Alternative Three maintains the existing setting, and experiences and benefits for the general allotment, there would be no offsite impacts to the recreation features as a whole. Alternative Three maintains the distinct niche represented by the setting of the GMCA.

Wilderness Study Area and Wild and Scenic Rivers

The impacts from Alternative Three and the identified mitigation to WSA and WSR resource are anticipated to be light. In addition, no offsite impacts to the Sweetwater WSA and WSR as a whole unit are anticipated. No impacts exceed maximum allowable standards, as identified in the Interim Management Policy for Lands under Wilderness Review. As a result of the above findings, cumulative impacts to the WSA and WSR are anticipated to continue in similar trends as documented in the affected environment.

RESIDUAL IMPACTS

Soil and Vegetation Resources

Under Alternative Three, in about a decade or so, changes are anticipated for lowlands, as livestock rotations are implemented in the use areas and more of the grazing use is shifted to the uplands. Lowlands would show increases in vegetative and litter cover and vegetative height. This would result in lower erosion rates, and contribute increased amounts of organic matter to the soil. Water quality and the storage of water and nutrients would also be enhanced by increased organic matter inputs to the lowland soils.

The Alkali Creek Sheep Use Area, having no hot-season use, and managed use by sheep, is expected to improve, displaying enhanced vegetation, soil, and water storage sooner than any other use area under this alternative. This would yield greater resilience to drought impacts, while also aiding in resisting the invasion and establishment of noxious weeds.

Riparian soils occurring outside of spring development/enhancement exclosures, riparian pastures, and special riparian grazing treatment pastures would be maintained in their current seral stage, or they could possibly trend slightly upward over an exceptionally long period of favorable growing conditions. This would occur on approximately 229 acres, or 11 percent, of the riparian soils in the allotment in this currently low seral stage. Often, the most degraded areas would not come back, as too much soil fertility has already been lost. However, the greatest chances for improvement can be found in those mid-seral systems that account for about 70 percent of these systems that are not severely degraded and still retain some inherent soil fertility. Enhancing these mid-seral systems and keeping them from falling into low seral conditions would benefit the largest percentage of riparian/wetland areas in the long term.

In the aforementioned sacrifice areas and their zones of impact, like the stock trails that radiate out from them, ideal conditions are created for the establishment of annual and perennial weeds. With ever-increasing recreational use, mineral development, natural animal movements, and annual turnout of livestock fed on non-certified weed-free hay, the chances for the establishment of new weeds and the spread of existing populations is highly likely.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of

the range improvements in this alternative. An estimated total \$1,945 of additional maintenance costs would occur upon completion of the proposed remaining range improvement projects by 2018. An estimated combined total \$12,485 of additional maintenance costs would accrue in the long term (2018-2027).

Wildlife/Fisheries Habitat and Threatened and Endangered Species

Long-term improvements in habitat conditions and reduced competition between big game species and domestic livestock would likely lead to increased stability and an overall increase in big game populations.

Long-term improvements in sage-grouse habitat conditions (both upland and riparian) would help sage-grouse populations in the GMCA remain static or increase.

Wild Horses

No residual impacts have been identified for wild horses under Alternative Three.

Cultural Resources

Due the decrease in livestock grazing impacts and the resultant decreases in erosion, damage, and disruption to these resources, improvements to the condition of prehistoric and historic sites and trails would slowly occur.

Recreation and Visual Resources

No residual impacts to the recreational setting or experiences and benefits are anticipated as a result of the implementation of this alternative.

Wild Study Areas and Wild and Scenic Rivers

The indirect and direct impacts documented for alternative 3 do not exceed maximum allowable standards as identified in the Interim Management Policy For Lands Under Wilderness Review. In addition this level of impact does not exceed impact standards for the WSR resource. Therefore residual impacts to the WSA and WSR resource would be slight as a result of the alternative. As long as portions of the WSA and WSR resource are unfenced from the GMCA slight visual and aesthetic impacts would continue in these areas. This impact is somewhat offset by the location of the WSA fence and its low level of contrast with the characteristic landscape. Moving the fence to the boundary would increase the level of contrast at the boundary of the WSA.

ALTERNATIVE 4

EFFECTS ON SOIL AND WATER RESOURCES (Alternative Four)

Soil Resources

Under this alternative, the GMCA would be divided into two allotments. This alternative proposes 48 miles of riparian enclosure fence, 68 new water sources, locations of salt at least one-half mile from water (to aid in the handling and distribution of livestock), and intensive herding. Nineteen miles of new fence would be required to divide the proposed two new allotments. With the 68 new water sources proposed under this alternative, one may conservatively assume that at least one new upland salt location per water development would be necessary to aid in drawing livestock into the uplands. One new sacrifice area would be created at each salt block location. The sacrifice areas associated with the existing salt block locations are generally not as large as those associated with water sources, but some amount of bare, compacted soil would be expected to develop around each one.

Within the Alkali Creek Common Allotment, livestock numbers would be based on historic use of the allotment, which is about 49 percent of the permitted use. Herding and rest-rotation grazing systems are expected to increase livestock use of vegetation on the uplands and alleviate some of the heavy use presently occurring in the riparian areas. Monitoring of grazing use would be sensitive enough to detect significant change. Implementation of this alternative would not adversely impact soil potential in the uplands. With use levels of riparian vegetation expected to be no more than moderate in grazing years, a fair to good chance of improvement from present conditions is expected, depending upon effective herding and proper stocking rates (Platts, 1989). However, very intensive management of livestock would be necessary to handle one large herd of livestock. Soil health conditions of

riparian areas would show slow improvement over many years or decades because complicating environmental conditions (such as drought) can slow or negate progress in some years.

As under Alternative One, a combination of seven riparian pastures, five completed and two proposed, would be constructed and maintained on important riparian zones. These riparian pastures would be used by livestock either in the spring or fall period. The effects would be variable, but, improvement in vegetative expression would be expected to occur over a period of several normal precipitation years. Functional integrity of the riparian systems, and the soils found there, would take longer to restore.

Impacts in the uplands from bunched, herded livestock would have a negative effect on the brittle shrub component (i.e., sagebrush, bitterbrush) in some areas. On sandy soils, loss of these shrubs would lead to the initiation of accelerated wind erosion (see Map 4-4, Wind Erosion Potential).

Map 4-3, Water Erosion Potential, and Map 4-4, Wind Erosion Potential, illustrate that if a management scenario decreases soil cover too much in the uplands, accelerated wind erosion can result. Areas of currently stabilized sand dunes to the south of Green Mountain, and medium- textured soils high in very fine sand, fine sand, and silt-size particles can become active and suffer erosional losses, decreasing the potential of these sites. In the medium and heavy-textured soils, water erosion in the form of new and more frequent rills and gullies would result. Any increases in erosion rates should be negligible and not affect soil fertility.

In the short-term, changes to the present condition of lowlands would be apparent. In the spring development exclosures and riparian pastures that would be constructed, increases in vegetation cover and litter would be most rapid. In the exclosures and fenced pastures, increases in vegetative/litter cover and vegetative height would lower erosion rates and contribute increased amounts of organic matter to the soil. Both water and nutrient storage of these sites would be enhanced, as would water quality. This grazing system holds the most promise to improve the Functioning-at-Risk and Non-Functional riparian conditions on the proposed Alkali Creek Allotment.

In the mid-term (five to ten years), even though increased upland use is part of the management strategy in this alternative, the pasture rotation strategy should allow for enough rest in the uplands to maintain adequate soil cover to buffer the erosive effects of wind and precipitation. The rotation should also allow enough time to alleviate annual soil compaction due to animal trafficking under moist conditions.

Water Resources

The expected impacts to water resources from Alternatives One and Three would also apply to Alternative Four with some variations primarily related to specific water development projects, new fences, spring exclosures, riparian pastures, and livestock management strategies.

Within the proposed Alkali Creek Allotment, the fate of the vegetation and rates of soil erosion - especially in and immediately adjacent to the riparian areas - would have the greatest influence on water quality. With livestock use levels under this alternative expected to be light to heavy, some amount of riparian zone trampling and bank damage is expected to occur. The heaviest impacts would occur around scarce natural water sources such as streams and springs. The transition zones between the uplands and the riparian areas are also susceptible to mechanical damage by livestock, such as soil compaction, when they are moist. With a rest-rotation grazing system, there should be enough time afforded for alleviation of what soil compaction may occur, thereby maintaining normal soil infiltration rates.

Some improvement in riparian conditions would be expected in the proposed Green Mountain Allotment. With a deferred-rotation system, the highest precipitation zone in the area and the highest potential production for riparian areas have excellent potential for maintaining and enhancing desirable riparian and wetland vegetation. Pasture moves in the forested parts of the allotment will be problematic, for moving all of the cattle out of one pasture and into another could prove to be difficult. The results of leaving a few of the cattle in the timbered areas of a pasture after the majority have been cleaned out, is sufficient to cause undesirable impacts to the small mountain streams found there.

For the new Green Mountain Allotment, deferred-rotation grazing and herding would be used to eliminate vegetation use on any given spot for most of the grazing season. This grazing strategy would lessen impacts to the riparian areas where cattle tend to congregate, especially in the summer season.

With the proposed managed grazing of sheep and no hot season grazing (at levels almost half that of current preference), the Alkali Creek Sheep Use Area would yield riparian zone improvements more rapidly when compared to the Green Mountain Allotment. As a result of this new management scenario, water quality parameters such as turbidity, total dissolved solids (TDS), and suspended sediment (SS) would be improved above the current situation.

For the seven riparian pastures previously described improvements in water quality would occur. This would be due to the elimination of livestock and horse damage to stream banks and adjacent areas, along with the restoration of the functional integrity of the riparian systems. Impacts to water resources outside of exclosures and riparian pastures would be directly attributable to the herding effectiveness; water quality should be enhanced.

There are currently 133 acres of land experiencing impacts from livestock (i.e., sacrifice areas) project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 Final Decision.

EFFECTS ON VEGETATION RESOURCES (Alternative Four)

Vegetation – General

Refer to the General effects on Vegetation Resources for Alternative One.

Grazing Management

Refer to the Grazing Management Section in Alternative One.

Upland Vegetation - Short Term

Under Alternative Four, each pasture in the proposed Alkali Creek Common Allotment (ACCA) or Green Mountain Allotment (GMA) would receive a rest period or deferment from livestock grazing during portions of the growing period. Deferring grazing use during the growing period is very important to the plant in terms of carbohydrate reserve levels. The carbohydrate reserves are used during periods of rapid herbage growth, such as initial growth, subsequent regrowth, and for respiration and slight growth during the winter (Cook 1976; Priestly 1962-from Coyne and Cook, 1970). Allowing growth without grazing pressure during portions of the growing period would allow the plant to have available ample carbohydrate reserves for normal growth and development. The restriction of grazing during portions of the growing season would allow an increase in vigor, root growth and replacement, seed production, and litter accumulation.

Seasonal grazing system in the Alkali Creek Sheep Pasture would result in sheep grazing from April 1 through June 15 and November 1 through December 31 of each year. This spring sheep grazing has historically taken place near East Alkali Creek on approximately 4,600 acres. The historical fall use would continue with the implementation of this alternative. Concentration of the fall sheep use in this use area would result in the decline of the vegetative vigor, production, and litter accumulation in the areas of overlap with spring sheep use. The remaining portions of the use area (approximately 16,600 acres) would be expected to improve in production, root growth and replacement, litter accumulation, vigor, and seed production.

Grazing during the growing season is considered detrimental to the vegetation by removal of portions of the plant necessary in the synthesis of carbohydrates and by forcing the plant to deplete its carbohydrate reserves by regrowth. However, not allowing livestock to graze the pasture the same time each year would allow the vegetation to recover.

In the proposed Alkali Creek Common Allotment one pasture each year would receive year round rest from livestock grazing to allow for growth and recovery of the vegetation. The absence of grazing would allow the plants an entire growing season without grazing pressure to improve vigor, root growth and replacement, seed production, and litter accumulation.

Spring-early summer cattle grazing (from May 1 to July 9) would occur in two pastures within the ACCA (Treatments Q and R) while the third and fourth pastures would be deferred (Treatments S and T) until July 10 (refer to Annual Grazing Treatments Table 4-34). This rest rotation grazing system allows two pastures to be deferred for two months of the growing season every year (Treatments S and T). The deferment is important to the vegetation in order to allow the plants most of the growing season without grazing pressure to improve vigor, root growth and replacement, seed production, and litter accumulation.

Grazing during the fall, winter (Treatments H and J), or dormant season is considered to be the least detrimental to the vegetation. Cook and Stoddart (1963) concluded that desert ranges are best adapted to winter grazing. Although there would be plant mortality and loss of crown cover (Cook and Stoddart 1963), the loss is expected to be less than the plants' yearly growth.

Despite some short-term negative effects due to periodic grazing during the growing season for both allotments, the overall beneficial effects of the grazing systems on upland vegetation would more than offset these short-term impacts because: (1) the majority of the upland rangeland is in good or fair condition (see Table 4-4, Forage Condition and Apparent Trend Summary), (2) grazing use would be rested or deferred during the initial vegetation growing season, (3) the level of grazing use would be dispersed to areas which are presently receiving only light use, and (4) grazing would be kept at a level well below average annual growth during the short term and interim periods.

Upland Vegetation – Long Term

The long-term impacts in the upland range of the ACCA five-pasture rest-rotation and GMA six-pasture deferred-rotation grazing systems would be increased vegetation production due to the increased seedling establishment, improved vigor, improved root growth and replacement, increased litter accumulation, and increased percentage composition of grass and forb key species.

A study by Gibbens and Fisser (1975) in the Red Desert region (where the southern portion of GMCA is located) on a two-pasture deferred-rotation grazing system found that plant composition, calculated as a percentage by species of the total vegetation cover, would result in a relative increase in the grasses and forbs.

In this same study, a two pasture deferred-grazing system showed an increase in grass cover of 31 percent outside of the control area, while the grass cover increase from 1967 to 1971 inside the control area was 25 percent. Therefore, the net increase of grass cover from 1967 to 1971 of 6 percent was a result of the two-pasture deferred grazing system. Shrub cover change from 1967 to 1971 outside the enclosure showed a decrease of 11 percent, while inside the enclosure was an increase of 34 percent. These results indicate that a two-pasture deferred grazing system should cause a reduction of shrub cover when compared to the absence of grazing. It is estimated that the proposed five-pasture rest-rotation grazing system in the southern portion (Red Desert Region) of ACCA would decrease shrub cover 10 percent.

The proposed six-pasture deferred-rotation grazing system in the GMA is expected to have these long-term impacts: improved vigor of vegetation species including root growth and replacement, increased litter accumulation, increased seed production and seedling establishment, and increased production.

Grazing in the North and South Arapahoe and Happy Springs Pastures would take place during the summer and winter months (refer to Table 4-34, Annual Grazing Treatments and Table 4-35, Acres Per Grazing Treatment Through One Complete Grazing Cycle). The winter grazing season, which would receive about 10 percent of the livestock grazing use, is least detrimental to the vegetation (Garrison 1972, Blaisdell and Holmgren 1984, Masters, et al. 1996a). The resulting impacts, such as decreased litter and seedling establishment created by grazing from May 1 through July 9 in these pastures, would be detrimental in the area of the summer sheep use.

Table 4-34. Long-Term Annual Grazing Treatments (Alternative Four)

Allotment/Pasture	Year 1	Year 2	Year 3	Year 4	Year 5
Alkali Creek Common					
Happy Springs	Q	P	T	S	R
North Arapahoe	R	Q	P	T	S
South Arapahoe	S	R	Q	P	T
Picket Lake	T	S	R	Q	P
Antelope Hills	P	T	S	R	Q
Alkali Creek Sheep	C-G-J-H	C-G-J-H	C-G-J-H	C-G-J-H	C-G-J-H
Green Mountain					
Sheep Creek	A-J-N	B-J-N	A-J-N	B-J-N	A-J-N
Reserve (Green Mt.)	D-N	D-N	D-N	D-N	D-N
Willow Creek	B-J-N	A-J-N	B-J-N	A-J-N	B-J-N
Crooks Creek	A-J-N	B-J-N	A-J-N	B-J-N	A-J-N
Stratton Rim	I-J-N	I-J-N	I-J-N	I-J-N	I-J-N
Hadsell	B-J-N	A-J-N	B-J-N	A-J-N	B-J-N

Riparian Management Pastures

Alkali Creek Common	Year 1	Year 2	Year 3	Year 4	Year 5
Long Slough	I-G-O	G-O	I-G-O	G-O	I-G-O
Crooks Creek/Bare Ring Slough ¹	I-G	I-G	I-G	I-G	I-G
W. Fork Crooks Creek	I-G-O	G-J-O	I-G-O	G-J-O	I-G-O
*Lost Creek ²	I-G	I-G	I-G	I-G	I-G
Ice Slough	G-J-O	G-J-O	G-J-O	G-J-O	G-J-O
Warm Springs Creek	I-G-O	G-J-O	I-G-O	G-J-O	I-G-O
*Sweetwater River ¹	I-G-O	I-G-O	I-G-O	I-G-O	I-G-O

¹Willow plant communities present within riparian management pasture.

²Ten years of rest would be required before livestock grazing is authorized.

* Pasture not yet completed

See Appendix 5 for a description of the grazing treatments listed in Table 4-34 above.

The increase in sheep grazing use during the winter, with no increased use expected from wildlife or wild horses, would not be significant enough to be detrimental to the vegetation resource over the long-term. Reduction of growing season grazing intensity would improve vigor of vegetation species and increase production in the long-term (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998).

The Lost Creek drainage would be expected to improve in condition and production over the long-term as a result of the riparian management pasture and the rest-rotation grazing system (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Masters, et al. 1996a, Holechek, et al. 1998). Within the Picket Lake, North Arapahoe and South Arapahoe Pastures, production and condition would be expected to improve slightly due to the improved distribution of livestock and wild horses through the use of water developments. As previously mentioned, the winter season is considered to be the least detrimental to the vegetation in terms of grazing. Winter is considered to be the least detrimental period of utilization for shrubs (Garrison 1972, Blaisdell and Holmgren 1984). The lack of grazing pressure during the growing period would allow the vegetation to improve in terms of vigor, root growth and replacement, seed production, seedling establishment, and litter accumulation.

Concentration of livestock, wildlife, and wild horses in areas offering shelter during winter storms is not considered detrimental to the vegetation in the long-term because there are numerous locations offering protection throughout the ACCA. Rest or deferment of grazing during the spring and summer months would allow the vegetation to recuperate from the depletion of carbohydrate reserve levels from winter grazing. A slight increase in forage production over the entire ACCA would be expected from implementation of this alternative in the long-term.

Areas which are favored as sheep bed-grounds would be expected to receive excessive grazing pressure. This alternative requires the sheep operators to move the sheep bed-grounds 1.5 miles every week. This impact would not occur in the Picket Lake, North Arapahoe and South Arapahoe Pastures of the ACCA where three miles of movement is required every week. The areas which have been historically-favored bed grounds, such as areas near water or which offer protection from adverse weather, would have the vegetation completely removed or damaged so severely that restoration would be extremely limited. An area of approximately one to three acres per bed ground would be expected to be impacted. The rest-rotation grazing system however, would allow the vegetation to partially recover from these short periods of heavy grazing. The rest-rotation grazing system and reduced livestock grazing levels should allow the vegetation to recover from these short periods of heavy grazing.

Table 4-35, Alternative Four - Long-Term Acres Per Grazing Treatment Through One Complete Grazing Cycle, shows the acres of different grazing treatments that are applied through a completed five year grazing cycle. The table displays the acres utilized by livestock grazing by the various annual treatments through one complete cycle.

**Table 4-35. Alternative Four-Long-Term
Acres per Grazing Treatment through One Complete Grazing Cycle**

Treatment	Public Land Acres				
	Year 1*	Year 2*	Year 3*	Year 4*	Year 5*
A	17,969	8,538	17,969	8,538	17,969
B	8,538	17,969	8,538	17,969	8,538
C	18,207	18,207	18,207	18,207	18,207
D	12,893	12,893	12,893	12,893	12,893
E	0	0	0	0	0
F	0	0	0	0	0
G	28,908	28,908	28,908	28,908	28,908
H	61,545	56,873	61,545	56,873	61,545
I	11,758	2,901	11,758	2,901	11,758
J	46,514	46,514	46,514	46,514	46,514
K	0	0	0	0	0
L	0	0	0	0	0
M	0	0	0	0	0
N	44,101	44,101	44,101	44,101	44,101
O	10,032	10,032	10,032	10,032	10,032
P	94,721	68,831	78,360	85,441	82,032
Q	68,831	78,360	85,441	82,032	94,721
R	78,360	85,441	82,032	94,721	68,831
S	85,441	82,032	94,721	68,831	78,360
T	82,032	94,721	68,831	78,360	85,441

*The totals for each year are greater than the acreage of the allotment because some pastures receive more than one treatment each year.

Range Improvements

Construction of the proposed range improvements would remove approximately 114 acres from production. Table 4-36 lists the total acres disturbed by each type of range improvement and the total acres that would be disturbed under this alternative. The range improvements disturbing the major proportion of the acres would be the spring developments (31 acres), pasture boundary fences (29 acres), riparian pasture fences (14 acres), water wells (29 acres), and reservoirs (12 acres). The overall impact to the vegetation within the GMCA as a result of range improvement construction would be minor.

Even though fences are beneficial in the management of livestock, they do cause trailing impacts along the fences. This would result in the deterioration of the vigor of the plants due to overgrazing and trampling. Use of motorized vehicles for maintenance would also lead to a reduction in vigor of vegetation. Another impact of the trailing of livestock, wild horses, and wildlife along fence lines, would be the removal of vegetation through trampling and compaction of the soil. This would cause adverse growing conditions. A change in composition of the vegetative species could occur in the immediate vicinity of the fence in areas away from the fence, impacts would be less noticeable. Heavy grazing would cause a decrease in the preferred species and an increase in the less-preferred species.

The existing fence on the southern boundary of the GMCA (proposed ACCA) would concentrate summer cattle use on the north side of the fence near the proposed Lost Creek Riparian Pasture. The forage in the areas of concentration would be removed by livestock through consumption and trampling. The grazing would result in the de-

cline of the preferred species and an increase in the less-preferred forage species. The overall production, seed production, vigor, condition, and trend of the vegetation would decline in the areas of concentration.

Impacts created through the development of a spring would include removal of vegetation, changes in composition, and decrease in vigor of plants. Use of the spring development by livestock would result in removal of vegetation immediately around the water trough, a circle roughly 50 yards in radius. Sacrifice areas would occur adjacent to the spring source and each of the water wells. Total disturbed area would be 2.6 acres for the spring development and 1.8 acres per water well development (Table 4-36). The vegetation would be removed mainly by livestock trampling. These areas would be mostly devoid of vegetation and would remain in that disturbed condition due to the continual use of the water trough. It is anticipated that there would be a decrease in the vigor of the vegetative species immediately surrounding the sacrifice area. The decrease in vigor would come about from the dust on the plants, the partial trampling of vegetation by livestock, and the heavy grazing which commonly takes place around water sources.

The development of the water wells would improve the distribution of livestock over the ACCA, thus promoting a more even utilization of the forage. Proper utilization of the forage is important in maintaining or improving the vegetative vigor, production, or range condition (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984). The properly-placed water developments, combined with the grazing systems, would pull the livestock from the overused existing natural water sources such as Crooks Creek and Lost Creek, allowing these areas to improve in vigor and production.

Overgrazing is marked by a disappearance of the preferred plants or of those physiologically less-resistant to grazing. Less-preferred or more resistant plants may survive and replace the removed plants (Stoddart, Smith, and Box 1975). This would eventually lead to a change in composition. Continued grazing would cause an influx of species, called invaders, which are not part of the natural plant communities. The invaders would be mobile annuals, but later, would encourage the establishment of herbaceous or woody perennials of low value (Stoddart, Smith, and Box 1975).

Any place which has the existing vegetation removed provides an opportunity for other plants to begin growth. The construction, maintenance, and use of the various proposed projects may cause enough disturbance to permit increased numbers of poisonous plants to invade the site. For example, halogeton (*Halogeton glomeratus*) is a poisonous annual often found on disturbed sites. The amount of trampling and utilization of the vegetation would decrease as the distance from water increased.

Table 4-36 depicts the estimated number of surface acres that would be disturbed as a result of the construction, maintenance, and continued existence of the proposed range improvements for this alternative.

**Table 4-36. Surface Acres Disturbed
Alternative Four Long-Term Proposed Range Improvements***

Type of Improvement	Number	Acres Disturbed per Unit	Total Acres Disturbed
Spring development	12+	2.6	31.2
Three-Wire fence (Use Area/Pasture boundary)	19 miles	1.5/miles	28.5
Riparian pasture fence	9.0 miles	1.5/miles	13.5
Cattleguard	3	0	0
Water well (new and existing) development	16	1.8	28.8
Reservoir reconstruction	3	4.0	12
Exclosure (Artesian wells/wetland fenced)	0	.2 on fenceline .9 inside permanent exclosure	0 on fenceline 0 inside permanent exclosure
Pipeline	0 miles	.1/miles	0
		Total	114
*See Appendix 11 for rationale.			

Summary

Short-term impacts under summer grazing (treatments A, B, D and N) would be reductions in plant vigor, litter accumulation, and seed production. Short-term impacts from fall and winter grazing (treatments B, H and J) would be reductions in plant vigor and litter accumulation. The summer-long rest and year-long rest (treatments G, O and

P) treatment would increase vigor, litter accumulation, seedling establishment, and seed production for the proposed Alkali Creek Sheep Pasture, the rotating rest pasture in ACCA and five riparian management pastures. Rest periods, which comprise part of treatments A and B, would enhance the vegetation by increasing vigor, root growth and replacement, seed production, and litter accumulation of the vegetation. The short-term impacts, such as increased vigor and seedling establishment would be enough to offset those which would be detrimental due to the moderate (20 percent) increase in long term grazing use above the 1980-2006 level (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The proposed long term use level (39,455 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) are 68 percent of the long-term average available livestock forage shown in Table 3-8, Present Allotment Production. Blaisdell and Holmgren recommended the basic stocking level on Intermountain salt-desert rangelands at 75 percent of the long-term average forage production because of the normal inability to adjust animal numbers to the wide variations in forage yield. This recommendation is based on long term forage (1935-1974) production on moderately-grazed (11 acres per AUM) salt desert rangeland. This recommendation provided adequate forage except in years when production was extremely low. The proposed long term use level (39,455 AUMs) for all grazing animals (cattle, sheep, wildlife, and wild horses) would be an average stocking rate of 11.9 acres per AUM on the public land within the ACCA and GMA. The last nine years (1999-2007) of below average precipitation have required lower livestock use levels to manage for rangeland health standards and provide for drought recovery.

Under this alternative, additional forage will be made more readily available for utilization as a result of increased distribution of livestock through range improvements. In the long term the upland areas located away from present livestock water sources within the North Arapahoe, South Arapahoe, Antelope Hills, Picket Lake, and Happy Springs Pastures and GMA would receive a 64 percent increase in grazing use over the 1999-2006 use levels. The area within the Picket Lake, North Arapahoe and South Arapahoe Pastures (formerly Seven Lakes Incommon Allotment), approximately 40 percent of the GMCA (refer to Appendix 6), would receive most of this increased grazing use. This increased livestock grazing intensity, combined with the grazing systems, would result in the vegetation of the upland areas maintaining or slightly improving in vigor, root growth and replacement, production, seed production, and litter accumulation (Blaisdell, et al. 1982, Blaisdell and Holmgren 1984, Holechek et al. 1998).

The upland and lowland areas within the Alkali Creek Sheep Use Area and Long Slough Pasture would improve in vigor, production, seedling establishment, seed production, and litter accumulation due to the lack of grazing during the summer growing season and year-long rest period.

Implementation of this alternative would result in a slight increase in production (USDI-BLM 1979, Blaisdell and Holmgren 1984). Also, by 2019, it is expected that there would be a static trend in upland range condition, a static to improving trend in those riparian areas outside riparian pastures within the Antelope Hills Pasture. Platts and Nelson (1989) rated rest-rotation grazing systems as fair for improving stream and riparian habitats (refer to Appendix 10). However, the proposed rest-rotation grazing system, which limits the summer grazing period to 35 days for this pasture, would allow for long-term improvement compared to the existing situation (Myers 1989, Masters et al. 1996b, Mosley, et al. 1997, Clary and Webster 1989, Clary and Webster 1990, USDI-BLM 1998).

Construction of the proposed range improvements would cause the loss of approximately 114 acres from production. Major impacts to the vegetation would be the removal of vegetation in the vicinity of the water troughs and the decrease in vigor of the vegetation through trampling and heavy grazing by livestock, wild horses, and wildlife along fences.

Overall, the impacts upon vegetation by implementation of this alternative are: (1) a static to slight increase in the percent composition of those vegetation species that are more desirable forage for livestock, wild horses, and wildlife (i.e., grasses, forbs, saltbush, and winterfat would increase relative to big sagebrush); (2) a slight increase in

production; (3) a static to upward trend in the condition class on the upland areas adjacent to water sources and on an estimated 76 percent of the public land riparian areas in the allotment; and (4) a stable trend in live vegetation cover (USDI-BLM-1979)(Holechek et al. 1998).

Wetland-Riparian Vegetation

Under this alternative, riparian pastures would continue to be grazed with a limited number of cattle for a predetermined amount of time in either the spring or the fall. Spring exclusions/developments would continue to be excluded from grazing. However, under Alternative Four, each riparian pasture would receive two years of rest out of every five, because grazing would not be permitted if cattle were present in those areas during the hot season (mid-summer). Improvement in plant diversity, variety of age classes, and structure in plant communities in riparian exclusions would be the same as those described under Alternative One. Improvement in riparian pastures would be similar to Alternative One, but accelerated due to the additional rest built into the grazing regime.

Riparian areas outside protective exclusions or pastures would also improve, even with hot season use, because of the limited amount of grazing time allotted for each pasture. In addition, these areas would also receive one year of rest out of every five, accelerating their improvement beyond that described in Alternative One.

EFFECTS ON LIVESTOCK GRAZING (Alternative Four)

Short Term Cattle

This alternative would provide for an initial use level of approximately 25 percent of permitted use. The extensive (75 percent for cattle) nonuse which has been authorized in the allotment over the past nine (1999-2007) years would continue in the short-term to allow for drought recovery and construction of range improvements. This policy is discussed in Assumptions for Analysis.

Interim Cattle

Under this alternative by 2017, there would be a 27 percent increase (from the 1999-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,300 to 3,850 head (refer to Appendix 5) by the end of the interim implementation period.

Under this alternative by 2017, there would be a 2 percent increase (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,900 to 3,850 head (refer to Appendix 5) by the end of the interim implementation period.

Long Term Cattle

Under this alternative by 2027, there would be a 56 percent increase (from the 1999-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of cattle from approximately 2,300 to 4,700 head (refer to Appendix 5) by full implementation of the AMP in the long-term.

Under this alternative by 2027, there would be a 25 percent increase (from the 1980-2006 average authorized cattle use) in spring-summer-fall cattle AUMs which would impact 18 cattle permittees by increasing the number of animal units of cattle use they would graze on public land within the GMCA. This alternative should not change the performance of individual animals but should increase the number of cattle from approximately 2,900 to 4,700 head (refer to Appendix 5) by full implementation of the AMP in the long-term.

Short Term Sheep

This alternative would not enable two grazing permittees to convert 1,325 winter sheep AUMs to 689 summer cattle AUMs and 5,194 (former Seven Lakes) to 4,940 (former Green Mountain) summer sheep AUMs to 5,017-4,158 summer cattle AUMs as the water developments become operational. Further, the two permittees, Stan and Linda Cole and W.S. Baldwin, would not experience an increase in the value of their base property to which their federal grazing permits are attached over the short-term because there would be no livestock conversions authorized under this alternative. In the short term, this alternative would not change the current level of economic viability of these two livestock operations.

Interim Sheep

Under this alternative by 2017, there would be a 62 percent increase in yearlong sheep AUMs (from the 1999-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 1,450 to 2,350 head (refer to Appendix 5) by the end of the interim implementation period.

Under this alternative by 2017, there would be a 13 percent decrease in yearlong sheep AUMs (from the 1980-2006 average authorized sheep use) which would impact two sheep permittees by decreasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but would decrease the number of sheep from approximately 2,700 to 2,350 head (refer to Appendix 5) by the end of the interim implementation period.

Long Term Sheep

Under this alternative by 2027, there would be a 97 percent increase in yearlong sheep AUMs (from the 1999-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 1,450 to 2,850 head (refer to Appendix 5) by full implementation of the AMP in the long-term.

Under this alternative by 2027, there would be a 6 percent increase in yearlong sheep AUMs (from the 1980-2006 average authorized sheep use) which would impact two sheep permittees by increasing the number of animal units of sheep use they would graze on public land within the GMCA. This alternative would not change the performance of individual animals but should increase the number of sheep from approximately 2,700 to 2,850 head (refer to Appendix 5) by full implementation of the AMP in the long-term.

Long Term Dual Use

From implementation of this alternative, a long-term increase in AUMs is predicted. By 2027, it is expected that there would be an improvement in upland range condition of at least one-half condition class resulting in fewer acres in low seral (poor) condition; fewer acres in mid seral (fair) condition; more acres in late seral (good) condition; and more acres in potential natural community (excellent) range condition (USDI-BLM, 1979). Improvement in upland and riparian forage conditions in the long-term would result in an increase in dual use (cattle and sheep) AUMs. The condition of riparian areas outside the riparian management pastures (approximately 1,360 acres or 66 percent of the public land total) is expected to remain static in the short term and begin to improve in the interim period. Improvement in vegetation cover and diversity would continue into the long term. Rest and deferred-rotation grazing systems were evaluated by Platts and Nelson (1989). Although these systems were only rated as fair for improving stream and riparian habitats (refer to Appendix 10), the reduced grazing use levels in the short term and interim periods would increase the rate of riparian area recovery.

Range Improvements

Table 4-37 lists the proposed range improvements and estimated project costs for their construction and installation at \$590,630 to \$611,320. Table 4-38 shows estimated maintenance costs for the proposed range improvements at \$7,575 per year. The estimated construction costs would range from \$1.26 to \$1.30 per public land acre or \$12.47 to \$12.91 per public land AUM. Under this alternative, it is proposed these improvements would be completed by the end of year 13 (2020) and would be funded 50 percent by the BLM (out of range betterment funds) and 50 percent by the grazing permittees and other cooperators. The maintenance responsibility of the proposed projects would be assigned to individual grazing permittees or a formally recognized permittee grazing association depending on the type and location of project. These projects would be designed to solve the water and livestock distribution problems present on the allotment.

The current trends and conditions of the lowland (adjacent to existing waters) areas within the Arapahoe, Antelope Hills-Picket Lake, Green Mountain, and Happy Springs Use Areas would continue in the short term pending completion of the proposed water developments and fencing. Completion of the proposed water developments and fencing would occur in the interim period and these lowland areas would show improvement in plant vigor and then condition. Improvement in vegetation cover and diversity would continue into the long term. The overall improvement in condition of these lowland areas due to periodic rest and deferment should offset the increase (20 percent from 1980-2006 average or 64 percent from 1999-2006 average) in the grazing intensity.

The proposed water developments listed in Table 4-37 would enable the cattle to graze much more of the allotment, making approximately an additional 3,800 to 7,800 summer cattle AUM's available (from the 1999-2006 authorized use levels). This would allow increases in cattle numbers both in the interim and long term, leading to an increased income potential for the grazing permittees in the interim and long-term.

Herding

Under this alternative, herding would be mandatory on both allotments. The deferred and rest-rotation grazing systems both require moving livestock from one pasture to the next for pasture rotation. In addition, "back riding" would be required to gather remaining cattle left behind in the initial pasture move. In addition, herding would be needed to keep the cattle within the prescribed use areas and pastures. A description of the herding needed to implement the proposed grazing systems is in Description of Alternative Four and Section Management Actions Common to All Alternatives. A more intensive level of cattle herding would be required under this alternative. Nine to ten seasonal riders with the associated higher labor costs discussed in Effects on Socioeconomics would be necessary to accomplish effective herding. Sheep herding would also be required. It is estimated that the sheep herding would necessitate hiring two to three herders with the associated costs discussed in Effects on Socioeconomics.

The higher level of proposed range improvements listed in Table 4-37 would be installed to make the herding program more manageable. However, there still would be higher herding costs for permittees associated with nine to ten seasonal riders. Nevertheless, experience on GMCA has shown that cattle have congregated and stayed around water sources or spring developments in a rested or deferred pasture or riparian management pasture when effective herding has not occurred. The increased level of herding proposed under this alternative, would prevent most problems of this nature provided cattle locations and utilization levels are closely monitored and controlled by the "range riders".

Livestock operators in the allotment would benefit by the proposed pasture and riparian management fencing and use area/ pasture rotation because their cattle would be confined in a smaller area than presently. Although moving cattle during the summer (July-August) from one pasture to the other would result in temporarily reduced weight gains until the cattle adjust to their new range, cattle would be limited to an area of approximately one-quarter to one-third the size of the area they can now graze unrestrained. This would increase the probability of a cow being bred (USDI-BLM, 1979).

Table 4-37. Construction and Labor Requirements for the Proposed Range Improvements Under Alternative Four

Year	Project	Units/Miles	Cost ¹	Total
2-6	Three-wire (Use Area/Pasture Boundary)	19 miles	\$4,840 mile	\$ 91,960
2-6	Riparian Pasture Fencing (1 Pasture/Year)	9 miles	\$4,840 mile(barbed)	\$43,560
			\$2,541 mile (permanent or temporary electric)	\$ 22,870
2-6	Cattleguards (1 each/Year)	0	\$3,207 2-lane-24'	\$ 0
		3	\$1,694 1-lane-12'	\$ 5,080
2-13	Spring Development (Includes Fencing) (1 Each/Year)	12+	\$ 3,630 each	\$ 43,560+
2-5	Reservoir Construction	3	\$ 7,261 each	\$ 21,785
2-13	Water Well Development (new) (1 Each/Year)	12	\$31,462 each	\$ 377,545
1	Water Well Development (existing)	1	\$ 9,680 each	\$ 9,680
1-3	Water Well Development (existing) (1 Each/Year)	3	\$ 6,050 each	\$ 18,150
	Water Pipelines (0) (0 miles/year)	0 miles	\$ 7,624 mile	\$ 0
	Exclosure (Artesian Wells Wetland Fencing)	0 miles	\$ 4,840 mile	\$ 0
	TOTAL (Barbed Wire Fence)		(\$1.30/public land acre)	\$611,320
	TOTAL (Permanent Electric Fence)		(\$1.26/public land acre)	\$590,630

¹ Cost information on file at the Lander Field Office.

Table 4-38. Estimated Maintenance of Proposed Range Improvements Under Alternative Four

Improvement	Number of Units	Annual Maintenance Cost/unit ¹	Total Annual Maintenance Cost	Estimated Life of Improvements
Springs	12+	\$121	\$1,450	20+ years
Wells	16	242	3,870	20+
Pipelines	0 (miles)	61	0	20+
Reservoirs	3	120	360	20+
Three-wire fence	19 (miles)	61	1,160	20+
Riparian pasture Fence	9 (miles)	61	550	20+
Cattleguards	3	61	185	20+
Exclosure fence	0 (miles)	61	0	20+
		Total	\$7,575	

¹Cost information on file in the Lander Field Office

EFFECTS ON WILDLIFE/FISHERIES HABITAT AND SPECIAL STATUS SPECIES (Alternative Four)

Nongame Wildlife and Game Birds

Nongame wildlife and game bird habitat conditions are closely linked to riparian conditions; therefore, improvement of habitat and corresponding increases in nongame/game bird populations and species diversity could be expected to take place as riparian areas improve.

Big Game

Under Alternative Four, negative impacts to big game associated with fences and water developments would occur. Likewise, whatever benefit to big game that might be provided by the addition of water sources in areas where there were none previously would also be realized under this alternative.

With the expected distribution of livestock through mandatory herding, big game species would be able to utilize ungrazed pastures prior to livestock movement as described in Alternative One. This would likewise provide an opportunity for big game to use areas free from livestock disturbance. However, moving cattle in one large herd would likely result in the complete displacement of big game from a given area until the cattle herd was to move on. In the wake of this movement, herbaceous forage would be greatly reduced until regrowth could occur. Big game use of the Alkali Sheep Use Area would also be expected during the summer period when livestock are not present. As with Alternative One, herbaceous riparian vegetation would be expected to improve due to the lack of hot season livestock grazing.

Expected improvements in livestock distribution away from important wildlife habitat associated with Alternative One would also occur under Alternative Four, since both alternatives share the same prescriptions for water. Likewise, any increase in the availability of suitable habitat resulting in a slight redistribution of pronghorn and mule deer (i.e. east of Lost Creek and the area between Crooks Mountain and U.S. Highway 287) would also be likely to occur under Alternative Four.

An improvement in moose habitat conditions outside protective exclosures/pastures would be slightly better than those described in Alternative One, due to one year's rest out of five. Those conditions associated with willow riparian habitats along the Sweetwater River and Crooks Creek Riparian Pastures (when constructed) would be similar to those described in Alternative One; however, Alternative Four's improvements would occur more rapidly due to the additional rest (two years out of five).

Fisheries

Improvements in trout and nongame fisheries under Alternative Four would be similar to those described under

Alternative One, but would likely occur sooner because of reduced livestock numbers, relatively brief (though heavy) grazing before rotation, and one year of rest out of every five years. Fisheries improvements in riparian pastures would be even faster due to two years of rest out of five (see Wetland-Riparian).

Special Status Species

None of the actions proposed under any of the alternatives are likely to affect any federally threatened or endangered species that may occur in the allotment. Prior to authorization of any surface-disturbing activity, a threatened or endangered species review would be conducted to determine if any adverse, site-specific effects would occur. If the review indicates that a “may affect” situation would occur for any listed species, consultation with the U.S. Fish and Wildlife Service (USFWS) would be initiated.

Chapter 3 of this document (Affected Environment) mentioned three federally listed species to be analyzed for potential adverse effects. They were the Ute ladies’ tresses, blowout penstemon, and those species affected by Platte River depletion.

Although potential habitat for the Ute ladies’ tresses occurs within certain parts of the allotment, there would likely be no effect to this species for the following reasons: 1) occurrence of this species has never been documented in the Lander Field Office; 2) none of the alternatives represent a substantial increase in livestock grazing; 3) no habitat type conversions would occur as a result of any of the alternatives; and 4) any new surface-disturbing activities planned under any of the alternatives would be subject to a separate site-specific NEPA review.

Any future water developments proposed in the allotment under Alternative Four would be subject to review (and possible consultation) under the Platte River Recovery Implementation Program, effective January 1, 2007.

Of the thirty BLM Sensitive plant and animal species carried forward from Chapter 3 for consideration, impacts from Alternative Four would be similar to those described under Alternative One, with the following exceptions: 1) sage-grouse (and other ground-nesting birds) would likely be negatively impacted by the large concentrations of cattle associated with the grazing regime in this alternative; 2) nests and eggs would be more likely to be trampled by livestock in the first pasture of the season; 3) sage-grouse chicks could be trampled, and herbaceous plant communities necessary to early brood survival could be reduced by brief but intensive grazing in the second pasture of the season; 4) by the time the herd reaches the third pasture (mid- to late summer), it may be in competition with sage-grouse broods seeking forb plants in riparian areas. By this time, however, sage-grouse chicks would be fairly mobile and able to select foraging areas away from (and possibly ahead of) cattle. During the occurrence of these impacts in pastures of use, sage-grouse nesting and brood-rearing in the rest pasture would proceed completely undisturbed by livestock. Of the four alternatives considered in this document, Alternative Four most imitates the grazing behavior of the bison with which these sensitive plant and animal species evolved (i.e., concentrated and intensive but of short duration).

EFFECTS ON WILD HORSES (Alternative Four)

The impacts associated with this alternative are identical to those identified under Alternative One. Also, the impacts associated with the fencing in Alternative Two for the Green Mountain HMA, would be the same as in this alternative. The fencing proposed in the Green Mountains (approximately 22 miles new fence) within the Green Mountain HMA would be detrimental to the wild horses, as it would prevent migration from winter ranges to summer ranges. Potential fence traps for horses to be caught in would also be created, especially throughout the winter months when snows on the mountain become deep and fences cannot be negotiated. This fencing, combined with the privately planned fencing on Crooks Creek, would eliminate the travel zone that exists between the Green Mountain HMA and the Crooks Mountain HMA, and would remove a portion of the travel zone between Green Mountain and the Stewart Creek HMA. Consequently, the lost opportunity to develop a wild horse viewing loop would occur, and the visitor days could be reduced by as much as 100 visitor days.

EFFECTS ON CULTURAL RESOURCES (Alternative Four)

Prehistoric Sites

Alternative Four is projected to have similar impacts to prehistoric sites as Alternative One. This is because erosion, livestock congregation, and trampling would continue until this alternative's grazing systems begin to have desired effects. The key to this alternative having an eventual beneficial effect on cultural resources is rest. When adequate rest of riparian areas, combined with high intensity-short duration grazing, is successfully implemented, then prehistoric sites along those areas would slowly recover from past and current effects of erosion, livestock congregation and trampling. In the short term (0-5 years), as the Alternative begins to be implemented, known and not-yet-discovered prehistoric sites along riparian areas would continue to degrade. In the mid-term (5-10 years), as this alternative's new projects and grazing systems take effect, the degrading effects to these sites would diminish and may, in a few cases, disappear. In the longer term (10+ years), effects to prehistoric sites would begin to be positive, as positive conditions at prehistoric sites (lack of erosion and livestock concentration) outweigh previous conditions.

Eleven known significant prehistoric sites are known to be affected under this alternative. Not-yet-discovered sites along riparian zones affected by this alternative are predicted to number approximately 600 (see Table 4-14).

Historic Trails and Sites

Under this alternative, one fence is planned that would cross the Rawlins-Fort Washakie Stage Trail. This fence would cause one direct and one visual adverse effect (as defined in the NHPA and Wyoming State Protocol) to the Rawlins-Fort Washakie Stage Trail. Livestock trailing and trampling along this fence (which would close off water at Crooks Creek) may occur, which would also cause adverse effects.

Alternative Four is also projected to have similar impacts to National Historic Trails and historic sites as Alternative One. In the short term (0-5 years), as the Alternative begins to be implemented, five riparian area crossings of the Seminoe Cutoff National Historic Trail, and a site associated with the Seminoe Cutoff (Immigrant Spring) along riparian areas would continue to degrade. In the mid-term (5-10 years), as this alternative's new projects and grazing/herding systems begin to take effect, the degrading effects to these trail crossings and sites would diminish and may disappear. In the longer term (10+ years), effects to National Historic Trails and historic sites would begin to be positive, as positive conditions at these locations (reductions in erosion and livestock concentration) outweigh previous conditions.

As shown in Table 4-17 (see Alternative One, Cultural Resources section), it is projected that this alternative's long-term impacts would cause fewer impacts to prehistoric sites, National Historic Trails, other historic trails, and historic sites than Alternative Two, but would cause more impacts to these resources than Alternatives One and Three.

EFFECTS ON RECREATION, VISUAL RESOURCES AND OPEN SPACE (Alternative Four)

Range improvements and actions authorized under this alternative would slightly alter the recreation settings as documented in the affected environment. Changes to the GMCA recreation setting resulting from the full implementation of Alternative Four include:

1) Naturalness indicator - The naturalness indicator around the range improvement sites would demonstrate a setting indicative of that in a front country setting. This would intensify the trend documented in those (back country and middle country) areas within view and adjacent to the proposed Green Mountain fence and the southern area of the allotment where several new water wells would be developed. This change would occur on 2.84% of the 298,989 acres of back and middle country settings within the allotment.

2) Evidence of Use indicator - continued maintenance and monitoring of the range improvements proposed under Alternative Four would result in an evidence of use indicator in and around these improvements indicative of a middle country environment. All improvements within primitive or back country settings would alter the social setting around the project area to that of a middle country environment. This trend would occur on 2.84% of 298,988 acres of primitive and back country settings.

No impacts are anticipated to the remoteness indicator or the mechanized use indicators.

The new fence installation around the Green Mountain Use Area would slightly alter the unique “situational attribute” documented in the affected environment; although a large portion of the unfenced character would remain in the core of the allotment the installation of this fence would reduce the agency’s abilities to manage for this quality. As Sanderson, et. al. (1986) found, the installation of the Green Mountain fence would decrease visitor preference for the area.

Overall changes to the setting component of the recreational environment within the GMCA would be slight; therefore the availability/realization of the benefits and experiences would also be slightly impacted. It is anticipated that the extent of the projects developed during the implementation of Alternative Four would not alter the setting to a threshold where the recreational experiences and benefits are no longer available, modified, or extensively reduced.

Table 4-39. Percent Reduction in Existing Setting (acres) by Recreation Setting Indicator

ALTERNATIVE 4: Recreation Feature % Reduction in Existing Setting (acres) by Recreation Setting Indicator				
	Physical Indicators		Social Indicators	Administrative Indicators
Feature	Remoteness (to Middle Country)	Naturalness (to Front Country)	Evidence of use (to Middle Country)	Mechanized use (to Middle Country)
Big Game Hunting Area	0%	.34%	.34%	0%
CDNST	0%	1.39%	1.39%	0%
Green Mountain	0%	8.28%	8.36%	0%
NHT	0%	.30%	.30%	0%

General Public Big Game Hunting Recreation Feature

Alternative Four would slightly alter the general setting of the feature and potentially the recreational experiences and benefits. The new water developments and fence proposed under Alternative Four constitutes a reduced habitat quality, however gains in habitat quality due to the double rest rotation system proposed, intensive herding, and the reduced overall stocking rate would offset the range improvement impacts.

Continental Divide National Scenic Trail Special Recreation Management Area

Alternative Four would not extensively alter the general setting of neither the feature nor the recreation experiences and benefits, therefore little to no impacts are anticipated as a result of this alternative to the CDNST settings and the areas recreational experiences and benefits.

The rest rotation ‘one heard’ grazing system and increased stocking rates proposed to be implemented under Alternative Four would result in extensive livestock aesthetic impacts (cattle defecation etc) during the period when the large heard is in pastures containing the CDNST, otherwise aesthetic impacts before and after a grazing period would be slight. Alternative Four would increase recreation experience and benefit detracting livestock encounters (Wallace, et al 1996) such as cows near camp, manure on the trail, and cows or impacts near streams. During rest or deferment periods in pastures containing the CDNST the aesthetics would improve. It is also anticipated that the implementation of this alternative would impact water quality during and after use periods, however during rest periods the water quality would be enhanced. Overall the alternatives rest rotation proposal would benefit the function of riparian areas in turn enhancing the quality of the unfenced CDNST water sources.

Green Mountain Recreation Feature

Impacts to recreation settings are anticipated in the Green Mountain Recreation Feature as a result of the fence and other projects around the mountain. However, the removal of the mountain from the general allotment would facilitate a rest period in the feature. The rest facilitated by the fence would offset setting impacts, and may actually enhance and/or increase the realization rate of the recreational experiences and benefits on the mountain.

National Historic Trail Recreation Special Recreation Management Area

Very slight impacts to the recreation setting and the resulting recreation experiences and benefits in this Special Recreation Management Area are anticipated as a result of this alternative.

Visual Resources

Alternative Four would decrease visual quality of the vegetative component during and after use periods. During rest and deferment periods the vegetative visual quality would improve. Over 20 years Alternative Four would benefit the visual quality of the vegetative component through increases in variety and contrast. Increases in vegetation would eventually recover the movement and color contrast components (key factors in drawing visitors' attention to the landscape) rendered in the vegetation. In turn the recreation setting and realized/available experiences and benefits would also be enhanced as a result of the benefits rendered to the visual quality of the historic trail landscape.

Open Space

The reduction in AUMs under this alternative would likely cause some permittees to leave the ranching business and to sell private lands within their ranching operations. However, this impact is not expected to occur to the degree described in Alternative Three since not as many AUMs would be reduced. Some of those private ranch lands are surrounded by or adjacent to BLM-administered public lands within the GMCA. Others are located within view of US Route 287, one of the main tourist routes to the National Parks and a major thoroughfare for the area's residents. The potential for the development of rural subdivisions in and near the GMCA would likewise increase as a result of the sale of these private lands. The development of rural subdivisions in the area would decrease the amount of open space related to the allotment and nearby agriculture lands. The potential effects of rural subdivision development would be comparable to, or greater than, the loss of open space associated with the development of the Pappy Draw Oil Field and, unlike mineral developments, would be permanent with unmitigated long term impacts to wildlife, recreation, visual resources and other resource values.

The area where these rural subdivisions could occur have been identified in a report entitled "Strategic Ranchland in the Rocky Mountain West" written in 2000 by American Farmland Trust (AFT), the Center of the American Trust, and the Nature Conservancy. Those lands lie between Sweetwater Station and Muddy Gap Junction in the Sweetwater River Valley. Several ranches owned by GMCA permittees that are currently identified as "Strategic Ranchland at Risk" appear on the map that accompanies this report.

EFFECTS ON WILDERNESS STUDY AREAS AND WILD AND SCENIC RIVERS (Alternative Four)

The table below contains a discussion of each required WSA value/data element and determines whether the level of impact from the action exceeds maximum allowable standards as directed by the Interim Management Policy for Lands under Wilderness Review.

Table 4-40. Predicted Impacts to Wilderness values as a Result of Implementing Alternative Four

Wilderness Value Indicator	Impact Description	Will the Impact Exceed Maximum Allowable Standard?
Visual Resource	Full implementation of Alternative four would result in slight change to the visual resource. Slight loss of the vegetation component in the riparian system would result in a loss of the movement element created by these taller grasses. Prior to the grazing season and especially during the pastures rest or deferment period this change would not be obvious to the casual observer. Long term recovery of this element would occur quickly due to the level of rest, active herding, and decreased stocking levels. .	No
Naturalness and Solitude		
Human Activity	Human activity would increase due to the intensive herding	No

	required in this alternative. This increase would only occur in the GMCA portion of the WSA for a short duration every 4 years out of the 5.	
<u>Wildlife presence</u>	Since this alternative relies heavily on herding and a rest rotation grazing system it is anticipated that increases in livestock encounters would be dispersed and not concentrated. This lack of concentrated livestock impact area would enhance the wilderness experience from the current condition.	No
Primitive Recreation		
Recreation Opportunities	Alternative 4 proposes no new projects in the WSA, additionally the main feature of the WSA is un-affected by livestock grazing resulting from this AMP. The above factors cause no change to the recreation setting and therefore no change to the corresponding opportunities available in the WSA. In addition it is anticipated that alternative 4 would not degrade visitor experiences in the area of the WSA contained within the GMCA.	No
Natural Appearing Environment	Slight reduction in the naturalness component of the recreation setting would occur in the riparian areas outside the Sweetwater Canyon Fence. This reduction is a result of poor riparian functionality and increased presence of livestock. In the long term the full implementation of the alternative would increase riparian functionality and reduce the presence of livestock.	No
<u>Surface Water</u>	Within the WSA fence water quality is expected to be good due to the years of rest and subsequent controlled grazing this has received; also, the WDEQ has monitored and assessed the Sweetwater River and removed it from the impaired water body list within the past ten years.	No Further Analysis Below
Vegetation		
Ecological Site Inventory	No lowering in seral condition would result from this alternative. Periodic rest, utilization triggers for livestock removal, and the increased ability to respond to triggers through herding would help managers work toward an upward trend.	No
Vegetation Utilization	Livestock would be moved based on utilization standards. The standard within the WSA would by definition be 50%.	No
Plant Vigor	No long term decrease in plant vigor would result from this alternative. Stubble height and utilization triggers for livestock removal would help managers improve riparian and upland range conditions.	No
Wildlife		
Wildlife Habitat	Under Alternative 4, this area would be grazed intensely for a relatively short period of time four years out of five and rested during the fifth. By this prescription, the impacts associated with livestock grazing would be minimized, recovery by vegetation would be rapid, and habitat quality would be expected to increase.	No
Population	The increased habitat quality described above should lead to an increase in population, especially for plants and non-game species.	No
Diversity	Decreased impacts to riparian areas, especially during the hot season, would be expected to cause some increase in diversity among plants and localized animal species.	No

WSA Resources Requiring Further Analysis:

Surface Waters

Outside the fence this alternative relies on herding to prevent over use of the riparian zones. In the long term plant vigor and production is expected to increase. As more extensive root systems develop, increased water infiltration and retention, through increasing the organic matter content of these soils, can be expected.

CUMULATIVE IMPACTS (Alternative Four)

Soil and Vegetation Resources

There are currently 133 acres undergoing impacts from livestock (i.e., sacrifice areas) and/or project developments (e.g., springs, wells, fences, and reservoirs) from projects completed since implementation of the 1999 Final Decision. This alternative would call for the completion of 12 spring developments, 16 new wells, and three reservoirs. Alternative Four would create 114 acres of new sacrifice area disturbance. This would amount to a total 247 acres of sacrifice areas.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in Alternative One. An estimated total \$7,575 of additional maintenance costs would occur upon completion of the proposed range improvement projects in this alternative by 2021.

Wildlife/Fisheries Habitat and Special Status Species

Additional fencing in the GMCA, in combination with fencing proposals in the Rawlins Field Office to improve livestock management south of the allotment, could negatively impact antelope movements of the Red Desert Antelope Herd as they move to crucial winter habitats near Rawlins and Interstate 80. Antelope would continue to be able to migrate to these crucial winter habitats, but new fencing could slow migration or change migration patterns.

The cumulative impacts of habitat loss from proposed water developments coupled with energy development and the CO2 pipeline would be the same as that described under Alternative One.

Wild Horses

The pasture and riparian fencing would be detrimental to the free-roaming character of the wild horse herds in the allotment. Any fencing would impede natural movements of wild horses within the herd areas. Fencing could also prevent horses from moving to open areas that are blown free of snow during winter months; this could cause stress and winter die-offs that have previously not occurred.

Cultural Resources

Reductions in trampling and congregation near natural water sources and riparian areas would decrease impacts to cultural resources, causing a positive trend in their long-term survival. However, new fencing across the Rawlins-Fort Washakie Stage Trail would degrade the historic character of this historic resource.

Recreation and Visual Resources

The actions and the intensity of those actions authorized (and the developed mitigation) under Alternative Four would not comprehensively compound the trends documented in the affected environment. Therefore, cumulative impacts to the recreation setting and the available/realized experiences and benefits would occur at a similar rate to that documented in the affected environment.

Off Site Impacts to the Recreation Features

Since Alternative Four maintains the existing setting and recreation outcomes for the general allotment, there would be no offsite impacts to the recreation features as a whole. Alternative Four maintains the distinct niche represented by the setting of the GMCA.

Wilderness Study Area and Wild and Scenic Rivers

The intensity of impacts as a result of Alternative Four would not exceed maximum allowable impacts for the WSA and WSR resource. The impacts that would occur are on a localized level and probably could be mitigated without

causing additional impacts. Potential to impact recreationists experience and benefit realization level exists, however this would occur in access areas and during the trip into the core WSA only. The area contained within the WSA and WSR does not have any known reasonable foreseeable actions that might synergies with the above impacts. In addition, no impacts to the WSA resource as a whole are anticipated as a result of the actions planned for Alternative Four.

RESIDUAL IMPACTS (Alternative Four)

Soil and Vegetation Resources

In about one to two decades, the Alkali Creek Common Allotment would show changes in the lowlands as the upland water sources are developed, livestock rotations and rest are implemented in the pastures, and more of the grazing use is shifted to the uplands. Lowlands would also show increases in vegetative/litter cover and vegetation height. This would result in lower erosion rates and contribute increased amounts of organic matter to the soil. Water quality, infiltration, and the storage of water and nutrients would also be enhanced by increased organic matter inputs to the lowland soils.

The smaller, new Green Mountain Allotment would also be expected to show some improvement in this period due to the planned grazing deferment, herding, and the naturally higher amounts of precipitation that occur on the mountain.

The residual impact to soils and vegetation from this alternative would be to create approximately 114 acres of sacrifice area associated with the new construction of nine miles of riparian fence, 19 miles of allotment division fence, 12 spring developments, 16 wells, and 3 reservoirs.

Approximately 114 acres of sacrifice areas around new water developments would be created. The vegetation would be removed mainly by trampling and somewhat by livestock and wildlife consumption. These areas would be mostly devoid of vegetation with some compacted soils and would remain in poor condition due to the continual use of the water source. It is believed that there would be a decrease in the vigor of the vegetative species immediately adjacent to the sacrifice area. The vigor decrease would come about from the dust on the plants, soil compaction by livestock soils are moist, the trampling and resulting mechanical damage of vegetation by livestock, and the heavy grazing which commonly takes place around water sources. Another 42 acres (28 miles fence x 1.5 acres trailing disturbance per mile = 42 acres) would be affected by the trailing of livestock, wild horses, and wildlife along the proposed pasture and riparian management fences. Trailing would cause the removal of vegetation through trampling and compaction of the soil. Higher erosion rates would also ensue on these areas devoid of vegetation. There would also be 28 miles of allotment division and enclosure fence-associated maintenance road altogether. Rill and gully initiation would occur on the sloping locations over time. Sandy soils would be prone to scouring by wind. The denuded, compacted, and heavily-used areas would also be the areas most prone to weed establishment.

Riparian soils occurring outside of spring development/enhancement enclosures, riparian pastures, and special riparian grazing treatment pastures would be maintained in their current seral stage, or would trend slightly upward over an exceptionally long period of favorable growing conditions. This would occur on approximately 229 acres (11 percent) of the low seral stage riparian soils in the allotment. Oftentimes, the most degraded areas would not come back, as too much soil fertility has already been lost; however, the greatest chances for improvement can be found in the mid-seral systems that account for approximately 70 percent of those systems that are not severely degraded, and that still retain some inherent soil fertility. Enhancing these mid-seral systems and keeping them from falling into low seral conditions would benefit the largest percentage of riparian/wetland areas in the long term.

Livestock Grazing

An estimated total of \$10,540 in annual maintenance costs have accrued through 2007 as a result of construction of the range improvements in Alternative One. An estimated total \$7,575 of additional maintenance costs would occur upon completion of the proposed range improvement projects in this alternative by 2021. An estimated combined total \$18,115 of additional maintenance costs would accrue in the long term.

Wildlife/Fisheries Habitat and Special Status Species

Approximately 480 acres of public land riparian habitat occurring outside special riparian management areas would be maintained in less-than-desirable conditions for sage-grouse brood rearing and nongame wildlife habitat. Reduced vegetative cover and lower production of forbs and insects would contribute to these conditions.

Increased distribution of pronghorn antelope and, to a lesser extent, mule deer, would occur as a result of additional waters being developed in areas that currently have no water.

Wild Horses

Development of range improvements would change distribution patterns and draw wild horses into areas that were previously not used. Implementation of any grazing management other than season-long grazing would tend to improve the forage base over time. This would provide a better forage base for wild horses than currently exists.

Cultural Resources

Due to the decrease in livestock grazing impacts and the resultant decreases in erosion, damage, and disruption to cultural resources, improvements to the condition of prehistoric sites, the OMCPE Trail, and the Seminoe Cutoff would slowly occur. However, the Rawlins-Fort Washakie Stage Trail would be further degraded due to increased modern intrusions.

Recreation and Visual Resources

The slight loss of the nearly undeveloped character of the allotment in addition to the slight loss of the unfenced “situational attribute” constitutes a residual impact to the recreational setting and available/realized experiences and benefits. Alternative 4 would slightly limit future recreation management options for the allotment. In addition any setting changes consistent with the trend indicated in the affected environment would alter the setting in a direction that is nearly impossible to reverse (Clark 1979).

Wilderness Study Area and Wild and Scenic Rivers

The indirect and direct impacts documented for Alternative Four do not exceed maximum allowable standards as identified in the Interim Management Policy For Lands Under Wilderness Review. In addition this level of impact does not exceed impact standards for the WSR resource. Therefore residual impacts to the WSA and WSR resource would be slight as a result of the alternative. As long as portions of the WSA and WSR resource are unfenced from the GMCA slight visual and aesthetic impacts would continue in these areas. In addition slight visual resource impacts would continue as a result of the WSA fence. However, the slight change facilitates quality visitor experiences in the interior of the WSA. In addition light livestock use and encounters would continue to occur in GMCA portions of the WSA. These residual impacts would not exceed the maximum allowable thresholds contained in the Interim Management Policy.

EFFECTS AND COMPARISON OF ALTERNATIVES ON SOCIOECONOMICS

Introduction

This section analyzes the estimated socioeconomic impacts associated with the management alternatives considered in this document. More specifically, the analysis focuses on the estimated income and employment impact associated with each alternative. The analytical procedure used for quantifying the impacts is a regional Input/Output model based on secondary data and then calibrated to represent the local conditions found in Fremont County. The analysis itself was done by David (Tex) Taylor (University of Wyoming), who used a calibrated IMPLAN (Minnesota IMPLAN Group, Inc.) model for Fremont County; the output of that effort is the source for the estimated impacts depicted later on in this section.

In addition to the IMPLAN analysis, a benefit/cost (B/C) analysis was done for all the alternatives (see Appendix 25). The purpose of this analysis was to provide additional information as an aid in ranking the alternatives. However, it should be mentioned that the B/C analysis only focused on the benefits and costs measured in the market place. The nonmarket impacts, such as values associated with open space, preservation of historic trails, protection and enhancement of riparian areas, protection and enhancement of protected species habitat, improvement of wildlife habitat, etc, were not quantified and incorporated into the analysis. Consequently, the B/C results represent only the market benefits and costs and not the nonmarket impacts. Therefore, the reader should be cautioned against using the results from the B/C analysis as the sole economic ranking criteria for ranking the

alternatives. Moreover, it should be pointed out that even though the nonmarket impacts were not quantified for the purposes of this analysis does not mean that these values were considered inconsequential. On the contrary, other studies done by authors such as John Loomis (Colorado State University) have clearly shown that once these nonmarket values are quantified they often represent a substantial contributor to the overall impacts. Nonetheless, even with the nonmarket caveat, results from the B/C analysis provide useful information that can be used in part to compare alternatives. A B/C section later on discusses the results derived from the B/C analysis.

Assumptions for IMPLAN

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It also includes the "ripple effect" ("multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts and accounts for changes in industries that sell inputs to the industries that are directly affected. It also quantifies the induced impacts which are the result of changes in household spending as household income increases or decreases due to the changes in production.

This analysis involves quantifying the direct changes in economic activity for some sectors in IMPLAN, which create indirect changes in activity for related sectors due to the "ripple effect". These production and consumption relationships, also called input-output relationships, are derived by IMPLAN to estimate the indirect and induced impacts based on changes in production that may result from a specific management alternative.

The technical assumptions for the IMPLAN model are:

Changes in exports are a driver of economic activity in the study area and affect output, earnings and employment, which in turn impacts population

Economic impacts to the study area accrue from BLM decisions impacting exports from the study region. This would include decisions affecting activities such as livestock grazing, oil and natural gas development and production, increased recreation opportunity, etc.

Indirect and induced benefits are quantified by the IMPLAN model.

Expenditures of residents would occur in the region regardless of BLM's actions that affect recreational opportunities, but changes in nonresident recreation patterns would alter the amount of money entering the local region. Thus, the analysis of economic impacts from recreation considers only recreation expenditures of nonresidents of the study area.

Regional Economic Impact Analysis Common to All Alternatives

IMPLAN was used to estimate the earnings and employment impact for all alternatives and the analysis was done in 2005 dollars. For the purpose of this effort, the impacts were separated out into direct impacts created by the BLM management action itself. Then the indirect and induced impacts generated by the direct change in economic activity created by the management action itself were also quantified. To illustrate how this works, suppose a management action creates increased livestock sales delivered outside the study region. This is the direct impact of the management decision. It is then assumed that this increased activity drives additional sales and purchases that have an impact on both earnings and employment within the study region, which is referred to as the indirect impact. Finally, the resultant impact of this additional economic activity increases jobs and income for households, which are referred to as the induced impact. The extent of this additional impact (indirect and induced) is often referred to as the multiplier effect, which would also be quantified.

To further clarify what is meant by using a regional impact analysis or input/output model (IMPLAN) to quantify the impacts associated with the alternatives being analyzed within the study area, the analysis starts out by identifying and quantifying the direct impacts associated with the alternatives being analyzed. For this analysis, the direct impacts are defined as those caused by the specific management action being analyzed and further assuming that they occur at the same time. For example, the direct impacts are assumed to occur simultaneously even though in reality these impacts may take time to work their way through the sectors in the study area. To illustrate this point, assume there is a management action being proposed that permits additional grazing on public lands. Furthermore, for the purposes of this example, it is assumed the result of this action results in exporting additional livestock sales outside the study area. This produces a direct infusion of money into the local economy. From a theoretical view, the impacts of this economic activity would be assumed to occur instantaneously. Moreover, to

capture the impact over time, the annual estimated increased livestock sales in our example are estimated over the project horizon, which in this case is 20 years. The result of the regional analysis quantifies the expected economic impact resulting from a continuing direct injection of revenue produced by the hypothetical increase in livestock exports into the study area's economy.

Once the direct impacts have been quantified, the indirect impacts are estimated. For the purpose of this analysis, the indirect impacts are generally defined as impacts caused by the direct impacts generated by management action associated with each alternative. From a theoretical standpoint, indirect impacts are a result of the direct impacts discussed above and they are also assumed to occur simultaneously. However, in the real world, just as direct impacts take time to work their way through the study area's economy, the indirect impacts also take time to work their way through the economy. Given the fact that management decisions impact the study area's economy over time, the direct and indirect impacts are estimated on an annual basis through the life of the planning horizon based on the estimated annual direct impact of the management decisions.

The economic activity created by additional livestock sales outside the region in our hypothetical example increases household spending and employment. The result of this economic activity is referred to as the induced impact and it further increased the economic activity created by the direct infusion of revenue in the study region from the initial increased livestock exports.

While the previous discussion provided a general understanding of the theoretical underpinnings of an input/output analysis, it is also important to have a general understanding of the likely economic outcome associated with BLM decisions affecting federal grazing in the GMCA before attempting to estimate the regional impacts. In other words, what is the likely economic affect of federal grazing reductions? Of course that depends on whether or not the reductions are real. Are they paper reductions or are they actual reductions that impact the historic stocking levels on the GMCA? If they affect the historic stocking levels then there are cash flow implications. If not, it can be argued that the cash flows are not impacted. For the purposes of the IMPLAN analysis, it is assumed that the level of economic activity associated with the livestock sector is a function of the forecasted AUMs by alternative. However, it needs to be noted that in order to determine if these cash flows reductions are actually realized, they have to be compared to historical long term actual use that will be discussed later on in this section.

Focusing on the IMPLAN analysis, it would be inappropriate to estimate the impact of BLM grazing reductions by simply evaluating the impact based on the average value of a BLM AUM of production because it does not fully account for the overall impact to the individual ranching operation. Consequently, if the IMPLAN runs were based only on the value of the direct production associated with BLM grazing to the ranching operation, the regional impact would be underestimated. On the other end of the spectrum, it could be argued that a BLM decision to reduce grazing that simultaneously impacts all the operators over a large area could lead to the affected operators being put out of business. Should this actually happen, the estimated economic impact to the study area would be based on a loss of economic activity from all these operations going out of business. However, taking this approach would likely overstate the impact. Not all operators would go out of business. Some operations would be sold and the new operator may be able to continue producing livestock. Moreover, other income producing activities could spring up in place of these operations shutting down, which would again offset the negative effect to the study region.

A more likely scenario is the affected permittees would adjust their operation to maximize profits. Based on Linear Programming (LP) work done at the University of Wyoming, this would entail a reduction in herd size that produces a negative impact on cash flows. There would also be a corresponding reduction in the economic activity in the study area. So for this analysis, the IMPLAN runs are based on the premise that the operators would respond to BLM reductions in grazing by modifying their operation to maximize profits and a corresponding reduction in economic activity within the study would occur, which is quantified by the IMPLAN results presented below.

In order to perform this analysis, the resource specialists estimated the impact by year and by alternative. From this effort, it was clear that the two resources showing the largest impact were livestock grazing and recreation visitor use. Therefore, the estimated level of grazing by livestock type and year for each alternative was estimated and serves as the foundation for the IMPLAN analysis. Likewise, the annual visitor days by type of recreation for each alternative was also estimated and the estimated recreation impact produced by IMPLAN is a product of that work as well.

Geographic Area Evaluated for Impacts

The study area for this analysis is Fremont County.

Regional Impacts

Alternative One

Table 4-41 illustrates the IMPLAN run for Alternative One. For this alternative, the direct impact (Value of Production) from livestock grazing produces about 2.1 times that amount in total economic impacts. With regard to recreation, the multiplier is lower than it is for livestock grazing and translates into slightly over 1.3, which means that the total impact derived from recreation is little over 1.3 times the direct impact. Overall, the average multiplier is slightly over 1.84 for the 20 year planning horizon, meaning that the total impact is 1.84 times the direct impact shown in Table 4-41.

Table 4-41. IMPLAN Run for Alternative One

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Direct Effects										
Livestock Grazing	\$971,991	\$971,991	\$971,991	\$971,991	\$971,991	\$990,931	\$1,009,872	\$1,028,812	\$1,047,753	\$1,066,693
Consumptive Recreation	\$421,654	\$425,870	\$430,129	\$434,430	\$438,774	\$443,162	\$447,594	\$452,070	\$456,590	\$461,156
Non Consumptive Recreation	\$64,656	\$65,590	\$66,538	\$67,502	\$68,481	\$69,476	\$70,488	\$71,515	\$72,560	\$73,622
Total	\$1,458,300	\$1,463,450	\$1,468,657	\$1,473,922	\$1,479,246	\$1,503,569	\$1,527,953	\$1,552,397	\$1,576,903	\$1,601,471
Total Impact										
Livestock Grazing	\$2,030,368	\$2,030,368	\$2,030,368	\$2,030,368	\$2,030,368	\$2,069,977	\$2,109,586	\$2,149,195	\$2,188,804	\$2,228,413
Consumptive Recreation	\$560,821	\$566,429	\$572,094	\$577,815	\$583,593	\$589,429	\$595,323	\$601,276	\$607,289	\$613,362
Non Consumptive Recreation	\$87,314	\$88,577	\$89,861	\$91,165	\$92,491	\$93,838	\$95,207	\$96,599	\$98,013	\$99,450
Total	\$2,678,503	\$2,685,375	\$2,692,323	\$2,699,348	\$2,706,452	\$2,753,244	\$2,800,117	\$2,847,070	\$2,894,106	\$2,941,225

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
Direct Effects											
Livestock Grazing	\$1,093,540	\$1,120,386	\$1,147,233	\$1,174,079	\$1,200,925	\$1,227,772	\$1,254,618	\$1,281,465	\$1,308,311	\$1,335,158	\$22,147,501
Consumptive Recreation	\$465,768	\$470,426	\$475,130	\$479,881	\$484,680	\$489,527	\$494,422	\$499,366	\$504,360	\$509,403	\$9,284,392
Non Consumptive Recreation	\$74,700	\$75,797	\$76,911	\$78,044	\$79,196	\$80,366	\$81,556	\$82,765	\$83,994	\$85,243	\$1,489,000
Total	\$1,634,008	\$1,666,609	\$1,699,274	\$1,732,004	\$1,764,801	\$1,797,665	\$1,830,596	\$1,863,596	\$1,896,665	\$1,929,805	\$32,920,893
Total Impact											
Livestock Grazing	\$2,284,491	\$2,340,569	\$2,396,647	\$2,452,724	\$2,508,802	\$2,564,880	\$2,620,958	\$2,677,035	\$2,733,113	\$2,789,191	\$46,266,229
Consumptive Recreation	\$619,495	\$625,690	\$631,947	\$638,267	\$644,649	\$651,096	\$657,607	\$664,183	\$670,825	\$677,533	\$12,348,723
Non Consumptive Recreation	\$100,911	\$102,395	\$103,904	\$105,438	\$106,997	\$108,582	\$110,193	\$111,830	\$113,495	\$115,187	\$2,011,445
Total	\$3,004,897	\$3,068,655	\$3,132,498	\$3,196,429	\$3,260,449	\$3,324,558	\$3,388,757	\$3,453,048	\$3,517,433	\$3,581,911	\$60,626,398

Impacts on Earnings and Employment

The average annual total labor earnings over the 20 year planning horizon are about \$877.6 thousand (Table 4-42). This total consists of average annual livestock labor earnings for Alternative One that amounts to about \$701 thousand and an annual average of slightly over \$176.7 thousand for recreation (Table 4-42). The relative contribution of livestock and recreation, livestock labor earnings accounts for about 80 percent of the total and the remaining 20 percent is associated with recreation.

Table 4-42 also depicts the estimated employment associated with Alternative One. In this case, the total annual average estimated employment over the 20 year study period is 36.7 and the contribution from livestock grazing and recreation is 25.9 and 10.8 respectively. Therefore, livestock grazing accounts for about 70.6 percent of the total employment and recreation makes up the remaining 29.4 percent.

Table 4-42 indicates the average total earnings per job over the 20 year planning period are about \$24,000. Over this same time frame, the average earnings per job for livestock grazing is slightly over \$27,000, which is considerably larger than the average of nearly \$17,000 earnings per job for recreation.

Alternative Two

Regional Impacts

Table 4-43 illustrates the IMPLAN run for Alternative Two. For this alternative, the direct impact (Value of Production) from livestock grazing produces nearly 2.1 times that amount in total economic impacts. With regard to recreation, the multiplier is lower than it is for livestock grazing and translates into a little over 1.3, which means that the total impact derived from recreation is slightly over 1.3 times the direct impact. Overall, the average multiplier is 1.9 for the 20 year planning horizon, meaning that the total impact is 1.9 times the direct impact shown in Table 4-43.

Impacts on Earnings and Employment

The average annual total labor earnings over the 20 year planning horizon are about \$1.046 million (Table 4-44). This total consists of average annual livestock labor earnings for Alternative 2 that amounts to about \$906 thousand and an annual average of about \$140.5 thousand for recreation (Table 4-44). Looking at the relative contribution of livestock and recreation, livestock labor earnings accounts for about 86.6 percent of the total and the remaining 13.4 percent is associated with recreation.

Table 4-44 also depicts the estimated employment associated with Alternative Two. In this case, the total annual average estimated employment over the 20 year study period is 42.1 and the contribution from livestock grazing and recreation is 33.5 and 8.6 respectively. Therefore, livestock grazing accounts for about 79.6 percent of the total employment and recreation makes up the remaining 20.4 percent.

Table 4-44 indicates the average total earnings per job over the 20 year planning period are about \$24,800. Over this same time frame, the average earnings per job for livestock grazing is slightly over \$27,000, which is considerably larger than the average of slightly less than \$17,000 earnings per job for recreation.

Table 4-42. Earnings and Employment, Alternative One

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Labor Earnings										
Livestock Grazing	\$615,260	\$615,260	\$615,260	\$615,260	\$615,260	\$627,232	\$639,204	\$651,176	\$663,148	\$675,120
Consumptive Recreation	\$137,899	\$139,278	\$140,671	\$142,078	\$143,498	\$144,933	\$146,383	\$147,847	\$149,325	\$150,818
Non Consumptive Recreation	\$21,589	\$21,903	\$22,223	\$22,548	\$22,878	\$23,213	\$23,554	\$23,901	\$24,253	\$24,611
Total	\$774,748	\$776,442	\$778,154	\$779,886	\$781,636	\$795,379	\$809,141	\$822,923	\$836,726	\$850,549
Total Employment										
Livestock Grazing	22.7	22.7	22.7	22.7	22.7	23.2	23.6	24.1	24.5	25.0
Consumptive Recreation	8.5	8.6	8.7	8.8	8.9	8.9	9.0	9.1	9.2	9.3
Non Consumptive Recreation	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4
Total	32.5	32.6	32.7	32.8	32.9	33.4	34.0	34.5	35.1	35.7
Average Earnings/Job										
Livestock Grazing	\$27,063	\$27,063	\$27,063	\$27,063	\$27,063	\$27,057	\$27,051	\$27,046	\$27,040	\$27,035
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,756	\$17,754	\$17,753	\$17,751	\$17,749	\$17,747	\$17,745	\$17,743	\$17,742	\$17,740
Total	\$23,870	\$23,846	\$23,823	\$23,799	\$23,775	\$23,792	\$23,807	\$23,822	\$23,836	\$23,850

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
Total Labor Earnings											
Livestock Grazing	\$692,114	\$709,108	\$726,102	\$743,096	\$760,090	\$777,084	\$794,078	\$811,072	\$828,066	\$845,060	\$700,902
Consumptive Recreation	\$152,327	\$153,850	\$155,388	\$156,942	\$158,512	\$160,097	\$161,698	\$163,315	\$164,948	\$166,597	\$151,820
Non Consumptive Recreation	\$24,975	\$25,345	\$25,721	\$26,103	\$26,492	\$26,886	\$27,288	\$27,696	\$28,111	\$28,533	\$24,891
Total	\$869,415	\$888,302	\$907,211	\$926,141	\$945,093	\$964,067	\$983,064	\$1,002,083	\$1,021,125	\$1,040,190	\$877,614
Total Employment											
Livestock Grazing	25.6	26.2	26.9	27.5	28.1	28.7	29.4	30.0	30.6	31.2	25.9
Consumptive Recreation	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	9.4
Non Consumptive Recreation	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.4
Total	36.4	37.1	37.9	38.6	39.4	40.1	40.9	41.6	42.4	43.1	36.7
Average Earnings/Job											
Livestock Grazing	\$27,036	\$27,037	\$27,038	\$27,038	\$27,039	\$27,040	\$27,040	\$27,041	\$27,042	\$27,042	\$27,047
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,738	\$17,736	\$17,734	\$17,732	\$17,731	\$17,729	\$17,727	\$17,725	\$17,723	\$17,721	\$17,739
Total	\$23,882	\$23,913	\$23,942	\$23,970	\$23,997	\$24,023	\$24,047	\$24,070	\$24,092	\$24,113	\$23,914

Table 4-43. IMPLAN Run for Alternative Two

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Direct Effects</u>										
Livestock Grazing	\$971,991	\$1,012,260	\$1,052,530	\$1,092,800	\$1,133,069	\$1,173,339	\$1,213,609	\$1,253,879	\$1,294,148	\$1,334,418
Consumptive Recreation	\$421,654	\$423,762	\$425,881	\$428,010	\$430,150	\$408,643	\$388,210	\$368,800	\$350,360	\$332,842
Non Consumptive Recreation	\$64,656	\$63,976	\$63,322	\$62,695	\$62,092	\$59,495	\$57,013	\$54,640	\$52,371	\$50,202
Total	\$1,458,300	\$1,499,998	\$1,541,733	\$1,583,504	\$1,625,312	\$1,641,477	\$1,658,832	\$1,677,319	\$1,696,880	\$1,717,462
<u>Total Impact</u>										
Livestock Grazing	\$2,030,368	\$2,114,485	\$2,198,602	\$2,282,718	\$2,366,835	\$2,450,951	\$2,535,068	\$2,619,185	\$2,703,301	\$2,787,418
Consumptive Recreation	\$560,821	\$563,625	\$566,443	\$569,276	\$572,122	\$543,516	\$516,340	\$490,523	\$465,997	\$442,697
Non Consumptive Recreation	\$87,314	\$86,385	\$85,492	\$84,635	\$83,812	\$80,312	\$76,967	\$73,768	\$70,710	\$67,786
Total	\$2,678,503	\$2,764,495	\$2,850,537	\$2,936,629	\$3,022,769	\$3,074,779	\$3,128,375	\$3,183,476	\$3,240,008	\$3,297,901

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Direct Effects</u>											
Livestock Grazing	\$1,402,577	\$1,470,736	\$1,538,895	\$1,607,054	\$1,675,213	\$1,743,372	\$1,811,531	\$1,879,690	\$1,947,850	\$2,016,009	\$1,431,249
Consumptive Recreation	\$336,170	\$339,532	\$342,927	\$346,357	\$349,820	\$353,318	\$356,852	\$360,420	\$364,024	\$367,665	\$374,770
Non Consumptive Recreation	\$49,832	\$49,485	\$49,159	\$48,855	\$48,572	\$48,309	\$48,065	\$47,841	\$47,636	\$47,450	\$53,783
Total	\$1,788,580	\$1,859,753	\$1,930,982	\$2,002,266	\$2,073,605	\$2,144,999	\$2,216,448	\$2,287,952	\$2,359,510	\$2,431,123	\$1,859,802
<u>Total Impact</u>											
Livestock Grazing	\$2,929,836	\$3,072,254	\$3,214,672	\$3,357,090	\$3,499,509	\$3,641,927	\$3,784,345	\$3,926,763	\$4,069,181	\$4,211,600	\$2,989,805
Consumptive Recreation	\$447,124	\$451,595	\$456,111	\$460,672	\$465,279	\$469,932	\$474,631	\$479,378	\$484,171	\$489,013	\$498,463
Non Consumptive Recreation	\$67,278	\$66,800	\$66,352	\$65,932	\$65,541	\$65,178	\$64,842	\$64,532	\$64,247	\$63,988	\$72,594
Total	\$3,444,238	\$3,590,649	\$3,737,135	\$3,883,695	\$4,030,329	\$4,177,037	\$4,323,818	\$4,470,672	\$4,617,600	\$4,764,600	\$3,560,862

Table 4-44. Earnings and Employment, Alternative Two

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Total Labor Earnings</u>										
Livestock Grazing	\$615,260	\$640,751	\$666,242	\$691,733	\$717,224	\$742,715	\$768,206	\$793,697	\$819,188	\$844,679
Consumptive Recreation	\$137,899	\$138,589	\$139,282	\$139,978	\$140,678	\$133,644	\$126,962	\$120,614	\$114,583	\$108,854
Non Consumptive Recreation	\$21,589	\$21,352	\$21,124	\$20,905	\$20,695	\$19,835	\$19,012	\$18,226	\$17,474	\$16,755
Total	\$774,748	\$800,692	\$826,648	\$852,616	\$878,597	\$896,194	\$914,180	\$932,537	\$951,245	\$970,288
<u>Total Employment</u>										
Livestock Grazing	22.7	23.7	24.6	25.6	26.5	27.4	28.4	29.3	30.3	31.2
Consumptive Recreation	8.5	8.5	8.6	8.6	8.7	8.2	7.8	7.4	7.1	6.7
Non Consumptive Recreation	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.0	1.0	0.9
Total	32.5	33.4	34.4	35.4	36.3	36.8	37.3	37.8	38.3	38.9
<u>Average Earnings/Job</u>										
Livestock Grazing	\$27,063	\$27,063	\$27,063	\$27,063	\$27,064	\$27,064	\$27,064	\$27,064	\$27,064	\$27,064
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,756	\$17,763	\$17,769	\$17,776	\$17,782	\$17,778	\$17,775	\$17,771	\$17,767	\$17,763
Total	\$23,870	\$23,953	\$24,031	\$24,105	\$24,175	\$24,351	\$24,518	\$24,675	\$24,824	\$24,963

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Total Labor Earnings</u>											
Livestock Grazing	\$887,807	\$930,935	\$974,062	\$1,017,190	\$1,060,318	\$1,103,445	\$1,146,573	\$1,189,701	\$1,232,829	\$1,275,956	\$905,926
Consumptive Recreation	\$109,942	\$111,042	\$112,152	\$113,274	\$114,407	\$115,551	\$116,706	\$117,873	\$119,052	\$120,242	\$122,566
Non Consumptive Recreation	\$16,622	\$16,498	\$16,381	\$16,271	\$16,169	\$16,073	\$15,984	\$15,902	\$15,826	\$15,756	\$17,922
Total	\$1,014,372	\$1,058,475	\$1,102,596	\$1,146,735	\$1,190,893	\$1,235,069	\$1,279,263	\$1,323,476	\$1,367,706	\$1,411,955	\$1,046,414
<u>Total Employment</u>											
Livestock Grazing	32.8	34.4	36.0	37.6	39.2	40.8	42.4	44.0	45.6	47.2	33.5
Consumptive Recreation	6.8	6.9	6.9	7.0	7.1	7.1	7.2	7.3	7.3	7.4	7.6
Non Consumptive Recreation	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0
Total	40.5	42.2	43.8	45.5	47.2	48.8	50.5	52.2	53.8	55.5	42.1
<u>Average Earnings/Job</u>											
Livestock Grazing	\$27,060	\$27,057	\$27,053	\$27,050	\$27,048	\$27,045	\$27,043	\$27,040	\$27,038	\$27,036	\$27,055
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,771	\$17,778	\$17,785	\$17,793	\$17,800	\$17,807	\$17,815	\$17,822	\$17,829	\$17,836	\$17,787
Total	\$25,030	\$25,091	\$25,148	\$25,200	\$25,248	\$25,293	\$25,334	\$25,373	\$25,409	\$25,443	\$24,802

Alternative Three

Regional Impacts

Table 4-45 illustrates the IMPLAN run for Alternative Three. For this alternative, the direct impact (Value of Production) from livestock grazing produces slightly less than 2.09 times that amount in total economic impacts. With regard to recreation, the multiplier is lower than it is for livestock grazing and translates into a little over 1.3, which means that the total impact derived from recreation is a little over 1.3 times the direct impact. Overall, the average multiplier is about 1.75 for the 20 year planning horizon, meaning that the total impact is 1.75 times the direct impact shown in Table 4-45.

Impacts on Earnings and Employment

The average annual total labor earnings over the 20 year planning horizon are about \$611.2 thousand (Table 4-46). This total consists of average annual livestock labor earnings for Alternative Three that amounts to about \$430.5 thousand and an annual average of slightly less than \$180.7 thousand for recreation (Table 4-46). Looking at the relative contribution of livestock and recreation, livestock labor earnings accounts for about 70.4 percent of the total and the remaining 29.6 percent is associated with recreation.

Table 4-46 also depicts the estimated employment associated with Alternative 3. In this case, the total annual average estimated employment over the 20 year study period is 26.9 and the contribution from livestock grazing and recreation is 15.9 and 11.0 respectively. Therefore, livestock grazing accounts for about 59.1 percent of the total employment and recreation makes up the remaining 40.9 percent.

Table 4-46 indicates the average total earnings per job over the 20 year planning period are \$22,700. Over this same time frame, the average earnings per job for livestock grazing is slightly over \$27,000, which is considerably larger than the average of about \$17,000 earnings per job for recreation.

Table 4-45. IMPLAN Run for Alternative Three

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
<u>Direct Effects</u>											
Livestock Grazing	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	
Consumptive Recreation	\$421,654	\$425,870	\$430,129	\$434,430	\$438,774	\$449,744	\$460,987	\$472,512	\$484,325	\$496,433	
Non Consumptive Recreation	\$64,656	\$64,156	\$63,685	\$63,242	\$62,828	\$63,003	\$63,223	\$63,490	\$63,803	\$64,162	
Total	\$1,166,421	\$1,170,137	\$1,173,925	\$1,177,783	\$1,181,713	\$1,192,857	\$1,204,322	\$1,216,113	\$1,228,239	\$1,240,706	
<u>Total Impact</u>											
Livestock Grazing	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	
Consumptive Recreation	\$560,821	\$566,429	\$572,094	\$577,815	\$583,593	\$598,183	\$613,137	\$628,466	\$644,177	\$660,282	
Non Consumptive Recreation	\$87,314	\$86,626	\$85,979	\$85,371	\$84,800	\$85,020	\$85,303	\$85,649	\$86,056	\$86,526	
Total	\$2,068,771	\$2,073,692	\$2,078,708	\$2,083,821	\$2,089,029	\$2,103,839	\$2,119,076	\$2,134,750	\$2,150,869	\$2,167,444	
Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Direct Effects</u>											
Livestock Grazing	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111	\$680,111
Consumptive Recreation	\$501,397	\$506,411	\$511,475	\$516,590	\$521,756	\$526,974	\$532,243	\$537,566	\$542,941	\$548,371	\$488,029
Non Consumptive Recreation	\$63,932	\$63,725	\$63,542	\$63,382	\$63,244	\$63,127	\$63,032	\$62,958	\$62,904	\$62,870	\$63,448
Total	\$1,245,440	\$1,250,247	\$1,255,128	\$1,260,083	\$1,265,110	\$1,270,212	\$1,275,386	\$1,280,635	\$1,285,956	\$1,291,352	\$1,231,588
<u>Total Impact</u>											
Livestock Grazing	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636	\$1,420,636
Consumptive Recreation	\$666,884	\$673,553	\$680,289	\$687,092	\$693,963	\$700,902	\$707,911	\$714,990	\$722,140	\$729,362	\$649,104
Non Consumptive Recreation	\$86,205	\$85,916	\$85,659	\$85,433	\$85,237	\$85,071	\$84,933	\$84,824	\$84,743	\$84,688	\$85,568
Total	\$2,173,725	\$2,180,105	\$2,186,584	\$2,193,161	\$2,199,836	\$2,206,609	\$2,213,480	\$2,220,450	\$2,227,519	\$2,234,686	\$2,155,308

Table 4-46. Earnings and Employment, Alternative Three

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Total Labor Earnings</u>										
Livestock Grazing	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515
Consumptive Recreation	\$137,899	\$139,278	\$140,671	\$142,078	\$143,498	\$147,086	\$150,763	\$154,532	\$158,395	\$162,355
Non Consumptive Recreation	\$21,589	\$21,411	\$21,242	\$21,084	\$20,935	\$20,978	\$21,037	\$21,112	\$21,202	\$21,307
Total	\$590,004	\$591,204	\$592,429	\$593,677	\$594,949	\$598,580	\$602,316	\$606,159	\$610,112	\$614,178
<u>Total Employment</u>										
Livestock Grazing	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
Consumptive Recreation	8.5	8.6	8.7	8.8	8.9	9.1	9.3	9.5	9.8	10.0
Non Consumptive Recreation	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total	25.6	25.7	25.8	25.9	25.9	26.2	26.4	26.6	26.9	27.1
<u>Average Earnings/Job</u>										
Livestock Grazing	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,756	\$17,764	\$17,771	\$17,779	\$17,786	\$17,796	\$17,806	\$17,816	\$17,825	\$17,835
Total	\$23,022	\$23,002	\$22,982	\$22,962	\$22,941	\$22,884	\$22,827	\$22,769	\$22,710	\$22,651

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Total Labor Earnings</u>											
Livestock Grazing	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515	\$430,515
Consumptive Recreation	\$163,979	\$165,619	\$167,275	\$168,948	\$170,637	\$172,344	\$174,067	\$175,808	\$177,566	\$179,341	\$159,607
Non Consumptive Recreation	\$21,220	\$21,142	\$21,071	\$21,008	\$20,953	\$20,905	\$20,865	\$20,831	\$20,804	\$20,785	\$21,074
Total	\$615,714	\$617,276	\$618,861	\$620,471	\$622,106	\$623,764	\$625,447	\$627,154	\$628,886	\$630,641	\$611,196
<u>Total Employment</u>											
Livestock Grazing	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
Consumptive Recreation	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	11.0	11.1	9.8
Non Consumptive Recreation	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	28.0	28.1	26.9
<u>Average Earnings/Job</u>											
Livestock Grazing	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069	\$27,069
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,842	\$17,849	\$17,855	\$17,862	\$17,869	\$17,875	\$17,881	\$17,888	\$17,894	\$17,900	\$17,832
Total	\$22,629	\$22,606	\$22,583	\$22,560	\$22,537	\$22,514	\$22,490	\$22,467	\$22,443	\$22,419	\$22,700

Alternative Four

Regional Impacts

Table 4-47 illustrates the IMPLAN run for Alternative Four. For this alternative, the direct impact (Value of Production) from livestock grazing produces about 2.09 times that amount in total economic impacts. With regard to recreation, the multiplier is lower than it is for livestock grazing and translates into nearly 1.34, which means that the total impact derived from recreation is nearly 1.34 times the direct impact. Overall, the average multiplier is slightly over 1.84 for the 20 year planning horizon, meaning that the total impact is 1.84 times the direct impact shown in Table 4-47.

Impacts on Earnings and Employment

The average annual total labor earnings over the 20 year planning horizon are about \$896.6 thousand (Table 4-48). This total consists of average annual livestock labor earnings for Alternative 4 that amounts to about \$721.6 thousand and an annual average of nearly \$175 thousand for recreation (Table 4-48). Looking at the relative contribution of livestock and recreation, livestock labor earnings accounts for 80.5 percent of the total and the remaining 19.5 percent is associated with recreation.

Table 4-48 also depicts the estimated employment associated with Alternative Four. In this case, the total annual average estimated employment over the 20 year study period is 37.2 and the contribution from livestock grazing and recreation is 26.5 and 10.7 respectively. Therefore, livestock grazing accounts for about 71.3 percent of the total employment and recreation makes up the remaining 28.7 percent.

Table 4-48 indicates the average total earnings per job over the 20 year planning period are about \$24,000. Over this same time frame, the average earnings per job for livestock grazing are slightly over \$27,200, which is considerably larger than the average a little more than \$17,000 earnings per job for recreation.

Table 4-47. IMPLAN Run for Alternative Four

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Direct Effects</u>										
Livestock Grazing	\$680,111	\$728,438	\$776,765	\$825,092	\$873,420	\$921,747	\$970,074	\$1,018,401	\$1,066,728	\$1,115,056
Consumptive Recreation	\$421,654	\$425,870	\$430,129	\$434,430	\$438,774	\$445,356	\$452,036	\$458,817	\$465,699	\$472,685
Non Consumptive Recreation	\$64,656	\$64,156	\$63,685	\$63,242	\$62,828	\$62,628	\$62,459	\$62,322	\$62,214	\$62,136
Total	\$1,166,421	\$1,218,464	\$1,270,579	\$1,322,765	\$1,375,022	\$1,429,731	\$1,484,570	\$1,539,540	\$1,594,641	\$1,649,876
<u>Total Impact</u>										
Livestock Grazing	\$1,420,636	\$1,521,447	\$1,622,257	\$1,723,068	\$1,823,879	\$1,924,689	\$2,025,500	\$2,126,311	\$2,227,122	\$2,327,932
Consumptive Recreation	\$560,821	\$566,429	\$572,094	\$577,815	\$583,593	\$592,347	\$601,232	\$610,250	\$619,404	\$628,695
Non Consumptive Recreation	\$87,314	\$86,626	\$85,979	\$85,371	\$84,800	\$84,518	\$84,278	\$84,080	\$83,923	\$83,806
Total	\$2,068,771	\$2,174,502	\$2,280,330	\$2,386,253	\$2,492,271	\$2,601,554	\$2,711,010	\$2,820,641	\$2,930,448	\$3,040,433

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Direct Effects</u>											
Livestock Grazing	\$1,163,383	\$1,211,710	\$1,260,037	\$1,308,364	\$1,356,692	\$1,405,019	\$1,453,346	\$1,501,673	\$1,550,000	\$1,598,328	\$1,139,219
Consumptive Recreation	\$477,412	\$482,186	\$487,007	\$491,878	\$496,796	\$501,764	\$506,782	\$511,850	\$516,968	\$522,138	\$472,012
Non Consumptive Recreation	\$61,885	\$61,658	\$61,454	\$61,273	\$61,114	\$60,976	\$60,859	\$60,763	\$60,688	\$60,632	\$62,081
Total	\$1,702,679	\$1,755,554	\$1,808,499	\$1,861,515	\$1,914,602	\$1,967,759	\$2,020,987	\$2,074,286	\$2,127,656	\$2,181,097	\$1,673,312
<u>Total Impact</u>											
Livestock Grazing	\$2,428,743	\$2,529,554	\$2,630,364	\$2,731,175	\$2,831,986	\$2,932,797	\$3,033,607	\$3,134,418	\$3,235,229	\$3,336,040	\$2,378,338
Consumptive Recreation	\$634,982	\$641,332	\$647,745	\$654,223	\$660,765	\$667,373	\$674,046	\$680,787	\$687,595	\$694,471	\$627,800
Non Consumptive Recreation	\$83,457	\$83,141	\$82,856	\$82,602	\$82,378	\$82,183	\$82,017	\$81,878	\$81,767	\$81,683	\$83,733
Total	\$3,147,182	\$3,254,027	\$3,360,966	\$3,468,000	\$3,575,129	\$3,682,352	\$3,789,670	\$3,897,083	\$4,004,591	\$4,112,193	\$3,089,870

Table 4-48. Earnings and Employment, Alternative Four (8)

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Total Labor Earnings</u>										
Livestock Grazing	\$430,515	\$461,160	\$491,804	\$522,448	\$553,092	\$583,736	\$614,380	\$645,024	\$675,668	\$706,312
Consumptive Recreation	\$137,899	\$139,278	\$140,671	\$142,078	\$143,498	\$145,651	\$147,836	\$150,053	\$152,304	\$154,589
Non Consumptive Recreation	\$21,589	\$21,411	\$21,242	\$21,084	\$20,935	\$20,856	\$20,788	\$20,731	\$20,683	\$20,646
Total	\$590,004	\$621,848	\$653,717	\$685,609	\$717,525	\$750,243	\$783,004	\$815,808	\$848,655	\$881,547
<u>Total Employment</u>										
Livestock Grazing	15.9	17.0	18.1	19.3	20.4	21.5	22.6	23.7	24.8	26.0
Consumptive Recreation	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.3	9.4	9.5
Non Consumptive Recreation	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total	25.6	26.8	28.0	29.2	30.4	31.6	32.9	34.1	35.4	36.6
<u>Average Earnings/Job</u>										
Livestock Grazing	\$27,069	\$27,094	\$27,115	\$27,134	\$27,151	\$27,167	\$27,180	\$27,193	\$27,204	\$27,214
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,756	\$17,764	\$17,771	\$17,779	\$17,786	\$17,794	\$17,802	\$17,810	\$17,818	\$17,826
Total	\$23,022	\$23,187	\$23,338	\$23,476	\$23,603	\$23,708	\$23,806	\$23,895	\$23,978	\$24,054

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Total Labor Earnings</u>											
Livestock Grazing	\$736,956	\$767,600	\$798,244	\$828,888	\$859,533	\$890,177	\$920,821	\$951,465	\$982,109	\$1,012,753	\$721,634
Consumptive Recreation	\$156,135	\$157,696	\$159,273	\$160,866	\$162,474	\$164,099	\$165,740	\$167,397	\$169,071	\$170,762	\$154,368
Non Consumptive Recreation	\$20,553	\$20,467	\$20,390	\$20,321	\$20,258	\$20,204	\$20,156	\$20,115	\$20,082	\$20,055	\$20,628
Total	\$913,643	\$945,764	\$977,907	\$1,010,075	\$1,042,265	\$1,074,479	\$1,106,717	\$1,138,978	\$1,171,262	\$1,203,570	\$896,631
<u>Total Employment</u>											
Livestock Grazing	27.1	28.2	29.3	30.4	31.5	32.7	33.8	34.9	36.0	37.1	26.5
Consumptive Recreation	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	9.5
Non Consumptive Recreation	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2
Total	37.9	39.1	40.3	41.5	42.7	43.9	45.1	46.3	47.6	48.8	37.2
<u>Average Earnings/Job</u>											
Livestock Grazing	\$27,224	\$27,233	\$27,241	\$27,248	\$27,255	\$27,262	\$27,268	\$27,273	\$27,279	\$27,284	\$27,204
Consumptive Recreation	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210	\$16,210
Non Consumptive Recreation	\$17,833	\$17,840	\$17,847	\$17,854	\$17,861	\$17,867	\$17,874	\$17,880	\$17,886	\$17,893	\$17,827
Total	\$24,136	\$24,212	\$24,283	\$24,350	\$24,413	\$24,472	\$24,527	\$24,580	\$24,629	\$24,676	\$24,017

Benefit/Cost Analysis

A benefit/cost analysis was done for each alternative. In order to do the analysis, the resource specialists estimated the annual costs and benefits for each alternative over the 20 year planning horizon. The annual benefits and costs produced from this effort were then expressed in 2006 dollars based on an estimated annual inflation rate of 1.93% (Consumer Price Index For All Urban Consumers: All Items, CPIAUCSL) and a discount rate of 3.0% (Office of Management and Budget, M-07-05, January 2, 2007). The summary of this analysis is illustrated in Table 4-49.

Table 4-49. Benefit/Cost Analysis

Present Value ('06 \$) Summary Table				
Item	Alt. #1	Alt. #2	Alt. #3	Alt. #4
<u>Cost</u>				
<u>New Development Cost</u>				
BLM	\$123,912	\$641,257	\$0	\$389,273
Permittee	\$47,867	\$687,370	\$0	\$427,175
Other Sources	\$32,387	\$0	\$0	\$0
Subtotal	\$204,166	\$1,328,627	\$0	\$816,448
<u>Other BLM Cost</u>	\$5,918,882	\$6,009,891	\$5,814,013	\$5,971,630
<u>Other Permittee Cost</u>	\$6,381,154	\$4,020,211	\$5,885,869	\$4,792,973
<u>Other Agency Cost</u>	\$3,939,358	\$4,485,455	\$2,386,670	\$3,431,272
<u>Summary</u>				
Total BLM Cost	\$6,042,794	\$6,651,148	\$5,814,013	\$6,360,903
Total Permittee Cost	\$6,429,021	\$4,707,581	\$5,885,869	\$5,220,149
Total Other Sources Cost	\$32,387	\$0	\$0	\$0
Total Other Agency Cost	\$3,939,358	\$4,485,455	\$2,386,670	\$3,431,272
Total Cost	\$16,443,561	\$15,844,184	\$14,086,551	\$15,012,324
<u>Benefits</u>				
Recreation Benefit	\$6,699,132	\$5,488,035	\$6,925,800	\$6,723,798
Water Storage Benefits	\$199,090	\$124,678	\$230,123	\$288,764
Salvage Values	\$902	\$10,891	\$0	\$6,167
Permittee Revenue	\$11,213,125	\$14,134,416	\$7,120,492	\$11,264,462
Total Benefit	\$18,112,249	\$19,758,019	\$14,276,415	\$18,283,190
<u>Discounted Benefit Cost Calculations</u>				
Discounted Total Benefits	\$18,112,249	\$19,758,019	\$14,276,415	\$18,283,190
Discounted Total Cost	\$16,443,561	\$15,844,184	\$14,086,551	\$15,012,324
Benefit/Cost Ratio	1.10	1.25	1.01	1.22

Looking at the results depicted in Table 4-49, Alternative Two yields the highest B/C ratio followed in descending order by Alternatives Four, One, and finally Three. But as mentioned in the Introduction to the Socioeconomics section, while the rank order of the B/C ratios provides useful information regarding how the market benefits and costs associated with each alternative stack up against each other, they only include the market costs and benefits. This means the nonmarket impacts are not included in the analysis and the reader should be cautioned against using the results from the B/C analysis as the sole economic ranking criteria.

A close examination of Table 4-49 produces some interesting observations. First of all, the magnitude of costs varies between alternatives. Second, the distribution, of costs and benefits changes depending on the management alternative being considered. Finally, the marginal costs to obtain the benefits likewise vary between alternatives. To get a clearer view of these relationships, Tables 4-50, 4-51 and 4-52 are presented below.

Table 4-50 indicates that under Alternative Two, both the BLM and permittee spend the most on new development costs geared principally for range improvements relative to the other three alternatives. This table also indicates that all other BLM costs are the highest under Alternative Two and the lowest for the permittee. Looking at the total costs, BLM costs associated with Alternative Two are again the highest and permittee costs are the lowest compared to the other three alternatives.

Looking at the benefit side, Table 4-50 indicates recreation benefits ranks the lowest under Alternative Two while permittee revenues rank the highest. Water storage benefits under Alternative Two also ranks the lowest relative to the other alternatives. But overall, the market benefits derived from all three alternatives favors Alternative Two, followed by Alternatives Four, One and Three. However, the reader should again remember that the nonmarket benefits are not included in this analysis. And one could reasonably conclude that the nonmarket benefits will vary among the alternatives and would likely be larger for alternatives with less intensive livestock grazing.

Table 4-50. Ranking of Costs

Ranking of Costs - Present Value ('06 \$ Summary Table)					
Item	Alt. #1	Alt. #2	Alt. #3	Alt. #4	
<u>Cost</u>					
<u>New Development Cost</u>					
BLM	3	1	4	2	
Permittee	3	1	4	2	
Other Sources	1	2	2	2	
Subtotal	3	1	4	2	
<u>Other BLM Cost</u>	3	1	4	2	
<u>Other Permittee Cost</u>	1	4	2	3	
<u>Other Agency Cost</u>	2	1	4	3	
<u>Summary</u>					
Total BLM Cost	3	1	4	2	
Total Permittee Cost	1	4	2	3	
Total Other Sources Cost	1	2	2	2	
Total Other Agency Cost	2	1	4	3	
Total Cost	1	2	4	3	
<u>Benefits</u>					
Recreation Benefit	3	4	1	2	
Water Storage Benefits	3	4	2	1	
Salvage Values	3	1	4	2	
Permittee Revenue	3	1	4	2	
Total Benefit	3	1	4	2	

Table 4-51 illustrates the percentage distribution of costs and benefits associated with each alternative. Looking at the results this way indicates the BLM's share of the new development costs is the highest under Alternative One and the permittees share of the new development costs are the highest under Alternative Two. Regarding other BLM costs, their proportion of the total other costs is the highest under Alternative Four followed closely by

Alternatives Two and Three. The permittees share to the total other costs is the lowest under Alternative Two and the highest under Alternative Three. Regarding total costs, Table 4-51 indicates BLM's share is highest under Alternative Four, followed closely by Alternative Two and the lowest under Alternative One. Contrasted to the permittee's proportion of total costs, their highest share occurs under Alternative Three and their lowest share falls under Alternative Two.

Table 4-51. Percentage Distribution of Costs and Benefits

Percentage Distribution of Costs and Benefits - Present Value ('06 \$ Summary Table)				
Item	Alt. #1	Alt. #2	Alt. #3	Alt. #4
<u>Cost</u>				
<u>New Development Cost</u>				
BLM	60.7%	48.3%		47.7%
Permittee	23.4%	51.7%		52.3%
Other Sources	15.9%	0.0%		0.0%
Subtotal	100.0%	100.0%		100.0%
<u>Other BLM Cost</u>	36.4%	41.4%	41.3%	42.1%
<u>Other Permittee Cost</u>	39.3%	27.7%	41.8%	33.8%
<u>Other Agency Cost</u>	24.3%	30.9%	16.9%	24.2%
<u>Summary</u>				
Total BLM Cost	36.7%	42.0%	41.3%	42.4%
Total Permittee Cost	39.1%	29.7%	41.8%	34.8%
Total Other Sources Cost	0.2%	0.0%	0.0%	0.0%
Total Other Agency Cost	24.0%	28.3%	16.9%	22.9%
Total Cost	100.0%	100.0%	100.0%	100.0%
<u>Benefits</u>				
Recreation Benefit	37.0%	27.8%	48.5%	36.8%
Water Storage Benefits	1.1%	0.6%	1.6%	1.6%
Salvage Values	0.0%	0.1%	0.0%	0.0%
Permittee Revenue	61.9%	71.5%	49.9%	61.6%
Total Benefit	100.0%	100.0%	100.0%	100.0%

Table 4-52 depicts the anticipated benefit per dollar of cost. In terms of the dollar of benefits derived from each dollar of cost, not surprisingly, the results indicate that Alternative Two ranks the highest, followed by Alternatives Four, One and Three. What is interesting in this table is that relative ranking varies depending on who is bearing the cost. For example, BLM derives the lowest return, measured in dollars of benefits per dollar in cost, for Alternative Three. The next lowest return in benefits per dollar expended by BLM is Alternative Two followed by One and Four. This ranking is different for the permittee cost. In their case, the highest benefit per dollar of cost occurs in Alternative Two followed by Four, One and Three.

Table 4-52. Anticipated Benefit Per Dollar Of Cost

Cost/\$ of Benefit - Present Value ('06 \$ Summary Table)				
Item	Alt. #1	Alt. #2	Alt. #3	Alt. #4
Total BLM Cost	\$3.00	\$2.97	\$2.46	\$2.87
Total Permittee Cost	\$2.82	\$4.20	\$2.43	\$3.50
Total Other Sources Cost	\$559.25			
Total Other Agency Cost	\$4.60	\$4.40	\$5.98	\$5.33
Total Cost	\$1.10	\$1.25	\$1.01	\$1.22

Conclusion

The following table (Table 4-53) is presented to show the overall results from the IMPLAN runs. A careful examination of this table indicates total labor earnings, total employment and average earnings per job is the highest for Alternative Two, followed by Alternatives Four, One and Three. This means that Alternative Two has the highest relative impact on the study region. However, to get a clearer understanding of the relative importance of these results, it is helpful to compare them to the earnings and employment in Fremont County. That comparison can be found in Table 4-54.

Table 4-53. Overall Results From IMPLAN Runs

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<u>Total Labor Earnings (Ranch Production Perspective)</u>										
Alternative 1	\$774,748	\$776,442	\$778,154	\$779,886	\$781,636	\$795,379	\$809,141	\$822,923	\$836,726	\$850,549
Alternative 2	\$774,748	\$800,692	\$826,648	\$852,616	\$878,597	\$896,194	\$914,180	\$932,537	\$951,245	\$970,288
Alternative 3	\$590,004	\$591,204	\$592,429	\$593,677	\$594,949	\$598,580	\$602,316	\$606,159	\$610,112	\$614,178
Alternative 4	\$590,004	\$621,848	\$653,717	\$685,609	\$717,525	\$750,243	\$783,004	\$815,808	\$848,655	\$881,547
<u>Total Employment (Ranch Production Perspective)</u>										
Alternative 1	32.5	32.6	32.7	32.8	32.9	33.4	34.0	34.5	35.1	35.7
Alternative 2	32.5	33.4	34.4	35.4	36.3	36.8	37.3	37.8	38.3	38.9
Alternative 3	25.6	25.7	25.8	25.9	25.9	26.2	26.4	26.6	26.9	27.1
Alternative 4	25.6	26.8	28.0	29.2	30.4	31.6	32.9	34.1	35.4	36.6
<u>Average Earnings/Job</u>										
Alternative 1	\$23,870	\$23,846	\$23,823	\$23,799	\$23,775	\$23,792	\$23,807	\$23,822	\$23,836	\$23,850
Alternative 2	\$23,870	\$23,953	\$24,031	\$24,105	\$24,175	\$24,351	\$24,518	\$24,675	\$24,824	\$24,963
Alternative 3	\$23,022	\$23,002	\$22,982	\$22,962	\$22,941	\$22,884	\$22,827	\$22,769	\$22,710	\$22,651
Alternative 4	\$23,022	\$23,187	\$23,338	\$23,476	\$23,603	\$23,708	\$23,806	\$23,895	\$23,978	\$24,054

Table 4-53 (cont.)

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
<u>Total Labor Earnings (Ranch Production Perspective)</u>											
Alternative 1	\$869,415	\$888,302	\$907,211	\$926,141	\$945,093	\$964,067	\$983,064	\$1,002,083	\$1,021,125	\$1,040,190	\$877,614
Alternative 2	\$1,014,372	\$1,058,475	\$1,102,596	\$1,146,735	\$1,190,893	\$1,235,069	\$1,279,263	\$1,323,476	\$1,367,706	\$1,411,955	\$1,046,414
Alternative 3	\$615,714	\$617,276	\$618,861	\$620,471	\$622,106	\$623,764	\$625,447	\$627,154	\$628,886	\$630,641	\$611,196
Alternative 4	\$913,643	\$945,764	\$977,907	\$1,010,075	\$1,042,265	\$1,074,479	\$1,106,717	\$1,138,978	\$1,171,262	\$1,203,570	\$896,631
<u>Total Employment (Ranch Production Perspective)</u>											
Alternative 1	36.4	37.1	37.9	38.6	39.4	40.1	40.9	41.6	42.4	43.1	36.7
Alternative 2	40.5	42.2	43.8	45.5	47.2	48.8	50.5	52.2	53.8	55.5	42.1
Alternative 3	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	28.0	28.1	26.9
Alternative 4	37.9	39.1	40.3	41.5	42.7	43.9	45.1	46.3	47.6	48.8	37.2
<u>Average Earnings/Job</u>											
Alternative 1	\$23,882	\$23,913	\$23,942	\$23,970	\$23,997	\$24,023	\$24,047	\$24,070	\$24,092	\$24,113	\$23,914
Alternative 2	\$25,030	\$25,091	\$25,148	\$25,200	\$25,248	\$25,293	\$25,334	\$25,373	\$25,409	\$25,443	\$24,802
Alternative 3	\$22,629	\$22,606	\$22,583	\$22,560	\$22,537	\$22,514	\$22,490	\$22,467	\$22,443	\$22,419	\$22,700
Alternative 4	\$24,136	\$24,212	\$24,283	\$24,350	\$24,413	\$24,472	\$24,527	\$24,580	\$24,629	\$24,676	\$24,017

Table 4-54. IMPLAN Average Total Labor Earnings & Employment (2008 - 2027)

IMPLAN Average Total Labor Earnings & Employment (2008 - 2027)					
REIS¹ Fremont County Earnings & Employment					
Item	Employment (2005)	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Earnings	\$651,935,000	\$877,614	\$1,046,414	\$611,196	\$896,631
% of Total		0.1346%	0.1605%	0.0938%	0.1375%
Employment	22,766	37	42	27	37
% of Total		0.1611%	0.1847%	0.1183%	0.1634%

¹Regional Economic Information System (REIS) 1969-2005

Overall, the earnings and employment generated by IMPLAN for all four alternatives represent less than .2% of the total earnings and employment for Fremont County (Table 4-54). Even though there is a variation in the regional economic activity produced by all the alternatives, the impact to the study region would be inconsequential. Therefore, regardless of what management alternative is chosen, the expected economic impact to Fremont County would be minor.

Even though the anticipated economic impact relative to the study region from any of the four alternatives is small, there could be important economic ramifications affecting individual livestock operations. The extent of this impact depends on whether or not individual alternatives lead to “real” reductions in livestock grazing on BLM administered lands in GMCA. In other words, are the proposed cuts in grazing “paper cuts”, cuts in licensed use not affecting long term historical stocking rates on the GMCA, or do they represent reductions in grazing levels that are lower than long term historical levels? To answer this question, Table 4-55 was constructed to provide a historical reference showing the authorized use for the GMCA compared to the average use being projected by alternative.

The time period for the historical use was broken into three categories. The first was from 1980 to 1998, which is considered by some to represent a more typical weather cycle. The second period identified was from 1999 to 2006 and was a period marked by drought. Finally, historical authorized use was computed for the entire 26 year period beginning in 1980 and extending through 2006.

Table 4-55. Authorized Use for GMCA Compared to Average Use Projected by Alternative

GMCA (BLM)		Alt. 1	Alt. 2	Alt. 3	Alt. 4
<i>Cattle</i>					
Minimum Cattle AUMs		13,030	13,030	9,120	9,120
Maximum Cattle AUMs		17,880	26,990	9,120	21,660
Average Cattle AUMs		14,833	19,178	9,120	15,390
Historical Authorized Use (AUMs)		Based on Average Stocking Levels			
'80-'98	18,826	Yes	No	Yes	Yes
'99-'06	13,892	No	No	Yes	No
'80-'06	17,364	Yes	No	Yes	Yes
<i>Sheep</i>					
Minimum Sheep AUMs		4,350	4,350	3,040	3,040
Maximum Sheep AUMs		6,000	9,070	3,040	6,840
Average Sheep AUMs		4,973	6,418	3,040	4,940
Historical Authorized Use (AUMs)		Based on Average Stocking Levels			
'80-'98	7,697	Yes	Yes	Yes	Yes
'99-'06	3,478	No	No	Yes	No
'80-'06	6,447	Yes	Yes	Yes	Yes
<i>Total</i>					
Minimum Total AUMs		17,380	17,380	12,160	12,160
Maximum Total AUMs		23,880	36,060	12,160	28,500
Average Total AUMs		19,805	25,595	12,160	20,330
Historical Authorized Use (AUMs)		Based on Average Stocking Levels			
'80-'98	26,523	Yes	Yes	Yes	Yes
'99-'06	17,370	No	No	Yes	No
'80-'06	23,811	Yes	No	Yes	Yes

After the historical data was compiled, it was compared to the estimated stocking levels for cattle, sheep and the total of the two. The result of that comparison is shown in Table 4-55 and can be interpreted by whether there is a “Yes” or “No” in the table. A “Yes” indicates there is a “real” cut in grazing and a “No” indicates the cut is a paper cut and would not result in stocking levels below what has occurred historically. For example, the “No” under Alternative Two for all three timeframes considered for cattle indicates the stocking levels under this alternative would not be reduced below what has historically occurred over the period from 1980 through 2006. Alternatively, the “Yes” occurring under all three timeframes for Alternative Two for cattle indicates this alternative would produce grazing reductions that lower stocking rates below what has historically occurred in the GMCA for all three timeframes considered. Therefore reductions in cash flows to the impacted operators would be expected for this alternative.

Open space is another consideration that should be factored into the analysis when looking at potential decisions that could impact ranch viability. For example, a report entitled “Strategic Ranchland in the Rocky Mountain West”; written by American Farmland Trust (AFT), the Center of the American Trust, the Nature Conservancy has a table showing the “Strategic Ranchland at Risk in 25 Rocky Mountain Counties, 2000-2020” ranks Fremont County number 21. This same table indicates 5% of the Fremont County’s strategic ranchlands are at risk, which also places 11% of the State of Wyoming’s strategic ranchlands at risk. But the data in the aforementioned table does not

indicate the location of these lands so it is unclear whether or not the ranches owned by the GMCA permittees would fall under this category.

Ultimately the market place will determine whether or not ranchland will end up being converted to residential development. However, if this conversion occurs, it is expected that the burden on local services would be substantially higher compared to maintaining these same lands in ranching.

Finally, while the social considerations are difficult to quantify, this area has a longstanding cultural background tied to livestock grazing. Even though livestock grazing on the GMCA represents a minor contribution to the study area's economy, the cultural impact from displacing ranching operations in this area could be more important in the long run than the economic considerations would suggest. In the final analysis, both the social and economic considerations in conjunction with the resource concerns affecting all uses in the impacted area will be factored into the decision process leading to an agency selected alternative.