APPENDIX I

UPLAND RANGELAND ECOSYSTEM REPORT
FOR
ENVIRONMENTAL ASSESSMENT

EAST ROSEBUD, WEST ROSEBUD, BUTCHER CREEK, RED LODGE CREEK ALLOTMENTS & BLACK BUTTE WILDLIFE HABITAT AREA

RANGELAND PROJECT

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INTRODUCTION

This report focuses on the characteristics and condition of upland rangeland ecosystems. Associated issues include current composition of vegetation communities and similarity of existing vegetation composition to desired composition. The analysis area includes upland grasslands and shrublands within areas designated as suitable for livestock grazing the Forest boundary of the Red Lodge Creek, Butcher Creek, East Rosebud and West Rosebud Allotments covered in this analysis. This report also includes a noxious weed risk assessment for the proposed action and provides a summary of three methods used to estimate livestock carrying capacity of each allotment and pasture in the analysis area.

The Report is organized as follows:

APPLICABLE LAWS, REGULATIONS AND POLICY

- **a. Federal**
  - ***- Public Rangelands Improvement Act of 1978***
  - ***-Forest and Rangeland Renewable Resource Planning Act of 1974 and National Forest Management Act of 1976***
  - ***-Multiple Use Sustained Yield Act of 1960***
- **b. State - Montana Water Quality Law**
  - ***-Surface Water Quality Standards***
- **c. Forest Service**
  - ***-National Direction***
  - ***-Custer National Forest Land and Resources Management Plan***
- **d. Best Management Practices**
  - ***-Cooperative Direction Letter From the Governor of Montana, U.S. Forest Service Regional Forester – Northern Region, and the State Director of the Bureau of Land Management (USDI Bureau of Land Management, USDA Forest Service, State of Montana 1996).***
  - ***-The Montana Technical Guide for Prescribed Grazing 528 (USDA Natural Resources Conservation Service 2005)***

ASSUMPTIONS, METHODOLOGY AND SCIENTIFIC ACCURACY OF INFORMATION USED

AFFECTED ENVIRONMENT

- **Introduction**
- **a. Natural Characteristics and Processes**
- **b. Human Influences**
  - ***-General Grazing Influences***
- **c. Upland Vegetation Status**
  - ***-Existing Condition***
  - ***-Desired Future Condition***

ENVIRONMENTAL EFFECTS

- **a. Background**
- **b. Effects Common to All Alternatives**
  - ***-Direct Effects***
  - ***-Indirect Effects***
  - ***-Short-term vs. Long-term Productivity***
  - ***-Irreversible/Irretrievable Commitments***
  - ***-Unavoidable Adverse Impacts***
- **c. Mitigation Included Under All Alternatives**
- **d. Effects By Alternative**
  - ***-Alternative 1 – No Grazing***

Direct Effects
Indirect Effects
Cumulative Effects
Forest Plan Consistency and Other Required Disclosures
Conclusions for Environmental Consequences
-Alternative 2 – Current Management
Direct Effects
Indirect Effects
Cumulative Effects
Forest Plan Consistency and Other Required Disclosures
Conclusions for Environmental Consequences
-Alternative 3 - Proposed Management
Direct Effects
Indirect Effects- Summary Across Analysis Area
Indirect Effects by Allotment
Cumulative Effects
Forest Plan Consistency and Other Required Disclosures
Conclusions for Environmental Consequences
-Effects by Alternative Summary

MITIGATION

MONITORING

INVASIVE PLANT MANAGEMENT

LIVESTOCK CARRYING CAPACITY

CITATIONS

APPLICABLE LAWS, REGULATIONS AND POLICY

a. Federal

Public Rangelands Improvement Act of 1978

43 U.S.C. 1901 et seq.
(a) The Congress finds and declares that:
3) unsatisfactory conditions on public rangelands present a high risk of soil loss, desertification, and a resultant under productivity for large acreages of the public lands; …; negatively impact the quality and availability of scarce western water supplies; threaten important and frequently critical fish and wildlife habitat; prevent expansion of the forage resource and resulting benefits to livestock and wildlife production; increase surface runoff and flood danger; reduce the value of such lands for recreational and esthetic purposes; and may ultimately lead to unpredictable and undesirable long-term local and regional climatic and economic changes;
(4) the above-mentioned conditions can be addressed and corrected by an intensive public rangelands maintenance, management, and improvement program involving significant increases in levels of rangeland management and improvement funding for multiple-use values;
(b) The Congress therefore hereby establishes and reaffirms a national policy and commitment to:
(1) inventory and identify current public rangelands conditions and trends as a part of the inventory process required by section 1711 (a) of this title;
(2) manage, maintain and improve the condition of the public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process...;
(d) Allotment management plan requirements: All permits and leases for domestic livestock grazing issued pursuant to this section may incorporate an allotment management plan developed by the Secretary concerned. …If the Secretary concerned elects to develop an allotment management plan for a given area, he shall do so in careful and considered consultation, cooperation and coordination with the lessees, permittees, and landowners

involved…having lands within the area to be covered by such allotment management plan. Allotment management plans shall be tailored to the specific range condition of the area to be covered by such plan, and shall be reviewed on a periodic basis to determine whether they have been effective in improving the range condition of the lands involved or whether such lands can be better managed under the provisions of subsection (e) of this section. The Secretary concerned may revise or terminate such plans or develop new plans from time to time after such review and careful and considered consultation, cooperation and coordination with the parties involved.
(e) Omission of allotment management plan requirements and incorporation of appropriate terms and conditions; reexamination of range conditions. In all cases where the Secretary concerned has not completed an allotment management plan or determines that an allotment management plan is not necessary for management of livestock operations and will not be prepared, the Secretary concerned shall incorporate in grazing permits and leases such terms and conditions as he deems appropriate for management of the permitted or leased lands pursuant to applicable law. The Secretary concerned shall also specify therein the numbers of animals to be grazed and the seasons of use and that he may reexamine the condition of the range at any time and, if he finds on reexamination that the condition of the range requires adjustment in the amount or other aspect of grazing use, that the permittee or lessee shall adjust his use to the extent the Secretary concerned deems necessary. Such readjustment shall be put into full force and effect on the date specified by the Secretary concerned.

43 U.S.C. 1902 Definitions
(a) The terms “rangelands” or “public rangelands” means lands administered by the Secretary of the Interior through the Bureau of Land Management or the Secretary of Agriculture through the Forest Service in the sixteen contiguous Western States on which there is domestic livestock grazing or which the Secretary concerned determines may be suitable for domestic livestock grazing.
(b) The term “allotment management plan” is the same as defined in section 1702 (k) of this title, except that as used in this chapter such term applies to the sixteen contiguous Western States.
(c) The term “grazing permit and lease” means any document authorizing use of public lands or lands in national forests in the sixteen contiguous Western States for the purpose of grazing domestic livestock.
(d) The term “range condition” means the quality of the land reflected in its ability in specific vegetative areas to support various levels of productivity in accordance with range management objectives and the land use planning process, and relates to soil quality, forage values (whether seasonal or year round), wildlife habitat, watershed and plant communities, the present state of vegetation of a range site in relation to the potential plant community for that site, and the relative degree to which the kinds, proportions, and amounts of vegetation in a plant community resemble that of the desired community for that site.
(e) The term “native vegetation” means those plant species, communities, or vegetative associations which are endemic to a given area and which would normally be identified with a healthy and productive range condition occurring as a result of the natural vegetative process of the area.

43 U.S.C. 1903. Rangelands inventory and management; public availability
(a) Following enactment of this chapter, the Secretary of the Interior and the Secretary of Agriculture shall update, develop (where necessary) and maintain on a continuing basis thereafter, an inventory of range conditions and record of trends of range conditions on the public rangelands, and shall categorize or identify such lands on the basis of the range conditions and trend thereof as they deem appropriate. Such inventories shall be conducted and maintained by the Secretary as a part of the inventory process required by section 201 (a) of the Federal land Policy and Management Act (43 U.S.C. 1711), and by the Secretary of Agriculture in accordance with section 1603 of title 16; shall be kept current on a regular basis so as to reflect changes in range conditions; and shall be available to the public.
(b) ...the goal of such management shall be to improve the range conditions of the public rangelands so that they become as productive as feasible in accordance with the rangeland management objectives established through the land use planning process, and consistent with the values and objectives listed in sections 1901 (a) and (b) (2) of this title.

Forest and Rangeland Renewable Resource Planning Act of 1974 and National Forest Management Act of 1976

In response to requirements set forth in these two Acts, final rules on National Forest System Land and Resource Management Planning established specific minimum management requirements to be met in accomplishing the

goals and objectives for National Forest System lands. These requirements were intended to guide the development, analysis, approval, implementation, monitoring, and evaluation of forest plans.

Multiple Use Sustained Yield Act of 1960

It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes (16 USC 2 (I); Sec 528). The terms multiple use and sustained yield are defined as:

"The management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some land will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output." (multiple use)

"The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land." (sustained yield)

b. Forest Service

National Direction

Agency policy and direction governing management of rangelands on National Forest System lands is outlined in the Forest Service Manual (FSM). Objectives of the range management program (FSM 2202, Objectives) are:
To manage range vegetation to protect basic soil and water resources, provide for ecological diversity, improve and maintain environmental quality, and meet public needs for interrelated resource uses.
To integrate management of range vegetation with other resource programs to achieve multiple use objectives contained in land and resource management plans.
To provide for livestock forage, wildlife food and habitat, outdoor recreation, and other resource values dependent on range vegetation.

Forest Service policy regarding management of rangelands (FSM 2203, Policy) is:
Use appropriate methods, such as grazing use by livestock or wild ungulates, prescribed fire, and mechanical or chemical treatments, for managing range vegetation.
Identify and inventory range resource values, including riparian, upland, and other critical areas to determine which areas meet or do not meet Forest land and resource management plan objectives.
Implement and monitor measures to restore and enhance plant diversity and productivity, water quality, and soil stability.
Enhance or maintain habitat of threatened, endangered or sensitive species of plants and animals.
Determine suitability and potential capability for producing forage for grazing and browsing animals and for maintaining and enhancing habitat for fish and wildlife Management Indicator Species.
Consistent with Forest land and resource management plans, make forage available to qualified livestock operators from lands that are suitable for livestock grazing.

Custer National Forest Land and Resources Management Plan

The Custer National Forest Management Plan states "The goal for rangeland management is to achieve a diversity of beneficial uses of rangeland resources, including harvest of surplus production through a cooperative and integrated management approach designed to attain healthy and productive soil and vegetation and clean air and water. Briefly stated our rangeland goal is range in "good condition." (USDA-Custer Forest Plan. 1986. pp. 3). "Good condition" within the context of the Forest Plan goal, (attain healthy and productive soil, vegetation, clean air and water) is synonymous with maintaining healthy and productive rangelands. The Forest Plan objective for range "is to improve overall vegetative conditions where needed through intensive range

management systems…" (USDA-Custer Forest Plan. 1986. pp. 4). The Forest Plan states all Allotment Management Plans will include a vegetative assessment that shows its importance to wildlife, livestock, and watershed. Native rangelands will usually be managed to encourage perennial native species (USDA-Custer Forest Plan. 1986. pp. 21) and soil and water resources will be managed to maintain or improve quality of watershed, including soil productivity and water quality (USDA-Custer Forest Plan. 1986. pp. 25).

c. Best Management Practices

As identified above under Surface Water Quality Standards, soil and water conservation practices (or BMPs) are the primary mechanism to minimize water quality impacts from non-point source pollution and still allow dispersed land management activities to occur on National Forest land.

Cooperative Direction Letter From the Governor of Montana, U.S. Forest Service Regional Forester – Northern Region, and the State Director of the Bureau of Land Management (USDI Bureau of Land Management, USDA Forest Service, State of Montana 1996).

In reference to the Montana Technical Guide for Prescribed Grazing (USDA Natural Resources Conservation Service 1996) signatories state "we have jointly prepared this rather unprecedented letter to you, our respective field office managers, to encourage the use of this Prescribed Grazing Standard, in a voluntary manner, to achieve our agencies' management objectives and meet the provisions of the Montana Water Quality Act and other state and federal laws as they relate to livestock grazing."

The Montana Technical Guide for Prescribed Grazing 528 (USDA Natural Resources Conservation Service 2005)

This technical guide suggests that management should "manipulate the intensity, frequency, duration, and season of grazing to:

- Improve or maintain the health and vigor of plant communities,
- Improve or maintain quantity and quality of forage for livestock health and productivity,
- Improve or maintain water quality and quantity,
- Reduce accelerated soil erosion, and maintain or improve soil condition,
- Improve or maintain the quantity and quality of food and/or cover available for wildlife,
- Promote economic stability through grazing land sustainability.

Other recommendations provided in the Technical Guide include:

<u>Criteria to Improve or Maintain the Health and Vigor of Plant Communities</u>

Duration and intensity of grazing will be based on desired plant health and expected productivity of key forage species to meet management unit objectives.

Adjust grazing periods and/or stocking rates to meet desired objectives for the plant communities and the associated resources, including the grazing animal.

Schedule livestock movements based on rate of plant growth, available forage, and utilization, not on calendar dates.

Periodic rest from grazing may be needed to maintain or restore the desired plant community following episodic events, such as wildfire or severe drought.

<u>Criteria for the Specific Purpose of Water Quality</u>

Maintain adequate ground cover and plant density to maintain or improve filtering capacity of the vegetation.

Criteria for the Specific Purpose of Soil Erosion and Condition

Maintain adequate ground cover, litter, and canopy to maintain or improve infiltration and soil condition.

Minimize concentrated livestock areas, trailing, and trampling to reduce soil compaction, excess runoff, and erosion.

Criteria to Improve or Maintain Food and/or Cover for Wildlife Species of Concern

Manage for diverse plant communities.

Manage plant height, structure and density for desired wildlife habitat.

Provide rest from grazing during critical nesting periods.

Planned Grazing Systems - Rangelands

A planned grazing system is comprised of multiple pastures that are alternately rested from grazing in a planned sequence. A grazing schedule is developed in order to regulate the time of the year grazing is to occur, the length of the grazing period, and the frequency and extent of plant defoliations. Scheduled rest periods for plant recovery after grazing are essential, and must occur within the current or following growing seasons of the plant species to be managed. The length and frequency of planned rest periods will determine the amount of grazing utilization possible without damage to plants.

Management should allow for flexibility of timing that livestock are turned onto or removed from a grazing unit, based on yearly variations in climate. There is no single grazing system that can be applied to all situations, as every management unit is unique. Grazing systems must be designed according to management objectives and resource concerns. Resource limitations such as poisonous plants, lease requirements, and seasonal availability of water must be considered. The system must have built in flexibility to accommodate for unplanned events such as severe drought, insects, or wildfire.

The forage requirements of the animals to be managed must be balanced with the total forage supply of the pasture. Consider the accessibility of forage during the period when livestock are scheduled to graze.

The number, size, and arrangement of pastures will greatly influence and possibly dictate the type of grazing system to be applied. The system must be designed considering water availability, fencing, and natural barriers. It must be compatible with labor resources, and ease of moving livestock must be considered. Systems that minimize animal stress will provide for higher animal performance.

In general, when designing the grazing schedule, no pasture should be grazed for more than half the growing season of desirable key species, to avoid selective re-grazing of preferred plants. As a rule of thumb, cool season species actively grow during April, May and June, while warm season species complete most of their growth during May, June and July. This will vary locally, but serves as a guide to determining the growing season.

Periods of use throughout the grazing season (early, mid, late) will be alternated from year to year. To ensure reproductive recovery of desirable key species, grazing may need to be deferred from initiation of growth until the dormant period at least once every three to four years. Where maintenance or enhancement of shrubs and/or trees is an objective, the season of use should be alternated from year to year, or the grazing prescription should provide for annual light use of browse species, to allow for woody species regeneration. Continued early spring use can reduce the potential forage production by eliminating new leaves needed to capture sunlight energy.

Plant growth and phenology, length of grazing period, target utilization levels, and frequency of grazing should be used to determine when livestock are ready to be moved to another pasture, instead of calendar dates. The season of use (spring, summer, fall, winter) within a pasture should be planned according to management objectives, plant physiological requirements, and animal nutritional needs. It must also be coordinated with

livestock management operations, such as breeding and calving periods. Early spring use may cause resource damage in areas where soils and streambanks are wet and more susceptible to compaction and animal trampling damage.

Herbaceous Forage Utilization

Utilization target levels are used to help ensure that resource objectives are met. Attaining a specified use level of desirable key species is not an objective, but serves as a reference point to evaluate the grazing system and its effect on the desired plant communities.

Target utilization levels should be planned by considering current and planned resource conditions, scheduled rest periods, and grazing tolerance of desirable key species. Utilization tolerance of native species varies by the physiology and morphology of the plant, season of use, soil, climate, vigor and health of plants, and competition with other species.

In general, during the growing season, plant health is affected by grazing when use levels exceed 50 percent of total current year's aboveground production by reducing or stopping root growth. In the dormant season, plant health is affected by grazing when use levels exceed 65% by reducing thermal cover of remaining stems, removing carbohydrate storage sites, damaging crown buds, etc. Planned use levels must ensure the plant has adequate leaf area and growth for photosynthesis and recovery following grazing. In areas where rangelands are in need of vegetation improvement using grazing as a tool, (or areas receiving less than 10 inches of annual precipitation), utilization levels will not exceed 35% during the growing season on desirable key species. In all other areas, utilization levels will not exceed 50% during the growing season on desirable key species. (Holechek et. al. 1999 Rangelands, Vol. 21(2)).

The rate of recovery from grazing is a function of two criteria:

(1) Factors associated with the physiology of the grazed plant, and
(2) Environmental factors that affect growing conditions.

The primary factors associated with plant physiology are:

(1) Amount of photosynthetic material remaining after defoliation,
(2) Susceptibility of growing points to damage or removal,
(3) Ability of the plant to produce new tillers, and
(4) Ability of the plant to allocate resources to maintain a favorable shoot to root balance.

Those factors associated with environmental conditions include soil moisture, soil and ambient temperatures, fertility, and competition. Plant recovery can only occur when these conditions are favorable for plant growth. Wildlife, insects, hail, or wildfire may also place demands on the forage resource that are beyond the control of the manager. The manager must provide an adequate recovery period following these types of harvests to sustain a healthy plant community.

Grazing strategies, which incorporate heavier utilization levels, should have a greater rest to grazing period ratio for sufficient plant recovery following grazing. When grazing frequency is low, and plants are assured adequate regrowth and recovery before being regrazed, plants are able to withstand a higher percentage of annual use--greater than 50 percent--to be removed during the short grazing period. In these systems, grazing is scheduled at high intensity for short duration, and then rested for long periods. These systems are beneficial to reduce selective grazing and can improve competitive interactions. Any temporary heavy utilization must not contribute to site deterioration.

Grazability and utilization levels must be evaluated using desirable key species and key areas in order to prevent resource degradation. Grazability and the determination of available forage allocated to grazing include kind and class of animal, consideration of distance to water, slope, topography, species preferences and palatability, and additional site specific factors.

ASSUMPTIONS, METHODOLOGY, AND SCIENTIFIC ACCURACY OF INFORMATION USED

Rangeland Condition and Health

The assessment for upland rangeland conditions utilized some rangeland health criteria and indicators, principally similarity to reference plant communities to derive a qualitative assessment of ecological status. The term “range condition” is not used because of its historical bias towards abundance of forage species, discounting the value of other ecologically important species. This follows recent recommendations by Pellant and others (Pellant et. al. 2000, Pyke et. al. 2002), procedures outlined in the National Range and Pasture Handbook (USDA-NRCS 1997), is consistent with the Range Inventory Standardization Committee (RISC 1983) recommendation to drop the term “range condition”, and Forest Service Handbook direction (USDA-FS Handbook 2090.11 Sect1.47a, USDA-FS Rangeland Inventory, Analysis, and Planning Guide 1993). Since release of the RISC Report (RISC 1983) there has been much discussion in the scientific literature about concepts and terminology used for evaluating, describing, and assessing ecological conditions of rangelands.

The Range Inventory Standardization Committee (RISC, 1983) of the Society for Range Management discussed concepts useful to the classification (e.g., ecological site and potential natural community), and assessment of western rangeland ecological conditions (e.g., ecological status and resource value rating). More recently the National Research Council (1994), the Natural Resources Conservation Service (NRCS, 1997), Pellant et. al. (2000), and Pyke et. al. (2002) has suggested additional concepts and methods appropriate to the assessment of rangeland ecological conditions. Common to all these approaches is the use of ecological classifications to describe environments with similar potentials to respond to management practices and disturbance events. Habitat types (Daubenmire, 1968), ecological sites (RISC, 1983,USDA-NRCS 1997), and range sites (Shiflet, 1973) are all examples of ecological classifications that define “a kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and respond to management” (RISC, 1983). The evolution of these discussions has resulted in the development of methods for assessing rangeland health (Pellant et. al. 2000, Pyke et. al. 2002), replacing range condition terminology. Many of the terms and concepts previously implied with range condition (i.e. desirable plants, undesirable plants, etc.) are now used for determining forage value (USDA-NRCS 1997).

The National Research Council (NRC), (NRC 1994), the Unity in Concepts Task Group (UCTG), (UCTG-SRM 1995), and the National Range and Pasture Handbook (USDA-NRCS 1997) recommended approaches, criteria and indicators for evaluating rangeland health. The National Research Council (NRC, 1994) outlined three criteria for determining rangeland health: degree of soil stability and watershed function, integrity of ecological processes (nutrient cycles and energy flow), and presence of functioning recovery mechanisms. The Unity in Concepts Task Group (UCTG-SRM, 1995) made several recommendations for evaluating ecological status of rangelands: 1) Site potential must be recognized in evaluating rangeland status; 2) Conservation of soil must be a primary consideration for sustainable management of rangelands; 3) Defined desired plant community as the one selected from a range of communities that may occupy a site and best meets objectives for conserving soil productivity and management objectives for the site; 4) Desired plant composition should be described in terms of species, life forms, or functional groups, rather than by individual species; 5) Introduced terms of soil conservation threshold and soil conservation rating for evaluating sustainability of rangeland ecosystems and recognized attributes of vegetation and soil surface features could be used as indicators of soil protection from erosion. The Natural Resource Conservation Service incorporated many of these concepts into the National Range Handbook and Pasture Handbook (USDA-NRCS 1997) and outlined an ecological classification framework for summarizing data and resource interpretations by ecological site.

Direct measures of ecological processes and site integrity status (i.e. degree of soil stability, watershed function, energy flow, nutrient cycling) are difficult to measure directly. However, many ecological attributes from field plot data and field observations can be used as surrogates or indicators to evaluate ecological processes, status, and site integrity. Typically more than one indicator is evaluated for each ecological component (Table 1). It should be noted that no single attribute or criteria is used to determine ecological status. An assessment of ecological status must consider a combination of attributes and criteria to determine an ecological rating. These data or attributes are best summarized using an ecological classification to organize field data by habitat type or ecological site and their associated vegetation communities or states. While it is true an evaluation of ecological status or rangeland health involves a number of indicators and criteria, current plant community composition and

species dominance as captured by floristic and functional/structural group similarity does indicate the presence/absence and/or abundance of some of the other indicators. For example, plant communities currently exhibiting low similarity typically have more bare soil, lower plant species diversity, less structure, and are less productive than communities exhibiting higher floristic functional/structural similarity within mixed grass prairie habitat types of the Northern Great Plains (USDA-FS 1992, DiBenedetto et. al. 2003). These relationships were found through summarizing plot data The Little Missouri National Grassland (USDA-FS 1992, DiBenedetto et. al. 2003) which summarized plot data according to grassland and shrubland habitat types and associated seral communities (i.e. successional vegetation states) associated with the habitat types.

Classification methods used in the Little Missouri National Grassland followed methods common to analyzing and grouping plots into plant community types sharing common vegetation and habitat type characteristics. Ecological classification provides a useful framework for organizing field data into classes or ecological units which permit summarization of attributes based on site capability. Driscoll et al. (1984) describes ecological classification as a framework for structuring data into similar subunits (classes) to permit analysis of complex situations and facilitate communication about differences and/or similarities between ecological units. Habitat type classifications are land unit classifications utilized by the USDA-Forest Service, Northern Region to define ecological units (biophysical settings) with similar capability within a landscape. Daubenmire (1968) defined a habitat type as a unit of land or biophysical setting where successional relationships, ecological capability and vegetation response to management are expected to be similar. Mueggler and Stewart (1980) provided the framework for defining biophysical environment settings associated with successional and historic climax vegetation states for the Red Lodge Creek, Butcher Creek, East Rosebud and West Rosebud Allotments Analysis Area. Classification of successional vegetation states found on different habitat types followed concepts and document format outlined by the Range Standardization Committee (RISC 1983), Forest Service Manual and Handbook direction for ecological classification (USDA-FS 1991), and National Range Handbook (USDA-NRCS 1997). Further, the classification incorporated the ecological principles and concepts for evaluating ecological status outlined by the National Research Council (NRC 1994) and the Unity in Concepts Task Group (UCTG) (UCTG-SRM 1995); and multiple state and transition succession and successional pathway concepts described by Westoby et al. (1989), Friedel (1991), Laycock (1991), USDA-NRCS (1997), and Stringham et. al. (2001). Rangeland health, ecological status, and resource value ratings can be summarized for each historic potential community and successional vegetation state within a habitat type using attributes from field data associated with indicators of rangeland health components. The information provided through the ecological classification of habitat types and associated plant communities can be the basis for describing desired future ecological conditions, resource values, and grazing allotment objectives according to land capability and floristic/structural similarity. Thus, floristic, functional/structural similarity was used in a qualitative assessment to provide a general sense of current ecological status based on departure of current vegetation communities from the reference potential community of grassland and shrubland habitat types. This was the approach was used to organize and evaluate plot data to describe similarity of current vegetation to the reference community for the analysis area.

Table 1. Ecological Indicators Used For Assessing Rangeland Health Components And Which Can Be Summarized In Ecological Classifications Of Habitat Types And Associated Plant Communities (Vegetation States). The list of attributes is from National Range And Pasture Handbook (USDA-NRCS 1997, Pp.4-23 – 4-42).

	Rangeland Health Components (Ecosystem Function, Processes, Site Integrity)		
Indicators	**Soil/Site Stability**	**Hydrologic Function**	**Integrity of Biotic Community**
1. Rills	X	X	
2. Water flow pattern	X	X	
3. Pedestalling	X	X	
4. Bare ground	X	X	
5. Gullies	X	X	
6. Wind erosion	X		

	Rangeland Health Components (Ecosystem Function, Processes, Site Integrity)		
Indicators	**Soil/Site Stability**	**Hydrologic Function**	**Integrity of Biotic Community**
7. Litter Movement (wind or water)		X	
8. Soil surface resistance to erosion	X	X	X
9. Soil surface loss or degradation	X	X	X
10. Plant community composition and distribution relative to infiltration and run-off		X	
11. Compaction layer (below soil surface)	X	X	X
12. Plant functional/structural groups			X
13. Plant mortality/decadence			X
14. Litter amount		X	X
15. Annual production			X
16. Invasive plants			X
17. Reproductive capability of perennial plants			X

Field Survey Methods

Field surveys were completed 2005 through 2007. The surveys consisted of walking traverses through a pasture noting vegetation communities (i.e. dominance type), vegetation composition, and cover. A preliminary classification of existing plant communities occupying habitat type settings was used to record the plant communities currently present in pastures within the allotments. The plant community classification was based on site, vegetation composition, and production by lifeform where plots with similar dominant species were grouped to represent the range of characteristics for a plant community (i.e. dominance type). Plot data collection and analysis followed field and analysis methods outlined in the Terrestrial Ecological Unit Inventory by Technical Guide (USDA-FS 2003) and Northern Region Ecosystem Inventory and Analysis Guide (USDA-FS-Northern Region 1992). Grassland and shrubland habitat types were identified for all field plots following Mueggler and Stewart (1980). Plots were grouped by habitat type than sorted and grouped into dominance types according to dominant species and plant functional groups (USDA-NRCS 1997). The plant community (i.e. dominance type) classification was used to map and describe existing vegetation for each pasture within a grazing allotment. A qualitative assessment of vegetation similarity was completed, relating the degree of departure or similarity of existing dominance type plant species composition to the climax plant community for each habitat type as defined by Mueggler and Stewart (1980). The qualitative assessment followed methods outlined by Pellant et. al. (2000). Maps of existing vegetation were compiled utilizing ArcMap a Geographic Information System (GIS) application by delineating vegetation map units based on vegetation patterns observed on 1:24,000 scale digital ortho-rectified imagery. Vegetation delineations were refined or adjusted based on field observations of dominance type patterns and extent within a pasture. Vegetation map unit (polygon) composition was recorded following vegetation mapping methods outlined in Northern Region Ecosystem Inventory and Analysis Guide (USDA-FS-Northern Region 1992).

Production utilization studies were also conducted between 2005 and 2007 on the allotments. The production utilization studies include collection of ungrazed forage production, calculating actual use as a percentage of ungrazed production, and actual use mapping. Production figures were adjusted for growing season precipitation based on weather records from the Red Lodge and Fishtail, Montana weather station *(High Plains Regional Climate Center – Univ. of Nebraska http://www.hprcc.unl.edu/cgi-bin/cli_perl_lib/cliMAIN.pl?mtnye).*

AFFECTED ENVIRONMENT

Introduction

The project area is on the Beartooth Ranger District, Custer National Forest. Both natural events and human activities have the potential to impact rangeland and forestland ecosystems (e.g. forest, grassland, and shrubland vegetation and soils). Significant natural events include wildfire, wind throw, and insect and disease, while significant human activities include mining, livestock grazing, roads, timber harvest, fire and fuels management, and recreation. The degree of impact depends upon the vegetation, soil, and hydrologic characteristics of the watershed and how sensitive and resilient they are to these disturbances. Vegetation, soil and hydrologic characteristics vary extensively across landscapes and thus are dictated by local landform, geologic material and climate.

a. Natural Characteristics and Processes

Climate

The climate is characterized by warm summers and cold winters. Summer weather varies with periods of hot spells and occasional cool days. Most precipitation falls late in spring and early in summer. Precipitation increases with elevation, ranging from 17.8 inches at the lower end of the project area to 60 inches at the higher elevations (Montana State Library - Natural Resource Information System http://nris.state.mt.us/gis/gisdatalib/downloads/precip_Stillwater.pdf). Early growing season precipitation, which varies annually, affects the amount of grass and forb production and too some extent composition of plant communities. The 31 year April through June precipitation average for the Red Lodge weather station is 8.69 inches and 8.25 inches for the Fishtail weather station. During the 2005 – 2007 period, April through June precipitation at the Red Lodge weather station varied from 2.79 inches (32% of average) to 13.51 inches (155% of average). For the same period precipitation varied from 5.15 inches (62% of average) to 11.76 inches (144% of average).

Fire Ecology, Ecotone Vegetation Succession and Patterns

Vegetation composition, structure, and patterns are largely defined by climate, landform, and soils; but natural disturbance agents including fire, wind throw, herbivory, and insects or disease can alter these vegetative characteristics. The current vegetation pattern of coniferous forest, mountain meadows, mountain grassland, and shrublands reflect the inter-actions between the physical environment, vegetation communities, and disturbance processes. The most recent large fire within the analysis area is the 1996 Shepherd Mountain Fire in the East Rosebud drainage. The fire was a stand replacing fire which created the current vegetation pattern which is dominated by early seral lodgepole pine forest and aspen communities along with mountain grassland and shrubland communities.

Past frequent to infrequent fires have created and maintained a mosaic of diverse vegetation communities which historically occurred along the Beartooth Front. These communities consisted of conifer forest, mountain grassland, mountain shrubland, and successional plant communities. Lower elevation foothills, valleys, and mountain sides are presently dominated by lodgepole pine, Douglas-fir, and limber pine cover types, probably occupying more area than they did historically. Field reconnaissance surveys of current vegetation patterns indicate historic grassland and shrubland communities being replaced by forested vegetation. While there are no studies specific to the Analysis Area, the assumed increases in woody vegetation are consistent with findings of several fire history studies on similar lower montane settings in southwest Montana. These studies of the Douglas-fir and limber pine/bunchgrass habitat type ecotone with mountain grassland and shrubland indicate a general increase in sagebrush on some sites and increased Douglas-fir and limber pine density and cover in areas formally dominated by grass and sagebrush (Arno and Gruell 1983, Arno Gruell 1986). This change in vegetation pattern is attributed to longer fire return intervals over the past 100 years as compared to the historic fire return interval. Arno and Gruell (1983) reported that historic mean fire interval ranged from 21 to 60 years within the Douglas-fir habitat types and averaged 74 years within the limber pine/bunchgrass habitat type. The

change in fire frequency is attributed to reduced fine fuels from grazing and less fire starts by Native Americans beginning in the late 1800s (Arno and Gruell 1986); and fire suppression beginning in the early 1900s (Arno et. al. 2000). It takes about 40 years for Douglas-fir to become established and reach fire resistant size. Fire return intervals of 21 to 60 year would have been effective in eliminating young trees and maintaining grassland and sagebrush dominance within ecotone settings. The lengthened fire frequencies (i.e. > 60 years) allows trees to become established and reach fire resistant size and persist and increase on these sites even when surface fires do occur (Arno and Gruell 1986).

The historic distribution and pattern of mountain sagebrush and the influence of fire and grazing in the establishment, maintenance and/or expansion of sagebrush communities is less certain. Sagebrush naturally occupied large areas of the landscape regionally, according to historical journal accounts and repeat photography studies (Welch 2005, Johnson 2000). Many of these historic accounts are from the plains of Wyoming, Idaho, Oregon, and Washington (Welch 2005) and are probably reporting the presence of sagebrush species other than mountain big sagebrush (*Artemisia tridentate subsp. vaseyana*). Arno and Gruell (1983) citing journal entries, intolerance of sagebrush to frequent fire, and repeat photography at ten sites suggest mountain grass-dominated communities were more extensive historically and sagebrush occurred as widely spaced plants or were restricted to small patches. They concluded along with Patten (1969) and Sindelar (1971) that mountain big sagebrush has increased on many sites since settlement. Arno and Gruell (1983) also noted soil differences play a role in the distribution and pattern of mountain big sagebrush on the landscape. Historically sagebrush was probably dominant on sites with cobbly, sandy, or clayey soils. Grasses tend to produce poorly on these sites and fine fuels available to carry a fire through these stands would have been less, allowing sagebrush to become established and persist on these sites. On sites with loamy soils grass was dominant, sagebrush plants, if present, were widely spaced or limited to small patches. Loamy soils support more grass production resulting in an abundance of fine fuels to carry fire. These sites probably experienced more frequent fire (i.e. 21 to 60 year mean fire return interval) and intensive fires keeping mountain sagebrush from becoming established. Others have reported it takes 30 or more years for sagebrush to recover to original densities on burned sites (Wamboldt et. al. 2001, Wamboldt and Payne 1986, Johnson 2000). Extending fire return interval beyond 60 years would provide an opportunity for sagebrush plants to become established on sites adjacent to older sagebrush patches or become denser in grassland communities where sagebrush plants were widely spaced. Arno and Gruell (1983) reported the forest–grassland ecotone of their study area, where they calculated a historic mean fire return intervals of 21 to 60 years, had not experienced a fire since 1918. The literature cited suggests similar grassland, sagebrush, and conifer ecotone biophysical settings within the analysis area probably have more sagebrush and conifer trees today than occurred historically.

Table 2 and 3 summarize a probable landscape composition associated with mountain sagebrush and mountain sagebrush with trees potential natural vegetation groups. A probable historic landscape composition under a natural fire regime for sagebrush sites would be 50% open sagebrush stands (Class C and D) with less than 15% canopy cover of sagebrush; 25% would be closed (Class B); 20% would have been a grass dominated community (Class A); and only 5% would have been closed canopy with noticeable dead sagebrush (Class E). The present composition of these sites is probably skewed towards Class B and E, there are no Class A post-fire grass dominated communities represented on sagebrush sites within the Analysis Area. Though there are substantial acres of grassland dominated habitat types within the Analysis Area.

Table 2. Probable Landscape Composition For Sagebrush Biophysical Setting. Fire Regime Description For Fire Regimes 1 Short-Interval Mixed Severity And Fire Regime 2 Short Interval Stand Replacement Fires. Short Interval Is 20-40 Yr. From Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions Draft April 6, 2005, (Hann Et. Al. 2003).

Class	Percent of Landscape	Descriptions
A: post replacement	20	Post-fire community of mountain forbs, grasses, and sprouting shrubs
B: mid-development	25	Mid-seral, dense (>15%) canopy cover of sagebrush with understory of mountain forbs and grass.
C: mid-open	40	Mid-seral, open (<15%) canopy cover of sagebrush with perennial grasses and forbs in interspaces.
D: late-open	10	Late-seral, open (<15%) canopy cover sagebrush community with

Class	Percent of Landscape	Descriptions
		mixed shrub/herbaceous community.
E: late-closed	5	Late-seral, closed (>15%) canopy cover sagebrush, noticeable dead component, with mixed shrub/herbaceous community
	100	

Table 3. Probable Landscape Composition For Sagebrush With Trees Biophysical Setting. Fire Regime Description For Fire Regimes 1 Short-Interval Mixed Severity And Fire Regime 4 Infrequent (35-100+ Yrs) Stand Replacement Fires. Short Interval Is 0-35 Yr. From Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions Draft April 6, 2005 (Hann Et. Al. 2003)

Class	Percent of Landscape	Descriptions
A: post replacement	20	Post-fire community of mountain forbs, grasses, and sprouting shrubs.
B: mid-development	20	Mid-seral, dense (>15%) canopy cover sagebrush community with an understory of mountain forbs and grasses. Sapling to pole sized encroaching conifers present.
C: mid-open	35	Mid-seral, open (<15%) canopy cover sagebrush community with perennial grasses and forbs in interspaces. Sapling to pole sized encroaching conifers present.
D: late-open	15	Late-seral, open (<15%) canopy cover sagebrush community with mixed shrub/herbaceous community. Scattered conifers/junipers on rocky sites.
E: late-closed	10	Late-seral, closed (>15%) sagebrush community, noticeable dead component, with mixed shrub/herbaceous community. Scattered conifers/junipers on rocky sites.
	100	

The sagebrush with trees potential vegetation group represent sites located within the ecotone between true conifer forest and true sagebrush habitat types. The probable historic landscape composition for sites that support a mix of sagebrush and sagebrush/conifer communities (Table 3) consisted of 20% early seral post replacement communities dominated by grasses and forbs (Class A); 25% was late seral communities either open canopy or closed canopy with dead sagebrush where trees were restricted to rocky outcrops (Class D, E); 55% of the landscape was mid-seral with open to closed canopy sagebrush and sapling and pole sized conifers present. The present landscape is probably skewed towards mid seral (Class B) dense sagebrush communities and sapling to pole size conifers, probably ranging from 10% to over 50% canopy cover and presently exceeds the 20% of the landscape. The Class A post-fire grass dominated community is not represented and late seral communities (Class D and Class E), probably comprises less than 25% of the landscape. While there are substantial acres of grassland habitat types, many of these sites are also experiencing conifer succession.

Management decisions regarding vegetation management within the conifer forest-grass-sagebrush ecotone should be considered within the context of a landscape goal defining the desired landscape composition for these biophysical settings. For example, is the management objective to restore and maintain a range of vegetation types and seral plant communities across the landscape, approximating what may have occurred historically? Or is the management objective to maintain the present composition of mid and late seral open and closed sagebrush communities? Related to the desired landscape vegetation composition is identification of desired resource values and terrestrial habitats. It would appear the present composition favors species associated with mid and late seral closed canopy sagebrush communities and mid seral open and closed conifer communities with a corresponding loss of habitat for species associated with grassland and early seral sagebrush and conifer communities.

b. Human Influences

Livestock grazing and alteration of natural fire frequency are the most important factors affecting upland grassland and shrubland vegetation communities in the project area. Roads and recreation also impact upland vegetation communities and sites. Roads change the land cover and use. Dispersed recreation activities can affect vegetation and soils on the specific sites they occur on. The most recent timber harvest activities occurred about 20 years ago in the West Red Lodge Creek drainage. These activities were limited in extent and the sites are presently dominated by sapling sized lodgepole pine.

Fire suppression efforts and other land use and management activities over the past 50 – 100 years have probably reduced the frequency and size of wildfires from what historically occurred within fire regimes 1, 2, and 4. These were typically short interval (< 35 yrs) to infrequent (35-100 year) fire return intervals with mixed severity to stand replacing fire events.

General Grazing Influences

Effects of livestock grazing on vegetation composition and soil, and vegetation productivity are dictated by the timing, intensity, duration of grazing, and length of rest and recovery periods from grazing within an area. Livestock grazing affects can be managed or mitigated by altering and/or manipulating anyone of these factors through planned grazing systems and/or minimizing overgrazing of forage plants and by balancing stocking levels with available forage. Allowable use guidelines for desirable key species and utilization monitoring are tools available for mitigating grazing effects, achieving management objectives, managing for desired vegetation composition, and desired production. Allowable use is defined as the degree of utilization considered desirable considering present resource conditions, management objectives, and level of management (USDA-NRCS 1997, Glossary pp. 2). Allowable use can vary depending on the desired utilization needed to achieve management objectives for a pasture. Allowable use may also vary annually as available forage fluctuates with precipitation and available soil moisture for plant growth. Planned grazing systems (e.g. deferred rotation, time controlled grazing) is another management tool used to mitigate effects of livestock grazing, achieve management objectives, achieve desired vegetation composition and species diversity, and maintain long term vegetation and soil productivity. Planned grazing systems provide periodic rest and allow grazed plants to recover from grazing during critical phenological stages of plant growth.

The critical phenological growth stage occurs when plants are rapidly growing to produce green leaf material, drawing down carbohydrate root reserves to support plant growth and physiological processes. The critical period continues until there is sufficient green leaf material to support the level of photosynthesis needed to meet a plant's physiological needs and replenish lost root reserves. For mountain grassland species the critical phenological stage occurs from initiation of green growth through seed ripe. Continuous heavy grazing use on desirable key species during critical phenological stages may be more detrimental than grazing at this level during the dormant season, when plants are not actively growing or initiating new growth (Holechek et. al. 2001, pp. 224). As a general rule, utilization greater than 51 percent of current year's growth is considered heavy grazing (Table 4). The detrimental affect occurs with repeated grazing of forage plants without providing adequate recovery/rest periods for plants to recover from grazing. Mitigating the effect of heavy continuous heavy grazing is accomplished either through establishing allowable use guidelines to achieve light to moderate grazing or implement planned grazing systems which provide periods of rest or defer grazing until after critical phenological stages of desirable/key species.

Table 4. Utilization Classes From R1 Range Analysis Handbook, (1981, Amendment 20, Pp. 271)

Utilization Class	Utilization Class
Non-use	0 -10%
Light Use	11 -30%
Moderate Use	31 – 50%
Heavy Use	51 – 70%
Extreme Use	> 70%

Desirable key species are plant species chosen to serve as indicators of change and serve as a guide to the grazing use of the entire plant community and if desirable key species are properly grazed, it is assumed the entire plant community will not be excessively grazed (USDA-NRCS 1997, Glossary pp. 32, USDI-BLM 1996, pp. 4). Desirable key perennial native grass species for mountain grassland and shrubland sites are Idaho fescue (*Festuca idahoensis*), tufted hairgrass (*Deschampsia cespitosa*), bluebunch wheatgrass (*Agropyron spicatum*), bearded wheatgrass (*Agropyron caninum*), needle-and-thread grass (*Stipa comata*), and western needle grass (*Stipa occidentalis*).

c. Upland Rangeland Vegetation and Habitat Types

Habitat type classifications define land areas capable of supporting similar vegetation and respond to management or disturbance processes in a similar way. Grassland and shrubland habitat types (Mueggler and Stewart 1980) occurring within the analysis area are summarized in Table 5.

Table 5. Predominant Grassland And Shrubland Habitat Types Occurring On Suitable Range Within The Red Lodge Creek, Butcher Creek, West Rosebud And East Rosebud Analysis Area

Habitat Type Common Name	Habitat Type Scientific Name	Habitat Type Code
Big Sagebrush/Idaho Fescue	*Artemisia tridentata/Festuca idahoensis*	ARTR/FEID
Shrubby Cinquefoil/Idaho Fescue	*Potentilla fruticosa/Festuca idahoensis*	POFR/FEID
Skunkbush/Idaho Fescue	*Rhus trilobata/Festuca idahoensis*	RHTR/FEID
Idaho Fescue/Bearded Wheatgrass	*Festuca idahoensis/Agropyron caninum*	FEID/AGCA
Idaho Fescue/Bluebunch Wheatgrass	*Festuca idahoensis/Agropyron spicatum*	FEID/AGSP
Idaho Fescue/Bluebunch Wheatgrass-western needlegrass	*Festuca idahoensis/Agropyron spicatum-Stipa occidentalis*	FEID/AGSP-STOC
Idaho Fescue/Richards needlegrass?	*Festuca idahoensis/Stipa richardsonii?*	FEID/STRI?

Table 6 provides an acre summary for the range analysis Area. Acre calculations were generated from the existing vegetation map (See Maps 3-A, 3-B & 3-C, Existing Vegetation Polygons). Total acres by allotment, acres of grassland and shrubland vegetation within suitable range, and percent suitable range within the allotment are summarized. Analysis of the affected environment is focused on grassland and shrubland communities occurring on suitable range. Suitable range is defined as areas within 5,000 feet of water and/or areas where slopes are less than less than 50% percent, and capable of producing at least 200 pounds per acre of forage.

Table 6. Red Lodge Creek, Butcher Creek, West Rosebud And East Rosebud Analysis Area, Suitable Range Acre Summary And Percent Of Allotment In Suitable Range (Acre Summary Includes National Forest System And Private Lands Within Allotment Boundaries)

Grazing Allotments	Total Allotment Acres	Suitable Range Acres	Suitable Range as Percent of Area/ Allotment
Butcher Creek	430	100	23%
Red Lodge Creek	560	270	47%
East Rosebud	1490	520	35%
Black Butte WMA	1180	600	51%
West Rosebud	3380	760	22%

Maps displaying upland grassland and shrubland dominance types occurring within suitable range were used to describe existing vegetation (See Maps 3-A, 3-B & 3-C, Existing Vegetation Polygons). Dominance types are the finest level of vegetation classification used to describe existing vegetation communities in this project area. Vegetation dominance type map labels were assigned to the map units based on a combination of field surveys, vegetation plot locations, and photo-interpretation. Table 7 shows the relationship between dominance types, functional plant groups, and similarity ratings. Dominance types are reoccurring plant communities defined by the

dominance of one or more species in the uppermost or dominant layer (USDA-FS 2004). Functional groups are groups of plant species with similar shoot or root structure, photosynthetic pathways, nitrogen fixing ability, life cycle, or other similar characteristics (USDA-NRCS 1997). Functional plant group composition and species diversity are principal factors used to explain ecosystem processes (i.e. nutrient cycling, productivity) on an ecological site (i.e. habitat type) (USDA-NRCS 1997). Criteria used to group dominance types into functional groups were physiologic, physiognomic, and morphological characteristics of the dominant plant species. The specific criteria are dominant species lifeform (e.g. tree, shrub, grass, forb, clubmoss), plant life cycle (e.g. annual, perennial), plant structure (e.g. short grass, mid grass), biomass (productivity), and whether a plant species is native or non-native. Floristic similarity is a qualitative comparison of species abundance and composition for existing dominance types with that of the reference plant community for the habitat type (i.e. departure or similarity of current community composition to the reference plant community). The criteria used as a qualitative evaluation of floristic functional/structural group similarity are summarized in Table 8.

Plant communities with low, low to moderate, and moderate floristic similarity generally have less species diversity, less ground cover, more bare soil, less structure, and are less productive than communities that have a moderate to high/high similarity (DiBenedetto et. al. 2003, USDA-FS 1992). Managing for or maintaining high floristic similarities for a habitat type generally means species and structural diversity is improved, there is more ground cover protecting soil from erosion, and grass productivity and available forage is higher.

Plot data collected within the analysis area indicates similar relationships for sites with low, low to moderate, and moderate floristic similarity to those described by DiBenedetto and others (2003) and USDA-FS (1992) with the exception of decreased litter and increased bare soil (See Maps 6-A, 6-B & 6-C, Vegetation Similarity Index & Vegetation Study Plot Inventory). On mesic mountain grassland sites, there is a difference in the type of vegetative cover protecting the soil: forb species, short grass species, and timothy, replace native mid-grass species. Low to moderate and moderate floristic and structural similarity on mountain grassland sites within the analysis area indicate a decrease of native mid grass species (e.g. Idaho fescue, bluebunch wheatgrass, bearded wheatgrass, western needlegrass) and increases in the abundance of forb species and timothy.

Desirable key perennial native grass species in upland grassland and shrubland communities are Idaho fescue, bearded wheatgrass, bluebunch wheatgrass, western needlegrass, needle-and-thread grass, and tufted hairgrass. These are species that should be the dominant grass species within mountain grassland communities or within the understory of sagebrush dominated communities (Mueggler and Stewart 1980). Planned grazing systems are the principle tool for improving the abundance of perennial native grass species by maintaining their physiological health through controlling the timing and intensity of grazing and providing adequate rest and recovery of grazed plants.

Table 7. Cross Walk Of Floristic Similarity, Functional Plant Group/Vegetation State, And Dominance Types For The Grassland And Shrubland Communities, Red Lodge Creek, Butcher Creek, West Rosebud, And East Rosebud Analysis Area

Floristic Similarity	Functional Plant Group/Vegetation State	Dominance Types (Note: Most common dominance types)
Moderate to High and High	**Grass Dominated States** Idaho fescue/Tufted Hairgrass State Idaho fescue/Bearded wheatgrass State Idaho fescue/Threadleaf Sedge State Idaho fescue/Bluebunch Wheatgrass State Tufted Hairgrass/Sedge State	**Grassland communities** Idaho fescue/Bluebunch wheatgrass (*Festuca idahoensis/Agropyron spicatum*) Idaho fescue/Threadleaf sedge (*Festuca idahoensis/Carex filifolia*) Idaho fescue/Bearded wheatgrass (*Festuca idahoensis/Agropyron caninum*) Idaho fescue/Tufted hairgrass Tufted hairgrass/Sedge (*Deschampsia cespitosa/Carex*) Idaho fescue/cool season grass Mixed cool season grass (equal mix of Idaho fescue, bluebunch wheatgrass, threadleaf sedge, needlegrass (*Stipa)* species) **Shrubland communities**

Floristic Similarity	Functional Plant Group/Vegetation State	Dominance Types (Note: Most common dominance types)
	Shrub Dominated States Mountain big sagebrush/Idaho fescue State Shrubby Cinquefoil/Idaho Fescue State Common snowberry	Mountain big sagebrush/Bluebunch wheatgrass (*Artemisia tridentata vaseyana/Agropyron spicatum)* Mountain big sagebrush/Idaho fescue (*Artemisia tridentata vaseyana/Festuca idahoensis)* Mountain big sagebrush/Idaho fescue-cool season grass Shrubby cinquefoil/Idaho fescue (*Potentilla fruticosa/Festuca idahoensis*) Skunkbush sumac/bluebunch wheatgrass (*Rhus aromatica/Agropyron spicatum*) Common snowberry (*Symphoricarpos alba*)
Moderate	**Herbaceous Dominated States** Cool Season Short Grass State **Shrub Dominated States** Mountain Big Sagebrush/Cool Season Grass State Common snowberry/Cool Season Grass State	**Herbaceous Communities** Cool season grass (*Idaho fescue < 10%, dominate cool season grass; bluegrass, sedge, junegrass, danthonia*) **Shrubland Communities** Mountain Big Sagebrush/Cool season grass (equal mix of bluegrass species, junegrass, or sedge species in understory; Idaho fescue, bluebunch wheatgrass <10%) Common snowberry/Cool season grass (equal mix of bluegrass species, junegrass, or sedge species in understory; Idaho fescue, bluebunch wheatgrass <10%)
Low to Moderate	**Herbaceous Dominated States** Cool Season Short Grass State Herbaceous Non-native State Forb State **Shrub Dominated States** Mountain Big Sagebrush/Forb State Mountain Big Sagebrush/Non-native State Shrubby Cinquefoil/Non-native State Shrubby Cinquefoil/Forb State Half Shrub State	**Herbaceous Communities** Cool season grass/sedge (*Idaho fescue < 10%, dominate cool season grass; bluegrass, sedge, junegrass, danthonia*) Sedge/Rush (*Carex/Juncus*) Kentucky bluegrass (*Poa pratensis*) Timothy (*Phleum pratense*) Smooth brome (*Bromus inermus*) Alpine mixed forb Clubmoss (*Selaginella densa*) **Shrubland Communities** Mountain big sagebrush/clubmoss (*Artemisia tridentata vaseyana/Selaginella densa*) Big Sagebrush/Timothy Big Sagebrush/Kentucky bluegrass Fringed sage (*Artemisia frigida*) Broom snakeweed (*Gutierrezia sarothrae*) Shrubby cinquefoil/Forb Shrubby cinquefoil/Timothy Shrubby cinquefoil/Kentucky bluegrass
Low	**Herbaceous Dominated States** Forb State Herbaceous Non-native State **Shrub Dominated States**	**Herbaceous Communities** Mixed Forb Japanese brome (*Bromus japanicus*) Cheatgrass (*Bromus tectorum*) Cropland and Hayland **Shrubland Communities**

Floristic Similarity	Functional Plant Group/Vegetation State	Dominance Types (Note: Most common dominance types)
	Common Snowberry/Non-native State **Agricultural land (Hayfields)**	Common snowberry/Timothy

Table 8. Qualitative Description Of Degree Of Departure From Ecological Reference Area (I.E. Habitat Types) For Floristic Similarity, Functional/Structural Groups. Taken from National Range And Pasture Handbook (USDA-NRCS 1997, Pp. 4-37) And Pellant Et. Al. (2000, Pp. 87)

Degree of departure from ecological reference area as defined by Habitat Type climax plant community (Mueggler and Stewart 1980)					
Indicator	**Low**	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
Floristic similarity-Functional/ Structural (F/S) Groups	Number of F/S groups greatly reduced; ***and/or*** relative dominance of F/S groups has been dramatically altered; ***and/or*** number of species within F/S groups dramatically reduced.	Number of F/S groups reduced; ***and/or*** one dominant group ***and/or*** one or more subdominant groups replaced by F/S groups not expected for the site; ***and/or*** number of species within F/S groups significantly reduced.	Number of F/S groups moderately reduced; ***and/or*** one dominant group ***and/or*** one or more subdominant groups replaced by F/S groups not expected for the site; ***and/or*** number of species within F/S groups moderately reduced.	Number of F/S groups slightly reduced; ***and/or*** relative dominance of F/S groups has been modified from that expected for the site; ***and/or*** number of species within F/S groups slightly reduced.	F/S groups and number of species in each group closely match that expected for the sight.

EXISTING CONDITION

West Rosebud Allotment

The West Rosebud Allotment is made up of two main pastures, West Rosebud and Morris Creek, and two small pastures. The allotment is made up of 3,276 acres, of these 500 acres are suitable for livestock grazing. Most of the suitable grazing land is located in the West Rosebud valley bottom between 6,000 and 6,200 feet of elevation.

Table 9 summarizes current vegetation types within areas suitable for livestock grazing (See Map 3-A, Existing Vegetation Polygons & Map 6-A, Vegetation Similarity Index & Vegetation Study Plot Inventory). Three hundred ninety-one acres (75% of grassland and shrubland acres) currently have moderate to high and high similarity to reference plant communities (Mueggler and Stewart 1980), 29 acres (5%) has moderate similarity, and 105 acres (20%) has low to moderate similarity. The low to moderate similarity acres are dominated by non-native grass species (timothy, smooth brome, Kentucky bluegrass). In aspen stands non-native species are the dominant understory species on 25 acres. While timothy produces an abundance of palatable forage for livestock, elk, and mule deer; and songbirds and game birds consume timothy seed; and timothy generally provides good ground cover and cover for a variety of birds and small mammals, it is highly competitive over native plant species (Esser 1993). Sites dominated by timothy and other non-native grass species exhibit lower diversity of native plant species.

The management objective should be to implement management practices which will improve and/or maintain the physiological health of desirable native grass species. Specifically, maintain desirable grass species in areas currently with moderate to high and high similarity and improve their abundance in areas with low to moderate and moderate similarity. These objectives can be accomplished through grazing management practices which balance livestock grazing with available forage, provide adequate rest and recovery from grazing for desirable species, and attempt to use timing and intensity of livestock grazing to decrease abundance of less desirable

grass species. Planned grazing systems should be implemented which manage the timing and intensity of livestock grazing, minimize re-grazing of desirable key grass species during critical growing periods, and provide adequate rest and recovery after grazing to improve and maintain the physiological health of desirable grass species.

Table 9. West Rosebud Allotment Summary Of Floristic And Functional/Structural Similarity For Grassland And Shrubland Vegetation Types Summarized By Pasture (See Maps 3-A & 6-A)

Pasture	Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
West Rosebud (1)	**Sagebrush Dominance Types**			
	Mountain big sagebrush/Idaho fescue	Moderate to High/High	ARTR/FEID	97
	Mountain big sagebrush/Idaho fescue/limber pine	Moderate to High/High	ARTR/FEID/PIFL	66
	Mountain big sagebrush/Idaho fescue/bluegrass	Moderate	ARTR/FEID/POA	4
	Mountain big sagebrush/Idaho fescue/smooth brome	Moderate	ARTR/FIED/BRIN	6
	Mountain big sagebrush/timothy/ponderosa pine	Low to Moderate	ARTR/PHPR/PIPO	14
	Mountain Grassland Dominance Types			
	Idaho fescue/bluebunch wheatgrass	Moderate to High/High	FEID/PSSPS	11
	Idaho fescue/timothy	Moderate	FEID/PHPR	6
	Timothy/common snowberry	Low to Moderate	PHPR/SYAL	5
	Timothy/Idaho fescue	Low to Moderate	PHPR/FIED	7
	Forested Dominance Types			
	Lodgepole pine/common juniper-common snowberry	NA	PICO/JUCO-SYAL	53
	Engelmann spruce/sedge	NA	PIEN/CAR	3
	Limber pine	NA	PIFL	18
	Aspen Dominance Types			
	Aspen-ponderosa pine/sedge	NA	POTR-PIPO/CAR	18
	Aspen-birch/sedge	NA	POTR-BECO/CAR	4
	Aspen/timothy	NA	POTR/PHPR	2
	Aspen-black cottonwood-ponderosa pine	NA	POTR-POBA-PIPO	1
	Aspen/common snowberry/timothy	NA	POTR-SYAL-PHPR	2
	Total Aspen Acres	NA		27
	Mesic Shrub Dominance Types			
	Gray alder/sedge	NA	ALIN/CAR	5
	Bebb willow/sedge-bluejoint	NA	SABE/CAR-CACA	5
	Sagebrush Dominance Types			
	Mountain big sagebrush/Idaho fescue	Moderate to High/High	ARTR-FEID	57

Pasture	Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Morris Creek (2)	Shrubby cinquefoil/Idaho fescue	Moderate to High/High	POFR-FIED	21
	Mountain Grassland Dominance Types			
	Idaho fescue/bluebunch wheatgrass	Moderate to High/High	FEID-PSSPS	56
	Idaho fescue/western needlegrass	Moderate to High/High	FEID-STOC2	9
	Timothy/western needlegrass	Low to Moderate	PHPR-STOC2	5
	Aspen Dominance Types			
	Aspen/mesic shrub	NA	POTR/MESIC	80
	Aspen/Kentucky bluegrass	NA	POTR-POPR	8
	Aspen/common snowberry	NA	POTR-SYAL	2
	Aspen/sedge	NA	POTR-CAR	7
	Total Aspen Acres	NA		96
	Mesic Shrub Dominance Types			
	Common snowberry/Idaho fescue	NA	SYAL-FEID	1
	Mountain Grassland Dominance Types			
	Idaho fescue/western needlegrass	Moderate to High/High	FEID-STOC2	6
	Timothy/Idaho fescue	Low to Moderate	PHPR-FEID	7
	Kentucky bluegrass/Timothy	Low to Moderate	POPR-PHPR	41
Gravel Pit (3)	**Aspen Dominance Types**			
	Aspen/timothy	NA	POTR-PHPR	8
	Mesic Shrub Dominance Types			
	Mesic shrub group	NA	MESIC SHRUB	1
Shorey Swamp (4)	**Sagebrush Dominance Types**			
	Mountain big sagebrush/Idaho fescue	Moderate to High/High	ARTR-FEID	64
	Mountain big sagebrush/Idaho fescue-smooth brome	Moderate	ARTR-FEID-BRIN	5
	Forest Dominance Types			
	Ponderosa pine/common snowberry	NA	PIPO-SYAL	5
	Aspen Dominance Types			
	Aspen/common snowberry	NA	POTR-SYAL	9
	Mountain Grassland Dominance Types			
	Sedge community group	Moderate	CAR	8
	Timothy/Idaho fescue	Low to Moderate	PHPR-FEID	10
	Kentucky bluegrass/Timothy	Low to Moderate	POPR-PHPR	15
Shorey Jungle	**Aspen**			

Pasture	Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
(5)	**Dominance Types**			
	Aspen/smooth brome	NA	POTR-BRIN	2
	Aspen/timothy	NA	POTR-PHPR	5
	Mesic Shrub Dominance Types			
	Common snowberry/timothy	NA	SYAL-PHPR	4
	Sagebrush Dominance Types			
Pinegrove CG (6)	Mountain big sagebrush/Idaho fescue	High	ARTR-FEID	4
	Mountain big sagebrush/timothy-ponderosa pine	Low to Moderate	ARTR-PHPR-PIPO	1

Note: Floristic similarity was not evaluated for open coniferous forest and deciduous woodland associated with Douglas-fir, limber pine or aspen vegetation types.

Monitoring is a key component for implementing and adapting management practices that will improve or maintain abundance of desirable native perennial grass species. A monitoring program should be able to determine the effectiveness of management practices in improving the abundance of desirable native grass species on key upland areas. Key areas should be selected within both moderate to high/high floristic similarity and moderate and low to moderate floristic similarity (Table 9). Monitoring sites need to be stratified by habitat type to monitor change and trend in abundance of desirable species on land units with similar capability. Monitoring can be combination of quantitative and qualitative observations such as utilization evaluations, permanent photo points, permanent transects located in key areas to monitor, and ocular surveys.

East Rosebud Allotment

The East Rosebud Allotment is located within the East Rosebud valley bottom. There are approximately 2,084 acres within the grazing allotment, of these 500 acres are suitable for livestock grazing. The entire drainage was burned in the 1996 Shepherd Mountain Fire. The Shepherd Mountain Fire was a stand replacing wildfire which opened up forested sites and mountain grassland parks and resulted in increases in aspen, chokecherry and other deciduous shrub communities. The allotment was rested from livestock grazing for a period of five years (1994-1999), including three years following the Shepherd Mountain Fire. Livestock grazing resumed in 2000 as fall grazing following Labor Day.

Table 10 summarizes current vegetation types within areas suitable for livestock grazing (See Map 3-B, Existing Vegetation Polygons & Map 6-B, Vegetation Similarity Index & Vegetation Study Plot Inventory). One hundred forty four acres (64% of suitable area) currently have moderate to high and high similarity to reference plant communities (Mueggler and Stewart 1980), 64 acres (29%) has moderate similarity, and 16 acres (7%) has low to moderate similarity. Six percent of the area (14 acres) currently with low to moderate similarity is dominated by non-native grass species (timothy, sheep's fescue, Kentucky bluegrass). While timothy produces an abundance of palatable forage for livestock, elk, and mule deer; and songbirds and game birds consume timothy seed; and timothy generally provides good ground cover and cover for a variety of birds and small mammals, it is highly competitive over native plant species (Esser 1993). Sites dominated by timothy and other non-native grass species exhibit lower diversity of native plant species.

The management objective should be to implement management practices which will improve and/or maintain the physiological health of desirable native grass species. Specifically, maintain desirable grass species in areas with moderate to high and high similarity and improve their abundance in areas with low to moderate, moderate, and low similarity. These objectives can be accomplished through grazing management practices which balance livestock grazing with available forage, provide adequate rest and recovery from grazing for desirable species, and attempt to use timing and intensity of livestock grazing to decrease abundance of less desirable grass species, particularly timothy. Planned grazing systems should be implemented which manage the timing and intensity of livestock grazing, minimize re-grazing of desirable key grass species during critical growing periods,

and provide adequate rest and recovery after grazing to improve and maintain the physiological health of desirable grass species.

Monitoring is a key component for implementing and adapting management practices that will improve or maintain abundance of desirable native perennial grass species. A monitoring program should be able to determine the effectiveness of management practices in improving the abundance of desirable native grass species on key upland areas. Key areas should be selected within both moderate to high/high floristic similarity and moderate and low to moderate floristic similarity (Table 10). Monitoring sites need to be stratified by habitat type to monitor change and trend in abundance of desirable species on land units with similar capability. Monitoring can be a combination of quantitative and qualitative observations such as utilization evaluations, permanent photo points, permanent transects located in key areas to monitor, and ocular surveys.

Table 10. East Rosebud Allotment Summary Of Floristic And Functional/Structural Similarity For Grassland And Shrubland Vegetation Types Summarized By Pasture (See Maps 3-B & 6-B)

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Sagebrush Dominance Types			
Mountain big sagebrush/Idaho fescue	Modereate to High/High	ARTR/FEID	13
Fringed sagebrush/Idaho fescue	Moderate	ARFR/FEID	9
Mountain Grassland Dominance Types			
Idaho fescue/spreading dogbane	Moderate	FEID/APAN	1
Idaho fescue/bluebunch wheatgrass	Moderatate to High/High	FEID/PSSPS	115
Idaho fescue/bluebunch wheatgrass-Kentucky bluegrass	Moderate	FEID/PSSPS-POPR	10
Idaho fescue/common snowberry	Moderate	FEID/SYAL	24
Idaho fescue/Sedge	Moderate	FEID/CAR	3
Idaho fescue/Forb	Moderate	FEID/FORB	1
Sheep fescue	Low to Moderate	FEOV	3
Timothy/common snowberry	Low to Moderate	PHPR/SYAL	6
Kentucky bluegrass/spreading dogbane	Low to Moderate	POPR/APAN	1
Kentucky bluegrass/cool season grass	Low to Moderate	POPR/CSGR	4
Kentucky bluegrass/Idaho fescue	Low to Moderate	POPR/FEID	2
Bluebunch wheatgrass/Idaho fescue	Moderate to High	PSSPS/FEID	16
Sedge	Moderate	CAR	11
Prairie sand reed/sedge	Moderate	CALO/CAR	5
Idaho fescue/bluebunch wheatgrass	Moderate to High/High	FEID/PSSPS	11
Idaho fescue/timothy	Moderate	FEID/PHPR	6
Timothy/common snowberry	Low to Moderate	PHPR/SYAL	5
Timothy/Idaho fescue	Low to Moderate	PHPR/FIED	7
Forested Dominance Types			
Lodgepole pine/bluebunch wheatgrass	NA	PICO/PSSPS	3
Ponderosa pine/Idaho fescue	NA	PIPO/FEID	4
Black/cottonwood/forb	NA	POBA/FORB	22
Aspen Dominance Types			
Aspen/sedge	NA	POTR/CAR	42
Aspen/chokecherry	NA	POTR/PRVI	1
Aspen/timothy	NA	POTR/PHPR	23
Aspen/common snowberry	NA	POTR/SYAL	51

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Total Aspen Acres			117
Mesic Shrub Dominance Types			
Willow-gray alder/Sedge		SALIX-ALIN/CAR	78
Chokecherry/spreading dogbane	NA	PRVI/APAN	1
Common snowberry/cool season grass	NA	SYAL/CSGR	8
Common snowberry/Kentucky bluegrass	NA	SYAL/POPR	16
Common snowberry/aspen	NA	SYAL/POTR	1
Common snowberry/chokecherry	NA	SYAL/PRVI	8
Common snowberry/timothy	NA	SYAL/PHPR	15
Common snowberry/Douglas fir	NA	SYAL/PSME	16
Common snowberry	NA	SYAL	13
Common snowberry/sedge	NA	SYAL/CAR	10

Note: Floristic similarity was not evaluated for open coniferous forest and deciduous woodland associated with Douglas-fir, limber pine or aspen vegetation types.

Butcher Creek Allotment

The Butcher Creek Allotment is comprised of 200 acres, of which, 70 acres are suitable for livestock grazing. Suitable grazing lands are made up of scattered native mountain grassland parks of non-native timothy grass. Between 1990 and 2007 actual use animal unit months (AUMs) has been 10% less than the permitted AUMs and the allotment was rested from livestock grazing for four years, 2001-2004.

Table 11 summarizes current vegetation types within areas suitable for livestock grazing (See Map 3-C, Existing Vegetation Polygons & Map 6-C, Vegetation Similarity Index & Vegetation Study Plot Inventory). Seven acres (15% of suitable area) currently have moderate to high and high similarity to reference plant communities (Mueggler and Stewart 1980), and 39 acres (85%) has low to moderate similarity. The low to moderate similarity areas are dominated by non-native grass species (timothy, Kentucky bluegrass). While timothy produces an abundance of palatable forage for livestock, elk, and mule deer; and songbirds and game birds consume timothy seed; and timothy generally provides good ground cover and cover for a variety of birds and small mammals, it is highly competitive over native plant species (Esser 1993). Sites dominated by timothy and other non-native grass species exhibit lower diversity of native plant species.

Table 11. Butcher Creek Allotment, Pasture One Summary Of Floristic And Functional/Structural Similarity For Grassland And Shrubland Vegetation Types Summarized By Pasture (See Maps 3-C & 6-C)

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Mountain Grassland Dominance Types			
Idaho fescue/bluebunch wheatgrass	Moderate to High/High	FEID/PSSPS	7
Timothy/Idaho fescue	Low to Moderate	PHPR/FIED	2
Timothy/sedge	Low to Moderate	PHPR/CAR	1
Timothy/common snowberry	Low to Moderate	PHPR/SYAL	10
Timothy/common snowberry/Idaho fescue	Low to Moderate	PHPR/SYAL/FEID	17
Kentucky bluegrass/timothy/common snowberry	Low to Moderate	POPR/PHPR/SYAL	9
Forested Dominance Types			
Limber pine/Idaho fescue	NA	PIFL/FEID	5
Aspen			

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Dominance Types			
Aspen/Forb	NA	POTR/FORB	13
Aspen/timothy	NA	POTR/PHPR	1
Aspen/common snowberry/timothy	NA	POTR-SYAL-PHPR	12
Mesic Shrub Dominance Types			
Ninebark/common snowberry/timothy	NA	PHMA/SYAL/PHPR	21
Shrubby cinquefoil/Idaho fescue	NA	POFR/FEID	13

Note: Floristic similarity was not evaluated for open coniferous forest and deciduous woodland associated with Douglas-fir, limber pine or aspen vegetation types.

The management objective should be to implement management practices which will improve and/or maintain the physiological health of desirable native grass species. Specifically, maintain desirable grass species in areas currently with moderate to high and high similarity and improve their abundance in areas with low to moderate, moderate, and low similarity. These objectives can be accomplished through grazing management practices which balance livestock grazing with available forage, provide adequate rest and recovery from grazing for desirable species, and attempt to use timing and intensity of livestock grazing to decrease abundance of less desirable grass species, particularly timothy. Planned grazing systems should be implemented which manage the timing and intensity of livestock grazing, minimize re-grazing of desirable key grass species during critical growing periods, and provide adequate rest and recovery after grazing to improve and maintain the physiological health of desirable grass species.

Monitoring is a key component for implementing and adapting management practices that will improve or maintain abundance of desirable native perennial grass species. A monitoring program should be able to determine the effectiveness of management practices in improving the abundance of desirable native grass species on key upland areas. Key areas should be selected within both moderate to high/high floristic similarity and moderate and low to moderate floristic similarity (Table 11). Monitoring sites need to be stratified by habitat type to monitor change and trend in abundance of desirable species on land units with similar capability. Monitoring can be combination of quantitative and qualitative observations such as utilization evaluations, permanent photo points, permanent transects located in key areas to monitor, and ocular surveys.

Red Lodge Creek Allotment

The Red Lodge Creek Allotment is situated along the Custer National Forest boundary. There are approximately 447 acres in the allotment, of these; about 240 acres are suitable for livestock grazing. Grazing has historically occurred on the allotment from June 1 through mid September. Between 1990 and 2007, actual use by livestock has averaged 17% less than the permitted use.

Table 12 summarizes current vegetation types within areas suitable for livestock grazing (See Map 3-C, Existing Vegetation Polygons & Map 6-C, Vegetation Similarity Index & Vegetation Study Plot Inventory). One hundred eight acres (58% of suitable area) currently have moderate to high and high similarity to reference plant communities (Mueggler and Stewart 1980) and 79 acres (42%) have low to moderate similarity. Seventy nine acres with low to moderate similarity are currently dominated by timothy and other non-native grass species. While timothy produces an abundance of palatable forage for livestock, elk, and mule deer; and songbirds and game birds consume timothy seed; and timothy generally provides good ground cover and cover for a variety of birds and small mammals, it is highly competitive over native plant species (Esser 1993). Sites dominated by timothy exhibit lower diversity of native plant species.

The management objective should be to implement management practices which will improve and/or maintain the physiological health of desirable native grass species. Specifically, maintain desirable grass species in areas currently with moderate to high and high similarity and improve their abundance in areas with low to moderate, moderate, and low similarity. These objectives can be accomplished through management practices which balance livestock grazing with available forage, provide adequate rest and recovery from grazing for desirable

species, and attempt to use timing and intensity of livestock grazing to decrease abundance of less desirable grass species, particularly timothy. Planned grazing systems should be implemented which manage the timing and intensity of livestock grazing, minimize re-grazing of desirable key grass species during critical growing periods, and provide adequate rest and recovery after grazing to improve and maintain the physiological health of desirable grass species.

Table 12. Red Lodge Creek Allotment Summary of floristic and functional/structural similarity for grassland and shrubland vegetation types summarized by pasture (See Maps 3-C & 6-C)

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Mountain Shrub Dominance Types			
Shrubby cinquefoil/Idaho fescue	Moderate to High/High	POFR/FEID	21
Shrubby cinquefoil/Idaho fescue/forb	Moderate to High/High	POFR/FEID/FORB	49
Shrubby cinquefoil/timothy	Low to Moderate	POFR/PHPR	53
Shrubby cinquefoil/timothy/forb	Low to Moderate	POFR/PHPR/FORB	9
Shrubby cinquefoil/common snowberry	Low to Moderate	ARTR/SYAL	4
Sagebrush Dominance Types			
Mountain big sagebrush/Idaho fescue	Moderate to High/High	ARTR/FEID	3
Mountain big sagebrush/Idaho fescue/cool season grass	Moderate to High/High	ARTR/FEID/CSGR	28
Mountain Grassland Dominance Types			
Idaho fescue/cool season grass	Moderate to High/High	FEID/CSGR	7
Timothy/forb	Low to Moderate	PHPR/FORB	3
Timothy	Low to Moderate	PHPR	10
Forested Dominance Types			
Douglas fir/common juniper	NA	PSME/JUCO	10
Douglas fir/common snowberry	NA	PSME/SYAL	5
Limber pine/shrubby cinquefoil/Idaho fescue	NA	PIFL/POFR/FEID	2
Limber pine/shrubby cinquefoil/forb	NA	PIFL/POFR/FORB	3
Limber pine/shrubby cinquefoil/timothy	NA	PIFL/POFR/PHPR	4
Limber pine/mountain big sagebrush/Idaho fescue	NA	PIEN/ARTR/FEID	14
Limber pine/common snowberry	NA	PIEN/SYAL	13
Black cottonwood/Idaho fescue	NA	POBA/EID	2
Aspen Dominance Types			
Aspen/Idaho fescue/cool season grass	NA	POTR/FIED/CSGR	11
Mesic Shrub Dominance Types			
Willow/sedge		SALIX/CAR	2

Note: Floristic similarity was not evaluated for open coniferous forest and deciduous woodland associated with Douglas-fir, limber pine or aspen vegetation types.

Monitoring is a key component for implementing and adapting management practices that will improve or maintain abundance of desirable native perennial grass species. A monitoring program should be able to determine the effectiveness of management practices in improving the abundance of desirable native grass species on key upland areas. Key areas should be selected within both moderate to high/high floristic similarity and moderate and low to moderate floristic similarity (Table 12). Monitoring sites need to be stratified by habitat type to monitor

change and trend in abundance of desirable species on land units with similar capability. Monitoring can be combination of quantitative and qualitative observations such as utilization evaluations, permanent photo points, permanent transects located in key areas to monitor, and ocular surveys.

Black Butte Wildlife Habitat Area

The Black Butte Wildlife Habitat Area is made up of one pasture with approximately 1,200 acres of which about 50% is suitable for livestock grazing. Elevations range from 6,300 feet at the top of the open parks to the west to 5,400 feet on the East Rosebud River. The area is a mosaic of vegetation types including open grasslands intermingled with aspen and shrub dominated sites. The diversity of upland vegetation along with riparian and wetland areas and open ponds provides high quality habitat for many wildlife species. According to the records on file at the Beartooth District, the area has not been grazed by livestock since 1968. Rest from livestock grazing initially was helpful in restoring the health of forage plants that were up until 1968, grazed under season-long livestock use. In 1996, the Shepard Mountain wildfire burned the eastern (open grasslands) side of the area. The lack of periodic grazing appears to be resulting in grass plants to become less robust and productive. Noxious weeds are found in a few scattered areas, mostly Canada thistle and houndstongue. Non-native grass species occupy the largest area of grassland communities (Table 13).

Table 13 summarizes current vegetation types within areas suitable for livestock grazing (See Map 3-A, Existing Vegetation Polygons & Map 6-A, Vegetation Similarity Index & Vegetation Study Plot Inventory). Fifty eight acres (13% of suitable area) currently have moderate to high and high similarity to reference plant communities (Mueggler and Stewart 1980), 7 acres (2%) have moderate similarity, and 326 acres (85%) have low to moderate similarity. The 326 acres with low to moderate similarity are currently dominated by timothy and smooth brome, non-native grass species. While timothy produces an abundance of palatable forage for livestock, elk, and mule deer; and songbirds and game birds consume timothy seed; and timothy generally provides good ground cover and cover for a variety of birds and small mammals, it is highly competitive over native plant species (Esser 1993). Sites dominated by timothy exhibit lower diversity of native plant species.

The management objective should be to implement management practices which will improve and/or maintain the physiological health of desirable native grass species to meet wildlife habitat management objectives. Specifically, maintain desirable grass species in areas currently with moderate to high and high similarity and improve their abundance in areas with low to moderate, moderate, and low similarity. These objectives can be accomplished through grazing management which balance livestock grazing with available forage, provide adequate rest and recovery from grazing for desirable species, and attempt to use timing and intensity of livestock grazing to decrease abundance of less desirable grass species, particularly timothy. Planned grazing systems should be implemented which manage the timing and intensity of livestock grazing, minimize re-grazing of desirable key grass species during critical growing periods, and provide adequate rest and recovery after grazing to improve and maintain the physiological health of desirable grass species.

Table 13. Black Butte Wildlife Management Area Summary Of Floristic And Functional/Structural Similarity For Grassland And Shrubland Vegetation Types Summarized By Pasture (See Maps 3-A & 3-C)

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Mountain Grassland Dominance Types			
Idaho fescue/bluebunch wheatgrass	Moderate to High/High	FEID/PSSPS	24
Idaho fescue/bluebunch wheatgrass-needle-and-thread grass	Moderate to High/High	FEID/PSSPS-STCO2	34
Timothy/Idaho fescue	Low to Moderate	PHPR/FIED	112
Timothy/common snowberry	Low to Moderate	PHPR/SYAL	6
Sedge	Moderate	CAR	5
Sedge/wild bergamot	Moderate	CAR/MOFI	2
Smooth brome/Idaho fescue	Low to Moderate	BRIN/FEID	88

Dominance Type Name	Floristic/ Structural Similarity	Dominance Type Code	Acres
Smooth brome/timothy	Low to Moderate	BRIN/PHPR	120
Forested Dominance Types			
Ponderosa pine/Idaho fescue	NA	PIPO/FEID	8
Aspen Dominance Types			
Aspen/smooth brome	NA	POTR/BRIN	16
Aspen/timothy	NA	POTR/PHPR	156
Mesic Shrub Dominance Types			
Common snowberry/sedge	NA	SYAL/CAR	44

Note: Floristic similarity was not evaluated for open coniferous forest and deciduous woodland associated with Douglas-fir, limber pine or aspen vegetation types.

Monitoring is a key component for implementing and adapting management practices that will improve or maintain abundance of desirable native perennial grass species. A monitoring program should be able to determine the effectiveness of management practices in improving the abundance of desirable native grass species on key upland areas. Key areas should be selected within both moderate to high/high floristic similarity and moderate and low to moderate floristic similarity (Table 13). Monitoring sites need to be stratified by habitat type to monitor change and trend in abundance of desirable species on land units with similar capability. Monitoring can be combination of quantitative and qualitative observations such as utilization evaluations, permanent photo points, permanent transects located in key areas to monitor, and ocular surveys.

Desired Condition

The desired condition for mountain grassland and shrubland communities is to maintain the dominance of native perennial grass species (e.g. bluebunch wheatgrass, bearded wheatgrass, western needlegrass, needle-and-thread grass, Idaho fescue, tufted hairgrass) on sites where they currently are the most abundant overstory or understory species and/or improve their abundance on sites currently dominated by less desirable non-native grass species. Examples of non-native species are timothy and smooth brome. In addition, maintain or improve the health of native upland shrub species including sagebrush, and chokecherry. Table 7 provides a crosswalk of floristic similarity, functional group and dominance types typically observed on the ground. The management objective is to increase the abundance of native perennial grass and maintain or increase the health and abundance of native shrub species on communities currently exhibiting low, low to moderate and moderate floristic similarity to the reference community; and maintain shrub and perennial mid grass abundance on communities currently with moderate to high/high similarity. Additionally, the desired condition for the Black Butte Wildlife Management Area will be to manage for plant communities which will meet wildlife habitat management objectives.

ENVIRONMENTAL EFFECTS

a. Background

Livestock Grazing Effects and Mitigating Grazing Management Practices

The principle livestock grazing affect on forage plants occurs during the growing season. The growing season is when grass and forb species are rapidly growing, initially depleting and than replacing carbohydrate reserves needed to maintain physiologic functions and plant health. The most detrimental period for grazing is late in the growing season (June) when plants are grazed and heavily re-grazed without adequate time for re-growth and replacement of carbohydrate reserves to occur before plants enter summer dormancy. Recovery from grazing is provided through planned grazing systems which provide periodic rest from grazing, allowing grazed plants to replace lost leaf material needed for photosynthesis and replace depleted carbohydrate reserves. Two pasture deferred rotation grazing systems provide rest from grazing alternate years and three pasture deferred rotation

grazing systems provide rest one year out of three (3 pasture deferred rotation grazing) are two examples of planned grazing systems. Time controlled grazing is a more intensively planned grazing system, where the timing and intensity of grazing is planned around the phenology and critical growth periods of forage species. Typically a pasture might be grazed for a short period during the rapid growth period (spring, early summer), allow at least 30 days of rest for recovery of grazed plants, and grazed again for a longer period during slow growing periods or plant dormancy (late summer and fall). Optimum timing attempts to limit grazing so desirable plant species are grazed once, re-grazing of plants within the same period is minimized, and plants are allowed to recover from grazing within the same growing season. Applications of timed grazing may be a tool that could be used to reduce the abundance of timothy and improve the abundance of native grass species. Grazing affects on forage species is generally less detrimental to plant health when grazing occurs after the growing season. However, residual vegetation cover is important. Residual cover (i.e. litter) helps capture precipitation, promotes water infiltration into the soil, recycles plant nutrients, protects soil from erosion, and provides upland bird nesting and brood rearing cover.

b. Effects Common to All Alternatives

Direct Effects

Direct effects occur at the same time and place as the proposed activity. These will vary by alternative and will be addressed under each alternative.

Indirect Effects

Indirect effects occur at a later time or distance from the proposed activity. Free-ranging livestock are considered indirect effects to upland vegetation as the activity is dispersed spatially and temporally. Indirect effects will vary by alternative and are discussed by alternative.

Short-term vs. Long-term Productivity

There are no short-term versus long-term productivity issues for upland vegetation under any alternative.

Irreversible/irretrievable Commitments

There are no irreversible/irretrievable commitments to upland vegetation resources under any alternative. Alternative two and three specify the use of grazing systems, utilization guidelines, and livestock management tools to mitigate the effects of livestock grazing on upland vegetation resources.

Unavoidable Adverse Effects

There are no unavoidable adverse effects on upland vegetation under any alternative.

c. Mitigation Included Under All Alternatives

There is no mitigation included, aside from the proposed management, under any alternative.

d. Effects By Alternative

Alternative 1 – No Grazing

Direct Effects

Direct effects occur at the same time and place as the proposed activity. Removal of allotment boundary and pasture fences would occur in all four allotments. These actions may impact soil and vegetation from vehicles and equipment used to remove the fences, but the impacts will be localized and temporary. The sites should recover rapidly.

Indirect Effects

Indirect effects occur at a later time or distance from the proposed activity. Free-ranging livestock are considered indirect effects to upland rangeland ecosystems as the activity is dispersed spatially and temporally. Indirect effects of Alternative 1 will be similar for all allotments. Implementation of Alternative 1 would eliminate affects of livestock grazing on upland grassland and shrubland communities. With time, native plant communities currently with low to moderate and moderate floristic similarity will change as native mid grass and other plant species become more abundant. Floristic similarity will change to moderate to high/high floristic similarity. Desirable plant species will generally be maintained in plant communities currently with moderate to high/high floristic similarity. Areas currently occupied by non-native grass species, timothy, smooth brome, and Kentucky bluegrass are the exceptions.

Elimination of grazing will probably have no effect on reducing the abundance of non-native grass species. Due to the competitive advantage timothy and other non-native grass species have over native grass species; they will probably persist as the dominant species. In fact, timothy may increase or invade sites where it is not currently the dominant species (Esser 1993). Use of planned grazing systems, designed to graze timothy when it is phenologically disadvantageous or prescribed fire, may be the only effective tools for restoring native grass species on sites currently dominated by timothy.

Grassland and shrubland communities evolved under some level of disturbance. Human influences can alter disturbance regimes by modifying the level, intensity, timing, and recovery periods. For example, season long livestock grazing systems with high livestock numbers, long grazing periods, and lack of adequate recovery periods are not the same type of grazing disturbance plant communities experienced historically. How, when, and how often (repeated grazing) plants are grazed; and length of rest or recovery time, dictates whether grazing has a beneficial or detrimental effect on grassland and shrubland communities. Continuous heavy livestock use can be detrimental to long term health of rangelands. Planned grazing systems which provide adequate periodic rest and recovery or light to moderate use can stimulate plant growth, provide for plant species diversity, and maintain health by meeting the physiological needs of desirable plant species.

Eliminating grazing over the long term would not necessarily mean grassland and shrubland plant communities would be as productive or as diverse as communities receiving periodic disturbance either from fire or light to moderate grazing (Holechek et. al. 2006, Holechek 1981, Holechek et. al. 2004). Without periodic disturbance grassland and shrubland plant communities can become stagnant, less productive, and less diverse. Plant litter accumulates over time, suppressing plant growth and species diversity. On mountain grassland sites with the potential to support tree and shrub species, woody vegetation may replace grass and forb species without periodic fire. Periodic disturbance whether by fire or herbivory by ungulates stimulates plant growth and helps maintain plant species diversity and productivity.

This alternative will provide the fastest rate of recovery to meet desired conditions for upland grassland and shrubland communities, except on those sites presently dominated by timothy. The lack of some level of periodic disturbance under this alternative may not result in the most diverse or productive plant communities over the long term or recovery of native grass species on areas currently dominated by non-native species. Black Butte Wildlife Management Area provides an example where 20 years of no livestock grazing appears to have had little effect on replacing non-native timothy and smooth brome with native grass species.

Cumulative Effects for Alternative 1

There are no past or present timber harvest activities occurring. Past and present, prescribed fire, wildfire, existing roads, and dispersed recreation will continue to influence upland vegetation.

Forest Plan Consistency and Other Required Disclosures

Compliance with Forest Plan standards and guidelines for range management would be met. It may not fully achieve the goal of maintaining healthy, vigorous vegetation cover that would provide forage and cover for wildlife, and livestock forage. It would provide soil stability but the absence of periodic disturbance may result in

less productive plant communities and plant species diversity. Especially on sites currently occupied by non-native grass species (i.e. timothy, smooth brome, and Kentucky bluegrass).

Conclusions for Environmental Consequences

This alternative would provide the fastest rate of recovery for all grazing impacted upland areas currently with low to moderate and moderate similarity still dominated by native grass species. The exception would be low to moderate similarity areas currently dominated by non-native species. These sites will probably continue to be dominated by timothy, Kentucky bluegrass, and smooth brome.

Alternative 2 - Current Management

Direct Effects

Direct effects occur at the same time and place as the proposed activity. There is no installation, reconstruction or removal of range improvements (i.e. water developments, fences) proposed, which may cause direct effects to vegetation and soils, under this alternative.

Indirect Effects

Indirect effects occur at a later time or distance from the proposed activity. Free-ranging livestock are considered indirect effects to upland rangeland ecosystems as the activity is dispersed spatially and temporally. Livestock grazing can affect plant species composition of vegetation communities over time. Grazing affects are dictated by the timing, intensity, duration of grazing within an area, and length of rest or recovery periods following grazing. These factors can be managed or mitigated by altering and/or manipulating any one of these factors through planned grazing systems and/or balancing the stocking levels with available forage production. These mitigation measures can maintain or change current plant species composition towards desired plant species composition.

Desired plant species as described under desired conditions and to meet desired range conditions described in the Custer National Forest Land and Resource Management Plan are bluebunch wheatgrass, bearded wheatgrass, western needlegrass, needle-and-thread grass, Idaho fescue, and tufted hairgrass. Increasing the abundance of these perennial native grass species is necessary to move sites currently with low to moderate and moderate floristic similarity to moderate to high/high floristic similarity. This would be accomplished by improving or maintaining the health and productivity of these species through continued use of planned grazing systems and associated allowable use guidelines contained in annual operating instructions (AOI) outlined under Alternative 2. The current management does provide periodic rest during critical phenological stages either on alternate years (two pastured deferred grazing systems) or two out of three years (three pasture deferred systems).

Livestock grazing impacts would be expected to continue at current levels. Production utilization studies (see discussion under the heading “Livestock Carrying Capacity” later in this report) indicate current permitted stocking rates exceed available forage in Butcher Creek, Red Lodge Creek, and West Rosebud Allotments. If utilization exceeds allowable use guidelines, it is likely there will be little improvement towards desired vegetation composition. Desirable forage plants will continue to be overgrazed and will not receive adequate rest and recovery needed to maintain the physiological health of desired plant species, despite continued use of planned grazing systems. The effects of management under Alternative 2 would probably result in no change in floristic similarity for sites currently dominated by non-native grass species (i.e. timothy, Kentucky bluegrass, smooth brome). There may not be movement towards desired vegetation composition for native plant communities currently with low, low to moderate, and moderate floristic similarity. Plant communities currently with moderate to high/high floristic similarity would probably continue to be dominated by mid grass species with short grass species being a minor component. The amount of change and/or effectiveness of management described under alternative two to change or maintain desired vegetation composition is difficult to assess without base line information describing vegetation composition when the current grazing systems were implemented.

Indirect Effects by Allotment/Pasture

West Rosebud Allotment

The West Rosebud Allotment is currently managed as a two pasture deferred rotation grazing system that provides early growing season deferment two years out of three. This would continue under Alternative 2. The authorized numbers would be 175 cow/calf pairs, not to exceed 226 animal unit months (AUMs) at 2.2 acres/AUM.

The mid to late season grazing should provide adequate rest, recovery, or deferment during critical phenological stages of desirable key species and meet the physiological needs of key plant species. However, utilization studies and carrying capacity analysis (see discussion under the heading "Livestock Carrying Capacity" later in this report) indicate there is available forage for 100 AUMs compared to 112 permitted AUMs in the West Rosebud Pasture and 87 AUMs compared to 114 permitted AUMs in the Morris Creek Pasture. If allowable use is not balanced with available forage, desired conditions in the uplands may not be achievable with the planned grazing system alone. Areas (Table 14) currently with moderate to high/high similarity (391 acres) should be maintained. Desirable plant species may not increase on areas which currently have low to moderate and moderate floristic similarity (134 acres). Non-native grass species of will likely continue to dominate areas (105 acres) they presently occupy. The amount of change and/or effectiveness of continuing current stocking levels and current grazing system is difficult to assess without base line information describing vegetation composition when the current grazing system was implemented.

Table 14. Summary Of Floristic/Functional Group Similarity For West Rosebud Allotment, West Rosebud And Morris Creek Pastures

Floristic Similarity	Acres
Moderate to High/High	391
Moderate	29
Low to Moderate	105

East Rosebud Allotment

The East Rosebud Allotment will continue to be managed as a late season pasture from September 1 through November 15. The scheduled use will provide the needed periodic rest or deferment during critical phenological stages of desirable key species each year. All desirable key species have completed or nearly completed the phenological stages critical to sustaining plant health by July 1. The allotment does not appear to be overstocked. Utilization studies and carrying capacity analysis (see discussion under the heading "Livestock Carrying Capacity" later in this report) indicate there is available forage for 151 AUMs compared to 150 AUMs authorized in the current grazing permit. The amount of change and/or effectiveness of continuing with current grazing system is difficult to assess without base line information describing vegetation composition when the current grazing system was implemented.

Under the late season grazing schedule every year, vegetation composition and patterns will probably remain similar to those summarized in Table 15. Vegetation composition on the 144 acres currently with moderate to high and high similarity and 64 acres with moderate similarity may improve with an increase in abundance of desirable species. The 16 acres with low to moderate similarity will probably remain the same, given these areas are dominated by timothy. Changing the timing and intensity of grazing areas dominated by timothy may be a strategy for reducing the dominance of timothy. Timothy is not resistant to heavy grazing (Esser 1993). Heavy use of timothy may be desirable, however, to reduce its vigor and improve the competitive advantage for desirable native grass species provided this can be accomplished without overgrazing native grass species.

Table 15. Summary Of Floristic/Functional Group Similarity For East Rosebud Allotment

Floristic Similarity	Acres
Moderate to High/High	144
Moderate	64
Low to Moderate	16

Butcher Creek Allotment

Under Alternative Two the Butcher Creek Allotment would continue to be managed as a single pasture under a high intensity/short duration deferred rotation grazing system. Under this grazing system the pasture is grazed early one out of three years and may be rested one out of four years. Utilization studies and carrying capacity studies (see discussion under the heading "Livestock Carrying Capacity" later in this report) indicate there is available forage for 50 AUMs, compared to 69 AUMs authorized under the current grazing permit. This grazing schedule provides deferment and rest during critical phenological stages two years out three. The three pasture deferred rotation grazing system should provide opportunities for rest needed to maintain the health of desirable key plant species, provided herd management is intensified to control livestock movement. However, if utilization exceeds available forage, it is likely desirable plant species will be overgrazed and the planned periods of rest may not be sufficient for plants to recover from grazing. The amount of change and/or effectiveness of continuing with current grazing system is difficult to assess without base line information describing vegetation composition when the current grazing system was implemented.

The seven acres (Table 16) currently with moderate to high and high similarity to reference plant communities may be maintained. Areas low to moderate similarity currently dominated by timothy (39 acres, Table 16) will probably continue to be dominated by timothy.

Table 16. Summary Of Floristic/Functional Group Similarity For Butcher Creek Allotment

Floristic Similarity	Acres
Moderate to High/High	7
Low to Moderate	39

Too reduce the dominance of timothy would require intensifying grazing management to manipulate timing and intensity of grazing to reduce the competitive advantage of timothy. Timothy is not resistant to heavy grazing (Esser 1993). Heavy use of timothy may be desirable to reduce its vigor and improve the competitive advantage for desirable native grass species if this can be accomplished without overgrazing native grass species. Eliminating grazing would not have an affect on reducing the abundance of timothy and it may increase on adjacent sites.

Red Lodge Creek Allotment

Under alternative two the Red Lodge Creek Allotment would continue to be managed as a mid to late season (August 1 to September 28). The scheduled grazing periods should provide for maintaining the health of desirable plant species. Grazing doesn't begin until August 1, after critical phenological stages (generally ends July 1) for desirable plant species are completed. The amount of change and/or effectiveness of continuing with current grazing system is difficult to assess without base line information describing vegetation composition when the current grazing system was implemented. However, production/utilization studies and carrying capacity analysis (see discussion under the heading "Livestock Carrying Capacity" later in this report) indicate available forage is not in balance with authorized AUMs under the current permit. The studies indicate there is 118 AUMs of forage compared to 191 AUMs authorized with the current permit. Given our knowledge about grazing effects on plant species grazed and rested during critical phenological stages, desirable vegetation composition may be achieved under this grazing system. However, if use of desirable plant species exceeds allowable use guidelines, planned rest and recovery periods may not be sufficient for these species to recover from grazing. The abundance of desirable plant species on the 108 acres currently with moderate to high and high similarity to reference plant communities may be maintained. Abundance of desirable plant species may not increase on 79

acres with low to moderate similarity (Table 17). Timothy will continue to be the dominant grass species on the 79 acres it currently occupies.

Table 17. Summary Of Floristic/Functional Group Similarity For Red Lodge Creek Allotment

Floristic Similarity	Acres
Moderate to High/High	108
Low to Moderate	79

Too reduce the dominance of timothy would require intensifying grazing management to manipulate timing and intensity of grazing to reduce the competitive advantage of timothy. Timothy is not resistant to heavy grazing (Esser 1993). Heavy use of timothy may be desirable to reduce its vigor and improve the competitive advantage for desirable native grass species. Provided this can be accomplished without overgrazing desirable native grass species. Eliminating grazing would not have an affect on reducing the abundance of timothy and it may increase on adjacent sites.

Black Butte Wildlife Management Area

Under Alternative Two no livestock grazing would be authorized for the Black Butte Wildlife Management Area. With the lack of grazing or any other periodic disturbance the present composition of the mountain grassland communities are expected to remain unchanged in terms of composition. However, the lack of disturbance may not mean these grassland communities are functioning ecologically at their potential, in terms of productivity and species diversity. Field surveys indicated these communities were not productive and plant species lack vigor. Timothy and other non-native species will continue to be the dominant grassland component within this area (326 acres, Table 18) and may expand into native plant communities.

Table 18. Summary Of Floristic/Functional Group Similarity For Black Butte Wildlife Management Area

Floristic Similarity	Acres
Moderate to High/High	58
Moderate	7
Low to Moderate	326

Too reduce the dominance of timothy would require intensifying grazing management to manipulate timing and intensity of grazing to reduce the competitive advantage of timothy. Timothy is not resistant to heavy grazing (Esser 1993). Heavy use of timothy may be desirable to reduce its vigor and improve the competitive advantage for desirable native grass species if this can be accomplished without overgrazing native grass species.

Cumulative Effects for Alternative 2

Past and present prescribed fire, wildfire, existing roads, and dispersed recreation will continue to be a minor influence on upland rangeland ecosystems.

Forest Plan Consistency and Other Required Disclosures for Alternative 2

Compliance with Forest Plan standards and guidelines for range management would be met. It may not fully achieve the goal of maintaining healthy, vigorous vegetation cover that would provide productive forage, cover for wildlife, and soil stability. Sites currently occupied by non-native grass species such as timothy, smooth brome, and Kentucky bluegrass will probably continue to be dominated by these species.

Conclusions for Environmental Consequences for Alternative 2

This alternative may not provide for recovery towards desired conditions for grazing impacted upland areas currently with low to moderate and moderate similarity. These sites will probably continue to be dominated by non-native grass species of timothy, Kentucky bluegrass, and smooth brome. Where current stocking levels

result in consistently exceeding allowable use, the health and vigor of individual desirable plant species may decline.

Alternative 3 - Proposed Action

The changes in grazing management proposed under Alternative Three are designed to reduce grazing duration, improve livestock distribution, and balance stocking rates with available forage to stay within allowable use guidelines. Better livestock distribution will increase use of under-utilized secondary range and reduce over-utilization on primary range. The objective for upland rangelands is to move current vegetation composition to desired vegetation conditions by increasing the abundance of desirable plant species (e.g. bluebunch wheatgrass, bearded wheatgrass, western needlegrass, needle-and-thread grass, Idaho fescue, tufted hairgrass).

Direct Effects

Direct effects occur at the same time and place as the proposed activity. Installation and reconstruction of water developments are the only activities considered to cause direct effects to upland vegetation plant communities under this alternative.

New or reconstructed fences are proposed in Butcher Creek and West Rosebud Allotments. Several existing fences would be removed in the West Rosebud Allotment. These actions may impact soil and vegetation, but the impacts would be localized and temporary. The sites should recover rapidly, but the rate of recovery will be relative to the grazing pressure on these sites.

Indirect Effects

Indirect effects occur at a later time or distance from the proposed activity. Free-ranging livestock are considered indirect effects to upland rangeland ecosystems as the activity is dispersed spatially and temporally. However, the exact timing and degree of effect on upland rangeland ecosystems is difficult to quantify.

The effects of the proposed changes in grazing management on upland rangeland ecosystems are based on a number of key factors and how they differ from current management. These factors include 1) proposed change in allotment management (number of livestock, grazing duration and AUMs), 2) construction of new allotment and pasture fencing, 3) implementation of active management tools, e.g., herding, culling and the use of mid-season triggers to move livestock within, or remove livestock from, the pasture, and 4) existing condition and resiliency of upland rangeland areas.

It is important to understand that predicting the effects of livestock grazing management on future vegetation composition of grassland and shrubland communities is an uncertain task. This is due to the variability of natural processes and characteristics, the variability of implementation and administration of past and proposed management, and the variability of the effectiveness of proposed management assuming adequate implementation. Effects of livestock grazing can be estimated based on the body of research dealing with the grazing affects on vegetation and associated rangeland ecosystem components as a response to differences in timing, intensity, and duration of grazing; and amount of rest provided to grazed range plants reported over the past 100 years. Given the body of rangeland research dealing with the effects of grazing, there is a reasonable expectation that desired conditions will be meet, provided management as outlined in Alternative Three is fully implemented and monitoring is used in conjunction with adaptive management to validate management assumptions or adjust management practices.

Indirect Effects – Summary Across Analysis Area

Alternative Three provides prescriptive grazing management practices, balancing livestock numbers with estimated available forage, prescribing periods of rest during critical phenological periods for desirable key species, and specifying allowable use guidelines of 55% for key areas for native grass and 60% for areas with timothy (see Maps 4-A, 4-B & 4-C, Percent Allowable Use). Proposed management will reduce AUMs in the Red Lodge Creek and Butcher Creek Allotments. Proposed allotment and pasture fences are expected to assist livestock management to reduce livestock effects on desirable plant species and improve the health and vigor of

these species. Healthy desirable plant species should increase in abundance and density, improving water infiltration and soil water storage which turn should improve forage productivity.

Additional management tools are proposed to manage livestock use on an annual basis in all four allotments. These tools include:

- The annual operating instructions (AOI). The AOI will specify the class of livestock planned to be grazed, grazing season, and period of use for each pasture.
- A utilization guideline of 55 percent will be implemented on key use areas throughout the allotments (60 percent in areas primarily composed of timothy grass). This standard is a tool or "mid-season trigger" for herding livestock out of key areas or moving livestock off the pasture. It is also an "end of season indicator" to help evaluate the implementation and effectiveness of management during the past grazing season. Consistent and diligent herding practices will be required by the permittee to ensure utilization standards are not exceeded.
- The use of mineral supplements will be encouraged to help draw livestock away from key areas.
- Herding will be encouraged to help move livestock away from key areas.

Implementation of proposed management practices, including planned grazing systems and allowable use guidelines should help reduce livestock grazing pressure on desirable species, and improve key areas. Since long term monitoring has never been implemented to track changes in range condition or trend in any of the above allotments, there is uncertainty about the effectiveness of these guidelines and the proposed management prescriptions in moving existing conditions to desired conditions. This uncertainty is due to 1) the lack past monitoring information, comparing allowable use guidelines and deferred rotation grazing systems in achieving desired vegetation composition, 2) uncertainty about the level of implementation and administration that will occur. Monitoring will be crucial to determine the effectiveness of the proposed allowable use guidelines in conjunction with planned grazing systems to achieve desired conditions in upland rangeland ecosystems. This is particularly true in situations where adaptive management strategies are expected to be used.

Indirect Effects by Allotment/Pasture

West Rosebud Allotment

Grazing management is reviewed and prescribed on an annual basis through the annual operating instructions (AOI). The planned grazing management will provide for maintaining the physiological health of desirable key plant species by balancing livestock numbers with estimated available forage, prescribing periods of rest during critical phenological periods for desirable key species, and specifying allowable use guidelines of 55% for key areas for native grass and 60% for areas with timothy (see Map 4-A, Percent Allowable Use). Under this alternative abundance of desirable key species should be maintained on 391 acres currently with moderate to high/high similarity (Table 19) and abundance of desirable key species should increase on 29 acres with moderate similarity. The 105 acres with low to moderate similarity currently dominated by non-native grass species, principally timothy and smooth brome will probably continue to be dominated by non-native species (Table 19).

Table 19. Summary Of Floristic/Functional Group Similarity For West Rosebud Allotment

Floristic Similarity	Acres
Moderate to High/High	391
Moderate	29
Low to Moderate	105

East Rosebud Allotment

Under Alternative Three the East Rosebud Allotment will continue to be managed as a late season pasture, grazed after labor day each year to reduce conflicts with recreation use. The alternative balances livestock numbers with estimated available forage, prescribes periods of rest during critical phenological periods for

desirable key species, and specifying allowable use guidelines of 55% for key areas for native grass and 60% for areas with timothy (see Map 4-B, Percent Allowable Use). Grazing management is reviewed and prescribed on an annual basis through the annual operating instructions (AOI). The planned grazing management will provide for maintaining the physiological health of desirable plant species. Under this alternative the abundance of desirable species should be maintained on 144 acres currently with moderate to high/high similarity and abundance of desirable species should increase on 64 acres of with moderate similarity (Table 20). Non-native species, primarily timothy and Kentucky bluegrass will probably continue to be the dominant grass species on 16 acres currently identified with low to moderate similarity (Table 20).

Table 20. Summary Of Floristic/Functional Group Similarity For East Rosebud Allotment

Floristic Similarity	Acres
Moderate to High/High	144
Moderate	64
Low to Moderate	16

Butcher Creek Allotment

Alternative Three provides prescriptive grazing management practices, balances livestock numbers with estimated available forage, prescribing periods of rest during critical phenological periods for desirable key species, and specifying allowable use guidelines of 55% for key areas for native grass and 60% for areas with timothy (see Map 4-C, Percent Allowable Use). Grazing management is reviewed and prescribed on an annual basis through the annual operating instructions (AOI). A deferred rotation grazing schedule will be implemented so grazing would never occur during the same period two years in a row. Under this scenario the bulk of grazing will occur after critical phenological stages of desirable grass species are completed, maintaining the physiological health of desirable key plants. The abundance of desirable species should be maintained on 7 acres currently with moderate to high/high similarity (Table 21). Non-native species such as timothy will probably continue to be the dominant grass species on 39 acres currently with low to moderate similarity (Table 21).

Table 21. Summary Of Floristic/Functional Group Similarity For Butcher Creek Allotment

Floristic Similarity	Acres
Moderate to High/High	7
Moderate	39

Red Lodge Creek Allotment

Alternative Three provides prescriptive grazing management practices, balances livestock numbers with estimated available forage, prescribes periods of rest during critical phenological periods for desirable key species, and specifies allowable use guidelines of 55% for key areas for native grass and 60% for areas with timothy (see Map 4-C, Percent Allowable Use). Grazing management is reviewed and prescribed on an annual basis through the annual operating instructions (AOI). A deferred rotation grazing schedule will be implemented, where grazing will not occur during the same period two years in a row. Under this grazing prescription desirable grass species will receive complete rest during critical phenological stages two years out of three. The physiological health of desirable species should be maintained with the proposed management. Abundance of desirable species should be maintained on 108 acres currently with moderate to high/high similarity (Table 22). Non-native species such as timothy will probably continue to be the dominant grass species on 79 acres currently identified as low to moderate similarity (Table 22).

Table 22. Summary Of Floristic/Functional Group Similarity For Red Lodge Creek Allotment

Floristic Similarity	Acres
Moderate to High/High	108
Low to Moderate	79

Black Butte Wildlife Management Area

Alternative Three would allow livestock grazing as a tool to improve plant productivity and enhance forage palpability for wildlife species. Grazing management is reviewed and prescribed on an annual basis through the annual operating instructions (AOI) which will specify allowable use guidelines of 35-40% for key areas and period of use (see Map 4-A, Percent Allowable Use). The area would be grazed every other year, with a high intensity short duration (2 days) grazing treatment every six to eight years. The proposed grazing schedule provides for complete rest during critical phenological period of desirable plant species two years out of three. The physiological health of desirable species should be maintained with the proposed management. Under this alternative abundance of desirable species should be maintained on 58 acres currently with moderate to high/high similarity abundance of desirable key species should increase on 7 acres with moderate similarity (Table 23). Timothy and smooth brome will probably continue to be the dominant grass species on 326 acres currently identified with low to moderate similarity (Table 23).

Table 23. Summary Of Floristic/Functional Group Similarity For Black Butte Wildlife Management Area

Floristic Similarity	Acres
Moderate to High/High	28
Moderate	7
Low to Moderate	326

Future management should consider grazing prescriptions targeted at reducing non-native grass species and increasing abundance of desirable native species. Restoring native mountain grassland communities would be consistent with management objectives for maintaining or restoring biodiversity and wildlife habitats. The proposed temporary grazing permit is an opportunity to experiment with different grazing prescriptions to reduce the abundance of timothy and other non-native grass species and restore mountain grassland communities. Timothy is not resistant to heavy grazing (Esser 1993). Heavy use of timothy and other non-native grass species during critical phenological stages may reduce its vigor and improve the competitive advantage for desirable native grass species. The objective would be to implement timed grazing and vary grazing intensity to overgraze timothy, while at the same time not overgraze desired native grass species. An example grazing prescription may be to heavily graze timothy early in the growing season, remove livestock to allow native grass species to recover, and re-graze the pasture later in the grazing season. Adoption of this type of grazing prescription would require additional monitoring to control the timing and intensity of grazing; and monitor vegetation response to insure management objectives are being met by the grazing prescription. The elimination of grazing over the past 20 years does not appear to have been effective in reducing the abundance of timothy and it may have increased on adjacent sites.

Cumulative Effects for Alternative 3

Implementation of alternative 3 is not expected to contribute to significant cumulative effects. Livestock grazing is the principle activity affecting upland rangeland ecosystems and associated grass and shrub communities within the analysis area.

Past and present timber harvest activities, prescribed fire, wildfire, existing roads, and dispersed recreation will continue to be an insignificant influence on upland rangeland ecosystems as described under the affected environment.

Forest Plan Consistency and Other Required Disclosures for Alternative 3

Alternative Three would implement the 1986 Custer National Forest Land and Resource Management Plan (Forest Plan) standards and guidelines for range management related to Management Areas B, D, G, G, and M. Compliance with Forest Plan standards and guidelines for range management would be met. It would provide conditions conducive to maintaining healthy, vigorous vegetative cover, provide cover for wildlife habitat, provide livestock forage, and maintain soil stability. The alternative may not fully achieve the goal for desired vegetation. Sites currently occupied by non-native grass species such as timothy, smooth brome, and Kentucky bluegrass will

probably continue to be dominated by these species. Sites currently dominated by desired native grass species will continue to be maintained as native mountain grassland communities.

Conclusions for Environmental Consequences for Alternative 3

This alternative should provide for recovery towards desired conditions for grazing impacted upland areas currently with low to moderate and moderate similarity and still dominated by native grass species. Sites dominated by non-native grass species will probably continue to be dominated by timothy, Kentucky bluegrass, and smooth brome. Stocking levels should be balanced with available forage under Alternative Three. Grazing should not result in consistently exceeding allowable use. The health and vigor of individual desirable plant species should be maintained or improve under the proposed stocking levels and grazing prescriptions.

Effects by Alternative Summary

Table 24 summarizes the effects by alternative relative to anticipated trend in upland rangeland ecosystems towards desired vegetation composition for grassland and shrubland communities.

Table 24. Summary Of Anticipated Trend In Upland Rangeland Ecosystems Across The Project Area

	Alternative 1	Alternative 2	Alternative 3
Direct	short term decrease[1]	no activity	short term decrease[1]
Indirect	improve to DFC[4]	static[2]	Improve to DFC[2]
Cumulative	improve but relative[3]	static	improve but relative[3]

[1] Decrease due to installation or removal of water developments and fences. Rapid site recovery anticipated.
[2] Improvement to Desired Future Condition (DFC) may require adaptive management and may not occur on upland sites dominated by timothy.
[3] Natural and other human activities will influence the recovery and future condition of upland rangeland ecosystems.
[4] Abundance of desirable plant species should increase, however, long term diversity and productivity of the ecosystem may not be maintained without periodic disturbance (e.g. fire, grazing) and areas presently dominated by non-native grass species will probably continue to be dominated by non-native species.

MITIGATION

Mitigation measures beyond adjusting the timing and intensity of livestock grazing through implementation of planned grazing systems include a variety of tools that will improve livestock distribution and discourage livestock from concentrating in selected areas. These include riding/herding, placement of supplements (salt, protein, mineral blocks etc.) in uplands, and control access to water.

MONITORING

Monitoring is a critical component for allotment plan implementation and should address several different management aspects. Monitoring should (USDA-FSH 2209.13_90 2004, pp. 17):

- Indicate whether actions are being implemented as planned.
- Indicate whether design criteria and standards are being met.
- Indicate whether management actions are effective in moving toward desired resource conditions.

The overall management goal in the Custer National Forest Plan for rangelands “is to achieve a diversity of beneficial uses of rangeland resources, including harvest of surplus production through a cooperative and integrated management approach designed to attain healthy and productive soil and vegetation and clean air and water. Briefly stated, our rangeland goal is range in good condition.” (USDA-Custer Forest Plan. 1986. pp. 3). “Good condition” within the context of the Forest Plan goal, healthy and productive soil, vegetation, clean air and water is synonymous with maintaining healthy rangelands. The effectiveness of management practices to achieve this objective can be evaluated through use of 17 rangeland health indicators (Pellant et. al. 2000, USDA-NRCS 1997) and monitoring grazing affects on desirable key native grass species (i.e. Idaho fescue, tufted hairgrass, bluebunch wheatgrass, bearded wheatgrass, needle-and-thread grass, western needlegrass).

Monitoring methods used should address the following elements:

- Utilization of key (desirable) species.
- Document changes in rangeland health indicators.
- Document presence and abundance of key (desirable) species.
- Document changes (trend) in presence and abundance of key (desirable) species.
- Provide a basis for documenting trend toward or away from other resource objectives.

Monitoring provides a basis for adjusting the timing and intensity of grazing use or implementing other management practices that might be more effective in meeting management objectives. Priority for monitoring should be given to areas of suitable range currently with moderate, low to moderate, low floristic similarity (Maps 3-A, 3-B & 3-C, Existing Vegetation Polygons & Maps 6-A, 6-B & 6-C, Vegetation Similarity Index & Vegetation Plot Inventory). Areas currently with moderate to high/high floristic similarity should also be monitored to assess whether proposed management is maintaining desired composition of these plant communities. Sites selected for monitoring should be stratified by habitat and/or ecological units to document changes on sites with similar capabilities to respond to management.

A multi-stage monitoring approach is proposed that incorporates a variety of monitoring methods differing in timing and intensity and blends quantitative measures with qualitative evaluations. Quantitative methods should be used to quantify baseline presence and abundance of rangeland health indicators, desirable plant species, and to monitor changes in their presence/abundance overtime (i.e. establish trend). These would involve establishment of permanent transects, micro plots, and photo points to record nested rooted frequency (USDA-FS 2005, USDA-BLM 1996). These locations should be stratified by habitat type or ecological unit (i.e. biophysical setting) so comparisons are made between sites with similar capability to respond to management. Nested rooted frequency will document and track changes in frequency of key (desirable) species and is a reliable measure of trend. Transect placement should be based on a stratified random sample design. Nested rooted frequency plots will provide a sample of upland rangeland conditions and trends monitored over time and provide a basis for evaluating the overall effectiveness of management practices in meeting desired conditions over the life of the allotment management plan. Stratification rules could be based on habitat type, allotment, pasture, primary range, and/or current condition of upland plant communities. If permanent Parker 3-Step transects have been established and are locatable within the allotments, an alternative or additional approach would be to establish nested frequency transects over the top of Parker 3-Step Transects. This would provide a record of trend back through the 1960s, when the Permanent Parker Transects were established. Caution should be taken to insure the Parker Transect is located in a homogenous vegetation community and on the same habitat type or ecological site and doesn't cross community or habitat type boundaries. This rule applies to placement of nested frequency transects not associated with Parker Transects as well.

Qualitative methods include permanent photo points and ocular surveys in key areas where permanent transects have not been established. Qualitative methods include Ocular Macro Plot Methods (USDA-FS 2003, USDI-BLM 1996) and rangeland health assessments (Pellant et. al. 2000). These methods will provide a qualitative assessment of changes in upland rangeland health. Photo points provide a visual portrayal of change over time. Methods for establishing photo points are outlined in Photo Point Monitoring Handbook (Hall 2001). Methods for evaluating utilization are found in "Utilization Studies and Residual Measurements, Interagency Technical Reference (USDI-BLM 1996).

INVASIVE PLANT MANAGEMENT

Noxious weed infestations are few and far between on the Red Lodge Creek, Butcher Creek, East Rosebud and West Rosebud Allotments and Black Butte Wildlife Habitat Area. Red Lodge Creek Allotment has some scattered infestations of Canada thistle and houndstongue. Butcher Creek Allotment also has scattered areas with Canada thistle and houndstongue. About 12 years ago sulfur cinquefoil was found on the Butcher Creek Allotment. Early detection and treatment caught the infestaton in time to prevent it from spreading and becoming a problem. In the East Rosebud Allotment noxious weeds are found mostly along the East Rosebud Road and include spotted knapweed, Canada thistle, houndstongue, leafy spurge and sulfur cinquefoil. Weed treatment has been on-going in the East Rosebud drainage for many years and noxious weeds do not appear to be spreading away from the roads or recreation sites. In the West Rosebud Allotment Pasture noxious weeds present include spotted

knapweed, Canada thistle, houndstongue and meadow hawkweed, all of which are currently being treated for control. Morris Creek Pasture includes a few scattered areas with Canada thistle and houndstongue. Noxious weeds in the Black Butte Wildlife Habitat Area include scattered plants of Canada thistle and houndstongue, however, there has not been a control program over most of this area to date. The Forest Service intends to initiate noxious weed control next field season.

Most likely, the primary vectors for spread of spotted knapweed and Canada thistle are vehicles and wind, the vectors for sulphur cinquefoil and meadow hawkweed are vehicles and birds, the vectors for leafy spurge are birds and wind, and the vectors for hound's-tongue are livestock, birds, wildlife and people.

The Beartooth District Weed Control Program is actively monitoring and treating noxious weeds annually on the allotments in the analysis area. This activity will continue regardless of which alternative of this environmental analysis is chosen. The goal for noxious weed management in the analysis area of the Beartooth Ranger District is to prevent noxious weeds from going to seed, reducing the number of acres infested with noxious weeds, and to eradicate, and reduce, all new starts as soon as they are found.

Noxious Weed Risk Assessment

In order to determine the risk of noxious weeds and other undesirable plants spreading in the analysis area due to the activity being analyzed in this environmental assessment the following risk assessment was conducted. The Forest Service Northern Region Risk Assessment Rating Procedure for Undesirable Plants was used for this determination. This method meets the direction contained in the *Forest Service Manual Zero Code 2080 - Noxious Weed Management*.

Northern Region Risk Assessment Rating Procedure For Undesirable Plants

Factor 1: *Likelihood of Undesirable Plant Species, Including Noxious Weeds Species, Spreading to Project Area:*

NONE (0): Undesirable plants, including noxious weed species not located within or immediately adjacent to the project area. Project activity is not likely to result in the establishment of undesirable weed species on the project area.

LOW (1): Undesirable plant species present in areas adjacent to but not within the project area. Project activities can be implemented and prevent the spread of undesirable plants into the project area.

MODERATE (5): Undesirable plant species located immediately adjacent to or within the project area. Project activities are likely to result in some areas becoming infested with undesirable plant species even when preventative management actions are followed. Control measures are essential to prevent the spread of undesirable plants or noxious weeds within the project area.

HIGH (10): Heavy infestations of undesirable plants are located within or immediately adjacent to the project area. Project activities, even with preventative management actions, are likely to result in the establishment and spread of undesirable plants on disturbed sites throughout much of the project area.

Factor 2: *Consequence of Undesirable Plant Establishment in Project Area*

LOW (1): None. No cumulative effects expected.

MODERATE (5): Possible adverse effects on site and possible expansion of infestation within project area. Cumulative effects on native plant community are likely, but limited.

HIGH (10): Obvious adverse effects within the project area and probable expansion of undesirable plants, including noxious weed infestations to areas outside the project area. Adverse cumulative effects on native plant community are probable.

Factor 2: ***Consequence of Undesirable Plant Establishment in Project Area***

LOW (1): None. No cumulative effects expected.

MODERATE (5): Possible adverse effects on site and possible expansion of infestation within project area. Cumulative effects on native plant community are likely, but limited.

HIGH (10): Obvious adverse effects within the project area and probable expansion of undesirable plants, including noxious weed infestations to areas outside the project area. Adverse cumulative effects on native plant community are probable.

Risk Rating Procedure

Step 1. Identify level of likelihood and consequence of adverse effects and assign values according to the following:

None = 0, Low = 1, Moderate = 5, High = 10

Step 2. Multiply level of likelihood times consequences.

Step 3. Use the value resulting in step 2 to determine Risk Rating and action as follows:

Table 25. Noxious Weed Risk Rating

Value	Risk Rating	Action
0	NONE	Proceed as planned.
1-10	LOW	Proceed as planned. Initiate control treatments on undesirable plant populations that get established in the area.
25	MODERATE	Develop preventative management measures for the proposed project to reduce the risk of introduction or spread of undesirable plants into the area. Monitor the area for at least 3 consecutive years and provide for control of new infestations.
50-100	HIGH	Modify project design and implement preventative management measures for the proposed project to reduce the risk of introduction or spread of undesirable plants into the area. Monitor the area for at least 5 consecutive years and provide for control of new infestations.

Undesirable Plant Risk Rating For Red Lodge Creek, Butcher Creek, East Rosebud And West Rosebud Allotments And Black Butte Wildlife Habitat Area Allotments

Step 1. Identify level of likelihood and consequence of adverse effects and assign values according to the above direction.

Likelihood rating is between low and moderate (2.5). Noxious weeds are present in very limited quantity within the project area, but are not likely to spread appreciatively with the current level of monitoring and treatment. The consequence of noxious weed establishment is between low and moderate (2.5). Cumulative effects on the native plant community are likely, but are very limited with continued monitoring and treatment. Spread of leafy spurge, spotted knapweed, meadow hawkweed, sulfur cinquefoil and Canada thistle is not promoted by continued livestock grazing and could continue without livestock grazing. Under alternatives 2 and 3 livestock may promote the spread of hound's-tongue. Hound's-tongue would also be spread by birds and wildlife under alternative 1.

Step 2. Multiply level of likelihood times consequences.

Likelihood (2.5) X Consequences (2.5) = Value (6.25)

Step 3. Use the value resulting in step 2 to determine Risk Rating.

A value of 6.25 gives a risk rating of low. The project may proceed as planned. Initiate control treatments on undesirable plant populations that get established in the area.

LIVESTOCK CARRYING CAPACITY

Livestock carrying capacity for the Butcher Creek, Red Lodge Creek, East Rosebud, and West Rosebud Allotmentswas estimated by using three different approaches. One method used was to map livestock forage utilization, another method used was a general forage production model using various allowable use levels. The third method used was to create an allowable forage use model using existing vegetation production data and geographic information systems (GIS). Since no grazing has occurred on the Black Butte Wildlife Habitat Area, carrying capacity was determined only with the use of the allowable forage use model.

Production/Utilization Studies

In 2005 forage production/utilization studies were initiated on the Butcher Creek, Red Lodge Creek, East Rosebud, and West Rosebud Allotments. These studies represent the first time that utilization data have been collected and analyzed in a thorough and comprehensive manner for all of the grazing areas (primary range) within these allotments. The data collected between 2005 and 2007 assists in determining livestock carrying capacity (proper stocking rate) which is needed to meet *Custer National Forest Plan* direction (see Table 26 Stocking Rate Summary 2005 - 2007 Production/Utilization Studies).

Production/Utilization Cage in Polygon 20838-1-1 on the Butcher Creek Allotment 7/27/06

The method used in these production/utilization studies involves comparing estimated forage utilization gathered visually and then comparing this actual utilization with allowable use in each map unit throughout each pasture. Actual utilization and map unit boundaries are based on a trained individual's best estimate and thorough coverage of each pasture. Clipping of forage production in grazed and ungrazed plots assist in the training of the individual's "eye" and provide production data which can be compared with data collected in succeeding years. Actual use (number & class of livestock and on/off dates) is obtained from the permittees, and on the ground observations, and is compared to actual utilization, allowable use, and permitted use for each pasture. A formula is used to determine the proper use capacity (carrying capacity) of each pasture. Allowable use is based on distribution patterns reflecting a stocking rate which will theoretically provide for proper use of riparian and other key livestock use areas within each pasture. The current grazing permits for the analysis area allotments specify that proper use of livestock forage in riparian and key use areas will not exceed 55% by dry weight. Allowable use takes into account the way that livestock use a pasture, the distance a map unit is from water, the roughness or steepness of the terrain of a map unit, and the intensity of livestock management (i.e. salting, water improvement, and herding can improve livestock distribution). Allowable use in any given map unit can change based on changes in livestock management and the time of year that a pasture is grazed. If livestock management intensity is increased, then allowable use may be increased in any given map unit. Complete reports and data for these production/utilization studies are available for review at the Beartooth Ranger District Office (2210 files for Butcher Creek, Red Lodge Creek, East Rosebud, and West Rosebud Allotments).

Precipitation during the months of April, May and June was used to adjust for the effects of drought on forage production since these are the months when forage plants come out of dormancy and produce rapid growth to near maturity. It is during this period of plant growth that plants are most efficient at utilizing available moisture. If not enough precipitation falls during this period, a poor forage production year occurs. This method of adjusting for drought does not consider the effects of available fall moisture or the condition of the forage plants (impacts that may be present from grazing that could have a negative effect on how efficiently the plants can use the available moisture). Data from the Red Lodge weather station was used to adjust livestock grazing capacity on the Red Lodge Creek and Butcher Creek Allotments, while data from the Fishtail weather station was used to adjust livestock grazing capacity on the East Rosebud and West Rosebud Allotments (see Tables 27 and 28 for the precipitation records for the Red Lodge and Fishtail weather stations growing season precipitation).

Table 26 summarizes all of the data collected during the 2005 - 2007 P/U studies and includes forage production from clipped plots in livestock key use areas, precipitation date, permitted, actual, estimated proper use, and adjusted for drought animal unit months (AUMs). It also displays the adjustment percent needed from permitted AUMs, livestock suitable acres for grazing, the number and percent of acres overgrazed, permitted stocking rate in acres/AUM and the adjusted stocking rate in acres/AUM.

Table 26. Stocking Rate Summary 2005 - 2007 Production/Utilization Studies

Stocking Rate Summary Table
Butcher Creek, Red Lodge Creek, East Rosebud, and West Rosebud Allotments
2005 - 2007 Production/Utilization Studies

Allotment Name	Year	Average Forage Production in Key Use Areas	Red Lodge Average Precipitation for April, May & June 31-year avg = 8.69"	Red Lodge Average % Percentage for April, May & June 31 year avg = 8.69"	Fishtail Average Precipitation for April, May & June 31 year avg = 8.26"	Fishtail Average % Precipitation for April, May & June 31 year avg = 8.26"	Red Lodge Precipitation Normalizing Multiplier (Multiplier X Stocking rate = Adjusted for precipitation)	Fishtail Precipitation Normalizing Multiplier (Multiplier X Stocking rate = Adjusted for precipitation)	Current Permitted AUMs	Actual Use AUMs	Estimated Proper Stocking Rate AUMs From Production Utilization Study	Adjusted Stocking Rate AUMs Using Precipitation Multiplier*	Estimated Stocking Rate Adjustment Needed In AUMs & %	Total Suitable Acres In Pasture	Acres Over-grazed & % Over-grazed	Permitted Stocking Rate Acres/ AUM	Adjusted Stocking Rate Acres/ AUM
Butcher Creek	2005	-	13.51	155%	11.76	144%	.45	-	69	-	-	-		-	-	-	-
Butcher Creek	2006	1,060 #/ac 2,180 #/ac	2.79	32%	5.15	62%	1.68	-	69	67	49	82	+ 13 AUMs +16%	68	23 ac 33%	.98	1.39
Butcher Creek	2007	1,261 #/ac 2,353 #/ac	8.36	96%	7.18	83%	1.04	-	69	39	59	61	- 8 AUMs - 12%	79	0 ac 0%	1.16	1.36
Average		**1,713 #/ac**	**8.22**	**94%**	**8.03**	**96%**	**1.06**	**-**	**69**	**53**	**54**	57	- 12 AUMs 17%	**74**	**12 ac 16%**	**1.07**	**1.36**
Red Lodge Creek	2005	-	13.51	155%	11.76	144%	.45	-	191	-	-	-		-	-	-	-
Red Lodge Creek	2006	780 #/ac	2.79	32%	5.15	62%	1.68	-	191	142	98	165	- 28 AUMs - 14%	235	97 ac 41%	1.23	1.40
Red Lodge Creek	2007	1,152 #/ac	8.36	96%	7.18	83%	1.04	-	191	168	130	135	- 56 AUMs - 29%	232	38 ac 16%	1.21	1.78
Average		**966 #/ac**	**8.22**	**94%**	**8.03**	**96%**	**1.06**	**-**	**191**	**155**	**114**	121	- 79 AUMs - 37%	**234**	**68 ac 29%**	**1.22**	**1.59**
East Rosebud	2005	1,900 #/ac	13.51	155%	11.76	144%	-	.56	150	91	122	68	- 82 AUMs - 55%	496	9 ac 2%	3.31	4.07
East Rosebud	2006	-	2.79	32%	5.15	62%	-	1.38	150		-	-	-	-	-	-	-
East Rosebud	2007	1,720 #/ac	8.36	96%	7.18	83%	-	1.17	150	132	103	121	- 29 AUMs - 19%	471	43 ac 9%	3.14	4.57
Average		**1,810 #/ac**	**8.22**	**94%**	**8.03**	**96%**	**-**	**1.04**	**150**	**111**	**112**	116	- 34 AUMs -23%	**484**	**26 ac 5%**	**3.23**	**4.32**
West Rosebud West bud	2005	1,050 #/ac	13.51	155%	11.76	144%	-	.56	112	82	69	39	- 73 AUMs -65%	253 353**	25 ac 10%	2.26 3.15**	3.67 5.11**
West Rosebud West bud	2006	660 #/ac	2.79	32%	5.15	62%	-	1.38	112	102	84	116	+4 AUMs + 3%	243 343**	24 ac 10%	2.17 3.06**	2.89 4.08**
West Rosebud West bud	2007	2,190 #/ac	8.36	96%	7.18	83%	-	1.17	112	95	92	108	- 4 AUMs - 4%	238 338**	9 ac 4%	2.13 3.01**	2.59 3.67**
Average		**1,300 #/ac**	**8.22**	**94%**	**8.03**	**96%**	**-**	**1.04**	**112**	**93**	**82**	85	- 27 AUMs -24%	**244 / 344**	**19 ac 8%**	**2.19 / 3.07****	**3.05 / 4.29****
West Rosebud Morris Cr	2005	1,168 #/ac	13.51	155%	11.76	144%	-	.56	114	92	98	55	-59 AUMs - 52%	206	2 ac .01%	1.81	2.10
West Rosebud Morris Cr	2006	782 #/ac	2.79	32%	5.15	62%	-	1.38	114	20 3 days^	-	-	-	184	9 ac 4%	-	-
West Rosebud Morris Cr	2007	1,212 #/ac	8.36	96%	7.18	83%	-	1.17	114	95	95	111	- 3 AUMs - 3%	186	0 ac 0%	1.63	1.95
Average		**1,054 #/ac**	**8.22**	**94%**	**8.03**	**96%**	**-**	**1.04**	**114**	**93**	**97**	101	- 13 AUMs - 11%	**192**	**4 ac 2%**	**1.72**	**2.03**

*Adjusted stocking rate AUMs for growing season precipitation used Red Lodge precipitation data for Butcher Creek and Red Lodge Creek Allotments and used Fishtail precipitation data for East Rosebud and West Rosebud Allotments. **Additional acres in the West Rosebud Allotment that were not grazed during the P/U Study, but could be grazed (Gravel Pit, Shorey Jungle & Shorey Swamp Pastures). ^Livestock were not in this pasture long enough to accurately assess the utilization level.

Table 27 is a summary of the Red Lodge weather station precipitation record from 2005 - 2007 for the months of April, May and June. The table shows the monthly total precipitation, the three month sum, the percent of mean and the normalizing multiplier that was used to adjust proper use capacity AUMs (carrying capacity) in the case of the P/U study. Upon analyzing monthly precipitation records it was discovered that drought effect may not have been as great as first thought. When the normalizing multiplier is used, on the average across the analysis area, the drought effect is estimated to be about minus 6 percent of average. Or, another way to look at these results is that forage production may have been down an average of 6 percent of average during the three year period 2005 - 2007.

TABLE 27. RED LODGE WEATHER STATION GROWING SEASON PRECIPITATION RECORD 2005 - 2007 USED TO ADJUST PU STUDY AND VEGETATION PRODUCTION DATA FOR DROUGHT

MONTHLY TOTAL PRECIPITATION IN INCHES

Year	April	May	June	Three Month Sum	% of Mean (Average)	Normalizing Multiplier*
2005	3.67	8.72	1.12	13.51	155%	0.45
2006	1.55	0.77	0.47	2.79	32%	1.68
2007	2.61	2.38	3.40	8.39	96%	1.04
Period of Record Statistics				**Three Month Mean**		
Mean				8.69	94%	1.06*
No. Years	31	31	31			3

* This number is used to adjust the proper use capacity AUMs in this PU Study

Table 28 is a summary of the Fishtail weather station precipitation record from 2005 - 2007 for the months of April, May and June.

TABLE 28. FISHTAIL WEATHER STATION GROWING SEASON PRECIPITATION RECORD 2005 - 2007 USED TO ADJUST PU STUDY AND VEGETATION PRODUCTION DATA FOR DROUGHT

MONTHLY TOTAL PRECIPITATION IN INCHES

Year	April	May	June	Three Month Sum	% of Mean (Average)	Normalizing Multiplier*
2005	2.24	7.78	1.74	11.76	144%	0.56
2006	1.97	0.78	2.40	5.15	62%	1.38
2007	2.28	2.01	2.89	7.18	83%	1.17
Period of Record Statistics				**Three Month Mean**		
Mean				8.26	96%	1.04*
No. Years	31	31	31			3

* This number is used to adjust the proper use capacity AUMs in this PU Study

Table 29 displays the 31 year precipitation record for the months of April, May and June for the Red Lodge weather station.

Table 29. 31 Year Precipitation by Year for April, May and June Red Lodge, Montana

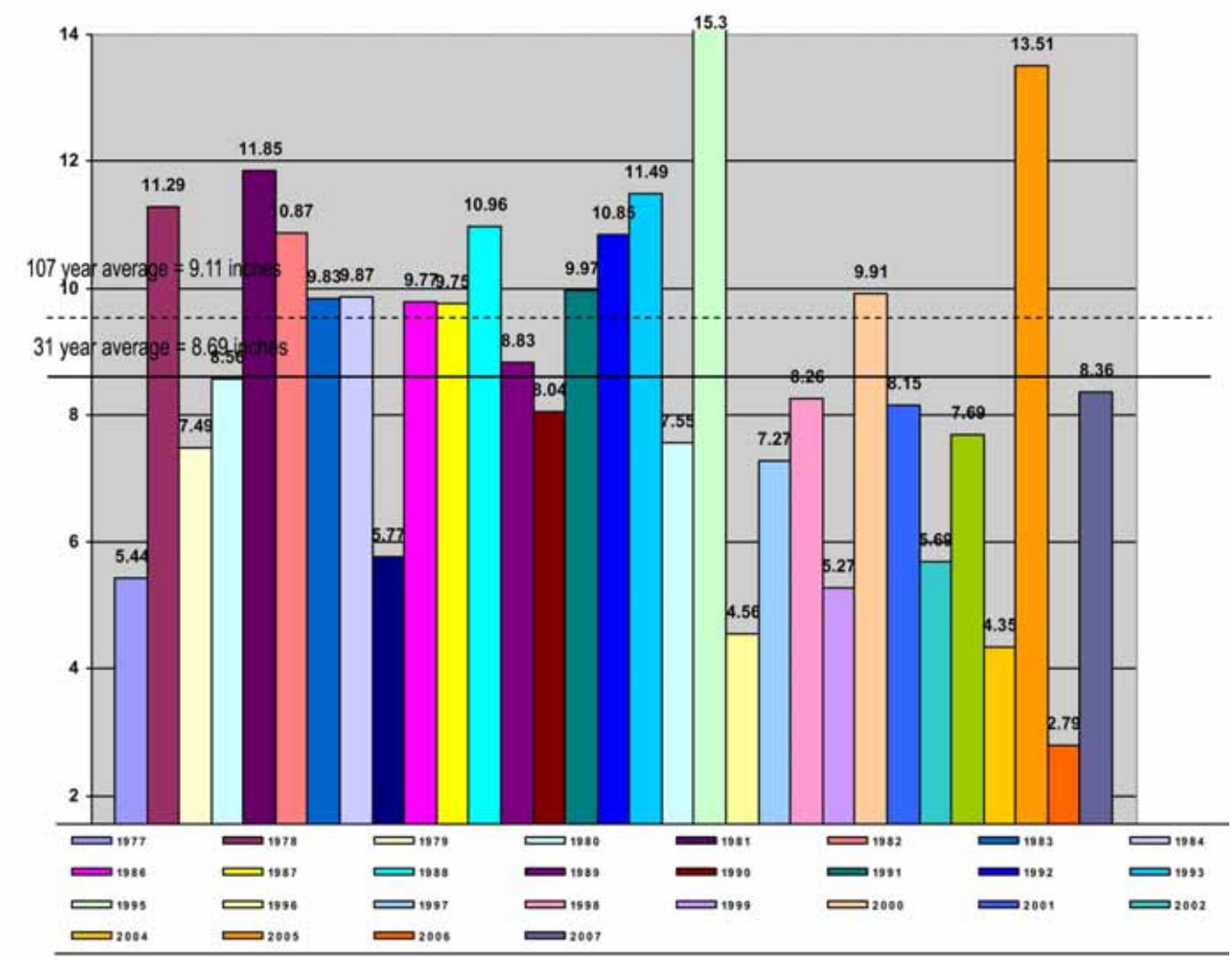
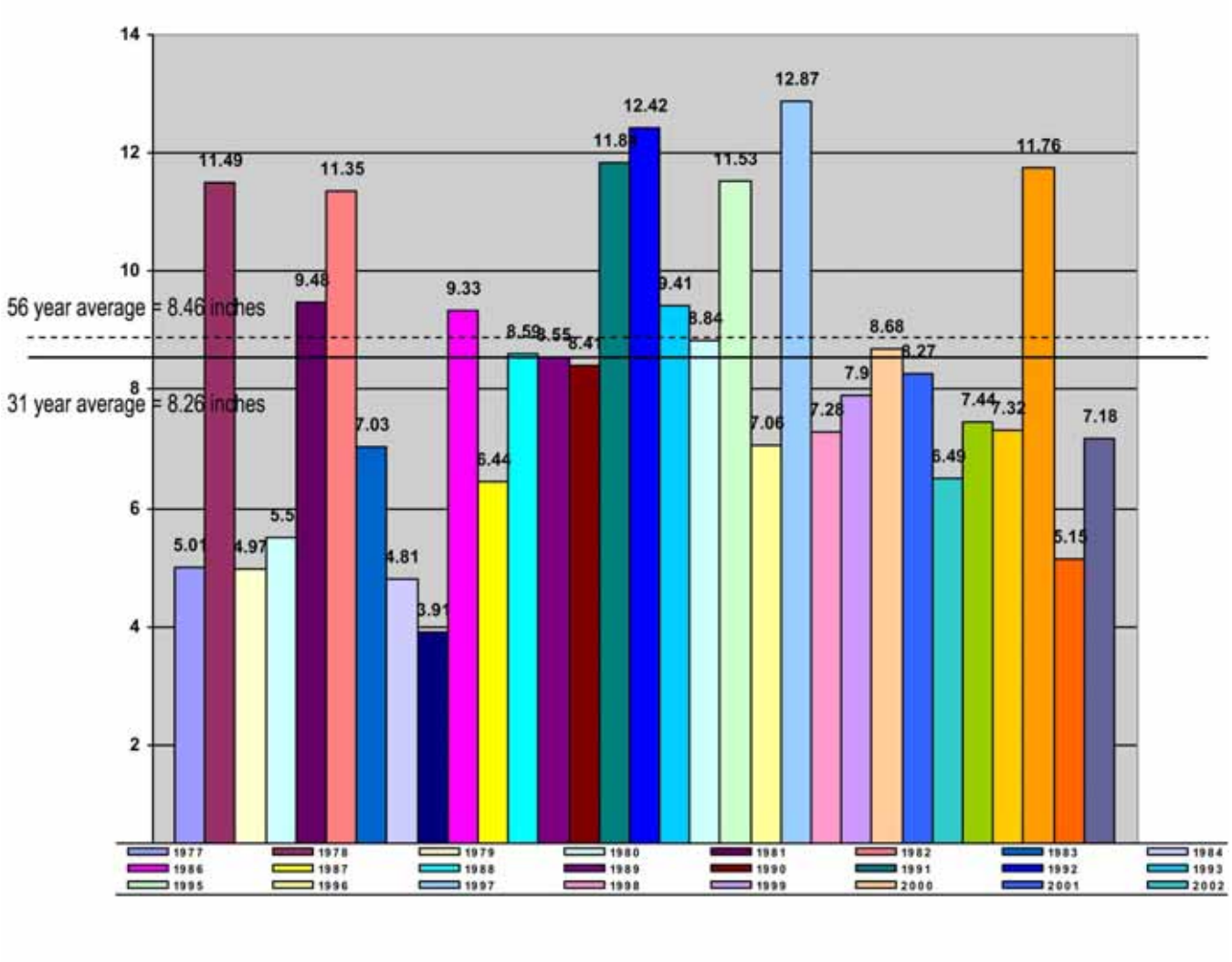


Table 30 displays the 31 year precipitation record for the months of April, May and June for the Fishtail weather station.

Table 30. 31 Year Precipitation by Year for April, May and June Fishtail, Montana



Average Forage Production Model

The average forage production model is a quick and dirty method to estimate what livestock carrying capacity could be under various levels of allowable use (allowable use is based on the intensity of livestock management; i.e. higher allowable use with full time herding of livestock, lower allowable use with no herding etc.). An average amount of dry weight livestock forage per acre for the whole pasture/allotment was estimated. This was multiplied by various allowable use levels from 30 percent to 60 percent across the whole pasture/allotment to yield available forage in pounds per acre. This number was then multiplied by the total number of suitable acres for livestock grazing. In the case of this model, 1,000 pounds of dry weight forage was consumed and trampled by a cow in one month. Forage required for a 1,000 pound cow in a month (AUM) was determined by dividing the total forage available by the amount of forage consumed and trampled by one AUM. Table 31 displays the number of AUMs and stocking rate in acres per AUM for each grazing pasture/allotment for each level of allowable use.

Table 31. Average Forage Production Stocking Rate Model

Forage Production Stocking Rate Model

Average Forage Production X Suitable Acres / Forage Requirement = Stocking Rate
(Assumes Four Allowable Use Levels 30%, 40%, 50% and 60% Over All Suitable Acres*)

Percent Grazing Allowable Use	Butcher Creek Allotment Average Forage Production 1,713 #/acre	Butcher Creek Allotment Total Suitable Acres	Butcher Creek Allotment Total Forage #/acre	Butcher Creek Allotment Forage Required per AUM 1,000#	East Rosebud Allotment Average Forage Production 1,000 #/acre	East Rosebud Allotment Total Suitable Acres	East Rosebud Allotment Total Forage #/acre	East Rosebud Allotment Forage Required per AUM 1,000#	Red Lodge Creek Allotment Average Forage Production 966 #/acre	Red Lodge Creek Allotment Total Suitable Acres	Red Lodge Creek Allotment Total Forage #/acre	Red Lodge Creek Allotment Forage Required per AUM 1,000#	West Rosebud Allotment West Rosebud Pasture Average Forage Production 1,300 #/acre	West Rosebud Allotment West Rosebud Pasture Total Suitable Acres	West Rosebud Allotment West Rosebud Pasture Total Forage #/acre	West Rosebud Allotment West Rosebud Pasture Forage Required per AUM 1,000#	West Rosebud Allotment Morris Creek Pasture Average Forage Production 1,954 #/acre	West Rosebud Allotment Morris Creek Pasture Total Suitable Acres	West Rosebud Allotment Morris Creek Pasture Total Forage #/acre	West Rosebud Allotment Morris Creek Pasture Forage Required per AUM 1,000#
	Available Forage #/Acre		Total Forage Available	AUMs	Available Forage #/Acre		Total Forage Available	AUMs	Available Forage #/Acre		Total Forage Available	AUMs	Available Forage #/Acre		Total Forage Available	AUMs	Available Forage #/Acre		Total Forage Available	AUMs
	Allowable Use X Production		Forage Production X Suitable Acres	Forage Production / 1,000#	Allowable Use X Production		Forage Production X Suitable Acres	Forage Production / 1,000#	Allowable Use X Production		Forage Production X Suitable Acres	Forage Production / 1,000#	Allowable Use X Production		Forage Production X Suitable Acres	Forage Production / 1,000#	Allowable Use X Production		Forage Production X Suitable Acres	Forage Production / 1,000#
30%	514	74	38,029	38 AUMs	543	484	145,200	145 AUMs	290	234	67,813	68 AUMs	390	244	95,160	95 AUMs	316	192	60,710	61 AUMs
Stocking Rate				1.95 Acres per AUM				3.34 Acres per AUM				3.44 Acres per AUM				2.56 Acres per AUM				3.15 Acres per AUM
40%	685	74	50705	51 AUMs	724	484	193,600	194 AUMs	386	234	90,418	90 AUMs	520	244	126,880	127 AUMS	422	192	80,947	81 AUMs
Stocking Rate				1.45 Acres per AUM				2.49 Acres per AUM				2.6 Acres per AUM				1.92 Acres per AUM				2.37 Acres per AUM
50%	856	74	63381	63 AUMs	905	484	242,000	242 AUMs	483	234	113,022	113 AUMs	650	244	158,600	159 AUMs	527	192	101,184	102 AUMs
Stocking Rate				1.17 Acres per AUM				2.00 Acres per AUM				2.07 Acres per AUM				1.53 Acres per AUM				1.88 Acres per AUM
60%	1028	74	76,102	67 AUMs	1086	484	290,400	290 AUMs	580	234	135,626	136 AUMs	780	244	190,320	190 AUMs	632	192	121421	121 AUMs
Stocking Rate				1.15 Acres per AUM				1.67 Acres per AUM				1.72 Acres per AUM				1.28 Acres per AUM				1.59 Acres per AUM
Permitted AUMs				69 AUMs				150 AUMs				191 AUMs				112 AUMs				114 AUMs
Permitted Stocking Rate				1.07 Acres per AUM				3.23 Acres per AUM				1.22 Acres per AUM				2.18 Acres per AUM				1.68 Acres per AUM
Stocking At 40% AU				Over Stocked				Slightly Under Stocked				Over Stocked				Slightly Under Stocked				Slightly Over Stocked

*Suitable acres from 2005 - 2007 Production/Utilization Studies. Note: AUM = 1000# dry matter consumed and trampled (780# eaten + 220# trampled)

Forage Production/Allowable Use Modeling Using GIS

The second approach that was used to calculate livestock carrying capacity involved computer modeling. The modeling exercise used a set of parameters that estimated how livestock use the analysis area allotments under the type and intensity of management that is currently practiced and/or that has been proposed in the preferred alternative. Parameters were based on the actual utilization mapping that was conducted from 2005 to 2007 (and other studies across the Ranger District in the near past). In the model, livestock allowable forage use was set based on slope, distance from water and distance from fences (see Tables 32 & 33 & Maps 4-A, 4-B & 4-C, Percent Allowable Use). Geographic information systems (GIS), a type of computer software in wide use by government and business, was used to do this calculating. The GIS program analyzed the model's parameters relative to estimated forage production (in pounds of dry matter per acre) from existing dominant vegetation types. This information was gathered by mapping the suitable (primary) livestock range and assigning polygons to each vegetation dominance type. Each polygon on the map was assigned a forage production figure based on study plot clipping and/or estimating of dry weight forage production. The GIS program used this vegetation layer in conjunction with the allowable use parameters to calculate the pounds of available forage by dry weight for each pasture of each allotment in the analysis area. From this information it was possible to calculate AUMs by dividing the dry weight forage available by 780 (the number of pounds of dry matter consumed by an average cow in one month). Table 32 displays the model parameters used for the four existing allotments where maximum allowable use (AU) is set at 60 percent. Table 33 displays the model parameters for the Black Butte Wildlife Habitat Area where maximum allowable use is set at 40 percent.

Table 32. Grazing Capacity Model Parameters
Red Lodge Creek, Butcher Creek, East Rosebud, & West Rosebud

Distance From Water (feet)	< 10% Slope	10% - 15% Slope	15% - 20% Slope	20% - 40% Slope	40% - 50% Slope
0' - 100'	60% AU	60% AU	60% AU	60% AU	60% AU
100' - 300'	60% AU	50% AU	40% AU	30% AU	20% AU
300' - 1,000'	50% AU	40% AU	30% AU	20% AU	10% AU
1,000' - 2,000'	40% AU	30% AU	20% AU	10% AU	0% AU
2,000' - 3,000'	30% AU	20% AU	10% AU	0% AU	0% AU
3,000 - 4,000'	20% AU	10% AU	0% AU	0% AU	0% AU
4,000' - 5,000'	10% AU	0% AU	0% AU	0% AU	0% AU
> 5,000'	0% AU	0% AU	0% AU	0% AU	0% AU
Distance From Fences (feet)	**< 10% Slope**	**10% - 15% Slope**	**15% - 20% Slope**	**20% - 40% Slope**	**40% - 50% Slope**
0' - 300'	50% AU	40% AU	30% AU	20% AU	10% AU

AU = Allowable Use

Table 33. Grazing Capacity Model Parameters
Black Butte Wildlife Management Area

Distance From Water (feet)	< 10% Slope	10% - 15% Slope	15% - 20% Slope	20% - 40% Slope	40% - 50% Slope
0' - 100'	40% AU	40% AU	40% AU	40% AU	40% AU
100' - 300'	40% AU	30% AU	20% AU	10% AU	0% AU
300' - 1,000'	30% AU	20% AU	10% AU	0% AU	0% AU
1,000' - 2,000'	20% AU	10% AU	0% AU	0% AU	0% AU
2,000' - 3,000'	10% AU	0% AU	0% AU	0% AU	0% AU
3,000 - 4,000'	0% AU	0% AU	0% AU	0% AU	0% AU
4,000' - 5,000'	0% AU	0% AU	0% AU	0% AU	0% AU
> 5,000'	0% AU	0% AU	0% AU	0% AU	0% AU
Distance From Fences (feet)	**< 10% Slope**	**10% - 15% Slope**	**15% - 20% Slope**	**20% - 40% Slope**	**40% - 50% Slope**
0' - 300'	30% AU	20% AU	10% AU	0% AU	0% AU

AU = Allowable Use

Table 34 summarizes the GIS livestock carrying capacity model. The Table displays both suitable and unsuitable acres for livestock grazing, the number of AUMs available by pasture/allotment, the carrying capacity stocking rate in acres per AUM, and the difference between permitted AUMs and estimated capacity in both AUMs and percent.

Table 34. GIS Capability/Dominant Vegetation Production Stocking Rate Model

Allotment &/or Pasture Name	Unsuitable Acres	Suitable/ Primary Acres	Total Acres	AUMs (780# dry matter/ cow/month)	Primary Acres Per AUM	Permitted AUMs	Difference Between Permitted & Model AUMs
Butcher Creek Allotment	329.7	101.4	431.1	39.4	2.57	69	-29.6 (-43%)
Red Lodge Creek Allotment	295.1	267.0	562.1	145.3	1.84	191	-45.7 (-24%)
East Rosebud Allotment	972.0	518.7	1,490.7	181.8	2.85	150	+31.8 (+17%)
Black Butte WMA	582.6	600.9	1,183.5	81.7	7.35	-	+81.7
Morris Creek Pasture	375.1	244.2	619.3	89.5	2.73	114	-24.5 (-21%)
West Rosebud Pasture	1,519.2	327.0	1,846.2	104.3	3.14	112	-7.7 (-7%)
Gravel Pit Pasture	165.8	83.1	248.9	13.3	6.25	-	+13.3
Shorey Jungle Pasture	409.7	59.5	469.2	18.8	3.16	-	+18.8
Shorey Swamp Pasture	155.1	42.9	198.0	19.5	2.20	-	+19.5
West Rosebud Total	**2,624.9**	**756.7**	**3,381.6**	**245.4**	**3.10**	**226**	**+19.4 (+8%)**
Analysis Area Total	**4,804.3**	**2,244.7**	**7,049**	**693.6**	**3.24**	**636**	**+57.6 (+8%)**

Summary of Methods

Table 35 summarizes a comparison of the four (three plus PU adjusted for precipitation) stocking rate evaluation methods discussed above, production/utilization study, production/utilization study adjusted for precipitation, forage production model at 40 percent allowable use and the livestock distribution/dominant vegetation model (forage production/allowable use modeling using gis).

Table 35. Comparison of Four Stocking Rate Evaluation Methods

Allotment & Pasture Name	Suitable Acres*	Permitted Stocking Rate	PU Study Proper Use Stocking Rate	PU Study Proper Use Stocking Rate Adjusted for Precipitation	Forage Production Model** at 40% use level	Livestock Distribution/ Dominant Vegetation Model***	Average 4 Methods Proper Stocking Rate****
Butcher Creek	74	69 AUMs	54 AUMs	57 AUMs	51 AUMs	39 AUMs	50 AUMs
Stocking Rate		1.1 Ac/AUM	1.4 Ac/AUM	1.3 Ac/AUM	1.5 Ac/AUM	2.7 Ac/AUM	2.0 Ac/AUM
Red Lodge Creek	234	191AUMs	114 AUMs	121 AUMs	90 AUMs	145 AUMs	118 AUMs
Stocking Rate		1.2 Ac/AUM	2.1 Ac/AUM	1.9 Ac/AUM	2.6 Ac/AUM	1.8 Ac/AUM	2.3 Ac/AUM
East Rosebud	484	150 AUMs	112 AUMs	116 AUMs	194 AUMs	182 AUMs	151 AUMs
Stocking Rate		3.2 Ac/AUM	4.3 Ac/AUM	4.2 Ac/AUM	2.5 Ac/AUM	2.9 Ac/AUM	3.4 Ac/AUM
West Rosebud West Rosebud	244	112 AUMs	82 AUMs	85 AUMs	127 AUMs	104 AUMs	100 AUMs
Stocking Rate		2.2 Ac/AUM	3.0 Ac/AUM	2.9 Ac/AUM	1.9 Ac/AUM	3.1 AC/AUM	3.3 Ac/AUM
West Rosebud Morris Creek	192	114 AUMS	97 AUMs	101 AUMs	61 AUMs	90 AUMs	87 AUMs
Stocking Rate		1.7 Ac/AUM	2.0 Ac/AUM	1.9 Ac/AUM	3.1 Ac/AUM	2.7 Ac/AUM	2.8 Ac/AUM
West Rosebud Shorey Swamp	43	NA	NA	NA	est. forage 1,500 #/ac = 26 AUMs	20 AUMs	23 AUMs
Stocking Rate					1.7 Ac/AUM	2.2 Ac/AUM	1.9 Ac/AUM
West Rosebud Shorey Jungle	56	NA	NA	NA	est. forage 800 #/ac = 18 AUMS	19 AUMs	19 AUMs
Stocking Rate					3.1 Ac/AUM	2.9 Ac/AUM	3.2 Ac/AUM
West Rosebud Gravel Pit	83	NA	NA	NA	est. forage 300 #/ac = 10 AUMs	13 AUMs	12 AUMs
Stocking Rate					8.3 Ac/AUM	6.4 Ac/AUM	6.9 Ac/AUM
West Rosebud All Pastures	618	226	NA	NA	242 AUMs	246 AUMs	244 AUMs
Stocking Rate		2.7 Ac/AUM			2.6 Ac/AUM	2.5 Ac/AUM	3.1 Ac/AUM

*Suitable acres from 2005 - 2007 Production/Utilization Studies. **AUM = 1000# dry matter/cow/month. ***AUM = 780# dry matter/cow/month & acres from GIS vegetation polygons.
****Acres from GIS vegetation polygons.

From the production/utilization studies, forage production model, and livestock distribution/dominant vegetation model, it is apparent that the permitted animal unit month (AUMs) need to be adjusted downward on the Butcher Creek and Red Lodge Creek Allotments. With improved livestock distribution (using forage on both sides of the East Rosebud River) in the East Rosebud Allotment, it will be possible to sustain the currently permitted 150 AUMs on this Allotment. The currently permitted 226 AUMs on the West Rosebud Allotment can also be sustained by reducing the number of AUMs by about 24 that are currently being run on the Morris Creek Pasture and reducing the number of AUMs currently being run on the West Rosebud Pasture by about 8. These AUMs can be moved to the additional 182 - 185 acres (51 - 52 AUMs) in the Gravel Pit, Shorey Jungle and Shorey Swamp Pastures that are part of the West Rosebud Allotment, but have not been used in the last 15 years.

The adjustment in AUMs needed on the Butcher Creek and Red Lodge Creek Allotments is summarized below. A 30 percent reduction on these two allotments is recommended for the following reasons. Since these stocking rate calculation methods are both qualitative and quantitative, each method does not provide perfect data, therefore, averaging the results from each method makes sense. Averaging the proper use AUMs among the four stocking rate methods equates to 50 AUMs on the Butcher Creek Allotment and 127 AUMs on the Red Lodge Creek Allotment. This is a 28% reduction on Butcher Creek and a 38% reduction on Red Lodge Creek

respectively. Another way to look at stocking rate is on the basis of how many acres it takes to properly manage a certain number of AUMs under a given management level. This is a way to compare the quality of pastures and allotments. There are an estimated 101 acres of suitable/primary rangeland in the Butcher Creek Allotment and an estimated 267 acres of suitable/primary rangeland in the Red Lodge Creek Allotment. This equates to 1.5 acres/AUM (101ac/69 AUMs) currently permitted and 2.0 acres/AUMs (101ac/50 AUMs) with a 28% reduction for Butcher Creek Allotment. For Red Lodge Creek Allotment, this equates to 1.4 acres/AUM (267ac/191 AUMs) currently permitted and 2.1 acres/AUM (267ac/127AUMs) with a 38% reduction. According to the Livestock Distribution/Dominant Vegetation Model, Red Lodge Creek Allotment should be a slightly higher quality allotment than the Butcher Creek Allotment in terms of the amount of forage available. If this is the case, the averaging method discussed above does not accurately account for this. Therefore, the recommendation is for a 30% reduction for both allotments. This equates to 2.1 acres/AUMs (101ac/48 AUMs) for Butcher Creek Allotment and equates to 2.0 acres/AUM (267ac/134 AUMs) for Red Lodge Creek Allotment. It has been determined ffom other production/utilization studies and forage modeling exercises on other allotments across Beartooth Ranger District that a stocking rate of 2.4 acres is a good average proper stocking rate on open, not too steep, grasslands with adequate water nearby. Both Butcher Creek and Red Lodge Creek allotments have deeper soils and higher producing forage plants than average due to the presence of Timothy grass and other more robust forage plants. Therefore, stocking rates between 2.0 and 2.1 acres per AUM are reasonable for these allotments.

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