Chapter 3

Environment and Effects

3.1 INTRODUCTION

This chapter provides information concerning the existing environment of the **Sioux 2003 Range Analysis** area, and potential consequences to that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2. The following describes the content of each resource/issue section in this chapter.

3.1.1 EXISTING CONDITION

Each Key Issue or resource area potentially affected by the proposed action or alternatives is described by its current condition and uses. These resource area descriptions also include descriptions of and reasons for the spatial and temporal boundaries of cumulative effects analyses. Existing base line, or benchmark, conditions and possible thresholds are also indicated.

Following each Key Issue or resource area description is a discussion of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. All direct, indirect, and cumulative effects are disclosed. Effects are quantified where possible, and qualitative discussions are also included.

The discussions of Key Issues, resource areas, and potential effects take advantage of existing information included in the Custer National Forest Plan's FEIS, other analysis EAs or EISs, analysis-specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the analysis includes all analysis-specific information, including resource reports, analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The project record is located at the Sioux Ranger District Office in Camp Crook, South Dakota, and is available for review during regular business hours. Information from the record is available upon request.

3.1.2 DIRECT AND INDIRECT EFFECTS

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would be significant in the foreseeable future.

3.1.3 CUMULATIVE EFFECTS

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

The analysis area and the temporal scale (time) considered for the cumulative effects analysis for the resource sections in this EA. In addition, a summary list of cumulative effects activities is presented. Refer to specific resource/issue sections for a specific discussion of cumulative effects.

Scope of the Cumulative Effects Analysis

The area chosen for the cumulative effects analysis is the North Cave Hills, South Cave Hills, and East Short Pines land units managed by the Custer National Forest. The reason for this area being selected is that the Sioux Ranger District manages these land units that are islands of forested landscape in the larger prairie-grassland ecosystem. Many miles separate these forested islands from each other, and the effects of management tend to be restricted to each land unit. The North Cave Hills, South Cave Hills, and East Short Pines land units are approximately 29,395 gross acres; of which the analysis area is approximately 23,470 acres. Surrounding lands are primarily private lands managed for livestock use, with a minor amount of lands managed by the State of South Dakota and the Bureau of Land Management, and will not be considered in detail in this analysis.

The temporal scale (time limits for past activities) selected for this analysis is from the 1960s to the present. This temporal timeframe captures shifts on the landscape due to uranium mining and reductions in the levels of livestock grazing. This mining and grazing era had a significant impact on the analysis area and the subsequent management activities that resulted from these activities are within a timeframe where the impacts can overlap with the rangeland analysis.

Past, Present and Reasonably Foreseeable Future Actions

In order to conduct a cumulative effects analysis, the alternatives considered under this Environmental Assessment must be considered in light of past, present, and reasonably foreseeable future projects (36 CFR 1508.6). For the purposes of cumulative effects analysis for resource areas, the following projects will be considered:

List of Cumulative Effects Activities

Past	Present	Reasonably Foreseeable
Livestock Grazing	Livestock Grazing	Livestock Grazing-ongoing
Post and Pole Cutting- East Short Pines	Post and Pole Cutting-East Short Pines	Post and Pole Cutting-East Short Pines - ongoing
Dispersed Recreation	Dispersed Recreation	Dispersed Recreation-ongoing
Mining Exploration – small amount of coal mining. Larger amount of uranium mining in the North and South Cave Hills	Oil Production – North Cave Hills	Oil Production – North Cave Hills- ongoing
Prescribed Fire Application-East Short Pines		

3.2 GENERAL SETTING

The analysis area covers over 29,000 acres of the North Cave Hills, South Cave Hills and East Short Pines on forest and non-forest land in Harding County, northeastern South Dakota.

This diverse environment is in the Great Plains-Dry Steppe Province Bailey's ecoregion (Bailey, 1995). The climate is continental with average annual temperatures of 30 to 58 degrees but temperatures can vary widely (-30 to 105 degrees) during the year. Summers are warm and winters are cold and dry. The growing season averages 115 days (mostly June through August). The majority of the annual precipitation (14-16") arrives during April through September as rain (NRCS, 1988 and High Plains RCC, 2002). Most of the summer rainfall results from thunderstorms with light to moderate intensity and short duration. Ten of the last twenty years had average precipitation less than the 100-year mean during the period May through August.

3.1.4 WATERSHED

The Cave Hills are in the North and South Fork Grand basins (USGS fourth order Hydrologic Unit Code (huc) drainage number 10130301 and 10130302) and the East Short Pines are in the Upper and the South Fork Moreau HUC (10130305 and 10130304). These watersheds have short, steep slopes in upper reaches along escarpments and long, moderate to wide, gently sloping valleys.

The north half of the North Cave Hills drains into Bowman-Haley Lake on the North Fork Grand River. The south half, and the South Cave Hills drain into the South Fork Grand River. All but the north edge of the East Short Pines drains into the South Fork Moreau River. The former drains to the North Fork Moreau River.

At the sixth-code level, one watershed (101303020303) has a moderate amount (75%) of the analysis area within the shed. The majority of all other sixth-code hucs have less than 15% of the analysis area within.

Runoff is from March to June as snow melts and spring rains arrive. Surface water quantity in the analysis area is limited by the well-drained soils. Stream flow is erratic and the streams that surround the analysis area flow intermittently. Spring flows from gauges outside the analysis area average 30 to 60 acre-feet per square mile (USGS). There are no perennial streams or water quality limited segments in the analysis area. Ground water is the primary source for livestock and domestic uses. Numerous springs appear at the base of escarpments that are important water sources. Water quality is fair to good from the sandstone formations and poor (soft and mineralized) from the others. Spring flows are less than 2 gallons per minute.

3.1.5 GEOMORPHOLOGY

The geology of the region is mainly Upper Cretaceous sandstone and clay, and areas overlain by Tertiary deposits. Elevation ranges from 3000 to 4000 feet in the analysis area, a distance of approximately 40 miles north to south. Dissected rolling prairie and tablelands characterize the landscape. There are two general physical settings, uplands (plateaus and gently rolling to steep hills with escarpments) and valleys (draws, valleys, and lower positions on hill slopes). Landforms in the analysis area include dissected uplands, plateaus, and alluvial outwash features (Custer National Forest Land type groups, 1996)

3.1.6 SOILS

Soils of the analysis area are predominantly Haploborolls, Argiborolls, Ustorthents, and some sodium affected Aridisols and Mollisols (NRCS, 1988). Soil map units from the Harding County Soil Survey (NRCS 1988) were used to help stratify and model vegetation.

The East Short Pines analysis area has more acres of soil map units with less resilient components than the Cave Hills. In general, the East Short Pines is comprised of a larger percentage of more productive soils than the Cave Hills. This is predominantly the effect of Slimbutte-Reva complex (SrE) and Watrous-Werner loams (WaB) map units. The soils in these units are less coarse and tend to be deeper and more base-rich (nutrients) than many soils in the Cave Hills.

3.1.7 UPLAND VEGETATION

There are three predominant range vegetation types in the analysis area as described in South Dakota Rangeland Resources, May 1977. All of these vegetation types are considered rangeland and will support livestock grazing. The predominant vegetation types are:

Wheatgrass - Needlegrass, which consists of a dense cover of midgrasses dominated by Western Wheatgrass, Needle and Thread, Little Bluestem, Prairie Sandreed, Green Needlegrass, Stonyhills Muhly and Spanish Clover Deer Vetch. With deterioration, sedges, Blue Grama, Threeawns and Fringed Sage increase.

Sagebrush - Grass, which is a open shrub grassland in the analysis area, in which Western Wheatgrass forms an understory to Sagebrush; also occurring are Saltbush, Greasewood, Western Snowberry, Blue Grama, Bluegrasses, and Junegrass. With deterioration the shrubby plants, such as Western Snowberry, increase and palatable perennial grasses are lost.

Pine - Savannah, which consists of a dense prairie with scattered ponderosa pine and deciduous trees in the drainages, with Little Bluestem, Big Bluestem, Prairie Dropseed, Stonyhills Muhly and Grama Grasses abundant. With deterioration there are varied responses including increases in dry sedges and Clubmoss, Wooly Verbena, Velvet Mullin, Broom Snakeweed and Fringed Sagewort.

The North and South Cave Hills have similar topography, vegetation, and soils. The East Short Pines vegetation indicates more cover exists and soils indicate the production potential is higher. The East Short Pines western wheatgrass habitat is nearly all moderate and high cover while the Cave Hills is mostly low cover.

Steep sandstone escarpments primarily surround the Cave Hills, while the East Short Pines has some surrounding uneven slopes. Soil map units in the Cave Hills analysis area are primarily coarse, loamy, shallow, and average 1000 pounds total potential production (NRCS) Upland soils in the East Short Pines average 1500 pounds per acre potential total production. There may be a slightly higher cover potential in the East Short Pines due to a larger proportion of more productive soils. Existing conditions can cause areas to produce less than potential, for example where short grass has replaced midgrass in midgrass potential dominated sites. Deeper, loamy soils are also more resistant to change under grazing pressure.

3.3 RIPARIAN AREAS AND HARDWOOD DRAWS

3.3.1 INTRODUCTION

This section discusses the existing condition of riparian areas and hardwood draws in the analysis area, including the assessment of current conditions noted from recent field inventories, and if those Riparian areas and woodland draws are meeting Forest Plan goals. This section also describes the effects of the proposed actions and alternatives on riparian areas and woodland draws.

3.3.2 FOREST PLAN GOALS AND OBJECTIVES

Evaluating riparian zones and hardwood draws during the range analysis phase (NEPA analysis) of Allotment Management Plan development is consistent with Forest Plan Management Area direction (Forest Plan pp. 81 and 83).

The goal of Custer Forest Plan management area M (Riparian emphasis) is to ″ protect from conflicting uses in order to provide healthy, self-perpetuating plant and water communities that will have optimum diversity and density of understory and overstory vegetation" (Forest Plan p. 80).

The goal of Forest Plan management area N (Hardwood Draw emphasis) is to ″ provide healthy, self-perpetuating plant communities that will have optimum diversity and density of understory and overstory vegetation" (Forest Plan p. 80).

Administratively, the 1987 Custer Forest Plan recognizes hardwood draws and riparian areas separately as indicated by separate management areas (Forest Plan, Management Area M - Riparian pp. 80-82 and Management Area N - Woody Draws, pp. 83-85). Ecologically, they may co-exist.

3.3.3 AFFECTED ENVIRONMENT

Riparian areas occupy approximately 5.0 miles (less than 10 acres) in the North and South Cave Hills, and East Short Pines within areas identified as primary rangeland for livestock. Generally, low palatability of riparian species and water tables has tended to keep cattle from concentrating in riparian areas within the analysis area. Most of the streams in the analysis area are considered ephemeral[1] or intermittent[2]. They carry a significant amount of water only in spring and after heavy rainfall (USDA, 1988, pp.1-2). There are no perennial streams in the analysis area. Perennial[3] streams are found outside the analysis area. There are no water quality limited segments in the analysis area.

Hardwood draws occupy 1,270 acres in the North and South Cave Hills and East Short Pines occupying six percent and three percent of the grazing allotments respectively. Of the total acres, 780

[1] An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral streambeds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

[2] An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

[3] A perennial stream has flowing water year-round during a typical year. The water table is located above the streambed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

acres (61 %) occur within areas identified as primary range for livestock grazing and 490 acres (39%) occurs in areas considered as unsuitable for livestock grazing.

Riparian and hardwood areas can be classified into three groups within the analysis area: Hardwood draws in higher gradient, constricted valley bottoms (ephemeral and intermittent streams); meadows with interspersed hardwood clusters in lower gradient, wider valley bottoms (intermittent streams); and seeps and ponds.

3.3.3.1 DISTURBANCE HISTORY

The following disturbances has had effects on the riparian and hardwood draws within the anlaysis area: grazing since the turn of the century, drought, insect and disease damage on hardwoods and uplands, wildfire (specifically Davis Draw), non-native seeding in Davis Draw and uranium mining. Since settlement times, there have been fewer wildfire disturbances due to fire suppression activities. There have been fewer wildfire disturbances due to fire suppression activity since settlement times. The specific detailed disturbance histories for each allotment are noted in the survey reports in the analysis record.

Livestock grazing is not the only disturbance affecting the health and sustainability of hardwood draws. Historic natural fire cycles also played a role in the development, age/size structure, and distribution of hardwood draws. The lack of younger age classes and low densities of chokecherry in the understory may be a result of the combined affects of changes to natural fire cycles, principally the lack of fire and livestock grazing. Many draws that were surveyed and determined to be functional, but at risk, had a dense understory of Kentucky bluegrass or western snowberry. These species effectively inhibit establishment of seedlings of desirable shrubs and green ash seedlings. An active restoration effort targeted towards hardwood draws needs to consider the role of fire or other vegetation treatments designed to provide openings in the understory for seedling establishment or stimulate regeneration of green ash sprouting in conjunction with managing livestock use. It is felt that elimination or changing the management of livestock grazing alone will not be sufficient to achieve the development of a younger age class of green ash trees and improved composition of desirable shrubs. The role of fire and associated affects on hardwood draws is outside the scope of this analysis as is the evaluation of using prescribed fire and silivicultural treatments to restore and maintain a diversity of age and size classes in hardwood draws. The focus of this analysis is on evaluating the effects of livestock grazing on hardwood draws and mitigating the affects by controlling the timing, intensity, and duration of grazing.

3.3.3.2 RIPARIAN TYPES

The riparian systems can be classified as lotic (associated with moving water) riparian types found in intermittent streams in the analysis area. Some lentic (associated with standing water) riparian types such as seeps and ponds are also found in the analysis area.

Lotic riparian vegetation associated with intermittent systems in the analysis area provide attributes that are important for dissipating stream energy associated with high waterflow, thereby reducing erosion. Intermittent stream characteristics can help filter sediment, capture bedload, and aid floodplain development. They can improve floodwater retention and ground water recharge. Some attributes of these systems can develop root masses that stabilize streambanks against cutting action (USDI Bureau of Land Management Technical Reference TR1737-9 1993 - Riparian Area Management; A Process for Assessing Proper Functioning Condition. 1993, p. 5).

Lentic seeps and ponds with associated physical characteristics and associated riparian vegetation absorb peak flows during flood events, recharge water slowly into underground aquifers, and improve water quality by filtering excess nutrients, breaking down chemical and organic wastes and by trapping sediments (Hansen, 1995. p. 6).

3.3.3.3 HARDWOOD DRAW TYPES

Hardwood draws and woodlands are an important vegetation type within the northern Great Plains Ecosystem. Green ash (*Fraxinus pennsylvanica*) contributes to the biodiversity of prairie landscapes by providing critical habitat for a variety of plant and animal species (Lesica 2001). The green ash/choke cherry (*Fraxinus pennsylvanica/Prunus virginiana*) is the predominant habitat type associated with hardwood draws and woodlands in Northwest South Dakota and have been described by various authors Girard et al (1984), Hanson and Hoffman (1988), Hanson et al (1984), and Hansen et al (1995). Undisturbed green ash stands are typically characterized by three layers of woody vegetation (Table III-1), a closed canopy overstory layer dominated by green ash with 119% foliar cover, a middle layer composed of tall shrubs and green ash saplings ranging from 6.6 to 9.8 ft in height, and a lower layer mid and low shrubs (31.8% foliar canopy), and herbaceous vegetation layer making up 14.1% foliar canopy (Girard et al 1984, Hanson and Hoffman 1988). This contrasts with disturbed stands, which are typically woodlands with an open overstory (< 69% foliar cover) and a single understory layer of low shrubs and herbaceous vegetation dominated by snowberry and Kentucky bluegrass. The abundance of chokecherry (*Prunus virginiana*) is also reduced in disturbed communities. The middle layer of tall shrubs and green ash saplings is often missing (Hanson and Hoffman 1985).

Table III-1: Summary of composition of dominant species by layer for undisturbed green ash/chokecherry habitat type (Girard 1984).

Green Ash Habitat Type	Mean height (feet)	Mean Basal Area (sq. ft}	Total Cover Percent	Relative Cover Percent
Green Ash overstory	26	17	119 (55-233)	82
Box elder overstory	20	22	27	18
Green ash sapling middle layer (> 6 ft)	13	.79	40	51
Chokecherry middle layer (> 6 ft)	10	.18	29	37
Chokecherry lower shrub layer (1-6 ft)	3.0		53	66
Snowberry lower shrub layer (1-6 ft)	1.8		22	27
Green ash seedlings herbaceous layer (< 3 ft)			6	4
Snowberry herbaceous layer (< 3 ft)			24 (0-30)	15
Kentucky bluegrass			32 (0-52)	20

Green ash and chokecherry generally dominate these systems and exist near the western reaches of their distribution. The Northern Great Plains has been described as a marginal environment for tree growth. Combined low precipitation, cold winters, high evapotranspiration rates, and a short growing season form a harsh environment for tree survival (Girard, 1985. p. 3).

Soil moisture has been described as important, but soil aeration may be more influential in some cases. Aeration limits tree root penetration that in turn limits water and nutrient absorption (Girard, 1985. p. 5). This is most likely the influence causing the lack of extensive hardwood stands along riparian

wetlands in wider valley bottoms of lower gradient where aeration is less likely due to their saturated state.

These hardwood draw species become more palatable to livestock in the fall, after nutrient levels begin to drop in other forage. Fall grazing tends to generate more browsing effects on woody species and less likelihood of recruitment and establishment of various age structures of the hardwood stands. Woody species recruitment and establishment is needed for channel maintenance and recovery. These species provide woody debris that dissipates energy, especially in hardwood stands found in higher gradient and more constricted valley bottoms (Rosgen A6 and B6). These stream types with hardwood stands have evolved in the presence of woody debris. Browsing/grazing of woody species can reduce recruitment and maintenance of diverse age classes needed to maintain a supply of woody debris to these systems. Reduced woody debris input into these systems can increase channel scour, spacing of step/pool features, and velocity of runoff events (Rosgen 1996, pp. 6-25 and 6-26).

3.3.3.4 RELATIONSHIP BETWEEN HARDWOOD DRAWS AND RIPARIAN AREAS

Native hardwoods are a component of the vegetation mosaic of the mixed grass prairie within the analysis area and are often found in or adjacent to riparian areas. It is estimated that riparian areas constitutes less than one percent of the analysis area, while hardwood stands constitutes about one to two percent of the analysis area. Although this represents a very small portion of the analysis area, the ecological values associated with them are very important for hydrologic function, soil stability, and biotic integrity.

The establishment and survival of hardwoods is closely linked to topography and usually restricted to areas of increased moisture, which helps explain their limited distribution in semi-arid climate (Girard et. al., 1989, p. 2). Due to a semi-arid climate, hardwood stands are restricted to areas of increased moisture such as along drainage ways, streams, springs, floodplains, and north-facing slopes. A number of factors, in addition to topography and climate, influence the hardwood draws such as microenvironment, fire, moisture regimes, wildlife, livestock, and disease and insects (Girard, 1985. p.1).

Within the analysis area, denser stands of hardwoods are found along ephemeral drainageways where the valley bottom is more constricted with higher gradient. More sparse and sporadic hardwood stands occur in microsites along wider valley bottoms with slight gradient in either ephemeral or intermittent drainageways.

Where hardwood species occur in the more constricted valley bottoms and higher gradient systems, sources of woody material are more critical for maintenance and recovery from runoff events through energy dissipation (Rosgen stream types A and B) (Rosgen, 1996, p. 6-25 to 6-26 and pers. comm. D. Prichard, 2001). This pertains to those intermittent or ephemeral stream types that are associated with wooded areas where woody material can act to slow flows and trap floating material. Streamside and upland vegetation produces the size of woody material over time that is helpful in these situations to capture bedload, aid floodplain development, and dissipate energy where appropriate for the applicable stream size and ecological setting where woody material is required. Without woody material, these areas are less effective in handling normal high-flow events because of their intensity (USDI Bureau of Land Management, USDA Forest Service, USDA Natural Resources Conservation Service 1998. p. 45). Some hardwood draws in the analysis area's A and B Rosgen stream types (Rosgen, 1996. p. 4-6) lack a diverse age structure where younger aged woody species are not available to replace mature and dying woody species.

Where hardwood species occur in the broader valley bottoms and slight gradient systems, sources of woody material are not essential for maintaining these systems (Rosgen stream types C and E) (Rosgen, 1996, pp. 6-25 to 6-26 and pers. comm. D. Prichard, 2001). Herbaceous vegetation plays a more critical role for maintenance and recovery from runoff events. Where sporadic hardwoods occur in these systems, they can provide woody debris to the system that can help dissipate energy from runoff events. However, they are not critical components to these stream types as are the herbaceous vegetation that provides adequate root masses capable of withstanding high-flow events.

3.3.3.5 FIELD INVENTORIES AND ASSESSMENT METHODOLOGY

During the 2001-2002 field seasons, Custer National Forest staff conducted interdisciplinary field surveys to assess riparian conditions and hardwood draws in all allotments.

Riparian Areas: In preparation for rangeland analysis for these allotments, three items were assessed in the riparian areas: 1) functioning conditions using Proper Functioning Condition (PFC) methodologies, 2) desired conditions, and 3) management considerations.

Proper Functioning Condition (PFC) is a methodology for assessing the physical functioning conditions of riparian areas. PFC defines a minimum level or starting point for assessing riparian areas and is the minimum riparian inventory method that the Forest Service is directed to do for riparian assessments.

This methodology is not used as a monitoring standard, but rather as a tool for prioritizing "at-risk" systems for restoration activities that can keep riparian areas from degrading or keep them from a non-functioning condition. Once a system is nonfunctional, the effort, cost, and time required for recovery is dramatically increased.

PFC condition ratings considered clarification outlined for intermittent systems as described in USDA MT-99, *Using the Proper Functioning Condition Assessment Method for Intermittent and Ephemeral Streams.* Cooperative Riparian Restoration.

Journeyman level specialists whose credentials are sufficient to make proper determinations given their training in PFC, knowledge of stream types, and supplemented with their experience and knowledge of the local area hydrology, soils, and vegetation ecology conducted this PFC assessment.

Hardwood Draws: During the summer of 2001 a survey of green ash woodland draws was conducted in the East Short Pines, North Cave Hills, and South Cave Hills of the Sioux Ranger District, Custer National Forest. The purpose of the survey was to assess current conditions, composition, and structure of the green ash and chokecherry habitat type found within primary range of grazing allotments scheduled for review and updates to allotment management plans.

Green ash draws were selected from previously mapped green ash draws and woodlands within the analysis area. In the North and South Cave Hills, 145 acres of hardwood draws within primary range (22% of primary range hardwood draws) were surveyed. In the East Short Pines, 59 acres of hardwood draws in primary range (53% of primary range hardwood draws) were surveyed. Because of their location in primary range, they were expected to have received high to moderate grazing use.

Field survey methods followed those described in the Montana BLM/Montana Riparian Wetland Association Riparian Wetland (Lotic wetland) Inventory Methods (Montana BLM/MRWA 1994,

Bitterroot Restoration 2002). Each draw was assigned a rating of healthy (properly functioning), functional - at risk, or not healthy. Information gathered through the survey methods was used to qualitatively assess whether ecological factors necessary for maintaining diversity of species, age distribution, and understory structure were present. The primary criteria used to assign a rating were based on amount of green ash and chokecherry regeneration and the abundance and presence of these species in the low and middle layers of the understory. Other criteria used included the presence and abundance of Kentucky bluegrass, western snowberry, and other undesirable species in the herbaceous layer along with a decrease in overstory canopy of green ash trees.

A healthy (properly functioning) rating was given to hardwood draws with multiple understory layers composed of mixed age classes of green ash trees. This means that seedlings and saplings were present in the understory.

Functioning-at risk rating was given to hardwood draws that are in a funcitioning condition, but there is an existing soil, water, or vegetation attribute that makes them susceptible to degradation (Prichard et. al. 1998). Hardwood draws with a low abundance of green ash seedlings or saplings and low abundance of chokecherry in the understory were considered to be functional but at risk because of the low potential for recruitment of younger trees into the middle and overstory layers that would replace older trees as they mature and eventually die. A functioning -at risk rating is meant to serve as a red flag, indicating a potential problem with ecological processes necessary for maintaining healthy hardwood draws.

Unhealthy rating was given to hardwood draws that are single storied stands, with low overstory canopy, with an understory dominated by herbaceous vegetation.

3.3.3.6 SUMMARY OF RIPARIAN SURVEYS

Presently, all but one ¼ mile segment of riparian areas found in the analysis area are properly functioning. Table III-2 below summarizes the riparian survey information by allotment.

Table III-2: Summary of Riparian Surveys

Allotment	Location	Segment ID#	Functioning Condition	Desired Riparian Condition	Mileage / Acreage	Comments
Pelham-Juberg	Pelham_Juberg	PJ1	PFC	Same as current, with minimizing trampling	0.25 mi	
Schleichart	Three Mine Ponds	SD1	PFC[1]	Same as current	<0.1 mi <0.1 ac	Water Quality may be at issue however is outside the scope of this analysis since the issue is related to past mining and not grazing. It is being assessed through a separate analysis.
Schleichart	Meadows Below Mine Ponds	SD2	PFC	Same as current	0.5 mi	Water Quality may be at issue however is outside the scope of this analysis since the issue is related to past mining and not grazing. It is being assessed through a separate analysis.

Table III-2: Summary of Riparian Surveys

Allotment	Location	Segment ID#	Functioning Condition	Desired Riparian Condition	Mileage / Acreage	Comments
Schleichart	Schleichart Reservoir	SD3	PFC	Same as current, with minimizing trampling of the dam area.	<0.1 mi <0.1 ac	Tank development below dam of Reservoir should be relocated away from drainage bottom. Water Quality may be at issue however is outside the scope of this analysis since the issue is related to past mining and not grazing. It is being assessed through a separate analysis.
Schleichart	Below Schleichart Reservoir	SD4	PFC	Same as current	0.5 mi	Water Quality may be at issue however is outside the scope of this analysis since the issue is related to past mining and not grazing. It is being assessed through a separate analysis.
Davis Draw	Davis Draw	DD1	PFC	Same as current	1.0 mi	
Jenkins						No riparian assessed
John Brown						No riparian assessed
JA Clarkson	Upper Dry Creek	JAC1	PFC	Same as current	1.0 mi	
JA Clarkson	Lower Dry Creek	JAC2	PFC	Same as current	0.25 mi	
JA Clarkson	Near E Clarkson Well	JAC3	FAR[2]	Decrease trailing/ trampling effects to move toward increasing water table	0.25 mi (Pvt. Land)	Trend is not apparent; possible postponing well water availability until mid to late season and/or monitoring effects of recent livestock management change and new distribution patterns due to change in water availability.
JB Clarkson						No riparian
Van Offern						No riparian
Box Springs	Box Springs No. 3	BS1	PFC	Same as current, with minimizing trampling	<1.0 ac	
Dunn						No riparian
Lone Mtn						No riparian

[1] PFC is an acronym for Proper Functioning Condition
[2] FAR is an acronym for Functioning At Risk

3.3.3.7 SUMMARY OF HARDWOOD DRAW SURVEYS

Many of the green ash draws visited in 2001 and in previous years were found to be missing the middle layer (greater than 6 ft.) composed of green ash saplings and chokecherry and open green ash overstory of mature trees (less than 69% canopy cover). The lower layer (less than 6 ft.) tended to be dominated by snowberry and herbaceous species and a low abundance of chokecherry and green ash seedlings. This contrasts with undisturbed green ash draws. The age structure of green ash is skewed towards pole size and mature trees. The lack of younger trees in the seedling and sapling size classes will create problems to sustaining the presence of green ash draws on the landscape in the future. Additionally, in some draws succession is proceeding from deciduous woodland dominated by green ash to coniferous forest dominated by ponderosa pine.

A total of 1,270 acres of hardwood draws are in analysis area, with 780 acres in primary range and 490 acres in unsuitable areas that are not grazed. Of the 780 acres of hardwood draws in primary range, approximately 210 acres were surveyed in 2001. Of those 210 acres surveyed, 195 acres were found to be functioning - at risk, 10 acres were found to be unhealthy, and 5.0 acres were found to healthy. Hardwood draws located on land rated as unsuitable for livestock grazing (490 acres) were not surveyed. General observations made of many hardwood draws within these settings has found them to be more diverse in terms of composition and age and size structure than hardwood draws located on primary range. The high number of hardwood draws functioning – at risk may be a reflection on the long history of grazing under season long grazing. Many of the grazing allotments have been managed under intensive grazing systems a relatively short time. Intensive grazing has occurred for approximately 25-30 years compared to 60 to 80 years of seasonlong grazing without periods of rest or deferment and with stocking rates that were higher than the current or proposed stocking levels. Much of the damage to hardwood draws probably occurred during this earlier period. Given the competive advantage that Kentucky bluegrass and snowberry have over the establishment of green ash and chokecherry seedlings it is not unreasonable to expect very little change in the composition and age and size composition of these hardwood draws under prescribed grazing systems alone. Without the use of some disturbance event, such as fire or active silivicultural treatments that would create openings in the understory where seedlings might become established it is unlikely the condition of these draws will change much even if grazing was eliminated. The best opportunity to change draws from functioning-at risk to healthy would be to combine prescribe grazing systems (controlling the timing and duration of grazing) with prescribed fire or silivicultural treatments to promote recruitment of younger age classes of tress into the middle and overstory layers. (See Table III-3).

Table III-3: Summary of Hardwood Draw Surveys

Allotment	Plot ID#	PFC Score	Functioning Condition of Hardwoods in Primary Range	Structure	Acreage	Comments
Jenkins (20 Ac Hardwoods)	East Draw/Middle Unit		Healthy			Low canopy green ash and dominance of snowberry in the understory may be an indication of potential problems in the future.
	Middle Draw/Middle Unit		At Risk			
Schleichart (510 Ac Hardwoods)	FS01080301B3002	71	At Risk	WLLMS	26	36 Ac At Risk
	FS01080301T3001	66	At Risk	WLHH	2	
	FS01080301T3006	74	At Risk	WLHH	2	
	FS01080301T3008	74	At Risk	WMHMS	6	
	Sawmill Canyon		Healthy			
	Ice Box Canyon		Healthy			
Davis Draw (100 Ac Hardwoods)	FS01080301B3003	71	At Risk	WMHH	3	15 Ac At Risk
	FS01080301B3004	63	At Risk	WLHH	6	
	FS01080301B3005	66	At Risk	WLHH	2	
	FS01080301T3003	63	At Risk	WLLMS	2	
	FS01080301T3004	71	At Risk	WLHH	1	
	FS01080301T3005	71	At Risk	WMLS	1	
	Davis Draw		At Risk			
JA Clarkson (10 Ac Hardwoods)	FS01080301C3002	63	At Risk	WLLS	2	9 Ac At Risk
	FS01080301C3003	74	At Risk	WLHH	1	
	FS01080301T3020	69	At Risk	WLHH	2	
	FS01080301T3021	66	At Risk	WLHH	2	
	FS01080301T3022	60	At Risk	WLHMS	1	
	FS01080301T3023	60	At Risk	WLHMS	1	
	JA Clarkson		At Risk			
JB Clarkson (110 Ac Hardwoods)	FS01080301C3004	57	Unhealthy	No trees	7	7 Ac Unhealthy 29 Ac At Risk
	FS01080301C3005	71	At Risk	WLHH	4	
	FS01080301T3025	71	At Risk	WLHH	2	

Table III-3: Summary of Hardwood Draw Surveys

Allotment	Plot ID#	PFC Score	Functioning Condition of Hardwoods in Primary Range	Structure	Acreage	Comments
	FS01080301T3026	66	At Risk	WMHH	1	
	FS01080301T3027	69	At Risk	WLLMS	4	
	FS01080301T3028	74	At Risk	WLHH	1	
	FS01080301T3029	66	At Risk	WLHH	3	
	FS01080301T3030	71	At Risk	WLHMS	11	
	FS01080301T3031	74	At Risk	WMHH	3	
	Timber Canyon		Healthy			
	Timber Canyon		Healthy			
	W Fk Peterson Canyon		At Risk			
John Brown (130 Ac Hardwoods)	FS01080301C3006	66	At Risk	WLHMS	7	35 Ac At Risk
	FS01080301C3007	66	At Risk	WLHH	3	
	FS01080301C3008	63	At Risk	WLHMS	5	
	FS01080301C3009	69	At Risk	WLHH	1	
	FS01080301C3010	74	At Risk	WMLMS	3	
	FS01080301T3012	77	At Risk	WMHH	14	
	FS01080301T3014	71	At Risk	WLHH	2	
	John Brown Spr		Healthy			
	Peterson Canyon		At Risk			
	John Brown Spr #2		Healthy			
	Holdup Canyon		Healthy			
	Holdup Canyon		Healthy			Potential problem of ash regeneration
Van Offern (70 Ac Hardwoods)	FS01080301T3015	74	At Risk	WLHH	2	9 Ac At Risk
	FS01080301T3016	74	At Risk	WLHH	1	
	FS01080301T3017	74	At Risk	WMHMS	1	
	FS01080301T3018	66	At Risk	WLHH	4	
	FS01080301T3019	69	At Risk	WLHH	1	
	McKinsey Gulch		Healthy			Potential problem of ash regeneration
Pelham-Juberg (180 Ac Hardwoods)	FS01080301T3009	71	At Risk	WMHH	2	3 Ac At Risk
	FS01080301T3010	71	At Risk	WMLS	1	
	FS01080301T3011	83	Healthy	WMLMS	1	
	South Draw/Middle Unit		Healthy			
	Riley Spring		Healthy			
Dunn (40 Ac Hardwoods)	FS01080301T3034	69	At Risk	WMHH	2	21 Ac At Risk
	FS01080301T3035	77	At Risk	WHHH	5	
	FS01080301T3036	83	Healthy	WHHH	5	
	FS01080301T3037	77	At Risk	WLHH	2	
	FS01080301T3032	69	At Risk	WLHH	9	
	FS01080301T3033	71	At Risk	WMHH	3	
	Adams Gulch		Healthy			Potential problem of ash regeneration
	Adams Gulch		Healthy			
Box Springs (90 Ac Hardwoods)	FS01080301T3041	71	At Risk	WMHH	4	25 Ac At Risk
	FS01080301T3042	83	Healthy	WLHH	2	
	FS01080301T3043	71	At Risk	WLHH	1	
	FS01080301T3039	69	At Risk	WLHH	5	
	FS01080301T3040	74	At Risk	WMHH	6	
	FS01080301T3044	74	At Risk	WLHH	6	
	FS01080301T3045	71	At Risk	WMHH	3	
Lone Mtn (10 Ac Hardwoods)	FS01080301T3038	71	At Risk	WLHH	6	6 Ac At Risk

The following tables summarize the total acres of woodland draws by Land Unit and Allotment.

Table III-4: Summary of hardwood draw acres for the North and South Cave Hills grazing allotments.

North and South Cave Hills Land Unit Allotments	Analysis Area Total Acres	Hardwood Draws Total Acres	Hardwood Draws in Unsuitable Grazing Acres	Hardwood Draws in Primary Range Acres	Hardwood Draws as a Percent of Area/Allotment
Davis Draw	1,140	100	50	50	9%
Jenkins	840	20	10	10	2%
Pelham, Julberg	2,320	180	50	130	8%
Schleichart	6,070	510	260	240	8%
JA Clarkson	1,960	10	0	10	1%
JB Clarkson	2,700	110	30	80	4%
John Brown	2,160	130	20	100	6%
Van Offern	1,330	70	20	50	5%
Cave Hills Analysis Area Total	**18,520**	**1,130**	**440**	**670**	**6%**

Table III-5: Summary of hardwood draw acres for the East Short Pines grazing allotments.

East Short Pines Land Unit Allotments	Analysis Area Total Acres	Hardwood Draws Total Acres	Hardwood Draws in Unsuitable Grazing Acres	Hardwood Draws in Primary Range Acres	Hardwood Draws as a Percent of Area/Allotment
Lone Mountain	870	10	0	10	1%
Dunn	1,800	40	10	30	2%
Box Springs	2,200	90	20	70	4%
East Short Pines Analysis Total Acres	**4,880**	**140**	**30**	**110**	**3%**

3.3.4. ENVIRONMENTAL EFFECTS - RIPARIAN AREAS AND HARDWOOD DRAWS

3.3.3.4.1 ENVIRONMENTAL EFFECTS - RIPARIAN AREAS

Alternative 1 - No Action

Under Alternative 1, livestock would be maintained at current permitted levels and timing, and managed under current grazing systems. Properly functioning riparian areas will continue to be maintained under current management. The JA Clarkson Allotment has about ¼ mile of riparian on private portion of the allotment near East Clarkson well. Current management will continue the two-pasture deferred grazing system, which has been practiced for five years. Yearlings tend to distribute more evenly and not concentrate to the degree that cow/calf pairs do, particularly near water and in draws. Current management should provide opportunities for decreasing trailing/trampling effects and to move toward increasing water table.

Alternative 2 - No Grazing

Elimination of grazing in riparian areas on primary range would eliminate foraging and trampling effects. Properly functioning riparian areas would be maintained. The functioning, but at risk, riparian area near East Clarkson Well may still continue to get grazed since it occurs on private land. If private land remains within the current allotment configuration, then the no grazing alternative would provide the most rapid response to improving riparian conditions on the functioning at risk riparian area near East Clarkson Well. Trailing and trampling effects would cease and the water table would increase to provide conditions for proper functioning.

Alternative 3 - Proposed Action

The proposed action will result in changes to grazing systems for all but two allotments (JA Clarkson and Lone Mountain) and reduced stocking rate for two allotments (Davis Draw, 60% and John Brown, 33%). However, JA Clarkson Allotment has had a recent change in management to help improve riparian conditions due to improved distribution through the use of yearlings and timing.

The JA Clarkson Allotment has about ¼ mile of riparian on private portion of the allotment near East Clarkson well. Proposed management will continue the current two-pasture deferred grazing system that has been practiced for five years. Yearlings tend to distribute more evenly and not concentrate to the degree that cow/calf pairs do, particularly near water and in draws. The proposed management should provide opportunities for decreasing trailing and trampling effects and to move toward increasing water table.

3.3.4.2 CUMULATIVE EFFECTS

The analysis area for cumulative effects is the allotment or pasture the riparian is located in. Livestock grazing is the principle activity affecting a small portion of riparian within primary range. Post and pole cutting occurs within ponderosa pine types and has no affect on riparian areas. Temporary road building associated with oil and gas production might occur in the reasonably foreseeable future. Leasing stipulations state roads and well pads will not be constructed within riparian.

Other activities affecting riparian areas include ongoing and planned prescribed fires. These impacts should not be significant and would probably not effect channel morphology and function nor water tables. Ongoing recreational use such as hunting, wood cutting and camping would not have any cumulative effects on riparian areas.

3.3.4.3. ENVIRONMENTAL EFFECTS - HARDWOOD DRAWS

Hardwood draws occupy 1,270 acres in the North and South Cave Hills and East Short Pines occupying six percent and three percent of the grazing allotments respectively. Of the total acres, 780 acres (61%) occur within areas identified as primary range for livestock grazing and 490 acres (39%) occur in areas considered as unsuitable for livestock grazing. Hardwood draws located in unsuitable range will not be affected or minimally affected by livestock grazing under all three alternatives. The analysis of the alternatives will be focused on 780 acres of hardwood draws located within primary range.

An active restoration effort targeted towards hardwood draws needs to consider the role of fire or other vegetation treatments designed to provide openings in the understory for seedling establishment or stimulate regeneration of green ash sprouting in conjunction with managing livestock use. It is felt that elimination or changing the management of livestock grazing alone will not be sufficient to achieve the development of a younger age class of green ash trees and improved composition of desirable shrubs. It is to be noted that domestic livestock are not the only animals impacting hardwood draws. Restoration of hardwood draws and the role of fire in sustaining hardwood draws are outside the scope of this analysis. The focus of this analysis is on evaluating the effects of livestock grazing on hardwood draws and mitigating the affects by controlling the timing, intensity, and duration of grazing.

Direct and Indirect Effects

Livestock grazing affects can have detrimental or positive effects on understory vegetation within hardwood draws. Positive effects of trampling and trailing can provide openings in the dense snowberry and grass-dominated understory for recruitment of seedlings. Detrimental effects are loss of young seedlings from browsing and trampling. Livestock make use of hardwood draws during summer principally for shade and loafing, especially in areas adjacent to water sources and fall browsing of woody species. During the fall time of year, the protein content of woody species remains high as compared to herbaceous species and livestock diets may shift towards higher protein woody species. This use can result in physical damage to woody vegetation through trampling and trailing and loss of young seedlings and saplings to browsing. Implementation of planned grazing systems, which eliminate continuous grazing by altering the timing, duration, and intensity of livestock grazing throughout the grazing season, can mitigate these effects.

Alternative 1 - No Action

Under Alternative 1, livestock would be maintained at current permitted levels and managed under current grazing systems. Seven of the grazing allotments are managed under a two pasture deferred rotation grazing system. This system has been in effect for 5 to 25 years. One allotment, Pelham-Juberg, has been and is managed as a three pasture twice over grazing system for the past seven years. Two allotments, Jenkins and Box Springs, are used as fall and winter use pastures. This has been practiced for 25 and 14 years respectively. One allotment, Lone Mountain, has been in deferred grazing until after July 16 for the past 25 years.

The conditions of these draws may be a remnant of years of season long grazing, early entry dates, and higher stocking rates that preceded implementation of the current grazing systems and indicate a long recovery period through changes in grazing systems alone. Lesica (2001) reported recovering hardwood draws dominated by western snowberry and Kentucky bluegrass will be difficult and require a long time and complete rest from livestock grazing may be insufficient to restore these draws. One study (Uresk and Boldt 1986) found tree seedlings more common in declining green ash woodlands with livestock grazing than those without (Lesica 2001). Improvement of these draws may require additional mechanical treatments or prescribed fire treatments to stimulate sprouting and provide openings for seedling establishment in conjunction with planned grazing systems before improvement in composition of desirable species can occur.

Hardwood draws currently at risk will probably change little under Alternative 1, though continuation of deferred rotational grazing systems and fall or winter use should not have a detrimental effect either. Higher densities of green ash seedlings and saplings have been found in draws managed under multiple-pasture, rotational grazing systems, winter pastures, and draws farthest from water (Lesica

2001, Jensen 1991). Hardwood draws in the Davis Draw and John Brown Allotments may be affected more by trampling from livestock seeking shade and fall or winter browsing than draws in the other allotments. This effect would be due to the higher stocking rates, the early turn on date, and the allowed days of grazing during the summer in these two allotments.

Alternative 2 - No Grazing

Elimination of grazing in hardwood draws on primary range would eliminate damage to green ash seedlings and saplings and chokecherry caused by livestock trampling and browsing. Competition from western snowberry and Kentucky bluegrass seems to be another and perhaps the primary factor inhibiting recovery of these draws. Due to the dominance of these species, it is unlikely elimination of livestock grazing alone would result in improvement of hardwood draws currently at risk. Lesica (2001) reported recovering hardwood draws dominated by western snowberry and Kentucky bluegrass would be difficult and require a long time. Effective restoration of these draws will probably require mechanical treatments or prescribed fire that open sites in the understory for seedling recruitment or promote sprouting. Additionally, grazing was found to be beneficial to seedling recruitment by one study (Uresk and Boldt 1986), though negatively effecting survival of the same species.

Alternative 3 - Proposed Action

The proposed action will result in changes to grazing systems for all but two allotments (JA Clarkson and Lone Mountain) and reduced stocking rate for two allotments (Davis Draw, 60% and John Brown, 33%).

Schleichart Allotment

The Schleichart Allotment has the largest acreage of hardwood draws of any of the allotments in the analysis area (510 acres) and the largest acreage in lands considered suitable for grazing, 240 acres. The balance (260 acres) of hardwood draws is located on lands considered unsuitable for grazing due to steep slopes and distance to water. Livestock grazing will have minimal effect on hardwood draws located on unsuitable lands except for occasional trailing or grazing by individual animals. The majority of hardwood draws are located in the eastern part of the Prairie Pasture. This pasture will be split into two pastures and the Schleichart Allotment will be managed as a three pasture deferred rotation-grazing system. The additional pasture will provide opportunities to better control the timing, intensity, and duration of grazing in hardwood draws that are concentrated in the eastern portion of the Prairie Pasture. The three pastures would change the period of use from 92 days for each of the two pastures to approximately 61 days for each of the three pastures. This reduces the duration of grazing and increases the periods of rest or deferment from grazing.

Some trampling of snowberry and Kentucky bluegrass by livestock may provide opportunities for the recruitment of green ash seedlings and saplings and chokecherry within hardwood draws currently dominated by western snowberry and Kentucky bluegrass. The shorter grazing periods combined with longer rest periods may provide opportunities for survival of green ash seedlings and saplings. The additional pasture along with the three pasture deferred grazing system will also provide management flexibility for future hardwood draw restoration management practices. Hardwood draws in the Schleichart Allotment should be monitored to determine if recruitment and survival of green ash and chokecherry seedlings is occurring under the proposed management system.

Pelham-Julberg Allotment

The Pelham-Julberg Allotment has 180 acres of hardwood draws; 130 acres are located on suitable grazing land and 50 acres on unsuitable lands. There will be no change to the current three pastures, twice over grazing system. This system of grazing management has been practiced for the past seven years. Under this management system the three pastures are grazed for two periods between May 21 and September 25. Grazing periods are 20 days during the first rotation and 25 days in the second rotation, providing 52 days of rest between grazing periods. The three pasture grazing rotation provides growing season deferment 2 years out of 3. The shorter grazing periods, longer periods of rest, and growing season deferment provided by this grazing system should increase chances for recruitment and survival of green ash and chokecherry seedlings. Hardwood draws in the Pelham-Julberg Allotment should be monitored to determine if recruitment and survival of green ash and chokecherry seedlings is occurring under the proposed management system.

Jenkins, John Brown, Davis Draw Allotments

The Jenkins, John Brown, and Davis Draw Allotments will be managed together under a coordinated management system. A three pasture, three year deferred grazing system is proposed for three pastures (Jenkins West, Jenkins Middle, Davis Draw) and a two pasture deferred grazing system for two pastures (John Brown, Jenkins East). There are 250 acres of hardwood draws within this group of allotments; 160 acres are located in areas considered suitable for grazing. The majority of these acres are in the John Brown Allotment (100 acres) and Davis Draw Allotment (50 acres). The proposed grazing system will provide deferment during the growing season 2 years out of three for the Jenkins and Davis Draw pastures and alternate year deferment for the John Brown Allotment. In addition, the turn in is changed from May 15 to June 1 in the John Brown Allotment and the stocking rate is reduced 60 percent for Davis Draw and 33 percent for John Brown. The grazing period is reduced from 106 days to 66 days in the John Brown Allotment and 106 days to 38 days for the Davis Draw Allotment. The period of grazing for Jenkins West and Middle pastures is 21 days.

These changes in grazing management should provide greater opportunities for survival of green ash and chokecherry seedlings in the Davis Draw Allotment by providing for shorter grazing periods, longer periods of rest, deferment past the growing season two years out of three, and delaying turn in to the middle of the growing season (June 1). Hardwood draws in both Davis Draw and John Brown Allotments should be monitored to determine if recruitment and survival of green ash and chokecherry seedlings is occurring under the proposed management system.

JA Clarkson Allotment

The JA Clarkson Allotment has 10 acres of hardwood draws all located on lands suitable for grazing. The proposed management will continue the current two pastures deferred grazing system that has been practiced for five years. The 10 acres of hardwood draws are located away from water sources and probably receive little livestock use under this grazing system. Each pasture is grazed for approximately 46 days by 222 yearlings. Livestock are put on the allotment June 1 and are removed August 31. Yearlings tend to distribute more evenly and not concentrate as a single herd to the degree that cow/calf pairs do, particularly near water and in draws. The proposed management should provide opportunities for survival of green ash and chokecherry seedlings, although the dominance of western snowberry and Kentucky bluegrass in the understory will inhibit seedling recruitment.

JB Clarkson and Van Offern Allotments

The JB Clarkson and Van Offern Allotments contain 200 acres of hardwood draws of which 130 acres occur on lands considered suitable for grazing. The majority of the hardwood draws on suitable grazing lands occur in the JB Clarkson Allotment (80 acres). The JB Clarkson and Van Offern Allotments will be managed under a coordinated management system where three pastures (McKenzie, East, and West) are grazed in a three-year rotation with a delayed turn in (June 16). The Casper Gulch Pasture will be grazed in a two year deferred grazing system and a delayed turn in date, June 16. Periods of grazing are reduced from 61 days to 40 days for the three pasture rotation pastures and fall use for the Casper Gulch Pasture is reduced from 107 days on alternate years to 46 days. Growing season deferment occurs two years out three for the McKenzie, East, and West Pastures and on alternate years for the Casper Gulch Pasture. The reduced grazing periods, deferred grazing past the growing season, and the delayed turn in to June 16th, should provide opportunities for recruitment and survival of green ash and chokecherry seedlings.

Dunn Allotment

The Dunn Allotment contains 40 acres of hardwood draws of which 30 are located on land considered suitable for grazing. Proposed management will be to continue the two pasture deferred rotation grazing system, but reduce the days of grazing. The early grazing period would be changed from 137 days (6/1-10/15) to 61 days (6/1-7/31) and fall grazing period from 108 days (7/15-10/31) to 92 days (8/1-10/31). The proposed management of alternate year growing season deferment combine with shortened grazing periods should provide opportunities for green ash and chokecherry seedling survival. The reduced grazing periods may be the most considerable management change that can benefit hardwood draws.

Box Springs Allotment

The Box Springs Allotment contains 90 acres of hardwood draws of which 70 acres are located on lands considered suitable for grazing. Bison have grazed the allotment during the fall and winter. Proposed management is to change to cattle and graze with cow/calf pairs and change the season of use to summer and fall. The season of use for the East pasture will be June 1 - September 10 (102 days) each year. The West pasture will be used in the fall each year from September 11 to October 31 (50 days). The major change in use will be the East pasture and the shift from a winter pasture by bison to summer use by cows with calves.

It is unlikely hardwood draws will see any improvement within the East pasture under this grazing system. There is no growing season deferment and 102 days of grazing during the heat of the summer will result in potentially higher use in hardwood draws by livestock. The proposed fall use of 50 days in the West pasture provides the best opportunities for recruitment and survival of green ash and chokecherry seedlings. Grazing use is deferred during the growing season each year with a relatively short period of use in the fall. Hardwood draws in the Box Springs Allotment should be monitored to determine if recruitment and survival of green ash and chokecherry seedlings is occurring under the proposed management system and effects from changing from bison to cow/calf grazing is not detrimental to hardwood draws.

Lone Mountain Allotment

The Lone Mountain Allotment has 10 acres of hardwood draws all located on land considered suitable for grazing. There is no proposed change to the grazing system or period of use. Grazing is deferred past the growing season (July 16) each year. Forty-two cow calf pairs graze in the allotment from July

16 - October 31 (108 days). These draws have an understory dominated by snowberry and Kentucky bluegrass providing little opportunity for recruitment of green ash or chokecherry seedlings without other management treatments. The 10 acres of hardwood draws are located near water and use of them by livestock for shade would be expected to continue. Under this system, the greatest impact will be to the survival of green ash and chokecherry seedlings should any become established.

3.3.4.4 CUMULATIVE EFFECTS

The cumulative effects analysis area for woody draws in the pasture or allotment boundary. Livestock grazing is the principle activity effecting hardwood draws within primary range. Out of the 1,270 acres of woody draws, 780 acres (61%) occur in primary range and will be used periodically by livestock. The remaining 490 acres (39%) of hardwood draws occur in unsuitable range on steep slopes and will most likely not be effected by livestock.

Post and pole cutting occurs within ponderosa pine types and has no effect of green ash trees. Temporary road building associated with oil and gas production might occur in the reasonably foreseeable future. Leasing stipulations state roads and well pads will not be constructed within hardwood draws.

Other activities effecting woody draws include ongoing and planned prescribed fires. These impacts should not be considerable and would probably be beneficial in stimulating regeneration of green ash saplings and chokecherry plants through sprouting. Ongoing recreational use such as hunting, wood cutting and camping would not have any cumulative effects on hardwood draws.

3.4 SOILS AND UPLANDS

3.4.1 INTRODUCTION

This section will discuss existing conditions and the environmental consequences of the proposed alternatives on soils and uplands. The analysis area for this discussion will be the eleven allotments that are scheduled for Allotment Management Plan (AMP) updates.

3.4.2 AFFECTED ENVIRONMENT

3.4.2.1 HISTORIC INFORMATION AND APPARENT TREND

The concept of range condition and trend is perhaps the most important one in rangeland management. There have been range analysis surveys completed in portions of the analysis area in 1963, 1965, 1966, 1968 and 1980. They showed the majority of the analysis area to be in a fair to good vegetative condition at that time. A small portion of the area was shown to be in a poor vegetative condition. The following displays the range condition estimates for each allotment based on these surveys.

1980 Range Condition (%) of Livestock Allotments.

Allotment Name	Poor Condition	Fair Condition	Good Condition	Excellent Condition
Pelham-Juberg		78%	22%	
Schleichart		63%	37%	
Davis Draw		93%	7%	
Jenkins		86%	14%	
John Brown	9%	74%	17%	
J.A. Clarkson	11%	29%	60%	
J. B. Clarkson		60%	40%	
Van Offern	16%	56%	28%	
Box Spring		18%	82%	
Dunn		43%	57%	
Lone Mountain		6%	94%	

Rangeland conditions described above were described using attributes relating to livestock forage values and conditions. These forage values and conditions were described generally as ratings of excellent, good, fair, poor, and very poor. The attributes used to reach these ratings are not necessarily the same attributes used as indicators of rangeland health today. However, they are generally closely related.

Since the last traditional range survey was done in 1980, many of the allotments in the analysis area have undergone change in their management in timing, intensity, or class of livestock as follows (also, see Appendix B-2 for further detail on grazing history):

Management changes made around 1980:

- Jenkins Allotment changed from season long grazing to winter grazing in 1977.
- Davis Draw increased 135% in AUMs in 1977, due to lack of fully implementing the approved allotment management plan.
- Lone Mountain shifted from season long sheep use to season long cattle use in 1977.

Management changes made recently:

- JA Clarkson shifted from season long grazing to a two pasture deferred rotation in 1997.
- JB Clarkson shifted from season long grazing to a two pasture deferred rotation in 1993.
- Van Offern shifted from season long grazing to a two pasture deferred rotation in 1993.
- Pehlam-Juberg shifted from season long to a three pasture deferred rotation system in 1995.
- Box Springs shifted from winter grazing to a two pasture-deferred winter grazing system in 1997.

Essentially no management changes made since 1980:

- Schleichart, John Brown, and Dunn have essentially have been under the same management prescription since the last traditional range survey was conducted in 1980.

Based on observations of existing data, field monitoring, knowledge of management changes, and professional judgment, the following displays apparent trend by allotment since the 1980s.

Allotment Name	Apparent Trend[4]
Pelham-Juberg	Not Apparent
Schleichart	Not Apparent
Davis Draw	Down
Jenkins	Up
John Brown	Down
J.A. Clarkson	Not Apparent
J. B. Clarkson	Not Apparent
Van Offern	Not Apparent
Box Springs	Up
Dunn	Not Apparent
Lone Mountain	Not Apparent

Since the last traditional range survey that was conducted in 1980, direction for assessing rangelands have changed. Traditional range surveys utilized a resource value approach to display range condition. In this approach, every actual or proposed use of the site has a different condition rating. For example, a site producing near its potential in terms of forage for cattle would be rated excellent for cattle grazing, but might be considered only fair for grazing of sheep or deer. Condition ratings do not necessarily imply site stability since condition may vary from poor to excellent on the same site, depending on the use considered.

Current policy directs that land condition inventory be conducted using current ecological concepts. Resource values, such as livestock forage availability and palatability, are assessed separately. During

[4] Apparent trend is inferred trend based on local professional knowledge of the resource, management changes, monitoring, stocking rate considerations, and consideration of historic condition data and recent survey observations and data.

2001, rangeland inventory was conducted in the analysis area using ecological approach to describing rangeland conditions. In this approach rangeland ecological condition is rated relative to the observed or measured attributes for the site, such as floristic similarity, structure, production, bare ground, litter amount, compaction, gullying, rilling, wind scouring, and presence of invasive species. From these attributes, interpretations were made about rangeland health and described in terms of biological integrity, hydrologic function, and soil and site stability. The following section describes the findings from 2001 field survey of various ecological attributes, and existing ecological rangeland conditions in the analysis area.

3.4.2.2 EXISTING CONDITION - ECOLOGICAL ATTRIBUTES AND STATUS

The process and attributes used for describing ecological integrity is similar to the framework outlined for assessing rangeland health. The framework is outlined by the National Research Council (NRC, 1994), the Unity in Concepts Task Group (UCTG-SRM, 1995) and the National Range Handbook (USDA NRCS, 1994). The NRC outlined three criteria for determining rangeland health: degree of soil stability and watershed function, ecological process integrity (energy and nutrient cycles), and the presence of functioning recovery mechanisms. The UCTG recommended that 1) site potential be recognized in the evaluation of rangeland status; 2) soil conservation be a primary consideration for sustainable rangeland management; 3) the desired plant community selected from a range of communities that may occupy a site be one that best meets management objectives and conserves soil productivity; 4) desired plant composition be described in terms of species, life forms or functional groups, not individual species; 5) soil conservation rating and soil conservation threshold be introduced terms for evaluating rangeland management sustainability; and vegetation and soil surface features would have to be indicators of soil protection from erosion.

3.4.2.3 EXISTING CONDITION SOIL QUALITY

Soil Quality and long-term productivity is one component of overall rangeland health. Surrogates such as aggregate stability, organic matter and soil crusts can be measured to assess soil quality, and the threshold values for soil disturbance types can vary across forest regions. Policy (FSM 2554, 1999) describes that total detrimental soil conditions should be 15% or less of an activity area (pasture in this analysis). Where more than 15% occurs, cumulative impacts should not increase the amount, and net movement should be to improve soil quality. Policy also describes the definitions and guidance for soil quality monitoring. For example, soil productivity is the long-term ability of soil to support vegetation and soil organisms and is expressed in terms of cover accumulation. Soil productivity is a measure of soil quality, as are soil hydrologic function and ecosystem health. National Forest Management Act of 1976 (NFMA) requires that land be managed to ensure these soil qualities are kept. Soil quality is monitored and indicated by such things as fire effects, compaction, displacement (erosion), puddling, or loss of ground cover and above ground organic matter. These attributes are site-specific (Page-Dumroese et. al., 2000) in that the effects of an amount of disturbance will vary with site factors such as slope and soil texture.

Where ground cover is lacking, soil texture plays a critical role in determining potential for lost productivity by influencing displacement and surface crusting. Generally, sandy loams and silt loams are more susceptible to displacement by blowing winds and soils with more clay are susceptible to puddling and crusting or sealing of the surface. Sandy loams have good trafficability and permeability

but low available water capacity and fertility to support plant growth compared to medium and fine textured soils (John R. Lane, personal communication).

While conducting the ecological survey of the analysis area in 2001, soil characteristics were evaluated. Texture and structure were also noted. In addition, soil horizon data was collected on 35 sites. Data used to address soil quality issues include soil texture and structure, erosion and displacement; presence of organic matter (surface ground cover and depth of litter, duff, and characteristics of surface and subsurface horizons); and ground cover.

Soil quality guidelines in all pastures (activity areas) are being met except for the Plateau Pasture of Schleichart Allotment due to coarse textured soils with low ground cover (FSM 2554 and FSH 2509). Surface soil compaction was not reported in the analysis area. No plots had platy or massive soil surface structure disclosed in the soil horizon data. There were 6 plots with the accelerated erosion (allotment specific discussion to follow). These one-tenth acre plots had fine to coarse loamy surface soils and good to fair ground cover (10-30% bare soil).

3.4.2.4 FIELD METHODS

Degree of soil stability, watershed function, and ecological process integrity are difficult to measure directly. Ecological attributes from field plot data can be used as surrogates for evaluating ecological integrity (Table III-6). Forest Service policy (FSH 2090) and the National Range Handbook (USDA-NRCS 1994) define a framework for summarizing data by ecological site. These are the basis used for evaluating ecological integrity for the analysis area.

An ecological classification was developed which organized the field data into groups with similar capability – habitat types and existing vegetation types. These groups and their resource values were used to define and describe existing conditions and where actions are needed to move toward desired conditions. Ecosystem health interpretations from the plot data relied on soil characteristics such as the identification of compacted soil structure, evidence of erosion, and presence of organic matter; surface ground cover, production data, and vegetation composition and structure.

Plot data from sampling efforts in the early 1990's and in 2001 (51 plots) and plot data from the Hansen et. al. Classification (1985) was used to assess the attributes and summaries shown in Table III-6.

Table III-6: Measured attributes used in this analysis for ecosystem health interpretations.

Attributes	Soil and Site Stability	Hydrologic Function	Biotic Integrity
Decreaser Grass Species	X		X
Graminoid Production	X		X
Total Production*	X	X	X
Floristic Similarity			X
Ground cover		X	
Structure	X	X	X

*Total production is grass and grasslike plants, forbs, and shrubs.

Soil and site stability refers to soil long term productivity and nutrient cycling. These refer to the capability of the soil to sustain vegetation cover without detrimental soil effects. Hydrologic function refers to the vegetation's ability to intercept precipitation, control runoff, promote infiltration, and capture available water in the soil. Community stability addresses plant composition, structure, species abundance, and regeneration at a level that sustains functioning ecological processes. The following sections describe general findings of each of the above ecological attributes. Interpretations from the attributes are summarized near the end of this section.

3.4.2.5 Ecological Status

A rating system was designed to calculate an index for each measured and observed ecological attribute by comparing existing vegetation community values with potential or desired vegetation community values. This ecological status rating was calculated only for grassland and shrubland, not for ponderosa pine habitat.

Additional qualitative attributes were used to more adequately address hydrologic and soil system functions as defined in the NRCS (1997) rangeland handbook. Table III-7 displays these ecological attributes and their scaling is found in the Composite Rating Summary (Table III-8). These attributes are a gross measure of ecological function and are scaled into slight, moderate, and extreme degrees of departure from reference. The existing plant functional groups in the analysis area were placed in a departure status by comparing the ecological condition of each community to a desired or potential community.

Table III-7: Upland Ecological Status Indicator Evaluation Matrix - Degree of Departure from Ecological Reference Areas

Indicator	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
Decreaser Grasses (measured)	Less than 20% of potential production.	20-40% of potential production.	40-60% of potential production.	60-80% of potential production.	Exceeds 80% of potential production.
Annual Production (measured & observed)	Less than 20% of potential production.	20-40% of potential production.	40-60% of potential production.	60-80% of potential production.	Exceeds 80% of potential production.
Floristic Similarity – Functional / Structural Groups (F/ S groups) (measured)	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 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 site.
Invasive Plants* (observed)	Dominate the area.	Common throughout the area	Scattered throughout the area.	Present primarily on disturbed areas	Rarely present in the area
Structure (6-18") (measured)	Less than 20% of potential production.	20-40% of potential production.	40-60% of potential production.	60-80% of potential production.	Exceeds 80% of potential production.
Bare Ground (measured)	Much higher than expected for the site. Bare areas are large and generally connected.	Moderately to much higher than expected for the site. Bare areas are large and occasionally connected.	Moderately higher than expected for the site. Bare areas are of moderate size and sporadically connected.	Slightly to moderately higher than expected for the site. Bare areas are small and rarely connected.	Amount and size of bare areas nearly to totally match that expected for the site.

Indicator	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
Litter Amount (measured)	Largely absent or dominant relative to site potential and weather.	Greatly reduced or increased relative to site potential and weather.	Moderately more or less relative to site potential and weather.	Slightly more or less relative to site potential and weather.	Amount is what is expected for site potential and weather.
Compaction Layer (measured & observed)	Extensive; severely restricts water movement and root penetration	Widespread; greatly restricts water movement and root penetration	Moderately widespread; moderately restricts water movement and root penetration.	Rarely present or is thin and weakly restrictive to water movement and root penetration.	None to minimal; not restrictive to water movement and root penetration.
Rills (observed)	Rill formation is severe and well defined throughout most of the area.	Rill formation is moderately active and well defined throughout most of the area.	Active rill formation is slight at infrequent intervals, mostly in exposed areas.	No recent formation of rills; old rills have blunted or muted features.	Current or past formation of rills as expected for the site.
Gullies (observed)	Common with indications of active erosion and downcutting; vegetation is infrequent on slopes and / or bed. Nickpoints and headcuts are numerous and active.	Moderate to common with indications of active erosion; vegetation is intermittent on slopes and / or bed. Headcuts are active; downcutting is not apparent.	Moderate in number with indications of active erosion; vegetation is intermittent on slopes and / or bed. Occasional headcuts may be present.	Uncommon with vegetation stabilizing the bed and slopes; no signs of active headcuts, nickpoints, or bed erosion.	Drainages are represented as natural stable channels; no signs of erosion with vegetation common.
Wind-Scoured, Blowouts, and / or Deposition Areas (observed)	Extensive.	Common.	Occasionally present.	Infrequent and few.	Matches what is expected for the site.
Soil Surface Resistance to Erosion (observed)	Extremely reduced throughout the area. Biological stabilization agents including organic matter and biological crusts virtually absent.	Significantly reduced in most plant canopy interspaces and moderately reduced beneath plant canopies. Stabilizing agent present only in isolated patches.	Significantly reduced in at least half of the plant canopy interspaces, or moderately reduced throughout the area.	Some reduction in soil surface stability in plant interspaces or slight reduction throughout the site. Stabilizing agents reduced below expected.	Matches that expected for the site. Surface soil is stabilized by organic matter decomposition products and / or a biological crust.
Soil Surface Loss or Degradation (observed)	Soil surface horizon absent. Soil structure near surface is similar to, or more degraded than, sub-surface horizons. Difference in subsurface organic matter content indistinguishable.	Soil loss or degradation severe throughout site. Minimal differences in soil organic matter content and structure or surface and subsurface layers.	Moderate soil loss or degradation in plant interspaces with some degradation beneath plant canopies. Soil structure is degraded and soil organic matter content is significantly reduced.	Some soil loss has occurred and / or soil structure shows signs of degradation, especially in plant interspaces.	Soil surface horizon intact. Soil structure and organic matter content match that expected for the site.

Overall, the midgrass dominated grassland had the best (slight to moderate departure) ecological condition for all components (biotic, soil and hydrologic). This suggests that the vegetation in those communities has the composition, cover, structure, and production to maximize ecological conditions and maintain site productivity. In contrast biotic, soil, and hydrologic function showed moderate departure (40-60% of potential) for shrub functional groups and low cover western wheatgrass and club moss dominated needle and thread grass functional groups.

Table III-8 displays the percent of each pasture in each ecological condition for NFS grassland and shrubland functional groups. It will be useful to return to this table in the allotment discussions. Table III-8 indicates ecological condition and directly reflects the mix of functional groups in an allotment. For example, allotments with a larger percentage of sagebrush (shrubland) or other functional groups in low ecological condition will show a larger percent in moderate departure class.

Table III-8: Composite Rating Summary – Similarity to Ecological Reference Areas (% of area*)

Land Unit	Allotment	Pasture	Indicator	Low Similarity	Moderate Similarity	High Similarity	Very High Similarity
North Cave Hills	Pelham-Juberg	North 808-01	Soil/Site Stability		88%	13%	0%
			Hydrologic Function		49%	51%	0%
			Biotic Integrity		88%	13%	0%
		Middle 808-02	Soil/Site Stability		94%	6%	0%
			Hydrologic Function		57%	43%	0%
			Biotic Integrity		94%	6%	0%
		South 808-03	Soil/Site Stability		72%	28%	0%
			Hydrologic Function		28%	72%	0%
			Biotic Integrity		72%	28%	0%
	Schleichart	Plateau 813-03	Soil/Site Stability		41%	59%	0%
			Hydrologic Function		35%	59%	6%
			Biotic Integrity		41%	59%	0%
		Prairie 813-04	Soil/Site Stability		13%	87%	0%
			Hydrologic Function		7%	83%	9%
			Biotic Integrity		13%	87%	0%
	Davis Draw	Davis 772-01	Soil/Site Stability		56%	44%	0%
			Hydrologic Function		21%	79%	0%
			Biotic Integrity		62%	38%	0%
	Jenkins	West 787-01	Soil/Site Stability		60%	40%	0%
			Hydrologic Function		14%	86%	0%
			Biotic Integrity		60%	40%	0%
		Middle 787-02	Soil/Site Stability		46%	54%	0%
			Hydrologic Function		8%	92%	0%
			Biotic Integrity		46%	54%	0%
		East 787-03	Soil/Site Stability		32%	68%	0%
			Hydrologic Function		7%	93%	0%
			Biotic Integrity		32%	68%	0%
South Cave Hills	John Brown	John Brown 788-01	Soil/Site Stability		58%	42%	0%
			Hydrologic Function		21%	77%	2%
			Biotic Integrity		58%	42%	0%
	JA Clarkson	North & South 784-01 & 02	Soil/Site Stability		73%	27%	0%
			Hydrologic Function		33%	67%	0%
			Biotic Integrity		73%	27%	0%
	JB Clarkson	West 786-01	Soil/Site Stability		73%	27%	0%
			Hydrologic Function		29%	71%	0%
			Biotic Integrity		73%	27%	0%
		East 786-02	Soil/Site Stability		65%	35%	0%
			Hydrologic Function		17%	83%	0%
			Biotic Integrity		65%	35%	0%
	Van Offern	Casper Gulch 821-01	Soil/Site Stability		64%	36%	0%
			Hydrologic Function		10%	87%	3%
			Biotic Integrity		64%	36%	0%
		McKenzie 821-02	Soil/Site Stability		70%	30%	0%
			Hydrologic Function		12%	88%	0%
			Biotic Integrity		70%	30%	0%
East Short Pines	Dunn	Dunn 775-01	Soil/Site Stability		35%	65%	0%
			Hydrologic Function		18%	66%	16%
			Biotic Integrity		35%	65%	0%
	Lone Mtn	Lone Mtn 794-01	Soil/Site Stability		55%	45%	0%
			Hydrologic Function		30%	70%	0%
			Biotic Integrity		55%	45%	0%
	Box Springs	West 759-01	Soil/Site Stability		11%	89%	0%
			Hydrologic Function		3%	56%	41%
			Biotic Integrity		11%	89%	0%
		East	Soil/Site Stability		41%	59%	0%

Land Unit	Allotment	Pasture	Indicator	Low Similarity	Moderate Similarity	High Similarity	Very High Similarity
		759-02	Hydrologic Function		5%	90%	5%
			Biotic Integrity		41%	59%	0%

*Percent has been relatived to reflect percent of capable grazing lands within the unit.

3.4.2.6 Desired Ecological Conditions

Desired ecological conditions are to maintain or improve communities with slight to moderate (or less) departure from reference condition and improve those communities with moderate departure. Moreover, the landscape will be managed to meet Forest goals for rangeland health (Forest Plan p. 3) which may keep the ecological status from being very near potential, however ecological health should still be met as well as other Forest standards and guides. The ecological types not meeting desired condition are the moderate similarity types as shown in Table III –8.

3.4.2.7 Allotment Specific Analysis- North Cave Hills

Pelham Juberg

There are three pastures in this allotment; North, South and Middle. Dominant communities in the allotment are low cover western wheatgrass and big sagebrush habitat (Table III-9). The potential production for the allotment tends to be about 1000 pounds (lbs) per acre except for Middle Pasture, which is higher (1500 lb per acre class). Western wheatgrass, big sagebrush (north and middle pastures), and pine-sun sedge communities (portions of middle and all of south pasture) characterize the grazing lands.

The North Pasture appears to have less productive soils than the other two pastures. Half the acreage has soil map units that support 1000 pounds per acre total average potential production or less. Some of this is explained by the 18% of the pasture that is badland or rock. Current herbaceous vegetation produces about 1000 pounds per acre and is primarily shortgrass dominated. The potential is midgrass dominance for this habitat type. Improvements in composition through recruitment of midgrasses like western wheatgrass and green needlegrass would improve ground cover, structure, and production. Change in distribution patterns will occur through improved salting practices and proposed water developments.

The Middle Pasture has a larger proportion of ReB soil map unit that has soils capable of higher potential cover production (Reeder). The amount of existing shortgrass dominated western and sagebrush components in this pasture does not reflect the site potential. Soil and site productivity can decline when decreased above and below ground cover and decreased ground cover occur over the long-term. This could lead to soil surface erosion, changes in soil structure, and decreased nutrient cycling over the long-term. Improvements in ground cover, structure, and composition are desired. Change in distribution patterns will occur through improved salting practices and proposed water developments. Almost half of the Middle Pasture is mapped as low cover big sagebrush habitat and is on soil map units ReB and RnB that are claypan range sites capable of supporting sagebrush habitat and higher cover western habitat. The Rhoades and Daglum soils are particularly susceptible to compaction when moist because of their texture. The proposed entry date should meet range readiness and soil condition needs with consideration to these soil types.

The South Pasture appears to have the most soils in the lower potential production classes. It has the highest percent badland and the highest percent low cover western wheatgrass habitat. There are pine trees on the plateau in grasslands on the RsF map unit. This is probably the gravelly coarse Reva soil that is the component of RsF that supports pine trees.

Though no specific areas of concern were noted, monitoring production and utilization in this allotment is suggested because of sensitive soils.

Table III-9: Percent of allotment in each vegetation type.

Vegetation Type	North %	Middle %	South %
1101 Western Wheatgrass – Threadleaf Sedge	21	24	32
1102 Western Wheatgrass – Threadleaf Sedge	3	3	5
2101 Silver Sage - Western Wheatgrass	3		
2201 Big Sagebrush – Western Wheatgrass	15	42	8
3101 Green Ash - Chokecherry	17		9
3501 Ponderosa Pine – Sun Sedge		12	11
3701 Ponderosa Pine - Chokecherry	17		21
9200 Rock	14		
9300 Badland	4	8	10

An area of disturbance also exists that could be a salting area (Charlie O'Dell, pers. comm.) just south off the road south of Riley spring in the North Pasture. Salting practices should not occur near roads.

Schleichert

There are four existing pastures in this allotment, the Summer, Calving, Plateau and Prairie. The Summer and Calving pastures contain mostly private land. Dominant communities in the allotment are low cover western wheatgrass, moist ponderosa pine habitats or ash habitat (Table III-10). The field survey identified less than 5% of the allotment contained marginal sagebrush habitat. The small area east of Devils Canyon was identified as the best sagebrush community in this allotment. Shrub cover was low and grass cover was moderate in the above-mentioned area of Devils Canyon site. The soils are not the typical deep, heavy soils big sagebrush tends to thrive on. The sagebrush communities may be marginally suited to the sites. To minimize impacts on the claypan RnB soils, timing of use on the middle and north end of the Plateau Pasture should not occur in early spring when soils are wet. The claypan soils are very susceptible to compaction and displacement when moist. Monitoring for compaction on these soils should be performed annually. Areas should be monitored for shrub regeneration, soil and site stability, and composition and structure.

The Plateau Pasture has the highest percent of pasture mapped as pine-sun sedge community type. Most of this was along the north edge of the plateau.

The low cover grasslands on more productive soils (WaB and WeC) are particularly areas of concern. It is estimated that 15% of the pasture (activity area) has detrimental soil conditions with respect to loss of surface soil and lack of cover and cover for sustained nutrient cycling. These areas are on the south third of the Plateau Pasture and along the edges of the plateau. A high concentration of water sources exists in the south end of the pasture that may have resulted in increased pressure in the area. These areas produce about 1000 pounds current years growth per acre and soils are capable of over 1500 pounds per acre potential. The field survey showed short grass or needle-and-thread or club

moss are dominant. Needle-and-thread is on droughtier sites (the Werner soil in these map units). These soils are coarse loamy. These areas are less resistant to disturbance because available water is very low and declines rapidly, and native soil fertility is low. These areas would be more susceptible to shifts in vegetation and soil quality issues than the rest of the pasture when grazing is summer long. Timing of grazing in the Plateau Pasture may have caused vegetation to decline due to inadequate length of rest when available water was present for regrowth. Management of water use in this pasture will change time of grazing in this area.

Table III-10: Percent of pasture in each vegetation type.

Vegetation Type	Summer%	Calving %	Plateau %	Prairie %
0 (non-NFS lands)	96	91		40
1101 Western Wheatgrass – Threadleaf Sedge	2	4	32	23
1102 Western Wheatgrass – Threadleaf Sedge			6	5
2101 Silver Sage – Western Wheatgrass			4	1
2201 Big Sagebrush – Western Wheatgrass		2	9	4
3101 Green Ash - Chokecherry		1	18	11
3501 Ponderosa Pine – Sun Sedge			15	1
3701 Ponderosa Pine – Chokecherry	1	2	10	8
9200 Rock				1
9300 Badland			1	

Salting practices and altering water availability by rotating tank shut offs in the Plateau Pasture would help move cattle across the Plateau Pasture at critical times for the different soils and vegetation states. The droughtier soils on the south end should be monitored and cattle moved off when climate dictates (soil moisture conditions for plant regrowth are adequate). Reduced stocking rates will alleviate some pressure on this area allowing vegetation to increase vigor and growth.

The Prairie Pasture consists mainly of hill slopes and valley and riparian area including the Ducks Unlimited pond. Half the pasture is private land. On the NFS lands, the major vegetation is low cover western wheatgrass habitat. The steeper, coarser, droughtier soils are less used than the fine loamy soils on the gentle toe slopes. Dominance types on the fine loamy soils tend to be increasers such as Kentucky bluegrass dominant or codominant with western wheatgrass. The gentler slopes and soils tend to be more resilient to disturbance because of high available water, deeper soil and higher fertility. These qualities promote good ground cover and production. The desired condition would be less bluegrass (less increaser species) and more native midgrasses (decreaser species like green needlegrass) and retained ground cover and production. The lower slopes around the highly used water sources should be monitored for vegetation composition and soil quality, and be considered a key area for this pasture.

Davis Draw

There is one pasture in this allotment. Dominant communities in the allotment are low cover western wheatgrass and moist ponderosa pine habitat followed by ash (Table III-11). The allotment has a mixture of steep, low cover grassy slopes and trees and shrubs in drainages. The steep upper slopes of the allotment are thin, coarse soils. In narrow, upper drainages there are hardwoods on moist aspects, and pine-bluebunch wheatgrass on steep, dry aspects. Much of this steep area receives little grazing pressure. Gentler drainages were mapped as ash-chokecherry where hardwoods occur. These wooded draws receive heavy pressure because they provide shelter, shade, and access or routes to water.

Nearly half of this allotment is western wheatgrass habitat. The higher cover western wheatgrass type occurs on the moister settings along upper slopes where grazing pressure is lower. Short grasses such as Kentucky bluegrass in the drainages and dry carex on the south toe slopes and droughtier soils dominate the lower cover western wheatgrass type. There is a non-native crested wheatgrass component on the lower half of the pasture.

Table III-11: Percent of allotment in each vegetation type.

Vegetation Type	Davis%
1101 Western Wheatgrass – Threadleaf Sedge	38
1102 Western Wheatgrass – Threadleaf Sedge	11
2101 Silver Sage – Western Wheatgrass	3
2201 Big sagebrush – Western Wheatgrass	10
3101 Green Ash - Chokecherry	17
3501 Ponderosa Pine- Sun Sedge	4
3502 Ponderosa Pine – Sun Sedge	2
3701 Ponderosa Pine - Chokecherry	12
9300 Badland	2

In the lower third of the valley (below the windmill), historic grazing management may have altered the vegetation to be short grass dominated. A particular area of concern is the droughtier area that occurs on the lower half of the steep side slopes of the pasture valley. Due to the gentle terrain, the majority of this pasture is primary range. Just inside the west gate, vegetation ground cover is extremely low. It is a highly impacted area where cattle congregate when they are ready to be moved (Charlie Odell, personal communication). Revegetation is very difficult on these soils and erosion hazard is high on these coarse, droughty soils when ground cover is lacking. This area may require an extended recovery period to gain ground cover and mid-grass dominated vegetation.

The lower bottom of the valley slope (about 100 acres) has high potential production capability because of increased soil depth, loamy texture, low slope, and run in position. Currently bare ground in large patches, large barren interspaces and club moss occur in areas. Kentucky bluegrass and western wheatgrass dominate the existing vegetation in other areas, and at times crested wheatgrass. Silver sagebrush is occasionally found, but potential is low for recovery due to lack of reproducing plant stock.

The proposed five-pasture system with adjacent Jenkins and John Brown Allotments may reduce timing and intensity issues on this allotment. When crested wheat is grazed early can promote native midgrass recovery (Jeff DiBenedetto, pers. comm.). Cattle movement altered with salting and watering could take additional pressure off the woody draws.

Jenkins

There are three pastures in this allotment; the East, Middle and West. The NFS land within this allotment carried dominant communities of low cover western wheatgrass. (see table III-12). Good composition and vigor were found in the west pasture. This was considered a reference area with good existing vegetation and site integrity. Composition was midgrass dominant, and production was over 1500 pounds per acre. The area has received historical winter grazing use, which appears to have maintained the site integrity.

It would be desirable to maintain the conditions of this allotment. Monitoring should be performed to assure the area vegetation composition, production, and soil quality does not degrade due to the change in rotation or scheduled use. These pastures are proposed in a five-pasture rotation to increase recovery time for Davis Draw and John Brown Allotments.

Table III-12: Percent of pasture in each vegetation type.

Vegetation Type	West %	Middle %	East %
Non-Forest Service	87	73	71
1101 Western Wheatgrass – Threadleaf Sedge	10	14	17
2201 Big Sagebrush - Western Wheatgrass	2	5	1
3101 Green Ash - Chokecherry	1	2	2
3501 Ponderosa Pine – Sun Sedge			1
3502 Ponderosa Pine – Sun Sedge			1
3701 Ponderosa Pine - Chokecherry		4	4
9300 Badland		3	3

SOUTH CAVE HILLS

John Brown

There is one pasture in this allotment. Dominant PNV-DTG in the allotment is low cover western wheatgrass and ponderosa pine-chokecherry habitat (see table III-13). The existing vegetation in the pine-chokecherry habitat is a mixture of grassy north slopes with some pine trees at the top and some areas of trees and shrubs in draws. Western wheatgrass – Threadleaf Sedge – low cover habitat occurs on the uplands and gentle lower slopes. The dominant soils are shallow and sandy where vegetation dominance types desired are midgrasses (needle-and-thread on drier sites with green needlegrass and western wheatgrass picked up on moister sites). Short-grasses are currently dominant.

Table III-13: Percent of allotment in each vegetation type.

Vegetation Type	John Brown %
1101 Western Wheatgrass – Threadleaf Sedge – low cover	32
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	3
2101 Silver Sage – Western Wheatgrass – low cover	3
2102 Silver Sage – Western Wheatgrass – moderate cover	1
2201 Big Sagebrush – Western Wheatgrass	12
3101 Green Ash - Chokecherry	11
3501 Ponderosa Pine – Sun Sedge	3
3701 Ponderosa Pine - Chokecherry	26
9300 Badland	9

The flat area just inside the west fence line is the most productive area in the allotment due to its deep profile and loamy texture. It can support about 1800 pounds per acre total cover potential production (NRCS). Currently, this soil map unit supports low cover western wheatgrass-threadleaf sedge, which produces less than 1500 pounds per acre and tends to be short grass dominated. The desired condition is to develop a midgrass (green needlegrass and western wheatgrass) dominated community with good ground cover. The majority of the allotment has sandier soils that tend to recover more slowly.

Condition and trend monitoring should be used to identify changes in composition and structure, production, and ground cover.

JA Clarkson

There are two pastures in this allotment; the North and South. Dominant communities in the allotment are low cover western wheatgrass and pine-chokecherry habitat. This allotment had the highest percent (16%) pine-sun sedge habitat within the analysis area. This habitat type tends to have grassy, gentle uplands with a few trees and occurs on the plateau. The major component of this soil map unit is moderately deep and loamy, not typical pine habitat, however where shallow soils occur in these units pine trees could thrive. Grasslands and patchy sagebrush with high bare soil currently occupy this soil map unit. The plateau grasslands are typically short grass dominated and have areas of high bare soil. Soils on the plateaus are loamy and should support more cover with a midgrass dominant community. More midgrasses in the plant community, improved ground cover, and soil quality monitoring is desired.

One-third of the allotment is low cover western wheatgrass habitat. This habitat is mainly on the lower slopes in the north end of the pasture on deep loamy soils that support western wheatgrass and silver sagebrush habitats. The area has potential to produce 1250 pounds per acre. While some existing community cover is near this level most are lower. Much of the area along the valley is dominated by shortgrasses and western wheatgrass. The desired condition is for a midgrass dominated community.

Table III-14: Percent of pasture in each vegetation type.

Vegetation Type	North and South%
1101 Western Wheatgrass – Threadleaf Sedge – low cover	31
1102 Western Wheatgrass – Threadleaf Sedge – modedrate cover	6
2101 Silver Sage – Western Wheatgrass	3
2201 Big Sagebrush – Western Wheatgrass	11
3101 Green Ash - Chokecherry	8
3501 Ponderosa Pine – Sun Sedge – low cover	7
3502 Ponderosa Pine – Sun Sedge – moderate cover	9
3701 Ponderosa Pine - Chokecherry	22
9300 Badland	1

There is very low ground cover and vegetation composition on the south end and west edge (one third to one fourth) of the south pasture where sagebrush was found during the field survey. A forb-dominated understory with high bare ground is in place where a midgrass community or big sagebrush is desired. The vegetation composition and structure of this area could be caused by a combination of natural conditions and livestock effects. The soils are loamy and tend to become impervious from raindrop impact when ground cover is lacking. Surface soils puddle, infiltration decreases and with slope, runoff and erosion may increase.

In the northeast end of the South Pasture on the plateau, soils show evidence of wind erosion (two blowouts). Cattle may exacerbate these. Coarser soils have high erosion hazard when adequate ground cover is not maintained. The water availability will be rotated in this pasture to remove pressure on soils and plant communities.

JB Clarkson

There are two pastures in this allotment; the West and East. Dominant communities in the allotment are western wheatgrass and pine-chokecherry habitats followed by pine-sun sedge (see Table III-15). This allotment has the one of the highest amounts of pine-chokecherry and pine-sedge habitats by pasture. The pine-chokecherry habitats occur primarily on north aspects and the pine-sedge habitats occur drier aspects with less slope and can be open grassy areas with trees.

The southwest uplifted edge of the plateau in the West Pasture has soils with poor vegetation composition and structure. High bare soil, low ground cover, and composition of forbs and patchy grass cover are found where midgrass dominance and big sagebrush components are desired with less bare soil. The fine loamy textured soils tend to become impervious from raindrop impact when ground cover is lacking. This increases puddling and decreases infiltration and with slope, increases runoff and erosion. Pedestalling is present on the gentle slopes. The sagebrush encountered during the field survey subsequently burned and should be monitored for regeneration and soil and site stability. The high bare soil component is consistent on these communities on the plateau.

Pine-sun sedge habitat on this allotment is grassy plateau areas. The soil map units tend to be deep, loamy soils not typical of pine habitat. Where shallow soils exist within these units pine colonization could occur. Soils on the plateau tops are capable of about 1500 pounds per acre average potential production (NRCS) and are primarily grasslands supporting short grass dominated communities with about 1250 pounds total production.

Table III-15: Percent of pasture in each vegetation type.

Vegetation Type	West %	East %
1101 Western Wheatgrass – Threadleaf Sedge – low cover	35	29
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	13	12
2101 Silver Sage -Western Wheatgrass – low cover	1	
2102 Silver Sage -Western Wheatgrass – moderate cover	2	
2201 Big Sagebrush – Western Wheatgrass	7	5
3101 Green Ash - Chokecherry	12	15
3501 Ponderosa Pine – Sun Sedge – low cover	12	5
3502 Ponderosa Pine Sun sedge – moderate cover	5	5
3701 Ponderosa Pine – Chokecherry – low cover	12	24
3702 Ponderosa Pine – Chokecherry – moderate cover	1	
9300 Badland		3

It appears the north one-third of the allotment has higher concentrated use than the south half where improved grassland structure and higher production were evident. The two water sources in the north third may concentrate cattle use and increase impacts from livestock in the area.

The most productive soils are in the south half of the pasture. The desired condition is for more midgrass dominated communities.

The Tank 1 overflow in the West Pasture has caused erosion on the downhill side of the tank. This overflow is proposed to be redirected away from the south side of the tank and dispersed over land in a manner that will not cause accelerated erosion.

The East Pasture is generally in better condition with less bare soil and fewer areas dominated by short grasses. Desired conditions are the same, while existing condition is slightly better with respect to ground cover and community.

Van Offern

There are two pastures in the allotment; the Casper Gulch and the McKenzie. Dominant communities in the allotment are low cover western wheatgrass and ash-chokecherry habitat (see Table III-16). This allotment has the highest percent of lower cover pine-bluebunch and lower cover western wheatgrass by pasture. Soil map units are mostly in the 1250 pounds per acre potential production class, which was observed during the field survey. McKenzie Pasture has more badland on the dissected slopes and this coincides with the less productive soils, particularly on the drier aspects. The pine-chokecherry habitat is moderate cover pine on cooler north slopes.

Table III-16: Percent of pasture in each vegetation type.

Vegetation Type	Casper Gulch %	McKenzie %
1101 Western Wheatgrass – Threadleaf Sedge – lower cover	44	48
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	6	4
2101 Silver Sage – Western Wheatgrass	2	1
2201 Big Sagebrush – Western Wheatgrass	4	5
3101 Green Ash – Chokecherry	35	15
3401 Ponderosa pine – Bluebunch Wheatgrass	6	4
3701 Ponderosa pine – Chokecherry – lower cover	1	14
3702 Ponderosa pine – Chokecherry – higher cover	2	
9300 Badland		11

No specific areas of concern were identified for this allotment. Production and composition may be slightly lower than the desired condition for grasslands. Inherently low ground cover and production and low fertility soils suggest long term monitoring of production and trend to detect effects of management on low productivity soils.

EAST SHORT PINES

Box Springs

There are two pastures in this allotment, the East and West. In the East Short Pines land unit, vegetation tends to reflect the higher productivity of soils. Higher cover and spectral class groups are observed. In general, there are more soil map units that are slightly more productive (1750 class) in the East Short Pines than in the Cave Hills.The moderate and high cover western wheatgrass habitat

occurs on these soils and other less productive soil map units (1250 class) as well. The dominant vegetation types are moderate cover western wheatgrass and ash habitat (see Table III-17). Western wheatgrass high cover type is mapped only in the East Short Pines and represents a moist habitat that at times includes big bluestem and mesic shrubs found on the stony hills (typically SrE soil map unit).

The Box Springs Allotment is two-thirds western wheatgrass habitats. The two pastures have subtly different topography, creating the different composition of vegetation in each. The East Pasture has longer, gentle slopes including badland, while the West Pasture has a plateau with steep uneven side slopes. There are more moderately sloping cool, moist north aspects in West Pasture supporting pine-chokecherry with more trees than in the East Pasture. There are more badlands and low cover grasslands in the East Pasture. The gentle sloping outwash areas and drainage ways in the East Pasture supports more sagebrush.

Table III-17: Percent of pasture in each vegetation type.

Vegetation Type	West %	East %
1101 Western Wheatgrass – Threadleaf Sedge – low cover	1	9
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	49	47
1103 Western Wheatgrass – Threadleaf Sedge – high cover	16	2
2101 Silver Sage – Western Wheatgrass – low cover		2
2102 Silver Sage – Western Wheatgrass - moderate cover		5
3102 Green Ash - Chokecherry	19	19
3501 Ponderosa Pine – Sun Sedge		2
3701 Ponderosa Pine – Chokecherry – low cover		4
3702 Ponderosa Pine – Chokecherry – moderate cover	11	
9300 Badland	2	10

High cover western wheatgrass habitat was evident only in the East Short Pines allotments. These areas tend to be midgrass dominant with good ground cover and are the desired condition for the sites. These are mostly on the SrE soil map unit, the stony hills range site that consists of big bluestem and little bluestem, with cool season midgrasses codominant. There is a shrub component including snowberry and chokecherry, and occasionally ash or pine trees. This habitat is very rare in the analysis area.

Box Springs Allotment has been grazed by bison primarily in the winter since 1961. Plant composition was better on the Box Springs side versus the Dunn side of the fence on the plateau. This may be due to soils and management. Soil map unit changed slightly from WaB to WeC (both contain the same soils). More of the shallow component in WeC is found in the Box Springs portion of the plateau yet it had better plant composition and also a few more trees.

The grassland occurring on the plateau in the West Pasture tends to be midgrass dominant with a few trees scattered along the edge of the plateau. The moderate to high cover grasslands along the hillslopes in the West Pasture is moderately productive in areas but can be dominated by Kentucky bluegrass. The mixed community in this type makes available a broad range of vegetation, from dry pine with little bluestem and dry sedge, to moist big bluestem swales. Maintaining the diversity of these areas is desired.

The grassland in the East Pasture tends to coincide with badland, shallow soils, or rock outcrop. The grassland on the west half of the East Pasture is on the SrE soil map unit, similar to the West Pasture. The higher cover grasslands also occurs on gentle hillslopes and along drainages on the east side of the East Pasture primarily on the CeE soil map unit, a shallow loamy soil in the 1250 pound per acre potential production class. Silver sagebrush is a component of the East Pasture found as two types alongside drainageways. The lower cover type tends to have more bare soil and the higher cover types tends to have a few trees. The presence of more sensitive soils in the East Pasture may warrant closer monitoring.

Dunn Allotment

There is one pasture in this allotment. Dominant communities in the allotment are moderate cover western wheatgrass followed by ash (see table III-18). This allotment has a fairly high proportion of high cover grassland, again found on the SrE soil map unit. The lower cover grasslands occur on areas with some exposed bedrock or shallow soils and this is the expected condition for such sites. The moderate cover grasslands tends to be on the SrE soil map unit which may indicate a departure from potential, since the higher cover grassland is mapped extensively on this unit in other pastures and in this allotment in some areas.

Table III-18: Percent of pasture in each vegetation type.

Vegetation Type	Dunn %
1101 Western Wheatgrass – Threadleaf Sedge – low cover	7
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	56
1103 Western Wheatgrass – Threadleaf Sedge – high cover	9
2202 Big Sagebrush – Western Wheatgrass	1
3102 Green Ash - Chokecherry	16
3402 Ponderosa Pine – Bluebunch Wheatgrass	6
3702 Ponderosa Pine - Chokecherry	1
9300 Badland	3

The field survey indicated other areas of concern that showed heavy use by livestock and decline in vegetation composition and forage production. In particular, the area just above the fence separating Dunn's private land from forest showed concentrated use. This area should be monitored annually to assure livestock is moved when the allowable use is met. The soil map units (CeE TxE SrE) near Dunn's are loamy or coarse loamy. The coarse loamy (TxE) soils are difficult to revegetate and are susceptible to wind erosion when adequate cover is not maintained. A representative plot on this map unit south of the road showed dry sedge dominance with needle-and-thread grass and high bare soil with less than 500 pounds per acre production. Short grasses (blue grama, needle leaved sedge) dominate western wheatgrass habitat and bare soil is higher than desired. The desired condition is to improve structure of the grasslands by recruiting more midgrasses and improving ground cover.

The deeper, loamy productive soils present on the plateau support the moderate cover grasslands, similar to the other pastures. Western wheatgrass habitat on these productive plateau soils (WaB) tends to be short grass dominated, different from the Box Springs Allotment (same map unit and WeC) across the fence. The soil map units have the same soil series, however the map unit in the

Dunn Allotment has more of the deeper, loamy, productive Watrous soil that is capable of supporting the same or better communities, structure, and cover.

Lone Mountain

There is one pasture in this allotment. This allotment has two unique landforms, the steep slopes of Lone Mountain and moderately entrenched slopes below. There is diversity in the mix of vegetation communities due to the diverse landscape. Dominant communities in the allotment are western wheatgrass, ash, pine-sun sedge and badland (see table III-19). This allotment has the highest percent (3%) Big Sagebrush – Western Wheatgrass and seems to fit with the landscape and badland components.

Silver sagebrush is found along drainages and tends to be of low cover with mostly grass existing vegetation along with badland exposed soil and rock. The Big Sagebrush – Western Wheatgrass occurs on soils that have potential to support this habitat. The existing vegetation is mostly grass with some sagebrush.

This soil map unit is quite different in this portion of the analysis area compared to the west side of the East Short Pines. The pine-sun sedge in this pasture is on gentle slopes with existing vegetation being grasses, some sagebrush and some areas of exposed rock or badland.

Table III-19: Percent of pasture in each vegetation type.

Vegetation Type	Allotment %
0ther	17
1101 Western Wheatgrass – Threadleaf Sedge – low cover	3
1102 Western Wheatgrass – Threadleaf Sedge – moderate cover	26
2101 Silver Sage – Western Wheatgrass – low cover	7
2102 Silver Sage – Western Wheatgrass – moderate cover	1
2202 Big Sagebrush – Western Wheatgrass	3
3102 Green Ash - Chokecherry	17
3501 Ponderosa Pine – Sun Sedge	12
3701 Ponderosa Pine - Chokecherry	3
9300 Badland	11

No specific areas of concern have been identified. The nearly level, naturally erodible soils in this allotment are sparsely vegetated badland with grasses and some sagebrush. The desired condition for grasslands is to maintain soil and site integrity, and have a mix of midgrass and shortgrass natives dominate.

3.4.2.8 SUMMARY

In general, the potential in the East Short Pines is higher than in the Cave Hills. Soils tend to be more productive and cover potential is higher. The East Short Pines site potential is being achieved in some areas, in other areas, vegetation composition is mixed mid and shortgrasses or shortgrass dominant while midgrass potential is achievable. Cover production is less than potential in these areas. The East Short Pines analysis area tends to be more resistant to change, while the claypan, coarser, and shallow soils in the Cave Hills analysis area are less resilient and less resistant to disturbance.

It is important to note the difference in potential and resistance between the two areas. Departure from potential could occur more quickly and last longer in the Cave Hills versus the East Short Pines with the same grazing disturbance level.

3.4.3 ENVIRONMENTAL EFFECTS

Historic livestock grazing in the allotments has resulted in changes in plant composition and structure, changes in ground cover and changes in soil surface characteristics. The ability of soils to handle rainfall infiltration, support plant growth and maintain site productivity may have been reduced to varying degrees by alteration of surface soil from trampling by livestock and removal of above and below ground cover.

Frequency, duration, and timing of use by livestock directly affect degree of alteration of the environment. Physical and vegetative component changes increase with time but are also dependent on site resiliency and resistance.

Alternatives that directly address the factors contributing to risk or loss of function will be deemed more effective. The effects of past activities can be measured, however management changes will affect changes in the future, which may be more difficult to measure. Quantitative changes in soil surface characteristics and effects on vegetation and hydrologic cycles as responses to grazing system or stocking rate changes have not been well researched. Environmental variability and variability in permit administration and compliance compound the difficulty in making quantifiable predictions. In some cases, a substitute element is used to assess effects and measure change. In some cases effects can only be addressed qualitatively.

The cumulative effects boundary for uplands and soils is the pasture or allotment boundary.

3.4.3.1 EFFECTS COMMON TO ALL ALTERNATIVES

All alternatives would have direct effects on upland soils and vegetation. Livestock use has direct physical impacts on soils by trampling and trailing. Direct impacts on vegetation include removal or other physical damage by grazing, browsing, loafing, and trampling.

Management strategies that maintain or enhance landscape and community diversity will result in healthier ecosystems. Promoting the natural variability and range of plant communities provide indirect benefits and allow for diversity.

Livestock grazing would continue in the analysis area. Allotments incur variations in season of use, stocking level, and animal type but the effects of livestock on vegetation and soils would be similar except for Davis Draw, and John Brown where stocking rate reductions are proposed.

Rest or deferred rotation grazing systems and monitored forage utilization would allow plants to retain vigor. Plant vigor would allow survival from fluctuations in growing season climate and physical impacts. Plant litter accumulation would continue at current rates for Alternative 1 and increased rates in Alternatives 2 and 3. The proposed action would promote soil protection, soil organic matter incorporation, and provide for wildlife needs in allotments.

Trampling, trailing, and loafing would continue to affect plant communities. Trailing effects are greatest where topography constrains travel. Trampling impacts on soils are greatest when soils are moist. Loafing impacts on vegetation and soils are greatest in shading or watering areas and collecting or turn out areas. The above-mentioned areas tend to be a small percent of an allotment but may detrimentally impact a desired vegetation community. Changing water distribution can reduce trailing and trampling impacts. Adjusting timing of use or changing or improving water availability and distribution can reduce trampling impacts. Changes in timing, duration, and intensity of use can also be used to decrease effects of trampling, trailing, and loafing.

3.4.3.2 DIRECT & INDIRECT EFFECTS – ALTERNATIVE 1 – NO ACTION

Under Alternative 1, livestock use would be maintained at the current permitted level. Grazing impacts on upland soils and vegetation would be higher than the other two alternatives. With no change in management, impacts to vegetation cover and density, community diversity and succession would continue at the current level. Soil disturbance by trampling and trailing would continue at current rates and locales. Current livestock grazing patterns have varying degrees and scales of direct, undesirable impacts on riparian and hardwood vegetation, soils, and upland vegetation in some areas. Changes in plant community succession and vegetation types, plant cover and height, and changes in soil characteristics would continue to indirectly affect dependent plant and animal species. With no action, ecological conditions on some less resilient sites would continue to move away from desired conditions or maintain steady states that may be in less that desired condition. Climate variability will more directly affect changes in less resilient sites.

The grassland associations not adjacent to creek bottoms or woody draws, will continue to develop towards the desired condition and be most benefitted by intensive grazing sytems. Since these areas are on the uplands and away from most watering locations and creek bottoms, they receive deferred use through the grazing system and less grazing pressure due to the topography. The Green Needlegrass, Western Wheatgrass and Needle and Thread will continue to grow and dominate as desirable species, while reaching the desired condition for grasslands.

Most allotments throughout the analysis area have had range improving measures already implemented. These measures were implemented to improve range conditions. For instance, entry dates are delayed to May 15 or later on all allotments in the analysis area. The objective was to improve long term range condition by timing livestock use to correspond with range readiness, or the stage of plant development at which grazing may begin without permanent damage to vegetation or soil. Deferred, deferred-rotation or other intensive grazing systems have been implemented on all allotments in the analysis area. Under the No Action alternative, those allotments that are presently overstocked will continue to deteriorate.

3.4.3.3 DIRECT & INDIRECT EFFECTS – ALTERNATIVE 2 – NO GRAZING

No grazing by livestock can affect different rangeland ecosystems in different ways. Very little data, if any, is available to determine the long term effects of no grazing on rangeland ecosystems. It has been apparent that little to no grazing for certain time periods (i.e. 10 years), has been beneficial to some areas of rangeland compared to the severe overgrazing that took place from the 1850's to the turn

of the century, to even now in some areas. Much literature, however, is available suggesting little difference in species composition, or successional rates, between livestock excluded areas and livestock grazed areas within the last 50 to 60 years.

In general, once livestock are removed, an increase in herbage yield would occur, showing noticeable appearance changes throughout the analysis area due to the abundance of residual vegetation. All acres that are currently grazed, or are suitable for livestock grazing, are expected to remain stable, or increase to a better condition in variable and undetermined periods of time and would develop towards and eventually reach the desired condition in the short term (less than 50 years), but then would level off demonstrating naturally slow successional rates.

Plant vigor would increase in some areas while desirable plant species number and density, and species composition would improve in areas with lower ecological conditions. The recovery or improvement rate may be faster in some areas than that in Alternative 1 or 3, but the latter would also result in improvements in upland vegetation and soils. Recovery is dependent on soil resiliency and existing vegetation parameters.

Foliar and ground cover have been compared periodically between grazed and ungrazed plots from 1931 to 1977 on Sagebrush - Bunchgrass rangeland in the Boise National Forest. There was consistently more vegetative cover in the grazed plots after 46 years than on the ungrazed plots. The differences in foliar cover between the grazed and ungrazed plots were variable from one sampling date to another and did not show any clear trends. While there were changes in vegetation over time, apparently the rate of succession was the same on both treatments. It has been shown that Kentucky Bluegrass (Type 1102) communities, Sagebrush-Grass (Type 2200) vegetation types and Blue Grama (Type 1101) vegetation types, which are common in the grassland areas in the analysis area, can dominate a site for a long duration with little change in range condition, even after the exclusion of livestock. Although, it has been shown that grazed areas contained more unpalatable shrubs and forbs, less total grass cover, shorter grass leaf heights, lower total yield, less litter, and lower water infiltration than areas inside exclosures after 15-18 years, these studies also show similar species of grasses and forbs present in both grazed and ungrazed sites.

3.4.3.4 DIRECT & INDIRECT EFFECTS – ALTERNATIVE 3 – PROPOSED ACTION

A reduction in numbers or season of use on the allotments that are presently overstocked will have a positive effect on the condition and trend of these allotments. The grassland associations not adjacent to creek bottoms or woody draws will continue to develop towards the desired condition and be most benefitted by more intensive grazing sytems. Since these areas are on the uplands and away from most watering locations and creek bottoms, they receive deferred use through the grazing system and less grazing pressure due to the topography. The Green Needlegrass, Western Wheatgrass and Needle and Thread will continue to grow and dominate the desirable species, while reaching the desired condition for grasslands.

A reduction in numbers is expected on two allotments in the analysis area. In the other allotments, changes in management, including, salting, water development, allotment entry delays, are being proposed to move rangelands toward the desired conditions. Many allotments are doing just that, but implementing the proposed action will ensure that those allotments continue moving toward the desired condition and that allotments that are not moving toward desired condition start moving in that

direction. The grassland areas not adjacent to creek bottoms or woody draws will have similar effects as under the no action alternative. These areas will continue to move toward the desired condition and gradually increase the desirable species, while decreasing the least desirable species.

The proposed action (Alternative 3) would allow vegetation and soil conditions to improve and move toward desired future condition at a higher rate than Alternative 1. In some heavily impacted areas, the current condition will be maintained for a longer period of time. In these areas slow improvement may be possible however Alternative 2 would provide more rapid improvement in soil conditions and vegetation health. These sites are generally in low ecological condition; short grass dominated with high bare soil and may have detrimental soil loss. Silver sagebrush habitat type dominated by short grass and big sagebrush dominated by forbs are two examples of low ecological condition.

Structural range improvements such as water tanks, pipelines, and diversions are proposed in this alternative to minimize detrimental effects on soils, riparian areas, hardwood draws and archeological resources. Water developments heavily impact the soil and vegetation conditions in a small area proximal to the development. Overflow control on water sources and proper sighting or relocating improvements can eliminate impacts on sensitive areas. When practical, spring water developments are generally managed so that the outlets flow into the natural channel. Changing distribution patterns and reducing grazing pressure are proposed to improve other areas of the pastures.

3.4.3.5 CUMULATIVE EFFECTS ALTERNATIVES 1 AND 2

Timber harvest has been minimal in the analysis area since the turn of the century. A study of the last 50 years of forest management indicates fire (wildfire and prescribed fire) has occurred or been used infrequently in portions of the analysis area. In 1977 over 2700 acres burned in the North Cave Hills. In 2001 about 1100 acres burned in the South Cave Hills. Wildfires have been recorded in the South Cave Hills since the 1940's. The largest wildfire (1100) was a low severity fire in 1963. Wildfire has been a minor component in the East Short Pines.

Fuels treatments have been small, except for a 500 acre treatment in 1994. Prescribed fire fuel treatments were small, less than 10% of the analysis area. Disturbance to pine stands and sagebrush was moderate, while changes in grasslands were imperceptible. There is little difference between alternatives when considering fuel treatments.

Mining exploration, mining oil and gas exploration and production have occurred in the past. Oil production is presently occuring and is expected to occur in the future. The uranium mining in the mid 60's and the oil production both have a cumulative effect on the Cave Hills. There were approximately 250 acres of grassland in the North Cave Hills affected by the mining that may never become productive grasslands again. The oil well pads and associated access roads remove more land from grass production. This land remains out of production as long as the well is producing and until it is rehabilitated after the well ceases production. Weed control has been limited to very small areas (less than 1%) of an allotment and negative effects from weed control on soils and vegetation resources have not been reported. Past in grazing management in the analysis area may have resulted in some recovery of vegetation.

Grazing in the analysis area has resulted in areas of high disturbance as found around water sources and salting areas, loafing areas and trails, however these areas are small relative to the size of a pasture

(activity area) and therefore do not affect a large change in vegetation communities or soil quality. The changes in management would likely result in some gains in ecological condition of soil and vegetation and the resulting hydrologic condition of the rangelands.

3.4.3.7 CUMULATIVE EFFECTS BY ALLOTMENT- ALTERNATIVE 3 – PROPOSED ACTION

Jenkins

There has been no change of more than ten percent in stocking rate during the allotment history. A two pasture system of season-long and variable year-long treatments was used from 1942 to 1974 followed by 25 years as a one unit yearly deferment, fall and winter use. A season change is proposed for this allotment. Late use has less effect on soil and vegetation resources than use during the growing season. Vegetation grazed during the growing season requires a recovery time to remain vigorous. In addition, these allotments all have major soil components with loamy or finer textures that are susceptible to compaction when soil moisture is present in the early season. Use during the time when soils are moist could increase compaction in some areas.

Davis Draw and John Brown

John Brown Allotment experienced little change in stocking rate during its history. Both allotments were used season-long to yearlong by cattle for 70 years pre-1966. In 1966 to 1975 deferred grazing (post seed set) was used then 25 years under the current cow/calf operation with deferred grazing until seed-set in rotation with Davis Draw. Davis Draw has had major changes in stocking rate in the last 30 years. The unit saw a 66% increase in stocking rate (cow/calf) for 1966-72 and timing was changed to deferment post seed-set. A short period of lighter sheep use followed. In 1977 (to present) a 135% increase in stocking rate occurred with the change back to a cow/calf operation and timing was changed to defer until seed set. Compared to season- or year-long, the deferred grazing treatments have provided some relief to the soil resource by avoiding impacts early in the season when soils are wet. This management change was probably less advantageous to vegetation conditions in that they would be slower to recover from the extended period of use. The proposed decreases (60% for Davis Draw and 33% for John Brown) in stocking rate would assist in recovery of the soil and vegetation resources where these are in low ecological condition. Soils in these allotments tend to be loamy or finer. Further, rest periods and timing would be manipulated by adding Jenkins' west and middle units to make a four-unit rotation. John Brown would be used alternately early and late every other year. The remaining three units would be under a deferred rotation in sequence of early-late-mid treatments. Early treatments could show increased compaction in some areas when soil moisture is present.

Pelham-Juberg

This management unit has had little change in its history and there is no proposed change in stocking rate. Pelham-Juberg experienced 70 years of season-long grazing with no deferment until 1967 when a three-unit deferred treatment was administered. In 1995 twice-over rotation was instituted. The south unit has more acres of coarser soils (Rockoa of RsF map unit). The historic season-long grazing possibly caused a decline in soil and vegetation conditions even on the more resilient sites. The deferred treatment may have provided some release of pressure on vegetation and benefited soils by minimizing trafficking on wet soils. Recent changes caused by moving to the twice-over rotation may

not be noticeable. Ketchum well pipeline proposed development could improve distribution in the unit. Controlling overflow at the K&R well area will also help minimize soil impacts.

Schleichart

Schleichart Allotment underwent season-long or yearlong (no deferment) treatments for nearly 85 years until 1975. At that time a deferred system (until seed set or after) was implemented for several years. Since 1978 a two-unit rest rotation (defer until after seed set) has been in place under reduced stocking rate (30% decrease). No changes in stocking rate are proposed. Similar impacts are foreseen from the long history of season- or year-long grazing. The current deferred system and reduced stocking rate have possibly released pressure on early season plants and reduced trafficking on wet soils. Changes in watering areas and salting practices are proposed to minimize impacts on soil and vegetation resources in some areas. Proposed improvements at Alice Springs would alleviate concentrated use in wet soils in that area. The south end of the plateau unit has the most productive soils in that allotment, yet resource conditions in that area show moderate departure from desired conditions. Soil quality objectives are to improve this area to increase cover, encourage nutrient cycling, and meet soil quality guidelines. Disturbances are possibly due to animal distribution problems directly related to the concentration of salting and water developments there. Historic overstocking prior to 1978 also had an impact. Altering water availability could change the use pattern and allow vegetation and soil conditions to improve however it is expected that change will be slow on the droughty sites.

JA Clarkson

A season long (no deferment) treatment was used for 50 years prior to 1942. This was followed by 50 years of a deferred (early winter) system. Grazing was deferred until late summer (1993-96) then in 1997 a two-pasture deferred (mid to late summer) system was applied. Stocking rate decreased 45% in 1993 and 22% in 1997. The historic regimen of season-long grazing did not afford plants much rest. Unless closely monitored, conditions could have been degraded during that time. Following this strategy with a late treatment for an extended time could assist in recovery of plant and soil resources. The recent stocking rate decreases could also provide a measure of recovery. No further stocking rate adjustment is proposed. Water availability and salting will be altered to release pressure and improve ground cover in the south end of the South Pasture. This area burned in a fire in 2001, which probably resulted in the decline in sagebrush cover and condition observed during the 2002 field season. Soils on the west edge of the plateau and in the North Pasture are not very resilient. The shallow and fine-textured (Rhoades) soil has slow permeability, high shrink-swell potential, and low fertility, and severely restricted root penetration. Compaction can be a problem. High use areas exist around Dry Creek in the North Pasture as well as around other water developments. Trampling and use of wet, clayey soils could be minimized by turning off Tanks 1 and 2 in the South Pasture until mid-June to allow soils to begin to dry. Not salting near water developments on loamy or finer soils will also minimize impacts.

JB Clarkson

There has been no large change in stocking rate historically on this allotment and treatments were similar to JA Clarkson (season- and year-long) until 1976 when 17 years of winter grazing occurred. Similar effects of past management are expected. Water availability and salting will be altered to remove pressure and improve ground cover in the area around Tank 1 in the west pasture. Trampling and damage to wet, clayey soils could be minimized by turning off water at Tank 1 until mid-June and

not salting in the area to improve conditions. Tank overflow control at Tank 1 and Johnson #2 are proposed to control soil erosion.

Van Offern

Nearly 85 years of season long or yearlong use preceded a deferred (after seed set) two pasture rotation treatment in 1977-93. Every other year Casper Gulch and Upper McKenzie were used from June-December while Lower McKenzie was used in winter (January-March). The current two pasture rotation for Casper Gulch and McKenzie has been in place since 1993 (with 33% decrease in stocking rate) with alternate year use after seed set. Soils in McKenzie and Casper Allotments are generally shallow and loamy or finer. Year long use probably had negative impacts on soil when use occurred while soils were moist. Vegetation did not have adequate recovery time and possible decline in composition and ground cover resulted. Lower McKenzie may have benefited more from winter use in the last 20 years than either of the other patures from mid-late season use. The proposed rotation with JB Clarkson's two pastures would provide more recovery for resources by alternating season of use and increasing rest periods.

Box Springs

No large changes in stocking rate have occurred in the allotment history. Box Springs Allotment supported season long or year long grazing for nearly 100 years prior to 1961. Winter use occurred from 1961 to the present, with a two-pasture rotation beginning in 1997 with bison. Site resilience in the East Short Pines is higher than the Cave Hills due to a higher proportion of more productive soils. Resilience is possibly higher in the west pasture due to the more productive soils compared to the east pasture. A portion of the west pasture is timbered while the east pasture is primarily grassland and some badland. Winter use possibly benefited the soil resource in the east pasture more than the west because of the preponderance of loamy or finer soils. Effects of bison use the last few years are probably not measurable. Potential changes in rotation, season, and livestock class are pending. Improvements in water sources will alleviate effects of trampling and trailing on wet soils around tanks and springs.

Dunn

Before 1950 up to 2800 sheep AUMs used the combined Box Spring and Dunn Allotments season long for about 50 years. Following was 36 years of cow/calf use season long stocked at around 600 AUMs. The present system with the same stocking rate was instituted in 1988 (defer until after seed set). Treatments have been used to promote grassland cover in this allotment. The lower south and southwest portion and the plateau in the allotment are grassland with loamy or finer soils and probably received higher use than the rest of the allotment. These locations also have water developments. Dunn Allotment proposed change in rotation stops two consecutive late treatments in an effort to improve hardwoods. Increased water storage at Adams Spring would support the new treatment. Annual monitoring of animal distribution especially near the southwest end (near gate) at turn out and fall take off would decrease pressure on resources in that area.

Lone Mountain

Little variation has occurred in the history of the allotment. Season long sheep operations existed from the early 1900's until 1977 (cow/calf). The present system (late season use after seed shatter) has been in place for 25 years. Effects of historic season-long sheep use are probably more evident on the less resilient soils and badlands away from Lone Mountain. These shallow, finer textured soils

typically have high bare soil in areas. Badland and sagebrush habitat dominate the vegetation component. Conditions were near those desired and no change in stocking rate is proposed.

3.4.3.8 ENVIRONMENTAL EFFECTS – SUMMARY

Table III-20: Area (NFS) moving from moderate departure toward desired conditions.

Area	Allotment	Pasture	NFS Acres	Percent in Moderate departure	No Action		No Grazing		Proposed Action	
					Trend	Recovery Rate	Trend	Recovery Rate	Trend	Recovery Rate
North Cave Hills	Jenkins	787-03 East	190	4-18	0	Moderate	+	Fast	+	Moderate
		787-02 Middle	360	6-34						
		787-01 West	290	6-26						
	Davis Draw	772-01	1145	10-36	0-	Slow		Moderate	+	Slow
	Schleichart	813-04 Prairie	2650	4-7	0	Fast		Fast	+	Fast
		813-03 Plateau	3080	18-21	-	Slow		Slow	0+	Slow
	Pehlam-Juberg	808-03 South	630	17-43	0-	Slow		Slow	0+	Slow
		808-02 Middle	820	40-66						
		808-01 North	870	28-49						
South Cave Hills	John Brown	788-01	2160	11-30	0-	Slow		Slow	0+	Slow
	JA Clarkson	784-01 & 02 North & South	2460	16-36	0-	Moderate		Moderate	+	Moderate
	JB Clarkson	786-01 West	1520	15-38	-	Slow		Slow	0+	Slow
		786-02 East	1180	7-28						
	Van Offern	821-01 Casper Gulch	280	4-25	0-	Slow		Moderate	0+	Slow
		821-02 McKenzie	1050	8-48						
East Short Pines	Box Springs	759-01 West	730	2-8	0	Fast		Fast	+	Fast
		759-02 East	1470	3-26		Slow		Moderate		Moderate
	Dunn	775-01	1800	15-30		Moderate		Fast	+	Fast
	Lone Mountain	794-01	870	20-37		Slow		Slow	0+	Slow

3.5 NOXIOUS WEEDS

3.5.1 INTRODUCTION

Forest-wide management direction for noxious weed management is to implement an integrated pest management program aimed at controlling new starts, priority areas and areas of minor infestations. Control actions will be implemented on areas of existing large infestations using all control methods including, mechanical, chemical, and biological (Chapter II, Page 3). The Forest is proposing to update the Custer National Forest. May 1986, Noxious Weed Treatment Program – Final Environmental Impact Statement, based on up-dated information on noxious weed infestations and new treatment methods. Weed treatment is outside the scope of this analysis. However, activities associated with the proposed action should consider risk of spread due to the activity. The cumulative effects boundary area used for effects analysis is the allotment boundary.

3.5.2 AFFECTED ENVIRONMENT

There have been 3.0 acres of Leafy Spurge, 5.6 acres of Canada Thistle and 2.0 acres of Floodman Thistle mapped in the North and South Cave Hills and 0.2 acres of Canada Thistle mapped in the East Short Pines. These are the only know noxious weed sites in the analysis area and are presently being chemically treated by the Harding County Weed Department. The Sioux Ranger District is also using biological control on the Leafy Spurge site with the introduction of Leafy Spurge Beetles.

The Custer National Forest plans to contract with Mid-Dakota Vegetation to map noxious weeds on 6,066 acres in the East Short Pines area. This will be completed during the 2004 field season and any additional areas with noxious weeds will be controlled using the measures described above.

3.5.3 ENVIRONMENTAL CONSEQUENCES

3.5.3.1 ALTERNATIVE 1 – NO ACTION (MAINTAIN CURRENT MANAGEMENT)

Direct/Indirect Effects: Because noxious weeds are spread through human and other activities, there could be an increase in acres infested by noxious weeds under this alternative. Ongoing activities such as hunting, grazing, firewood cutting, etc may continue to spread current noxious weed species and possibly introduce new species. Ongoing control of noxious weeds is accomplished by a cooperative approach between the Forest Service and local County weed boards. There is currently an agreement in place between the Custer National Forest and Harding County to use Integrated Pest Management practices to control noxious weeds using chemical, mechanical, and biological control measures. Integrated Pest Management practices are expected to avoid new noxious weed infestations and control existing noxious weed populations. The No-Action Alternative should not result in any major increases in acres of noxious weeds in the analysis area. However, construction of range improvements may disturb the ground and may provide a seed bed for noxious weeds.

Cumulative Effects: Implementation of this alternative would not be expected to contribute to significant cumulative effects. Since livestock grazing, post and pole cutting, dispersed and developed recreation, and prescribed fire activities have occurred in the past, are presently occurring and will

occur in the future and there are only 11 acres of noxious weeds mapped in the analysis area it is doubtful that these activities will have any cumulative effects on the noxious weed population in the area. Since noxious weeds can be spread by vehicles and ground disturbing activities, hunting, oil well pads, temporary road building, etc may have contributed to the introduction and spread of noxious weeds in the past and may continue to do so in the reasonably foreseeable future.

3.5.3.2 ALTERNATIVE 2 - NO GRAZING

Direct/Indirect Effects: Because noxious weeds can be spread through other activities other than grazing, ongoing activities such as hunting, firewood cutting, and other uses of the forest may continue to spread current noxious weed species and possibly introduce new species. The result could be an increase in acres infested by noxious weeds even under this alternative. However, improved range conditions and an increase in vegetative competition could result in a decrease in acres infested by noxious weeds. On going control of noxious weeds is accomplished by a cooperative approach between the Forest Service and local County Weed Boards. There is currently an agreement in place between the Custer National Forest and Harding County to use Integrated Pest Management practices to control noxious weeds using chemical, mechanical, and biological control measures. Integrated Pest Management practices are expected to avoid new noxious weed infestations and control existing noxious weed populations. The No Grazing Alternative should not result in any major increases in acres of noxious weeds in the analysis area. However, removal of range improvements may disturb the ground and may provide a seed bed for noxious weeds.

Cumulative Effects: Implementation of this alternative would not be expected to contribute to major cumulative effects. Since prescribed fire activities, post and pole cutting, dispersed and developed recreation and firewood gathering have occurred in the past, are presently occurring and will occur in the future and there are only 11 acres of noxious weeds mapped in the analysis area it is doubtful that these activities will have any cumulative effects on the noxious weed population in the area. Since noxious weeds can be spread by vehicles and ground disturbing activities, hunting, oil well pads, temporary road building, etc may have contributed to the introduction and spread of noxious weeds in the past and may continue to do so in the reasonably foreseeable future.

3.5.3.3 ALTERNATIVE 3 - PROPOSED ACTION

Direct/Indirect Effects: Because noxious weeds are spread through human and other activities, there could be an increase in acres infested by noxious weeds under this alternative. Ongoing activities such as hunting, grazing, firewood cutting, etc may continue to spread current noxious weed species and possibly introduce new species. Ongoing control of noxious weeds is accomplished by a cooperative approach between the Forest Service and local County weed boards. There is currently an agreement in place between the Custer National Forest and Harding County to use Integrated Pest Management practices to control noxious weeds using chemical, mechanical, and biological control measures. Integrated Pest Management practices are expected to avoid new noxious weed infestations and control existing noxious weed populations. Alternative 3 should not result in any major increases in acres of noxious weeds in the analysis area. However, construction of range improvements may disturb the ground and may provide a seed bed for noxious weeds.

Cumulative Effects: Implementation of this alternative would not be expected to contribute to major cumulative effects. Since livestock grazing, post and pole cutting, dispersed and developed recreation, and prescribed fire activities have occurred in the past, are presently occurring and will occur in the future and there are only 11 acres of noxious weeds mapped in the analysis area it is doubtful that

these activities will have any cumulative effects on the noxious weed population in the area. Since noxious weeds can be spread by vehicles and ground disturbing activities, hunting, oil well pads, temporary road building, etc may have contributed to the introduction and spread of noxious weeds in the past and may continue to do so in the reasonably foreseeable future.

3.6 HERITAGE RESOURCES

3.6.1 INTRODUCTION

Heritage resources are a broad term that refers to cultural properties and traditional life way values. A heritage property may be the physical remains of archaeological, historical, and architectural sites and/or a place of traditional cultural use. Traditional life way value refers to the connection between the landscape and a groups' traditional beliefs, religion, or cultural practice.

The National Historic Preservation Act (NHPA) and its implementing regulations require Federal Agencies to consider effects of their undertakings on historic properties. The term historic properties refer to cultural properties that have been determined eligible for the National Register of Historic Places (NRHP). The 36CFR800 outlines the set of procedures established by the NHPA that Federal Agencies must follow before implementing an action that may affect historic properties.

Federal Agencies make decisions that may limit use of lands over which they have stewardship. The effect these decisions may have on American Indian traditional use, belief systems, religious practices, and life way values must be considered as directed by the Archaeological Resources Protection Act of 1979 (ARPA), the NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA) and the American Indian Religious Freedom Act (AIRFA).

National Park Service Technical Bulletin No. 38 provides information and advice on considering traditional cultural properties. If sites meet the National criteria they must be considered under the National Historic Preservation Act (NHPA). A property demonstrates traditional cultural value if its significance to Native American beliefs, values and customs "has been ethnohistorically documented and if the site can be clearly defined"(Parker and King 1990:15-27). Properties or natural features significant in mythology, cosmology and history of a Native American group are potentially eligible to the NRHP. The key factor is traditional use - used by Indian people from the local area over time (McConnell n.d.). Preliminary identification of traditional cultural properties for this analysis was conducted by reviewing ethnographic information including an ethnographic overview compiled for the Custer National Forest in 1995 (Deaver and Manning 1995), NAGPRA documantation for Ludlow Cave (Sundstrom 1996), historic references to the area and through meetings with Hidatsa, Northern Cheyenne, Mandan, Lakota and Cheyenne tribal members.

From these sources the Crow, Cheyenne, Sioux, Mandan, Hidatsa, Arikara and Shoshone were found to have had or may have connections to the analysis area. All tribes expressed concern for the respectful treatment of burials and access to and respectful treatment of prayer, fasting, vision questing sites, rock art and eagle catching sites. The Cave Hills, particularly Ludlow Cave, were specifically identified as areas that deserved special attention.

The decision for re-issuance of grazing permits is an undertaking as defined in the NHPA and requires Federal Agencies to take into account the effects of livestock grazing and related actions on

archaeological and historical properties. In 1995, the Custer National Forest (CNF) became a participant in the South Dakota Programmatic Agreement (SDPA) between the South Dakota State Historic Preservation Officer (SDSHPO), the Advisory Council for Historic Preservation and the Northern Region of the Forest Service regarding cultural resource management on National Forest Lands in South Dakota. One of the goals of the SDPA was to streamline some of the Section 106 compliance process and as part of the agreement a series of specific site inventory strategies (SIS) were developed that addressed undertakings such as timber harvesting, prescribed burning, and range rescission.

3.6.2 AFFECTED ENVIRONMENT

The South Dakota portion of the Sioux District is subdivided into five land units of various size and configuration based primarily upon the isolated buttes and hills topography. These land units consist of the North Cave Hills, the South Cave Hills, the Slim Buttes, the East Short Pines, and the West Short Pines. The analysis area encompasses portions of the North Cave Hills, the south portion of the South Cave Hills, and all of the East Short Pines. Each of these land units presents a similar environment, but each is unique and has its own characteristics and varying evidence of cultural utilization. These units are summarized briefly in the table presented below.

Table III-21: Heritage Inventory Acres and Number of Sites Recorded by Allotment

Unit	Allotment	Sites recorded	% of Federal Acres Inventoried
North Cave Hills	Schleichart	81	16%
	Davis	57	3%
	Pelham	124	64%
	Jenkins	24	0%
South Cave Hills	JB Clarkson	12	12%
	JA Clarkson	15	33%
	John Brown	4	25%
	Van Offern	0	2%
East Short Pines	Dunn	36	53%
	Box Springs	39	44%
	Lone Mountain	17	8%
Totals		**409**	

The North Cave Hills in particular contains the richest concentration of archaeological sites in the Northwestern Plains (James Keyser, personal communication, 1996). These sites include world-class examples of rock art, bison jumps, rock shelters and deeply stratified open sites. Further, site densities for the other units in the analysis area, while lower, are still far above the rest of the region as a whole. These sites represent a wide variety as well as unique examples that are extremely valuable for their scientific value.

What may have attracted people to these units is the unique setting and availability of scarce resources found in these isolated pine parklands. The Forest units are remnants of the Cannonball and Ludlow members of the Paleocene aged Fort Union Formation and are located on the eastern periphery of the ponderosa pine parklands. The topographic relief of these units varies from 300 to 1000 feet above the plans. Surrounded by grasslands, these "island-like" buttes contain five separate yet contiguous ecozones: hardwood draws, ponderosa pine, upland grassland, tabletop grassland and rimrock break each supporting a diverse array of animal, bird and plant life. Prehistorically, these "island oases"

offered the regions most available water, shelter, and habitat for mammals such as bison, deer, elk, wolves, bear, bighorn sheep, and mountain lion. Representations of many of these animals are found in the rock art inscribed along the faces of the sandstone buttes today.

Archaeological investigations in this area indicate this high resource diversity has attracted an equally high level of prehistoric and historic occupation (Beckes and Keyser 1983). Over 400 heritage sites have been recorded on NFS lands in the analysis area representing past human use ranging from bison hunting and eagle trapping to military expeditions, ranching, mining and homesteading. For the last 100 years the principal historic use has been sheep and cattle grazing, logging, mining, oil and gas development, hunting and recreation. These historic and prehistoric activities have left their mark on the historic landscape seen today

3.6.2.1 CULTURE HISTORY-PREHISTORIC OVERVIEW

The analysis area is located entirely within Harding County, South Dakota, in the very northwestern corner of the state. The analysis falls within Region #1 of the South Dakota State Plan for Cultural Resources, the Sandstone Buttes Region (Winham and Hannus, 1990). The cultural chronology for the analysis area is taken from Beckes and Keyser (1983). The earliest period is Paleo-Indian and spans roughly 12,000 years ago to about 7,500 years ago. These include the Clovis Complex (11,500-10,500 years ago), Folsom Complex (10,700-10,080 years ago), and a series of named cultural groups within the Plano Complex (10,000-7500 years ago).

The Paleo-Indian is followed by the Early Archaic Period that spans roughly 7,500 to 4,500 years ago. The Early Archaic includes the Logan Creek/Mummy Cave complex (7,500-5300 years ago) of large side-notched projectile points and the Oxbow Complex (5300-4500 years ago). This is followed by the Middle Archaic Period which can be defined to span approximately 4,500 to 3,000 years ago. The Middle Archaic includes the McKean Lanceolate Complex (4,500-4,000 years ago), the Duncan Complex (4,000-3500 years ago), and the Hanna Complex (3,500-3000 years ago). The Late Archaic Period follows and can be dated roughly 3,000 to 1500 years ago. Frison's Late Plains Archaic includes two well-defined complexes which are the Pelican Lake Complex (3,000-1850 years ago) and the Besant/Sonota Complex (1950-1350 years ago). Transitional between the Late Plains Archaic and the following Late Prehistoric Period is the Avon Lea Complex (1750-1100 years ago).

The Late Prehistoric Period is dated 1450 to 250 years ago. This period includes the Plains Village Tradition that dominated from around 950-170 years ago and a series of sites with small side notched projectile points for use with bow and arrow, which are typical of the Late Prehistoric Period.

The last period to be discussed is the Protohistoric Period that dates to the introduction of the horse and European cultural items to to the archeological record. The introduction of the horse can be estimated to 230 years ago and this period will last to about 150 years ago.

Ethnographic literature places several tribes in the analysis area during the late Protohistoric period, including the Crow, Cheyenne, Arapahoe, and Lakotas. Wickiups and pits associated with eagle trapping were once common in the area and may be attributed to Hidatsa and/or Mandan use of the Buttes. Undoubtedly, some of the stone circles in the vicinity are affiliated with Lakotas who continued to pass through the area on their way to hunting expeditions in the Powder River country well into the reservation era and after Euro-American settlement of the area was well underway.

North Cave Hills Unit

The North Cave Hills represent about 19% of the total area under study for range recission. A relatively small portion of the unit has been systematically inventoried, but the North Cave Hills contain 52% of the sites in analysis area. This unit contains the most diverse expression of cultural occupation and utilization in the Sandstone Buttes archeological region and the northwestern plains area in general.

The sequence of human occupation in the North Cave Hills over the last 10,000 years is virtually complete. Virtually every named cultural period outlined in the brief cultural chronology section is present in the sites that can be identified as to temporal range. This is largely due to the excavation work done at the Mossbacher sites (Metcalf and Black, 1985), the Lightning Springs excavations (Keyser and Davis, 1984), the recent reevaluations of the Ludlow Cave materials (Sundstrom, 1996), the work at the rock art sites (Keyser and Sundstrom, 1984) and the few sites from which diagnostic artifacts were surface collected or noted.

Many of the rock art sites in the North Cave Hills are directly attributed to Late Prehistoric period. The geometric abstract style are the oldest of the rock art sites and due to weathering and association to sites in adjacent regions, are speculated to be possibly Archaic in age. at the very least, very early Late Prehistoric in age. Two other rock art styles are directly related to the Late Prehistoric. The Shield Bearing Warrior style is Late Prehistoric, possibly Shoshonean in origin. Some shield warriors extend into the protohistoric based on association with horses, but most are from the Late Prehistoric period. Contemporaneous with these shield-bearing warriors is the Hoofprint style of rock art. These date to the Late Prehistoric and Early Historic periods as well.

South Cave Hills Unit

The South Cave Hills represent about 12% of the total analysis area. This unit has seen systematic survey of almost one quarter of its total area, but contains only 6% of the total sites in the analysis area. While a great deal is known of the North Cave Hills cultural occupation, little is known of the chronology in the South Cave Hills, primarily due to the lack of extensive test excavation projects and intensive survey. At site 39HN531, several cord marked sherds were recovered. The sherds have not been adequately analyzed, but are believed to relate to the Plains Village Tradition and can allow placement of this stone circle site in the Late Prehistoric Period. At 39HN529, several glass trade beads were noted in the rock crevices that relate the site to the Protohistoric or Historic period. These beads may indicate the location of a burial or offering site.

These are the only sites to contain surface artifacts that can be determined to be temporally diagnostic. The rock art panels at 39HN515, 39HN516, and 39HN529 are also attributed to the Late Prehistoric period. The rock art consists of boat form animals, a tipi, tally or groove marks and a thunderbird.

East Short Pines Unit

The East Short Pines represent about 8% of the analysis area. The entire unit of the East Short Pines has seen some level of cultural inventory. Some 26% of the total recorded sites are found in this unit. A total of 90 cultural resource sites are located within the East Short Pines Unit.

Little is currently known of the occupation and cultural chronology of the East Short Pines. Only one excavation has been conducted in the unit at the ESP quarry (39HN298). No diagnostic artifacts were

found but carbon 14 dates suggest the area was used during the Late Prehistoric (Keyser and Fagan 1987:240).

The earliest known occupation of the unit is from the Middle Plains Archaic period, ca. 4,500 to 3,000 years ago. Five sites are identified as potential Middle Plains Archaic sites from the recovery of surface projectile points and point fragments. One site is identified as a Hanna component (39HN317) and the others are unidentified Middle Archaic sites (39HN312,315,327 & 149).

Two sites represent the Late Plains Archaic, 39HN318 and 39HN458, both Pelican Lake complex sites based on surface collected projectile points. This complex can be dated approximately 3,000 to 1,850 years ago.

Three sites represent the Late Prehistoric Period, ca. 1,450 to 250 years ago. This includes 39HN642 with a small side notched arrow point and 39HN148, an isolated find occurrence of a single cord marked ceramic rim sherd which may be related to the Plains Village Tradition or the Initial Middle Missouri variant. The ESP quarry site (39HN298) investigations suggest that the primary users of the quarry were Middle Missouri villagers who came to the northwestern Plains to hunt bison and exploit various types of readily available lithic resources (Keyser and Fagan 1987:233).

The majority of identified sites in the East Short Pines are historic Euro-American sites. Twenty sites have been identified as historic in origin, and these include rock art, a homestead, and rock cairns or rock johnny sites.

3.6.2.2 CULTURE HISTORY-HISTORIC OVERVIEW

European and Euro-American contact upon the lands eventually to become western South Dakota reflect a long history. Although written records of these contacts are rare and often general, several expedition diaries describe specific landmarks that are still present today. Francisco Vasquez de Coronado, during his 1540-1541 exploration from Mexico to the Kansas area, claimed the entire American interior for Spain. For nearly 100 years Spain's rights to this vast area went undisputed until French traders, migrating south from Canada and establishing ties with the Indians, claimed for France all territory which they entered (Robinson 1905: 27).

On January 1, 1743, a party led by Louis-Joseph de la Verendrye and his brother Francois, sons of the French-Canadian explorer Pierre Gaultier de la Verendrye, journeyed to within sight of the Black Hills while traveling with Indian guides on their quest of the Pacific Ocean. After a short excursion through these hills they traveled east to near present-day Ft. Pierre where, on March 30, they commemorated the discovery of this country and its claim by the King of France by placing a leadened plate on a low hill overlooking the Missouri River (Brown and Willard 1924: 26). It wasn't until 1913, when this Verendrye Plate was rediscovered, that the authenticity of this event was verified (DeLand 1914: 99).

During their 1804-1806 expedition of the Louisiana Purchase Lewis and Clark encountered French traders who spoke of the Black Mountains, referring to the Black Hills. John Jacob Astor, hoping for control of the fur trade in the far west and along the Pacific Coast, enlisted the aid of Wilson Price Hunt in 1811 for an overland expedition from Missouri to Oregon. This group traveled through the area of present-day Harding and Perkins County (Brown and Willard 1924: 27; French 1908: 125; Robinson 1904: 87). Bonneville traveled near the Black Hills in 1831 and Prince Maximilian encountered others familiar with this Black Mountain area during his 1833 travels (Brown and Willard 1924: 26, 27).

3 Environment and Effects

The 1851 Fort Laramie Treaty between the United States and all tribes defined the boundaries of Indian country. The Sioux, in particular, were confined to an area bounded by four rivers--the Heart, Missouri, North Platte and White--and a line running north and south along the west side of the Black Hills. This treaty obligated all tribes to cease fighting among themselves, allow safe travel for whites through their lands and allow the establishment of military posts within their territories (Sturtevant 1988: 49-50; Utley 1993: 43). Later, in an attempt to clear the way for major overland travel routes, the Fort Laramie Treaty of 1868 established the Great Sioux Reservation that included portions of present-day Montana, Nebraska, North and South Dakota and Wyoming (Anonymous 1974: 6; Utley 1993: 77, 82-83).

Increasing conflicts in the Black Hills between Indians and whites, along with the U.S. Army's interest in establishing outposts in this area, led to the 1874 Black Hills Expedition under the command of Lt. Col. George Armstrong Custer. Lakota Scouts who guided Custer's 1874 expedition stopped at Ludlow Cave (39HN1), telling Custer that the cave was a dwelling place of Wakan Tanka (Great Spirit or Great Mystery). According to the scouts, the cave was a place where native people congregated to pray and leave offerings (Frost 1979:30). A small detachment of the expedition explored the cave, noting numerous pictures of animals and "hieroglyphics" inscribed on the sandstone. Colonel Ludlow made a survey of the interior following the passage some 400 feet back. Numerous offerings were found in crevices at the entrance including an old flintlock pistol that General Custer took and a human skull that the surgeons pronounced as a white man. General Custer named the cave Ludlow after his chief engineer of the expedition (Krause and Olson 1974:110). Two members of this expedition, Horatio N. Ross and William T. McKay, discovered gold near present-day Custer in July of 1874 (Brown and Willard 1924: 571)

The annihilation of U. S. troops under the command of Lt. Col. George Armstrong Custer at the Battle of the Little Bighorn on June 25, 1876 was soon followed by the Slim Buttes Battle on September 9-10, 1876. Under the Command of General George Crook, the army successfully fought against Sitting Bull, Crazy Horse, American Horse and several other Sioux leaders. One outcome of this last major battle was the Black Hills Agreement of September 26, 1876. Almost by force, and in violation of earlier treaty provisions, the Black Hills and all unceded territory were given up by the Sioux (Green 1982: 115-116; Utley 1993: 167). As a result, the Great Sioux Reservation was reduced to portions of North and South Dakota (Anonymous 1974: 6-8). The Sioux Act of 1889, accepted by President Benjamin Harrison on February 10, 1890, reduced the territory of the Great Sioux Reservation into six small areas occupying mid North and South Dakota (Utley 1993: 273, 280).

One of the most remarkable events in Native American history was the emergence of the Ghost Dance Doctrine. From the Paiute holy man, Wovoka, came the directive for each tribe to develop their own ceremony which would result in the reuniting of all Indians with their deceased relatives and a return to their former ways of life (Utley 1993: 282). The Sioux first learned of the Ghost Dance in 1889 and by the spring of 1990 it was inaugurated among the Sioux at the Pine Ridge Reservation (Mooney 1896: 819).

Suspecting Sitting Bull as a major influence behind this new threat to the Indian Office back in Washington, and wishing to remove him to the confines of Fort Yates, the decision was made to arrest him (Mooney 1896: 854). In the early morning hours of December 15, 1890, along the banks of the Grand River on the Standing Rock Reservation and amidst a camp of Ghost Dancers, a short struggle brought the end to the life of Sitting Bull (Fechet 1908: 185-193; Utley 1993: 299-307).

Rumors spread quickly of Sitting Bull's death and residents of the Cave Hills were told that the Sioux had left the reservation and were enroute to their area, killing and plundering as they traveled. Several residents gathered at the Lewis residence, near present day Harding, and constructed rifle pits and trenches in preparation for the Indian arrival. In reality, most of Sitting Bull's followers traveled south to the Cheyenne River Reservation (Hamilton nd: 537-540; Hanson 1933: 17; Utley 1993: 308).

Large-scale cattle ranching, followed by sheep and horse ranching, were some of the earliest economic industries to develop in the early 1880s following the massive bison slaughter era on the western plains of South Dakota. Free grasslands, and the unusual nutritious character of the grass, attracted the large outfits from Texas and Oklahoma and soon several were established in the area. The E6 on the Grand River (later the Turkey Track), the Hash-Knife (or Mill Iron) in southeast Montana and northwest South Dakota, the Roosevelt Ranch based in North Dakota but with rangeland in South Dakota, Abe Jones in the Slim Buttes, J. Grant in the Short Pine Hills, and the Empire Sheep Company near Buffalo are only a few of the places which ran livestock on open range (Hanson 1933: 12-13). By 1884 there were estimates of 700,000 to 800,000 cattle on these ranges (Brooks and Jacon 1994: 9).

The Marquis De Mores, founder of Medora, North Dakota, established the Medora & Black Hills Stage and Forwarding Co. in 1884 (Briggs 1929: 251; Brown 1995: 45). Hoping to monopolize on the transportation of mail, freight and passengers, he set out to prove that this route was the most efficient in the area. One of the stage stops was on the South Fork of the Grand River near the present site of Buffalo (Brown 1995: 41; Crawford 1925: 313; Hanson 1933: 28-29). This stage line was discontinued by the winter of 1885-1886 due to three main reasons. First, the Marquis failed to secure a mail contract. Second, Medora was not the best or the shortest route to the Black Hills. Finally, placer mining was being replaced by deep vein mining in the Black Hills which significantly reduced the prospecting rush to the area and cut down passenger traffic (Goplen 1946: 38-39; Crawford 1925: 318-322).

Overstocking of grazing areas and drought conditions preceded the devastating winter of 1886-1887. Livestock died by the thousands and many of the larger outfits were ruined or were forced to sell out at significant losses. Soon, smaller outfits and homesteaders were lured to the area by visions of cheap land and promising futures. These newcomers competed heavily with the few remaining large outfits. Prime grazing lands and springs were fenced off and homesteads dotted the landscape (Hanson 1933: 14-15).

An Act of Congress, in 1849, organized the Territory of Minnesota (Armstrong 1866: 33). President James Buchanen signed a bill creating the Territory of Dakota in 1861. Shortly afterwards the Territory of Idaho was created which included Montana and Wyoming. In 1864 the Territory of Montana was created and the Wyoming portion was reattached to the Dakota Territory. This lasted until 1868 when the Territory of Wyoming was created. Finally, in 1889 South Dakota entered the union as the 39th state (Lotze 1928: 467, 470).

Harding County was named for J. A. Harding who was Speaker of the House of Representatives of the Legislature Assembly of Dakota Territory in 1881. County boundary lines were redefined in 1883 and finally, in 1908 the present boundaries of the county were established. The county was organized in 1909 with Buffalo as its county seat (Brown 1995: 54; Hanson 1933: 1-2).

South Dakota experienced two major settlement booms: the first involved the eastern portion of the state and the Black Hills during 1878-1887 and was centered on agriculture and mining ventures; the second involved the western portion of the state during 1902-1915 and was centered on ranching. The Homestead Act of 1862 granted to any current or potential U.S. citizen at least 21 years of age 160 acres. Residency of at least five years resulted in clear title to the land, or for a six month residency the land could be bought for $1.25/acre. In Harding County this method was popular during the years from 1907-1914 (Brooks and Jacon 1994: 12; Hanson 1933: 23).

The early 1900s saw the second settlement boom to western South Dakota and by 1910 the beginning of a severe drought was underway. Dryland farming techniques were introduced which further conflicted with long established livestock ranchers since both occupied marginally productive lands. The South Dakota Agricultural Extension Service, created in 1915, sought to assemble experts in a variety of livestock or agricultural oriented fields in order to provide information to those involved in the ranching and farming industries. Federal financial support programs, such as the Federal Farm Loan Act of 1916 and the Federal Warehouse Act of 1916, helped many individuals survive the hardships of life in western South Dakota.

The Civilian Conservation Corps, one of President Franklin Roosevelts' New Deal reform projects, was created in 1933. This agency organized massive forces of unemployed young men and sent them to work on a variety of forest and range related projects throughout the country (Baker et al. 1993: 123-124; Malone and Roeder 1976: 230).

Livestock production in western South Dakota contributed heavily to the needs of the country during World War II. Throughout the next two decades livestock production dominated the agricultural operations in South Dakota, but falling profit margins outweighed gradually stable production costs and many small landowners were forced to sell out to large acreage units. In addition, there has been a marked population loss among the smaller rural communities as more and more people are forced to move to larger urban area (condensed from Brooks and Jacon 1994: 14-30).

3.6.2.3 Forest History

Inspector John S. Hatten examined the North and South Cave Hills, the East and West Short Pines Hills and the Slim Buttes in 1902 and recommended they be set aside as Forest Reserves. Public pressure against the withdrawal of lands available for settlement resulted in a two to three year hiatus before these areas were officially declared Forest Reserves. In 1908 these five Forest Reserves were consolidated, along with two in Montana, into the Sioux National Forest. The Custer and Sioux National Forests were consolidated in 1918 and became the Sioux-Custer National Forest. This Forest name was short-lived, though, and by 1920 the Custer National Forest was officially designated (Clark 1982: 43-44; Odell 1983: 1-5).

The presence of the Civilian Conservation Corps (CCC) and later employment of destitute ranchers in the depression-era Economic Administration (ERA) underscores the important role of the Forest Service to the development of northwestern South Dakota ranching and farming communities. CCC camps were stationed at Needmore and north of Camp Crook. The two camps on the Sioux District were in operation a little over a year (1936-1937) but managed to build about two hundred miles of range fences, one hundred miles of road, about fifty reservoirs, and developed around two hundred stock-water springs (USDA 1962:30). Many of these improvements were located in the North Cave Hills, South Cave Hills, and East Short Pines.

Small-scale lignite coal mining was common in western South Dakota during the early 1900s, usually providing fuel for area homesteads. Three of the larger mines operating in Harding County were the Hodge near Reva, the Giannonatti near Ludlow and the Hilton in the South Cave Hills (Hanson 1933: 50). The Hilton Mine (39HN534), operated by Henry Hilton and his sons Bill, George, Matt and Walter, has not been thoroughly investigated but consist of the remains of the mine and building (Sundstom 1993).

Large-scale mining exploration and development increased within the Forest units of Harding County during the 1950-1960s. By mid 1955 close to 65,000 acres within the Slim Buttes and Cave Hills contained mineral locations claims. One strip mine uranium bearing lignite bed in the North Cave Hills was heavily developed by Kerr-McGee in the early 1960s. Abandoned today, it exhibits the lasting results of non-reclamation upon a fragile landscape. Oil exploration in Harding County has been limited, but at least two wells are operating in the Cave Hills (Clark 1982: 45-46).

Numerous range improvement and few timber harvest projects have been conducted within these five units. Most of these involve limited landscape disturbance. Recently, there has been increased pressure from energy developers who desire access to certain units. Over the last one hundred years land use practices such as the establishment of Indian reservations, the creation of Forest Reserves, logging, mining, livestock grazing, recreation, road system development and policies of fire suppression have added, changed and altered the heritage resources in the analysis area. These changes have contributed to the development of the historical landscape as seen and experienced today.

3.6.3 CULTURAL RESOURCES INVENTORY STRATEGY

Considerable literature exists that addresses the effects of livestock grazing on the rangeland ecosystem. Heavy grazing has been found to disturb and compact soil, reduce infiltration, increase runoff, reduce herbaceous plant cover and litter, promote the loss of stream bank stability, and lead to over-grazing of woody draws (Belsky et al.). The effects of livestock grazing and trampling is not homogenous across the western landscape, however, since these effects vary with rainfall, slope, soil stability and vegetation type as well as animal density, season of use, duration of use, and animal distribution.

While the effects of livestock grazing have been extensively studied, few studies have been conducted on the effects of livestock grazing on heritage resources. In 1990, the Army Corps of Engineers sponsored a study of grazing effects on heritage resources in Utah and observed that primary effects were trampling, soil compaction, surface artifact breakage and artifact displacement. Secondary effects included soil erosion, reduction of ground cover, destabilization of stream banks and artifact transport within cattle trails (ASPPN 1990:1-15). Ten years later, the CNF conducted a study of grazing effects on heritage sites in the Little Missouri National Grasslands (Floodman 2000). Effects identified during this study included trailing and trampling associated with the construction and use of range water pipelines, stock water tanks, reservoirs, fences, and the use of salt blocks. Roughly half of the heritage sites monitored during this grasslands study were found to have some level of impact from grazing activities.

Since grazing of livestock has occurred in the analysis area for at least one hundred years it is likely that some if not all of the archaeological sites have been disturbed to some degree. The range rescission SIS is designed to identify the type and extent of livestock grazing effects that related range

developments have had on heritage resources. It is composed of three components: 1. Range Improvement Inventories; 2. Heritage Site Monitors; and 3. New Inventories.

3.6.3.1 RANGE IMPROVEMENT INVENTORIES

Given that large herbivores are central place foragers with the "central" (or home place) centered on water, it was assumed that the greatest effects would be observed on or adjacent to water developments. The optimum grazing area lies within a radius of 0.8 kilometers (2624 feet) from the water source with an outside radius limit of 1.6 kilometers (5249 feet). Rough terrain such as deep gullies, steep slopes and/or rocky outcrops can further restrict animal movement even when water sources are within otherwise acceptable distances. To address these areas, inventories were conducted of all range improvements such as reservoirs, spring developments, pipelines, and tanks that were either not previously inventoried for heritage resources, or the past inventories did not meet present standards in the MTPA. These improvements were identified through the range INFRA database and review of 7.5' topographic maps. A ten-acre block (660 foot radius) centered on each improvement was inventoried. Previously inventoried improvements, where heritage sites were found and the project modified to avoid the sites, were also examined to observe whether the protective measures were sufficient.

From 1979 to 2001 approximately 6060 acres within the analysis area have been inventoried for heritage resources and 409 heritage sites have been recorded. Table III-22 summarizes the previous and new range improvement inventories conducted by allotment.

Table III-22: Previous Range Improvement Inventories and Heritage Sites Recorded

Allotment	Number of Range Water Improvements	# of Range Improvements Inventoried prior to 2001	Acres Inventoried in 2001 for Range improvements	Number of Improvements with Sites
North Cave Hills	38	6	320	6
South Cave Hills	33	9	240	3
East Short Pines	13	6	70	9
TOTALS	84	21	650 acres	18

A total of 84 range water improvements have been constructed within the analysis area. A review of a dates of construction of 24 of these improvements prior to 1940 suggest they may have been originally constructed by the CCC or other WPA programs, and may be in themselves eligible for nomination to the National Register of Historic Places. Sixty-three improvements were found that had never been inventoried for heritage resources. Cultural inventories of these improvements were conducted under a contract with Field Research Services in 2001 (Walker-Kuntz et al. 2002) and through in-service seasonal workforce. Field services inventoried 33 improvements, recorded four new sites, and monitored 202 previously recorded sites. Glenn Denton and Annie Brewer, seasonal employees for the CNF, inventoried 53 range improvements, recorded 13 new sites, monitored 31 previously recorded sites.

North Cave Hills

There are four allotments addressed in this study that are located within the North Cave Hills: Pelham-Juberg, Jenkins, Davis Draw and Schleichart. Detailed information on inventoried range water improvements by allotment is in the project record.

Pelham-Juberg Allotment

The Pelham-Juberg Allotment is located along the east face of the North Cave Hills and encompasses 2275 acres. Most of the rock art inventories, mineral inventories and testing, and range projects have been performed within the allotment boundaries. Three minerals related projects and four range projects have been conducted on the allotment.

Four Dams, one pipeline, two springs and two wells have been developed within the allotment of which only the Pelham pipeline was inventoried for heritage sites before construction. The CCC who were present in the area in 1935 may have constructed the four dams. All the range improvements were examined through the SIS, totaling 90 acres of inventory. A total of 1521 acres have been systematically inventoried in the area.

There are 124 recorded heritage sites within the allotment boundaries. There are 25 stone ring sites, 21 rock art panels, 19 rock shelters, most with rock art and including Ludlow and Pelham caves; 17 artifact scatters, three historic rock art, one associated with the CCC, 12 prehistoric rock cairns, four historic sites, and 19 isolated finds. The wide variety of sites suggests possible ceremonial visitation, prehistoric habitation, and historic use, notably by the CCC. Prehistoric sites with deep cultural deposits have been recorded in the sheltered drainages below the rimrock such as lightening Springs. This suggests that these areas may hold additional sites and that both the plateaus and side canyons were used for campsites and reused numerous times throughout prehistory.

Davis Draw Allotment

The Davis Draw Allotment borders the Pelham-Juberg Allotment along its west side and is sandwiched between the Schleichart Allotment to the north and the Jenkins Allotment to the south. The allotment is located primarily in the Davis Draw drainage below the rim rock.

Other than the 1979-1980 rock art inventory, only one heritage inventory has been conducted within the allotment. The project, D3-82-2, was for the Jenkins spring where an existing tank was to be moved out of the ravine. No cultural resources were recorded within the five acres inventoried for this analysis.

There is one dam, one spring and one well that provide water for this allotment. The CCC or other drought relief programs constructed the dam, Davis Draw reservoir, in 1940, possibly. Davis Draw well was in place by 1967. All three improvements were inventoried under the SIS, resulting in 30 acres of inventory.

There are 57 sites on record within the allotment boundaries. Twenty-four are rock art sites, thirteen are stone rings sites, eight are artifact scatters, eight are rock shelters, two are cairns and one is some kind of rock structure of unknown function. The high number of rock shelters and rock art sites is not surprising given that the allotment boundaries include the rimrock and the provenience to Ludlow Cave. The low number of cairns suggests that these function as something other than signal markers.

Jenkins Allotment

This allotment is located along the south side of the North Cave Hills along the dissected flanks and lower draws. There are no existing water sources within this allotment. Past archaeological investigations include the rock art inventory in 1979-1980, which recorded six sites; the year 2000 Nahani bison kill site testing which resulted in the recovery of datable materials assigning the site to the Besant occupation; and the Cave Hills exchange in 1990 that added acreage and the Brown's Pond to the Jenkins Allotment.

Despite the lack of systematic inventory of the allotment, twenty-four heritage sites have been recorded including eight stone ring sites, six rock art sites, five artifact scatters, one rock shelter, one rock structure, one historic rock cairn, and two isolated finds have been recorded. Field monitor of these sites did not find any direct effects from cattle grazing. The lack of grazing effects maybe the result of the absence of developed water on the unit, the dissected nature of the unit, and the primarily fall and winter use when the grass is mature.

Schleichart Allotment

The Schleichart Allotment is located along the western edge of the North Cave Hills and encompasses 5974 acres, of which 4430 is considered suitable acres. It borders the Pelham-Juberg and Davis Draw Allotments and is situated in the draws and bottomlands and on top of one plateau.

For the previously conducted heritage investigations, the Schleichart Allotment has had five inventories for special use permits and minerals projects. Abandoned uranium mine reclamation related projects account for two projects. The rest of the inventories were for range improvements projects.

There are 17 range improvements on record for the allotment, of which twelve were installed before compliance with the NHPA was required. Six of these improvements, CT Reservoir 1 and 2, Boundary Reservoir, Schleichart Draw reservoir, Hard Pan Reservoirs one and two, may be related to CCC or WPA Drought relief projects conducted in the NCH in the late 1930s and early 1940s. Schleichart reservoir in particular display a stone lined spillway often associated with the CCC era construction. All were inventoried with the SIS and resulted in 170 acres. A total of 980 acres have been systematically inventoried for heritage resources.

Eighty-one sites have been recorded within the Schleichart Allotment boundaries, 51 of which suggest prehistoric use for campsites. There are 18 rock art sites, one possible eagle-trapping pit, a cairn with rock art, one rockshelter, a bison kill site, and seven isolated finds. From more recent historic times, two cedar tanks, historic inscriptions and a hand-hewn water trough have been recorded.

South Cave Hills

The South Cave Hills unit has not been inventoried as intensively as the North Cave Hills unit with the exception of the South Cave Hills Rock Art survey (D3-93-11). This survey was designed to search for rock art in the South Cave Hills and inventoried approximately 1120 acres and recorded 21 sites, 4 of which were rock art sites. Although the South Cave Hills are of the same rock formations and exhibit large sandstone exposures ideal for rock art imagery, it remains a question as to why this area was not used as intensely as the North Cave Hills. Details of the heritage inventory and results for the range allotments in the South Cave Hills are found in the project record.

JA Clarkson Allotment

The JA Clarkson Allotment is 1957 acres in size and is located at the north end of the South Cave Hills, south of the Brown cutoff. Two minerals related projects have been conducted within the allotment boundaries – in 1977 an access road to the ALPAR Resources oil well was inventoried with negative results (D3-77-10), and the East Buffalo Seismic Project recorded four sites within the allotment.

Two range related projects have been inventoried covering 40 acres, and yielded negative results. Eight range improvements have been constructed within the JA Allotment of which six are in current use. With the SIS inventories, the total acres inventoried within the allotment are 639 acres.

Four of the improvements were constructed in the 1940s or 1950s prior to the NHPA. SIS inventories of these locations recorded one site near the Dry Creek Reservoir. Two of the range improvements were inventoried prior to construction, and revealed negative results.

Fifteen heritage sites have been recorded within the JA Clarkson Allotment. Stone Circle sites were the most common (6), followed by cairns, (5), one eagle trap, one historic rock art site, one artifact scatter and one isolated find. The site types suggest the allotment was utilized in prehistoric times for camping, eagle trapping, and possibly marking important areas with cairns, and in historic times for leaving initials on the sand rock, sheepherder cairns, and grazing.

JB Clarkson Allotment

The JB Clarkson Allotment is 2528 acres in size and borders the JA Clarkson Allotment to the south. Two minerals related projects for the Meridian 14-30H East Buffalo Federal well and access roads were conducted in 1989. The inventory recorded two sites, 39HN452 and 453, which were then monitored by an archaeologist during the construction of the access road and well pad. Three range related projects were conducted; none of which recorded any heritage sites.

Ten range improvements have been constructed within the JB Clarkson of which seven are in current use. With the SIS inventories, the total acres inventoried within the allotment are 329 acres. Like the JA Allotment, most of the water and fence improvements were constructed in 1940 or earlier. Only one site, 39HN858, was found adjacent to a spring development.

Twelve heritage sites are on record for the JB Clarkson Allotment. Four of the sites are artifact scatters, two are rock cairns, two are rock art sites and three are rock shelters of which have rock art panels within them. One isolated hearth was exposed during the construction of the access road to a well pad. Carbon 14 date taken from the hearth suggests a date of 2710 BP, placing the use of the hearth during the Late Archaic Period. The site types found indicate the allotment area was used for camping during the prehistoric times and that both prehistoric and historic people carved their thoughts and/or initials on the sandstone.

John Brown Allotment

The John Brown Allotment is located to the east and south of the JA Clarkson and JB Clarkson Allotments in the South Cave Hills. Previous heritage inventories include one proposed land exchange and four range-related projects.

Under the SIS, four additional range improvements, constructed in 1960 or earlier, were inventoried. One new site, 39HN857, was recorded. A total of 543 acres have been inventoried within the

allotment and four heritage sites recorded. The heritage sites recorded to date are representative of both prehistoric and historic occupations. The prehistoric sites found include one stone circle site and an artifact scatter. Two historic sites were found – one historic trash scatter and a historic rock art, which contains the name of "M.W. Clarkson 1928 ". The historic trash site was found to be associated with the Clarkson and Brown family ranch located outside the Forest Boundary and used from 1914 to the 1940s (Site form, Karen Redmond, 1990). The site was tested and evaluated as not eligible the same year.

Van Offern Allotment

The Van Offern Allotment is located on the southeast end of the South Cave Hills unit and covers 1541 acres. No heritage inventories had been conducted prior to the range rescission inventory and no sites are on record for the allotment. The two range improvement inventories yielded negative results.

East Short Pines

In 1983 Forest archaeologists conducted a heritage inventory for the East Short Pines unit in an effort to identify the extent and type of archaeological sites that occur in the unit. The inventory was stratified according to five ecosystem units – Ponderosa Slope/Rockland, Upland Grassland, Rolling Grassland, Table Top Grassland, Rimrock and Rimrock Breaks. Approximately 6080 acres were investigated and 59 sites were recorded. Prehistoric site types consisted of quarries, lithic workshops, occupation sites, stone circles, and cairns. Primary activity related to these sites appeared to be the acquisition of Tongue River silicified sediment (TRSS) materials used to make stone tools. Two extensive quarry sites were located.

Besides the quarry activities and sheepherder sites, numerous other cairns were recorded which suggest the possible use of the East Short Pines as a sacred or fasting area. These fasting locations are represented by the numerous small rock piles (cairns) dispersed over the benches and rim of the buttes (Allen 1983). The East Short Pines inventory included the Dunn, Box Springs, and Lone Mountain Allotments. Details of the heritage inventory of the range improvements by allotment are found in the project files.

Dunn Allotment

The Dunn Allotment is located along the west side of the East Short Pines and encompasses 1701 acres. Three previous inventories have been conducted within the allotment, two for a proposed prescribed burns, one for a range development.

Six range improvements have been constructed within the allotment, most of which were installed prior to 1967. The improvement at Adams spring was a reconstruction of the spring installed in 1940. Five of the older improvements were inventoried for the SIS. In all, a total of 960 acres have been inventoried for heritage resources.

A total of 36 heritage sites have been recorded within the Dunn Allotment. Site types found include artifact scatters (10), historic rock art (10), cairns (8), stone circles (2), quarries (2), isolated finds (3) and one rock alignment. The ESP quarry site, 39HN298, is located in this allotment. These site types suggest prehistoric camps and stone quarries as well as historic rock art initials and sheepherder monuments.

Box Springs Allotment

The Box Springs Allotment is 2270 acres in size and is located east and adjacent to the Dunn Allotment. Five heritage inventories have been conducted within the allotment for range improvements, and the allotment was included in one prescribed burn project conducted in 1993.

There are four range improvements within the allotment and one, Fox well, has been abandoned. Range inventories for the Box Springs #3 and Fox well conducted in 1982 were reconstructions of existing improvements. SIS inventory for Box Springs #2 yielded previously recorded site 39HN546. Total area inventoried within the allotment is 963 acres.

A total of 39 sites have been recorded within the allotment boundaries. Artifact scatters, which are possible prehistoric campsites, dominate the site types. Two stone circle sites recorded may also be considered habitation or campsites. Three quarry sites were recorded suggesting lithic material acquisition and toolstone reduction was also done. The cairns sites function is not known. Five isolated finds were also recorded

Lone Mountain Allotment

The Lone Mountain Allotment is located along the east side of the East Short Pines and is bordered to the west by the Box Springs Allotment. It is the smallest of the allotments considered and is 860 acres. Two range projects have been conducted within the allotment boundaries.

The allotment has five range improvements on record of which two were inventoried prior to construction. With the SIS inventories of the other three improvements, a total of 70 acres have been inventoried within the allotment boundaries that concentrated on range improvements.

Seventeen heritage sites have been recorded within the allotment. Eleven of the sites are artifact scatters and one is a stone circle site, which suggests the area was used for campsites or habitation sites. One historic homestead, the Arthur Ruona place, is located in this allotment. There are also three cairns of unknown function and one isolated find.

3.6.3.2 SUMMARY OF HERITAGE RANGE INVENTORIES

In all, thirty-five (51%) range water improvements have sites on or adjacent to them. Twenty-four of these projects were inventoried prior to the 2001 survey, and twelve of them had sites recorded in the analysis area. Prior to 2000, efforts were made to avoid the sites by relocating the improvement and any other ground disturbing activities related to the construction, outside of the site boundary. In all but one case, the site avoidance efforts were successful, however the effects of subsequent livestock use in and around the improvement was apparently not considered. The 2001 inventory addressed 63 range improvements and recorded 12 new sites found at 11 improvements.

The CCC may have built 24 range improvements of which at least two have since been reconstructed. Fifteen of the CCC range improvements were constructed on or adjacent to prehistoric sites. Two of the newly recorded sites may be related to the CCC – wooden tanks are still being used at the Hillside and Schliechart Draw. Schliechart reservoir is probably the best remaining structure still in use – the rock-lined spillway is still visible along the west side of the dam. Since the CCC improvements are now over 50 years old and associated with an important era in local, state and national history, any proposed reconstruction, cleanout, or removal activities would constitute an undertaking under the NHPA and would require formal consultation with the MTSHPO.

3.6.4 HERITAGE SITE MONITORING

All previously recorded sites within the analysis area were relocated and site condition assessments were made. This monitoring effort was conducted to determine grazing effects not only within the optimum to outer limits of grazing areas but to look at the effects at a landscape scale in an effort to discover potential effects that may occur independent of the water centered impact areas. The type and level of effect was recorded on site monitoring forms. Any sites displaying effects that might compromise site integrity and/or significance were evaluated for site eligibility and protective measures were proposed.

A total of 409 heritage sites are currently recorded within the analysis area. Forty-three of the heritage sites are isolated finds and were not relocated or monitored. A summary of the monitoring efforts and results of Field Research Services and Forest Service work in 2001 is captured in table format in Appendix A of the heritage report in the project files. Of the 366 monitored sites, sixty-five (18%) displayed some type of disturbance from livestock grazing. One quarter of the heritage sites have been disturbed by range water improvements due to the indirect effects of livestock trailing across sites on their way to these improvements or trampling and bedding on sites located adjacent to the improvements. Table III-23 summarizes the effects found by allotment.

Table III-23. Summary of Livestock Effects by Range Allotment

Allotment	Sites	Affected Sites	Trail	Trample	Trail and Trample	Spring	Well	Tank	Dam
North Cave Hills	258	44	30	16	10	6	0	2	3
South Cave Hills	27	5	3	1	1	1	0	0	1
East Short Pines	81	16	13	4	2	1	1	1	1
Totals	366	65	46	21	13	8	1	3	5

Livestock trailing was the most common disturbance to heritage sites with forty-six (12.5%) sites crossed by livestock trails. Formation of cattle trails is one indisputable consequence of livestock grazing and these trails generally connect favored grazing, resting and watering areas. Trails form along routes of least resistance such as the crest of ridges, in valleys, or parallel to contour lines. Identification of the level of impact from livestock trailing was based on the distance below the present ground surface (PGS) and vegetative cover (Walker and Heitschmidt 1986). Low impact trails would be level with the PGS and still support continuous but sparse vegetation; moderate impact trails are level or just below PGS with limited vegetation; and high impact trails would extend below the PGS and be void of vegetation. It should be noted that trail formation is essentially an edaphic manifestation of livestock behavior since cattle tend to move between locations in a pasture in a single file along the route of least resistance. The formation of trails has been found to develop regardless of grazing methods (Walker and Heiftschmidt 1986).

Of the forty-six sites crossed by cattle trails, 24 (55%) had severe impact trails, 19 (17%) had moderate and 3 (21%) had low impact trails. The most severe disturbance occurred as the trail reached a water development and the easiest travel route was most restricted due to the topography. Three spring developments, one tank, one well, and two reservoirs have severe trails across sites located adjacent or within 100 meters of the water source. Four sites are severely affected by trailing to three spring developments, one tank, one well, and two reservoirs. Severe impact trails across sites are of the most concern since these trails promote soil erosion, artifact movement, and expose buried

cultural deposit. In many cases where the travel route is restricted multiple severe impact trails develop as the trails reach a depth that prohibits livestock movement (generally around 25-30 centimeters). Loss of site integrity and cultural material that is in its natural or original place (in-situ) may be severe enough to compromise the importance of the site and its potential nomination to the NRHP.

Trampling was observed at 21 sites, of which nine were severely disturbed. Trampling was concentrated around spring, tank and reservoir developments where livestock tend to congregate, bed and lounge. Combined with grazing, vegetation cover is reduced, exposing cultural material to a greater degree of deflation from wind or water erosion. Trampling also compacts the soil, reduces rainfall infiltration and increases soil erosion.

The degree of damage associated with trampling at a particular site depends on soil type, soil water content, seasonal climatic conditions and vegetation type. Trampling dry soil will chum the soil surface, reducing the size of naturally occurring soil aggregates. Trampling moist soils destroys existing soil aggregates by compacting them into a comparatively impermeable surface layer composed of dense, unstable clods. Both dry and moist trampling is detrimental to infiltration rate and erosion, which has implications on site preservation of in-situ cultural deposits. Studies have indicated a 25-30 centimeter of "chummed" deposits can occur, mixing the cultural deposition of at least one thousand years.

The combination of trailing and trampling was found at thirteen sites, with nine of these sites exhibiting severe disturbance. Only two of the nine sites were located on or adjacent to water developments. According to Walker-Kuntz (2002) the effects of trailing and trampling were confined to an area one hundred meters or less from the water source. While the two sites near water sources had the severe disturbance confined to the 100 meter or less radius, the seven other sites were located along woody draws or in areas that provided grass and cover. These areas are often located within a mile of the water source.

The Forest Archaeologist and members of the IDT, including the District Range Technician, in an effort to identify specific measures that might remove, reduce or mitigate the severe impacts identified at that time, reviewed all sites identified as having severe effects from livestock grazing in the field during 2001 and 2002. Measures considered include removal of the range improvement, evaluative site testing, fencing, erosion control, and mitigation. A total of 26 sites were reviewed, including the twelve sites identified as threatened and needing evaluation and possible protection. Those sites are detailed in the heritage report in the project files.

3.6.4.1 HERITAGE SITE MONITOR SUMMARY

The field review found four sites (39HN20, 39HN467, 39HN571, and 39HN861) not eligible for nomination to the NRHP and no further work warranted. Two sites, 39HN 318 and 39HN704, could not be relocated by the monitor effort or during field review and were dropped from further analysis.

Two of the remaining twenty-two sites, 39HN157 and 39HN204 are considered heritage assets and are listed (39HN204) or eligible (39HN157) to the NRHP. Site treatments for these sites are described below. Ten of the 22 sites are located or adjacent to a developed water source such as a reservoir, well or spring. Five of these sites are located in the Schleichart Allotment. Cattle grazing, trailing, and trampling are affecting two sites near Schleichart reservoir. While actual construction of the reservoir

and Ducks Unlimited pond may have initially destroyed a portion of both sites, large portions of the sites retain integrity and may still have the potential to contribute important information.

It is interesting to note that the time of monitor has an important bearing on the observation of cattle effects. The two sites at Schleichart were monitored in the fall of 2001 and severe effects were found. These sites were reviewed last summer (2002) and then again in the spring in 2003. Severe trampling and trailing with little or no on site vegetation was found in 2002, supporting the 2001 observations. In the spring of 2003, however, all the trailing and trampled areas were grassed over. With a wet spring and no early grazing in the area the vegetation recovered and the sites stabilized. All observations need to be tempered with season, weather/climate, and grazing schedule factors so an accurate analysis of grazing effects on site integrity can be carried forward. From these limited observations, it appears that the analysis area is fairly resilient if precipitation is timely and the grazing regime appropriate. Temporary effects to the archaeological sites may be forgiven as long as these effects are allowed to recover through a change in grazing regime.

This is especially evident at 39HN98. The 2001 monitor indicated severe trailing and trampling while the 2002 fall review found all trails, regardless of depth and severity, grassed over and stabilized. Continued monitoring and removal of the salt block will be done.

The fourth site near a range improvement in the Schleichart Allotment is near an abandoned spring where cattle still gather to graze the lush vegetation around the seep. While the 2001 monitor found severe trailing and trampling these effects were covered by dense vegetation when field reviewed.

The last site, 39HN157, is a large site northeast of a reservoir where trailing down to the reservoir is evident at the site. This site was protected through the application of a dirt pad to protect the site from vehicle traffic, and field review of the site found the pad intact. The trailing occurring across the site does not affect the site in any significant manner.

One site, 39HN153, is located in the Pelham-Juberg Allotment and is a stone ring site where cattle are trailing across the site to reach a spring development below. Only one severe trail is noted, but continued trailing up and across the drainage is causing erosion down slope from the site.

Four sites, 39HN299, 318, 347, and 546, in the East Short Pines are found on or adjacent to water developments. Sites 39HN318 and 546 have recently been included in new range projects designed to avoid these sites, yet develop adequate water sources through a new pipeline and tank network. Continued monitoring will be necessary to discern the success of this project. The placing of a tank at 39HN347 appears to have successfully protected the site form further damage. Site 39HN299 has yet to be reviewed.

Twelve sites, all but one (39HN335 in the East Short Pines) are not near or adjacent to water sources or range improvements, but still display severe effects form cattle grazing. Field review found four sites, 39HN122, 39HN229, 39HN335, 39HN654, located along cow trails or trails leading to water sources. Three of the sites had severe trails but the trails did not threaten the integrity of the site at this time. Continued monitoring of these sites is recommended in case any changes in the grazing regime causes increased traffic across these sites. One site, 39HN335, awaits review.

Three sites, 39HN16, 39HN48 and 39HN170, are located along or just off the edge of the plateau along the easiest route to and from water sources. All three have severe trails but are not numerous

enough to cause a level of effect that would threaten site integrity. Fences that may have channeled the cattle along the fence line cross all these sites.

Another three sites, 39HN194, 200 and 204, are located along or in woody draws. The vegetation in the draws attracts cattle to "shade up". Effects of this attraction have had severe effects on 39HN204, Lightening Springs, where the sidewalls of the draw are caving in as the cattle continue to cross and lounge at the site.

The last site, 39HN518, is crossed by a road which channels the cattle to and from water. Located in a fairly shallow soils, the routes are somewhat stabilized to bedrock so the trailing, albeit severe, should not affect the site further.

Table III-24 describes the nine sites currently identified through monitoring and review efforts that are potentially eligible, eligible or listed on the NRHP and display effects severe enough to threaten the site eligibility and/or integrity. Reduction, removal and mitigation of effects on these nine sites are addressed by alternatives in the following chapter.

Table III-24. Summary of Heritage Sites with Severe Livestock Effects

Site Number	Site Type	Effect	Mitigation Measure
39HN64	Prehistoric camp	Reservoir, tank, severe trailing	Reduce effects through less livestock, different season of grazing
39HN89	Prehistoric camp	Reservoir, trailing, trampling	Reduce effects through less livestock, different season of grazing
39HN200	Prehistoric camp	Trailing	Reduce effects by blocking off access to woody draw from site
39HN122	Prehistoric camp with stone ring	Trailing	Effects may be reduced with new water source – monitor for any change in condition
29HN153	Stone ring	Trailing	Reduce erosion along trails by filling in deep trails and channeling cattle to one or two stable trails.
39HN204	Prehistoric camp	Trailing and trampling	Direct cattle crossing elsewhere. Close off access.
39HN654	Prehistoric camp	Trailing	Monitor to see if new water source redirects cattle trailing. If not, provide alternative route.
39HN318	Prehistoric camp	Trailing	Reduce effects through new water source. Monitor.
39HN546	Prehistoric camp	Trailing and trampling	Reduce effects through new pipeline – monitor

3.6.5 ENVIRONMENTAL EFFECTS

3.6.5.1 EFFECTS COMMON TO ALL ALTERNATIVES

Prehistoric and historic resources are a nonrenewable resource. Significant heritage resources have many values including their use to gather scientific information on human culture history, interpretive and educational value, values associated with important people and events of significance in our history, and often an aesthetic value such as a prehistoric petroglyph or an historic landscape. For Native American groups and other traditional culture groups archaeological and historic sites often have importance for religious and ceremonial purposes or simply as locations for traditional uses significant in a particular group's ongoing cultural identity. Significant heritage resources under the NHPA are called historical properties and have been formally evaluated in consultation with the SHPO. For this effort, all heritage resources in the analysis area are considered potentially eligible to the NRHP and are treated as historical properties unless they have been formally evaluated as Not Eligible or Eligible.

An effect, according to 36 CFR 800.9(a), may include an alteration to the property's characteristics of location, setting or use. Adverse effects are defined as those that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association and include but are not limited to:

- Physical destruction, damage or alteration of all or part of the property
- Alteration of the character of the setting when that character contributes to the property's qualification for the National Register
- Introduction of visual, audible or atmospheric elements that are out of character with the property or alter its setting.

A direct effect occurs when the action of the undertaking itself impacts the heritage resource. For example, ground-disturbing activities such as spring development, buried pipeline installation or road construction may damage or demolish a site. An indirect effect is not caused by the action itself but is the secondary result of the undertaking. An example would be the development of a spring source near a site that would result in livestock trailing across the site. Another example of an indirect effect would be the improvement of road systems into areas of known heritage resources that may result in artifact collection or heritage resource disturbance/destruction. Appendix A of the Heritage Report presents a summary of the sites within the analysis area that are presently being disturbed by livestock activity. Table 8 of the Heritage Report describes the nine sites identified with severe disturbance. The Heritage Report is located in the project record.

3.6.5.2 ALTERNATIVE 1: NO ACTION - MAINTAIN CURRENT MANAGEMENT

Under this alternative the current management practices would continue. All range water improvements and fences would remain in place. The continued livestock use of the analysis area, under current management practices, will result in continued disturbance to the sixty-five sites that are identified in Appendix A of the Heritage Report. Livestock trampling and trailing will continue at nine sites identified with severe disturbance. Under the NHPA, this undertaking may require the evaluation of 8 sites identified with severe disturbance and the mitigation of 39HN204 and any other sites found to meet the evaluation criteria defined in Section 106 of the NHPA. With an anticipated continued, or possibly an increase in, vegetation cover loss and ground erosion, particularly at lithic artifact scatter sites, opportunities for illegal artifact collection and/or vandalism will likely continue or increase.

3.6.5.3 ALTERNATIVE 2: NO GRAZING

Under this alternative all livestock and existing range improvements would be removed. The removal of livestock will result in a reduction or elimination of livestock disturbance to the 65 sites identified in Appendix A of the Heritage Report found in the project file.

The removal of any existing range improvements will result in ground disturbance. All heritage sites in and around these improvements could be affected and mitigation or avoidance of these sites would be required. At least 24 improvements associated with the CCC would be destroyed resulting in the loss of the historical context and setting of these important resources. The removal of livestock grazing and the related facilities also affects the historical landscape of the analysis area that has developed over the last 100 years. Documentation of this change may be required by the SDSHPO to mitigate the loss of this important context.

With the elimination of the range program in the Analysis area continued research at known heritage sites, and identification of new sites, would likely be reduced if not totally eliminated due to the lack of range support funding. While monitoring of known sites would continue, as required under the deferred maintenance program, opportunities for additional investigations may be confined to short-term/limited funding projects such as Passport In Time or to catastrophic events such as wildfires or flooding.

Illegal artifact collecting by local amateurs has occurred at several sites for years. Fewer administrative visits will likely result in an increase in this type of illegal activity at recorded and unrecorded sites.

3.5.6.4 ALTERNATIVE 3: PROPOSED ACTION

Under this alternative there will be an adjustment to the grazing management practice with the goal to improve the ecological integrity, improve livestock distribution and reduce or eliminate livestock effects to heritage resources. Any new or replacement of range improvements would be inventoried for heritage resources. This inventory would not only include the specific 10 acre block around the proposed location as dictated by the SIS but an inventory of areas surrounding the improvement to record any sites that could be trailed and/or trampled by livestock traveling to and using the new facility. Final placement of the improvement would be designed to avoid any of the direct and indirect effects. The effects to the heritage resources are discussed by allotment below.

North Cave Hills

This unit has the highest number of sites (258) and the corresponding highest number of sites affected by livestock grazing (44 sites). The relative percent of sites affected (17%) is within a percent or two with the other units in the analysis area. Seven of the 44 sites have been severely affected.

Pelham-Juberg

Fourteen sites are currently being affected by livestock grazing, four of which are considered severely affected. The proposed allotment prescription will reduce or eliminate severe effects to all four sites through relocation of water sources (39HN153), minimizing trailing impacts by deflecting livestock off sites (39HN153, 39HN204), and improving access to water (39HN122, 39HN654).

Schleichart

Nineteen sites are currently being affected by livestock grazing, three of which are considered severely affected. The proposed allotment prescription may reduce severe effects to 39HN64 and 39HN89 by relocating the Schliechart tank away from the reservoir and using salting and new pasture fence to more evenly distribute grazing. Monitoring of these sites for improvement through utilization studies will be essential for gauging the success of these prescriptions, and the possible need for prescription modifications.

Jenkins

Livestock grazing is currently affecting three sites, however none are being affected severely. The change from winter to summer grazing may increase effects to archaeological sites and a comprehensive monitoring schedule will be necessary to assess this potential effect.

Davis Draw

Livestock grazing is not severely affecting the eight sites located in this allotment. Reduction of stocking levels may aid in the overall reduction of effects to archaeological sites.

South Cave Hills

Twenty-seven sites are recorded within the South Cave Hills, of which five (19%) are affected at some level by cattle grazing. None of the five sites are severely affected. Heritage monitoring of affected sites will gauge the reduction of impacts through better range management in this unit. Range utilization studies will aid in gauging any changes in site condition.

East Short Pines

Sixteen of the 81 sites in this unit have been affected at some level by livestock grazing (19%). At least two of the 44 sites have been severely affected.

Box Springs

Six of the sites in this allotment have been affected by livestock grazing, two severely. Reconstruction of Fox Spring and plugging fox well should reduce or eliminate effects to 39HN318. Construction of pipeline and the addition of two tanks should reduce the effects to 39HN546 by better livestock distribution.

Dunn

Six sites in this allotment have been affected by livestock grazing, One site identified as severely affected needs field review to develop methods to reduce or eliminate these impacts. Plans to better distribute livestock in the southwest corner of the allotment may alleviate impacts to 39HN299. Monitor of this area would be required to see if the impacts have been reduced.

Lone Mountain

Four sites in this allotment have been affected by livestock grazing, two possibly severely. Field review of 39HN335 and 39HN571 is necessary to verify site condition, and any needed protection measures. Monitoring of these sites is included in the allotment prescription.

3.6.5.5 SUMMARY OF EFFECTS

It appears that better range management practices that alleviate the general effects to soil, vegetation and water sources in this alternative will also help to improve the conditions of, and preserve, our heritage sites. Continued presence of Forest Service personnel within the allotment may discourage illicit artifact collection and site vandalism.

All of the allotment plans will require intensive heritage site monitoring to measure the effectiveness of stocking rate reduction and implementation of the utilization standards relative to a baseline character at each site. Monitoring is outlined in Table II-8 located in Chapter II of this EA. A detailed monitoring plan is essential to this effort and will be implemented within the analysis area in order to assess the effectiveness of Alternative 3. This plan will involve establishing photo points from which site conditions will be documented. The extent of ground disturbance at sites will be measured from established focal points during various times of the year also. This monitoring plan will also incorporate range utilization studies and be based upon a dynamic range management plan that may necessitate specific changes if continued site disturbances are observed.

3.6.5.6 CUMULATIVE EFFECTS

The analysis area is the boundary for the effect analysis for heritage. This area has been used for livestock grazing in some manner for over one hundred years and is now a part of the historical landscape of the Cave Hills and East Short Pines. The establishment of the Forest Reserves in 1906 began the organization of the analysis area into allotments that included grazing prescriptions to improve the rangeland and provide better forage for livestock. In the 1930s, the CCC constructed numerous reservoirs and spring developments to provide improved water sources for livestock use. Changes in allotment boundaries and prescriptions through the years have responded needs to improve the range ecology of these unique areas. Out of 409 heritage sites, and over 100 years of livestock grazing, the present levels and prescription of livestock use currently affect 65 sites. The continued improvement and implementation of more intensive range management practices designed to alleviate the impacts of livestock grazing to soil, vegetation and water sources will also continue to improve the conditions of sites affected by livestock grazing and preserve the heritage resources.

3.7 TES WILDLIFE SPECIES

The effects to wildlife species of concern are disclosed in the following section order:

- USFWS Federally listed species.
- Forest Service Region-1 Sensitive Species
- Habitat Indicator Species and Key Species
- Aquatic Species
- Other Wildlife Species

The Custer National Forest established a list of management indicator species (MIS) based upon NFMA regulations criteria (USFS, 1986, p. 19 and 180). The concept of MIS includes both biological indicators (those species that represent a whole group of other species that use the habitat similarly), as well as species of high interest, such as major hunted species and those listed as threatened or endangered. Biodiversity as applied and considered in this analysis (see glossary) is based on a course filter (MIS) / fine filter (TES) process which includes associated habitats. The analysis assumes habitat is a surrogate for wildlife and plant populations. Several recent court decisions have supported this approach to management concerning project analysis in relation to 36CFR 219.19 [Inland Empire Public lands Council v. USFS, 88 F.3d 754, 760 (9th Cir. 1996) and Idaho Sporting Congress v. Thomas 137 F. 3d 1146 (9th Cir. 1998)] and for programmatic plans and the NFMA diversity provision [Northwest Forest Plan – Seattle Audubon Soc. v. Mosely, 871 F. Supp. 1291 (W.D. Wash. 1994) aff'd 80 F. 3d 1401 (9th Cir. 1996)].

3.7.1 USFWS LISTED SPECIES

The Ranger District does not provide habitat designated as "Critical" for any federally listed species. In addition, the analysis area does not contain any specially designated habitats relative to federally listed or proposed species nor USFS Northern Region sensitive species (Bosworth, March 12, 1999).

A. Bald eagle (Threatened)

There would be *no effect* on the bald eagle from the preferred alternative because there is no suitable habitat for this species in the analysis area.

B. Black-footed ferret (Endangered)

There would be *no effect* on the black-footed ferret from the preferred alternative because there is a lack of adequate acreage of prairie dog towns to support black-footed ferrets.

There would be no cumulative impacts to any USFWS Listed or Proposed species. A complete Biological Assessment (BA) was completed for USFWS Federally Listed Threatened, Endangered, or Proposed Wildlife Species, and that document is in the analysis files.

3.7.2 USFS SENSITIVE WILDLIFE SPECIES

3.7.2.1 AFFECTED ENVIRONMENT

Sensitive Species are "Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

- Significant, current or predicted downward trends in population numbers or density; and,
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. (FSM 2670.5, P. 12, 6/23/95)

The current USFS Northern Region (R1) sensitive species list (Bosworth, March 12, 1999) was reviewed and species absence and presence is summarized. Table III-25 lists the wildlife species considered in this and those species present or potentially present in the analysis area. Detailed habitat information for each species is in the Wildlife Specialist Report in the analysis files.

Table III-25: Forest Service R-1 Wildlife Sensitive Species on the Custer National Forest

Species	Considered in Analysis [1]	Existing Habitat
Peregrine falcon	Yes	Migrant, no existing eyries in or adjacent to the analysis area.
Bighorn sheep	No	Non-existent within and immediately adjacent to the analysis area.
Townsend's big-eared bat	Yes	Known habitat exists within or immediately to the analysis area.
Pallid bat	No	Non-existent within and immediately adjacent to the analysis area.
Spotted bat	Yes	Potentially present based on suitable habitat.
Northern goshawk	Yes	Potential nest habitat present, but limited in distribution; no known nests
Black-tailed prairie dog	Yes	Known habitat exists within or immediately to the analysis area, limited to one town in the South Cave Hills.
White-tailed prairie dog	No	Non-existent within and immediately adjacent to the analysis area.
Burrowing owl	Yes	Typically nests in burrows of prairie dogs, ground squirrels, or other small mammals.
Sage grouse	Yes	Potential nest habitat present, but limited in distribution; no known leks.
Greater prairie chicken	No	Non-existent within and immediately adjacent to the analysis area.
Fisher	No	Non- existent within and immediately adjacent to the analysis area (Foresman, 2001, p. 203-205).
Northern bog lemming	No	Non- existent within and immediately adjacent to the analysis area (Foresman, 2001, p. 125-126).
Flammulated owl	No	Non- existent within and immediately adjacent to the analysis area (Skaar, 1996, p. 57).
Black-backed woodpecker	No	Non- existent within and immediately adjacent to the analysis area (Skaar, 1996, p. 67).
Yellowstone cutthroat trout	No	Non-existent within and immediately adjacent to the analysis area.
Baird's sparrow	Yes	Potentially present based on suitable habitat.
Sprague's pipit	Yes	Potentially present based on suitable habitat.
Loggerhead shrike	Yes	The species nests in woody draws of grasslands. Known existing habitat is present and the species is potentially present in the analysis area.
Boreal toad	No	Non-existent within and immediately adjacent to the analysis area.

Table III-25: Forest Service R-1 Wildlife Sensitive Species on the Custer National Forest

Species	Considered in Analysis [1]	Existing Habitat
Northern leopard frog	Yes	Inhabits streams, springs, and reservoirs. Known habitat exists adjacent to analysis area and potential habitat occurs within the analysis area.
Tawny crescent butterfly	Yes	Potentially present based on suitable habitat.
Regal fritillary butterfly	Yes	Potentially present based on suitable habitat.
Dakota skipper butterfly	No	Non-existent within and immediately adjacent to the analysis area. Outside of known range; absence of suitable tall grass prairie.
Belfragi's chlorochroan bug	No	Non-existent within and immediately adjacent to the analysis area.
Sturgeon chub	No	Non-existent within and immediately adjacent to the analysis area. (See Aquatic Ecosystem/Fisheries report.)

[1] **No** = No further analysis will be completed; **Yes** = Considered in analysis.).

3.4.2.2 ENVIRONMENTAL CONSEQUENCES

Table III-26 notes the determinations of effects on Northern Region Sensitive Wildlife Species for the analysis area.

Table III-26: Determination of Effects on USFS Northern Region Sensitive Wildlife Species. [1]

Species	Alternative 1 (No Action)	Alternative 2 (No Grazing)	Alternative 3 (Proposed Action)
Peregrine flacon	MIIH	NI	MIIH
Townsend's big-eared bat	MIIH	NI	MIIH
Spotted bat	MIIH	NI	MIIH
Northern goshawk	MIIH	NI	MIIH
Black-tailed prairie dog	BI	NI	BI
Burrowing owl	MIIH	NI	MIIH
Sage grouse	MIIH	NI	MIIH
Baird's sparrow	MIIH	NI	MIIH
Sprague's pipit	MIIH	NI	MIIH
Loggerhead shrike	MIIH	NI	MIIH
Northern leopard frog	MIIH	NI	MIIH
Tawny crescent butterfly	MIIH	NI	MIIH
Regal fritillary butterfly	MIIH	NI	MIIH

[1] **NI** = No impact. **MIIH** = May impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species. **BI** = Beneficial.

3.7.2.3 USFS SENSITIVE WILDLIFE SPECIES – CUMULATIVE EFFECTS

Peregrine Falcon

Considering past, present, and reasonably foreseeable activities, Alternatives 1 (No Action), 2 (No Grazing), and 3 (Proposed Action) would have no direct, indirect, or cumulative effect on peregrine

falcon associated with nest sites as no nest sites are present. Other present activities including recreation, and reasonably foreseeable future actions such as oil and gas leasing, exploration, and development are expected to have negligible additional effects for Alternative 1 and 3 and not impacts for Alternative 2 on the peregrine falcon.

Townsend's Big-Eared Bat

Considering past, present, and reasonably foreseeable future actions there would be no impact to hibernacula or survey sites for this bat species. Reasonably foreseeable future actions including oil and gas activities and wildfire could alter forage areas, though the location or extent of these impacts in unknown. The cumulative effects of all activities under Alternative 1, 2, and 3 would likely be negligible.

Spotted Bat

Reasonably foreseeable future actions (oil and gas activities, wildfire) could alter potential forage areas, though the location or extent of these impacts in unknown. Considering past, present, and reasonably foreseeable future actions Alternative 1 (No Action) and 3 (Proposed Action) would have minimal potential impact and Alternative 2 (No Grazing) no impacts on the spotted bat.

Northern Goshawk

Reasonably foreseeable future actions (including oil and gas activities, wildfire) could alter potential forage areas, though the location or extent of these impacts in unknown. Considering past, present, and reasonably foreseeable future actions Alternative 1 and 3 would have minimal potential impact associated with change in understory vegetation structure within mature forest stands compared to no impacts from Alternative 2.

Black-Tailed Prairie Dog

The past distribution of prairie dog towns in the analysis area is unknown, though some towns were likely present, though limited by physical and environmental conditions. The present distribution of prairie dogs towns is potentially a minimal area in the northeast South Cave Hills. There are no identified active towns within the analysis area. Reasonably foreseeable future actions that could alter prairie dog towns include wildfire, which could improve habitat (remove trees, reduce some visual barriers, increase grassland habitat) and ground disturbing activities (stock water sources, oil and gas related activities), which could provide loose soil areas and facilitate colonization of new areas. Direct mortality to prairie dogs could result from shooting under State hunting regulations under all Alternatives. Overall, and considering the past, present, and reasonably foreseeable activities of cumulative effects, Alternative 1 (No Action) and 3 (Proposed Action) could have slight improvements in potential habitat, and Alternative 2 (No Grazing) could because of higher resulting grassland structure and less physical soil disturbance (livestock hoof scuffing) result in a slightly inhibit colonization of areas by prairie dogs.

Burrowing Owl

The past distribution of burrowing owls in the analysis area is unknown, though some burrowing owls were likely present in prairie dog towns located along the base of the buttes. The present distribution of burrowing owls is potentially a minimal because of the limited distribution of suitable mammal burrows. Reasonably foreseeable future actions that could alter burrowing owl habitat include

wildfire, which could improve habitat (remove trees, reduce some visual barriers, increase grassland habitat). Overall, and considering the past, present, and reasonably foreseeable activities of cumulative effects, Alternative 1 (No Action) and 3 (Proposed Action) could have slight improvements in potential habitat, and Alternative 2 (No Grazing) a neutral effect. Alternative 2 could slightly limit colonization of areas by prairie dogs thereby limiting potential burrowing owl nest sites, but could also slightly increase the distribution of burrows from mammalian predators (e.g., badgers) that could prey on the increased number of small mammals associated with high grassland structure.

Sage Grouse

Past activities including livestock grazing, wildfire (2001 South Cave Hills), and installation of structures have reduced big sagebrush habitat though the acreage of these reductions are not known. Present ongoing activities (e.g., recreation use) are limited and not expected to add incrementally to changes in sagebrush habitat, but potentially may include grouse mortality associated with regulated hunting. Reasonably foreseeable future actions include oil and gas activities, wildfire, and regulated hunting.

Considering the past, present and reasonably foreseeable activities of cumulative effects, Alternative 1 (No Action) would continue to maintain the existing moderate sagebrush grassland structure compared to slight improvements under Alternative 3 (Proposed Action) and a higher rate of improvement in sagebrush grassland structure under Alternative 2 (No Grazing) for potential sage grouse habitat. Direct impacts to sage grouse would likely continue to include regulated hunting.

Baird's Sparrow

Past, present, and reasonably foreseeable activities of cumulative effects include periodic low-intensity wildfires, which removed vegetative cover in the short-term, but maintained grassland habitat in the long-term. Activities other than those associated with permitted livestock grazing, such as recreation, or reasonably foreseeable future actions such as oil and gas activities are expected to result in minor additional incremental reductions in the habitat for this bird. Overall, and considering the cumulative effects, Alternative 1 (No Action) would continue to limit suitable habitat and Alternative 3 (Proposed Action) could have a slight improvements in potential habitat, and Alternative 2 (No Grazing) the most potential improvement in habitat.

Sprague's Pipit

Past, present, and reasonably foreseeable activities of cumulative effects include periodic low-intensity wildfires, which removed vegetative cover in the short-term, but maintained grassland habitat in the long-term. Fires could also remove some scattered trees within grasslands, but likely retain sufficient trees to provide for nesting habitat. Activities other than those associated with permitted livestock grazing, such as recreation, or reasonably foreseeable future actions such as oil and gas activities are expected to result in minor additional increments to the habitat for this bird. Overall, and considering the cumulative effects, Alternative 1 (No Action) would continue to limit suitable habitat and Alternative 3 (Proposed Action) could have a slight improvements in potential habitat, and Alternative 2 (No Grazing) the most improvement in potential habitat for Sprague's Pipit.

Loggerhead Shrike

Past wildfires may have reduced some overstory trees in some woody draw habitat. Livestock use has reduced the ecological condition of some woody draws. Present recreation use likely has a minimal

impact to the loggerhead shrike. Reasonably foreseeable future actions include increased motor vehicle use on roads and incidental to shrikes feeding on grasshoppers and other insects along roads. Increased motor vehicle use would likely be associated with the trend in increased recreation use and likely oil and gas exploration, production and development. Considering past, present and reasonably foreseeable future actions Alternative 1 (No Action) would have the most impact on shrike habitat because of declining trends in woody draws (nest habitat) and associated grasslands. Alternative 3 (Proposed Action) would improve these woody draws that are at risk as well as adjacent grasslands over time. Alternative 2 (No Grazing) would potentially help improve woody draws for nest habitat and grasslands for foraging habitat over Alternative 1 and 3.

Northern Leopard Frog

Past activities have included uranium mining, oil and gas related activities, livestock grazing, and recreation. Present use includes oil and gas related activities at two existing well sites and ongoing recreation use, which are likely to have minimal impacts to the northern leopard frog and its habitat. Reasonably foreseeable future actions include increased oil and gas related activities and implementation of remediation of an abandoned uranium mine. The remediation would, over the long-term, potentially improve environmental conditions in several permanent ponds used by the northern leopard frog. Recreation use is likely to increase slightly over time. Considering past, present, and reasonably foreseeable future actions, Alternative 1 (No Action) would have a slight impact on the northern leopard frog compared to Alternative 3 (Proposed Action), which would have a slight improvement in habitat. Alternative 2 (No Grazing) would in terms of water sources have mixed effects of favoring riparian habitat, but having an unknown impact on permanent water sources.

Tawny Crescent Butterfly

Past activities have included wildland fire, prescribed fires, and livestock grazing have altered habitat though the extent of the change is unknown. Herbicide treatment for noxious weed has been limited to isolated weed infestation sites and likely had minimal or no impacts to this butterfly. Present activities include herbicide treatments to control or contain isolated noxious weed infestations are likely beneficial in the long-term since the actions help maintain native plants as habitat. Reasonably foreseeable future actions noxious weed control, oil and gas related activities, and abandoned uranium mine remediation actions, which are expected to have minimal change in the habitat of the tawny crescent butterfly. Wildfires could potentially alter extensive areas of habitat for this butterfly. Considering past, present, and reasonably foreseeable future actions, Alternative 1 (No Action) would maintain much habitat, but continue the declining trend in some woody draws currently classified as at risk, as compared to Alternative 3 (Proposed Action) which would maintain habitat in the short-term and improve it over the long-term. Alternative 2 (No Grazing) would improve habitat overall as compared to Alternative 1 (No Action) and 3 (Proposed Action).

Regal Fritillary Butterfly

Considering past, present, and reasonably foreseeable future actions, Alternative 1 (No Action) would maintain much habitat, as compared to Alternative 3 (Proposed Action), which would maintain more habitat in the short-term and improve it over the long-term. Alternative 2 (No Grazing) would improve habitat overall as compared to Alternative 1 (No Action) and 3 (Proposed Action).

3.7.3 HABITAT INDICATOR SPECIES-KEY SPECIES

3.7.3.1 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The goshawk was previously addressed as a USFS Northern Region sensitive species. The goshawk is also a Custer National Forest Habitat Indicator Species for old growth timber (1986, USFS, p. 18). Table III-27 notes the Habitat indicator species and key species considered (see glossary), and summarizes the environmental effects on those species. Detailed habitat information for each species is in the Wildlife Specialist Report in the analysis files.

Table III-27: Habitat Indicator Wildlife Species, Sioux Ranger District, Custer National Forest

Species	Habitat Indicators [1] Key Species [2]	Habitat	Habitat or Species Present (P) or Absent (A)	Alt. 1 No Action	Alt 2 No Grazing	Alt. 3 Proposed Action
Northern goshawk	HABITAT INDICATOR	Forest: old growth. Nests in mature forest containing suitable prey species. Previously discussed under Sensitive species.	P	O	O	O
White-tailed deer	HABITAT INDICATOR KEY SPECIES	Forest: dog hair ponderosa pine. Riparian habitat, ponderosa pine forest. Dog-hair ponderosa pine and riparian.	P	O	+	+
Ruffed grouse	HABITAT INDICATOR	Forest: aspen	A			
Western kingbird (Ashland R. D.)	HABITAT INDICATOR	Forest: open savanna. Woody draws in prairie (open savanna) provide habitat.	N/A			
Lark sparrow (Sioux R. D.)	HABITAT INDICATOR	Forest: open savanna. Woody draws or scattered shrubs in prairie (open savannah) provide habitat.	P	-	+	+
Northern oriole	HABITAT INDICATOR	Riparian: tree. Riparian areas contain deciduous trees provide habitat.	P	O	+	O
Yellow warbler	HABITAT INDICATOR	Riparian: shrub. Shrubby riparian areas provide habitat.	P	O	+	O
Ovenbird	HABITAT INDICATOR	Hardwood draw: tree	P	O	O	O
Rufous-sided towhee	HABITAT INDICATOR	Hardwood draw: shrub	P	-	+	O
Brewer's sparrow	HABITAT INDICATOR	Evergreen shrubs: sagebrush	P	-	+	+
Sharp-tailed grouse	HABITAT INDICATOR KEY SPECIES	Prairie grasslands. Woody draws and grasslands.	P	O	+	+
Cutthroat trout	HABITAT INDICATOR KEY SPECIES	Aquatic: cold water. Previously addressed - Sensitive Species	A			
Largemouth bass	HABITAT INDICATOR	Aquatic warm water	P	O	O	O
Elk	KEY SPECIES	Forest and grasslands. (potential habitat)	P	O	+	+
Golden eagle	KEY SPECIES	Cliffs, mature forest, and grasslands.	P	O	+	+

Table III-27: Continued						
Species	**Habitat Indicators [1] Key Species [2]**	**Habitat**	**Habitat or Species Present (P) or Absent (A)**	**Alt. 1 No Action**	**Alt 2 No Grazing**	**Alt. 3 Proposed Action**
Merlin	KEY SPECIES	Forest, woody draws, and grasslands.	P	O[1]	+[1]	+
Mule deer	KEY SPECIES	Ponderosa pine forest, juniper forest, woody draws and sagebrush grasslands.	P	O	+	+
Bighorn sheep	KEY SPECIES	Cliffs and grasslands.	A			
Pronghorn antelope	KEY SPECIES	Grasslands.	P	O	+	+

[1] "O" equates to Neutral Effects; "+" equates to Beneficial Effects; and "–" equates to Negative Effects

White-Tailed Deer

Alternative 1 (No Action) would maintain most habitats, but some local areas (woody shrubs) could continue to decline for the white-tailed deer as compared to Alternative 2 (No Grazing) and Alternative 3 (Proposed Action). Alternative 2 (No Grazing) would generally improve woody draw structure through an absence of grazing and trampling over that of continued grazing in Alternative 1 (No Action) and 3 (Proposed Action). Considering past, present, and reasonably foreseeable future actions, Alternative 1 (No Action) would maintain much habitat, as compared to Alternative 3 (Proposed Action), which would maintain more habitat in the short-term and improve it over the long-term. Alternative 2 (No Grazing) would improve habitat overall beyond that of Alternative 1 (No Action) and 3 (Proposed Action).

Lark Sparrow

Alternative 1 (No Action) would maintain most habitats, but some local areas could continue to decline for the lark sparrow as compared to Alternative 2 and Alternative 3. Alternative 2 (No Grazing) would generally improve grassland structure through an absence of grazing and trampling over that of continued grazing in Alternative 1 (No Action) and 3 (Proposed Action). Considering past, present, and reasonably foreseeable future actions, Alternative 1 (No Action) would maintain more habitat, as compared to Alternative 3 (Proposed Action), which would maintain more habitat in the short-term and improve it over the long-term. Alternative 2 (No Grazing) would improve habitat overall as compared to Alternative 1 (No Action) and 3 (Proposed Action).

Northern Oriole, Yellow warbler, Ovenbird, spotted (Rufous-sided) towhee

Alternative 1 (No Action) and Alternative 3 (Proposed Action) are likely to maintain riparian trees and shrubs and woody draws the existing condition compared to slow improvement in habitat in Alternative 2 (No Grazing). Mature forests are likely to remain the same under all Action Alternatives. Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) likely to generally maintain riparian and woody draw condition, though some areas may decline, compared to and relatively static conditions in Alternative 3 (Proposed Action) and slow improvements in the long-term in habitat in Alternative 2 (No Grazing).

Brewer's sparrow

Alternative 1 (No Action) and Alternative 3 (Proposed Action) are likely to maintain sagebrush grasslands in the existing condition compared to slow improvement in habitat over the long-term in Alternative 2 (No Grazing). Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) and Alternative 3 (Proposed Action) are likely to maintain sagebrush grasslands compared to slow improvement in habitat in Alternative 2 (No Grazing).

Sharp-tailed grouse

Alternative 1 (No Action) and Alternative 3 (Proposed Action) are likely to maintain grasslands in the existing condition compared to slow improvement in habitat including grassland structure in Alternative 2 (No Grazing). Under Alternative 1 (No action) some isolated areas may slowly decline (e.g., Davis Draw), but not under Alternative 2 and 3. Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) and Alternative 3 (Proposed Action) are likely to maintain grasslands compared to modest improvement in habitat in Alternative 2 (No Grazing).

Largemouth Bass

The largemouth bass is discussed under "Aquatic Habitat" section later in this document.

Elk

While all Alternatives would maintain potential elk habitat, Alternative 1 (No Action) would continue a downward trends in some portions of woody draws and grasslands, compared to Alternative 3 (Proposed Action) which would modify livestock grazing to improve trends in the identified woody draws currently at risk and improve adjacent grasslands. Alternative 2 (No Grazing) would improve existing trends in woody draws at risk and generally improve forage for potential elk habitat. Management Area N, woody draws, includes aspen stands (USFS, Oct. 1986, p. 83). Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline in ecological condition along with some woody draws (Management Area N) compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands and woody draws would slowly improve in ecological condition and improve habitat in Alternative 2 (No Grazing).

Golden Eagle

All Alternatives would likely result in minimal risk of disturbance to existing golden eagle nest sites and maintain existing habitat in the short-term because of the projected low intensity, relatively short period of disturbance, and season of use. In the long-term foraging habitat on NFS lands under Alternative 1 (No Action) would likely slowly decline compared to a static to slow improvement under Alternative 3 (Proposed Action) or slow though more comprehensive improvement in foraging habitat under Alternative 2 (No Grazing).

Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline along with some woody draws (Management Area N) compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands and woody draws would slowly

improve in ecological health and improve habitat, in Alternative 2 (No Grazing). Prey species would likely follow overall vegetation condition trends over the long term.

Prairie falcon

All Alternatives would likely result in minimal risk of disturbance to existing prairie falcon nest sites and maintain existing habitat in the short-term because of the projected low intensity, relatively short period of disturbance, and season of use. In the long-term foraging habitat on NFS lands under Alternative 1 (No Action) would likely slowly decline compared to a static to slow improvement under Alternative 3 (Proposed Action) or slow though more comprehensive improvement in foraging habitat under Alternative 2 (No Grazing). Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands would slowly improve in ecological health and improve habitat, in Alternative 2 (No Grazing). Prey species would likely follow overall vegetation condition trends over the long term.

Merlin

All Alternatives would likely result in minimal risk of disturbance to existing merlin nest sites and maintain existing habitat in the short-term because of the projected low intensity, relatively short period of disturbance, and season of use. In the long-term foraging habitat on NFS lands under Alternative 1 (No Action) would likely slowly decline compared to a static to slow improvement under alternative 3 (Proposed Action) or slow though more comprehensive improvement in foraging habitat under Alternative 2 (No Grazing).

Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline along with some woody draws (Management Area N) compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands and woody draws would slowly improve in ecological health and improve habitat, in Alternative 2 (No Grazing). Prey species would likely follow overall vegetation condition trends over the long term.

Mule Deer

The effects for mule deer are the same as those previously described for elk.

Pronghorn antelope

While all Alternatives would maintain pronghorn habitat, Alternative 1 (No Action) would continue a downward trends in some portions of grasslands, compared to Alternative 3 (Proposed Action), which would modify livestock grazing to improve trends in grasslands. Alternative 2 (No Grazing) would improve existing trends in grasslands and generally improve more habitat for pronghorn. Hunting as regulated by SDGFP has occurred in the past and would likely continue in the future. Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands would slowly improve in ecological health and improve habitat in Alternative 2 (No Grazing).

3.7.4 AQUATIC SPECIES

3.7.4.1 AFFECTED ENVIRONMENT

Northern Region sensitive fish species that are known to exist in western South Dakota include the sturgeon chub (*Macrhybopsis gelida)* and the sicklefin chub (*Macrhybopsis meeki*). Rare or sensitive fish species documented as present in the Natural Heritage Database by South Dakota Game and Fish for Harding County include sturgeon chub (*Macrhybopsis gelida)* and Lake Chub (*Couesius plumbeus*). These species were both last observed in the main stem Little Missouri River in 1976. Both the sturgeon chub and sickle fin chub are known to inhabit primarily the main channels of large turbid rivers. Habitat conditions in the small streams found in the analysis area are not suitable for these species.

All Alternatives would result in "No Impact" to the sturgeon chub and sicklefin chub as these Northern Region sensitive fish species are absent from the analysis area and adjacent streams.

According to McClure (Sept 3. 2002) limited information exists on fish populations in the analysis area. The area is primarily drained by Bull Creek a tributary to the South Fork of the Grand River. Fish species documented as present in Bull Creek on 6/28/95 midway between the North and South Cave Hills (T21N-R5E-Sec 16) as determined through seining, included green sunfish, fathead minnow, and creek chub (Meester, 1995). An additional sampling effort on Campbell Creek (T21N-R5E-SEC 3), a tributary to Bull Creek, revealed the presence of fathead minnow and brook stickleback. Browns Pond a 40-acre, 12-foot deep reservoir recently acquired by the Forest Service is located on Campbell Creek and supports a population of white crappie and a few rainbow trout.

According to Deisch (Feb. 25, 2002, p. 2) Brown's pond was sampled by SDGFP personnel in 2000 and found to have an extremely high density of black crappie and green sunfish. Stocking records indicate that Brown's Pond has been managed as a trout fishery and has received rainbow trout stocking since 1982. Based on the current abundance of crappie and use by local anglers, the SDGFP suggested it might be more appropriate to manage Brown's Pond as a warm water fishery and suggested stocking with largemouth bass.

3.7.4.2 ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action) and Alternative 3 (Proposed Action) are expected to result in no impacts to fisheries in Brown's Pond because the area around the pond is excluded from the grazing allotment. Alternative 2 (No Grazing) – No effects to non-native populations of crappie, trout, and possible largemouth bass (MIS) in Browns pond are expected due to the exclusion of the pond grazing and any other incidental grazing. Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action), Alternative 2 (No Grazing, and Alternative 3 (Proposed Action) are all expected to have minimal to no effects on fisheries.

3.7.5 OTHER WILDLIFE SPECIES

Wild Turkey (Introduced Species)

Overview - The wild turkey (*Meleagris gallopavo*) has been in South Dakota only since 1948 and in the analysis area since the late 1950's (Hauk and Halseth, May 1995, p. 1). Wild turkey are reported to

have moved out of the Montana long pines where they were introduced in 1955, and winter along Little Missouri River (Baylor and Rosine, 1970, p. 39).

The analysis area is adjacent to the state boarder of South and North Dakota. The wild turkey was never native to North Dakota (Johnson and Knue, 1989, p. 243). Wild turkeys are not particularly well adapted to North or South Dakota and their survival depends on a great extend on the generosity of farmers, ranchers and wildlife groups. Without landowner tolerance and supplemental feed, turkey cannot survive the winters in most areas of North Dakota (Johnson and Knue, 1989, p. 243) and by inference in Harding County, South Dakota.

Forest Plan - The wild turkey was not identified as an MIS species in the Custer Forest Plan (USFS, Oct. 1986, p. 17). The Custer Forest Plan does address wild turkey (along with white-tailed and mule deer) as "selected species" within Management Area " (1986, USFS, p. 53, Col. 1). The goal of the Management Area D is "To maintain or improve the long-term diversity and quality of habitat for the selected species identified by Ranger District as well as accommodating other resource management activities...." Management Area D is identified in a portion of the East Short Pines.

Population Trend - Trend data for Black Hills turkey broods show a low to declining turkey numbers over the past four years, most notably in 1992 and 1993 when it is believed spring snowstorms hampered brood production and survival. The young: hen ratio was (3.99) for the period 1992-1994 and was the lowest for any four-year period on record as of 1994 (Hauk and Halseth, May 1995, p. 5).

Environmental Effects: While all Alternatives would maintain wild turkey habitat, Alternative 1 (No Action) would continue a downward trends in some portions of woody draws and grasslands, compared to Alternative 3 (Proposed Action) which would modify livestock grazing to improve trends in the identified woody draws currently at risk and improve adjacent grasslands. Alternative 2 (No Grazing) would improve existing trends in woody draws at risk and generally improve forage for potential wild turkey habitat. Management Area “N” woody draws includes aspen stands (USFS, Oct. 1986, P. 83).

Reasonably foreseeable future actions include wildfires and oil and gas related activities. The past level of hunting activity is likely to increase slightly in the future. All Alternatives would maintain ponderosa pine forests, as livestock grazing does not directly impact these habitats. The greatest risk in terms of habitat would be from loss of habitat from wildfires, which could remove foraging areas in the short-term and forest and woody draw cover in the long-term.

Considering the cumulative effects of past, present, and reasonably foreseeable future actions Alternative 1 (No Action) is likely to maintain most grasslands though some could slowly decline along with some woody draws (Management Area N) compared to stable to improving conditions in these habitats in Alternative 3 (Proposed Action). Grasslands and woody draws would slowly improve in ecological health and improve habitat in Alternative 3 (No Grazing).

3.8 RARE PLANTS

3.8.1. INTRODUCTION

Forest Service policy regarding Biological Evaluations for Sensitive Species is summarized in Forest Service Manual (FSM) 2672.4. The intent of the Biological Evaluation process is to assess the potential impacts of proposed management activities, and ensure that such activities will not jeopardize the continued existence of:

- Species listed, or proposed to be listed, as Endangered or Threatened by the U. S. Fish and Wildlife Service, and,
- Species designated as sensitive by the Regional Forester.

Interagency cooperation between the Forest Service and the USFWS, regarding proposed, threatened or endangered species is described in Section 7 of the Endangered Species Act. Definitions relating to "consultation" and "conference" are given in FSM Supplement 2600-90-6. Currently, no federally listed known or suspected Threatened or Endangered plant species or critical habitat occurs on lands managed by the Custer National Forest. There are no plant species that are currently a proposed threatened species on the Sioux District of the Custer National Forest.

3.8.2 FOREST PLAN MANAGEMENT DIRECTION

The Custer Forest Plan provides limited forest-wide management direction for threatened or endangered plant species. The Forest Plan provides general management direction (page 3) that indicates; "the goal for the management of Threatened and Endangered plant and animal species is to provide habitat that contributes to the recovery of the species". Page 17 of the Plan indicates that no federally listed threatened or endangered plant species occur on the National Forest units of the Custer National Forest at the time the Forest Plan was prepared (1986). Since that time, there continues to be no plants designated as Threatened or Endangered that occur within the Custer National Forest. Within the framework of the Custer Forest Plan, direction is given to manage for retention of habitat of unique plant species that include sensitive species (Forest Plan, p. 20 and Appendix VII). Specific management area standards and goals for management areas B, D, E, M, and N are silent on the topic of sensitive plant species.

3.8.3 AFFECTED ENVIRONMENT

A literature review was conducted for this analysis with the intent of identifying if plant species classified as "sensitive" may potentially exist within the analysis area. A number of data sources were reviewed in order to compile a list of plant species that may potentially be found in the analysis area and, therefore, should be evaluated in this Environmental Assessment. These include the South Dakota Natural Heritage Program (SDNHP, 2002), previous botanical surveys in the analysis vicinity (1994 Heidel survey and 2001 Forest Service surveys), and the 1999 Region One sensitive species list.

Field surveys for the plants listed as high potential for occurrence were conducted during the 2001 field season by Custer National Forest staff. Plant surveys emphasized reconnaissance of habitats where sensitive plants might occur in areas of moderate to high grazing. Surveys were conducted at intensity level of "Limited Focus".

Many species are listed as sensitive for the Custer National Forest. Portions of the Custer Forest fall within various ecological settings, ranging from the Northern Great Plains, the Northern Great Basin, and the Northern Rocky Mountains. As a result of a review of existing information relative to species extent of distribution and ecological requirements, a list of sensitive plant species have been screened as to its potential habitat by district. The seven sensitive species for the Sioux Ranger District are specific by state (Montana or South Dakota). Even though the analysis area is entirely in South Dakota, the surveyors were watching for species listed in each state. However, only the five species with potential habitat on the South Dakota portion of the Sioux District were evaluated for inclusion in this analysis, since the analysis area is all within the state of South Dakota.

The following Table III-28 provides a list of sensitive plant species that have been screened for inclusion in this assessment. Only the five South Dakota species will be carried forth into the analysis. A complete Biological Evaluation document was completed and provides a complete list of sensitive plant species considered, with detailed habitat information for each species. The Biological Evaluation for Sensitive Plants is in the project files.

Table III-28: Sensitive Plant Species Considered for the Analysis Area

Common Name	Scientific Name	Habitat	Closest known population	Potential of Occurrence	Vulnerability to Effects from Livestock
Dakota buckwheat (Known)	*Eriogonum visherii*	Barren, often bentonitic badlands slopes and outwashes in the plains.	Slim Buttes - Irish Butte (S. of Mtn Ranch Sp. #1); approx. 40 air miles from analysis area	High	Low
Barr's milkvetch (Suspected)	*Astragalus barrii*	Gullied knolls, buttes, and barren hilltops, often on calcareous soft shale and siltstone.	West of Ekalaka Hills; approx. 60 air miles from analysis area	Moderate	Low
Golden stickleaf (Suspected)	*Mentzelia pumila*	Open gravelly or sandy ground, roadsides, dry clearings, washes. Desert shrubland/woodland in the valley and foothill zones.	NE WY, S Central MT, SW ND; approx. 200+ air miles from analysis area	Low	Low
Mountain bluebells (Known)	*Mertensia ciliata*	Forested slopes-damp thickets in course to medium textured soils. Valley bottoms associated with springs, seeps, and spring fed watercourses. Intermediate shade tolerance. Very drought intolerant. The Slim Butte population is located on the lower slope of a steep north facing slope. Usually occurs in wetlands, but occasionally found in non-wetlands.	Known in Tepee Canyon of Slim Buttes; West Short Pines – 1912 Collection (land ownership unknown); – approx. 40 air miles from analysis area	High	Low
Prairie gentian (Known)	*Gentiana affinis*	Wet meadows, shores, springs, seepage areas and low prairie	Collected in 1910 from "Cave Hills" & described as abundant. Spring fed springs (most in hardwood draws) in the N. and S. Cave Hills were extensively surveyed in 1994. No plants were found.	High	Low to Moderate

3.8.4 ENVIRONMENTAL CONSEQUENCES

The risk of adverse effects from proposed project activities was evaluated for five sensitive plants. No proposed, endangered, threatened, or sensitive plant species were located during field surveys in the analysis area. None of the alternatives proposed are expected to have any impact on four of the five sensitive plant species. The proposed projects are not expected to impact individuals or habitat for *Eriogonum visheri, Astragalus barrii, Mentzelia pumila,* and *Mertensia cilliata.*

Selection of the proposed action alternative May Impact Individuals or Habitat, but will not Likely Contribute to a trend towards Federal Listing or Loss of Viability to the Population or Species of *Gentiana affinis* that may exist within the analysis area. A 1910 collection of this species is known to have come from the Cave Hills. However, an extensive 1994 survey (Heidel, 1995) did not find any populations of this species in the analysis area. Proposed actions will help improve rangeland conditions that will provide for ecological integrity needed for this species. However, potential habitat in the analysis area occurs in areas where livestock seek water, forage, and shade.

Future activities in the analysis area or changes in current project design or activity will require threatened, endangered, and sensitive plant review and possible additional field survey.

Table III-29 summarizes the findings for Sensitive Plants:

Table III-29: Sensitive Plant Species - Summary of Conclusion of Effects

Species	Alternative 1 – No Action	Alternative 2 – No Grazing	Alternative 3 – Proposed Action
Dakota buckwheat	NI[1]	NI	NI
Barr's milkvetch	NI	NI	NI
Golden stickleaf	NI	NI	NI
Mountain bluebells	NI	NI	NI
Prairie gentian	MIIH	NI	MIIH

[1] NI =No Impact
[2] MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal Listing or a loss of population viability.

3.8.4.1 CUMULATIVE EFFECTS COMMON TO ALL ALTERNATIVES

Implementation of any of the alternatives considered in this Environmental Assessment would not be expected to contribute to significant cumulative effects.

Eriogonum visheri, Astragalus barrii, Mentzelia pumila, Mertensia cilliata, and *Gentiana affinis* inhabits sites that presents few options for future activity and has experienced little activity in the past, whether the activity be logging, mining, grazing, recreation, or prescribed burning or other activities. Well pads, temporary road building might occur in the reasonably foreseeable future but the activities can generally be located away from populations upon further site review.

Other activities affecting sensitive plants include ongoing livestock grazing on several allotments. Additionally, ongoing and planned prescribed fires could impact sensitive plants. These impacts should not be significant due to the types of habitats sensitive plants occur in (open dry sites, seasonal meadows or woody draws) and are not affected to a great degree by the project activities. Ongoing range use by livestock has the most likelihood of cumulative impacts on the sensitive plant resource, because range use may be concentrated in the potential habitat for *Gentian affinis* (moist settings and woody draws). Ongoing recreational use such as hunting, wood cutting and camping would not have any cumulative effects on sensitive plants.

3.9 SOCIAL AND ECONOMICS

3.9.1 AFFECTED ENVIRONMENT

The analysis area covers eleven allotments located in Harding County, South Dakota. The current permittees reside in Harding County, South Dakota. The 2000 population estimate was 1,353 persons for Harding County. According to the 2000 Census, approximately 32% (375) of the labor force (1,173) in Harding County is employed in agriculture, forestry, and fisheries. Measurements of farm income in these areas consist of farm proprietor's net income, the cash wages, pay-in-kind, other labor income of hired farm workers, and the salaries of officers of corporate farms. Cash receipts for the sale of livestock products were over $27,502 in 1999. The inventory of all cattle in 2002 was 76,000 (National Agricultural Statistics Service).

Grazing is an important economic and management use on the Sioux District. There are ten livestock producers on eleven allotments within the analysis area. The livestock permitted in all allotments are cattle. The analysis area consists of approximately 23,470 acres of FS lands. Of these FS acres, approximately 15,775 acres are considered suitable for livestock grazing. The current permittees are permitted up to 1109 cow/calf pairs with bulls, up to 622 yearlings, and 175 bison on the eleven allotments under analysis. This represents approximately 0.03 percent of the 2002 county livestock inventory in Harding County, SD.

3.9.2 EFFECTS ANALYSIS

To describe project level analyses, the Forest Service uses the term “cost efficiency analysis” when all inputs and outputs cannot be measured in dollar terms. The cost efficiency analysis deals separately with market and non-market outputs and effects. All outputs that can be assigned monetary values undergo traditional economic efficiency analysis. Alternatives are compared on the basis of criteria such as highest ascertained (such as environmental, economic, and social impacts) are itemized and either quantified or qualified to the extent possible.

This economic efficiency analysis considers the revenues, benefits, and costs associated with each alternative by allotment. Present net value is based on benefits that will be produced during the life of the allotment management plan and costs including capital investments. All benefits and costs are discounted 4% annually to bring them into a common base year. This allows a direct comparison of investments that may be required; a useful life for the investment is show. If the useful life is longer than the term of the permit, or than estimated, the investments will be available if the grazing permit is issued again in the future.

The figures for Forest Service Present Net Value, Permittee Present Net Value, and Revenues for Counties (25% Fund) and are found in Tables III 29-31 below. The comparison summary indicates that Alternatives 1 and 3 have the only positive value for Forest Service and Permittee Present Net Value. Alternative 1 has the highest Revenue to the County. Alternative 2 provides no revenue to the county and Alternative 3 provides $203 less to the county than Alternative 1. The cost to the permittee to manage the allotment is reflected in the Permittee Present Net Value. These are based on assumptions that include days for monitoring, moving livestock, hauling salt, maintaining range improvements, etc. Assumptions used for Alternatives 1 and 3 are essentially the same. Alternative 2 indicates no cost or present value to the permittee.

Table III-30: Alternative 1: No Action (Maintain Current Management)

Allotment	AUMS	Head Months	FS Total PNV	Permittee Total Present Value	Possible 25% Fund
Box Springs	932	706	$44,358.01	$39,511.78	$238.28
Davis Draw	845	640	$40,217.29	$26,280.96	$216.00
Dunn	597	452	$28,413.87	$32,935.62	$152.55
JA Clarkson	477	361	$22,702.54	$32,938.39	$121.84
JB Clarkson	1050	793	$49,974.15	$50,540.31	$267.64
Jenkins	145	110	$6,901.19	$19,622.78	$37.13
John Brown	863	654	$41,073.99	$33,071.69	$220.73
Lone Mountain	199	151	$9,471.29	$19,599.27	$50.96
Pelham-Juberg	1171	887	$55,733.08	$33,385.11	$299.36
Schleichart	1337	1013	$63,633.75	$56,681.60	$341.89
Van Offern	392	297	$18,657.02	$21,626.07	$100.24
Totals	**8008**	**6064**	**$381,136.18**	**$366,193.5**	**$2,046.60**

Table III-31: Alternative 2: No Grazing

Allotment	AUMS	Head Months	FS Total PNV	Permittee Total Present Value	Possible 25% Fund
Box Springs	0	0	($12,252.22)	$0.00	$0.00
Davis Draw	0	0	($4,770.71)	$0.00	$0.00
Dunn	0	0	($4,955.62)	$0.00	$0.00
JA Clarkson	0	0	($10,595.41)	$0.00	$0.00
JB Clarkson	0	0	($14,737.43)	$0.00	$0.00
Jenkins	0	0	($887.57)	$0.00	$0.00
John Brown	0	0	($4,234.47)	$0.00	$0.00
Lone Mountain	0	0	($3,661.24)	$0.00	$0.00
Pelham-Juberg	0	0	($5,454.88)	$0.00	$0.00
Schleichart	0	0	($26,368.34)	$0.00	$0.00
Van Offern	0	0	($1,146.45)	$0.00	$0.00
Totals	**0**	**0**	**($89,064.35)**	**$0.00**	**$0.00**

Table III-32: Alternative 3: Proposed Action

Allotment	AUMS	Head Months	FS Total PNV	Permittee Total Present Value	Possible 25% Fund
Box Springs	932	706	$42,530.23	$41,339.56	$238.28
Davis Draw	334	253	$14,911.89	$27,325.59	$85.39
Dunn	595	451	$26,007.29	$35,136.67	$152.21
JA Clarkson	477	361	$21,755.76	$33,885.18	$121.84
JB Clarkson	1050	793	$49,419.42	$51,095.04	$267.64
Jenkins	145	110	$5,916.54	$20,607.44	$37.13
John Brown	581	440	$25,720.93	$34,844.84	$148.50
Lone Mountain	199	151	$9,471.29	$19,599.27	$50.96
Pelham-Juberg	1171	887	$50,288.86	$36,384.59	$299.36
Schleichart	1337	1013	$56,244.77	$62,098.79	$341.89
Van Offern	392	297	$17,437.31	$22,554.18	$100.24
Totals	**7213**	**5462**	**$319,704.29**	**$384,871.13**	**$1,843.43**

3.9.2.1 ADDITIONAL PERMITTEE IMPACTS

Alternative 2: No Grazing.

One additional potential impact of Alternative 2, No Grazing, is to the permittees. Loss of their current grazing permits could have two possible impacts. The first possibility is that the permittees will be forced to locate and lease private pasture from other local landowners or obtain privately leased pasture in a more distant location. Privately leased pasture is moderately available in the area, although in some years it is quite difficult to locate. The average cost of private pasture in the State of South Dakota was just over $17 per head month in 2000 (Morgan's Pasture and Range Prices Indicators - South Dakota Agricultural Statistics). This would be a cost of $103,088 for the cattle currently permitted on Forest Service lands. This compares with $8,186 under the currently existing permits. Additionally, if it is necessary to lease pasture in a more distant location, the permittee would incur increased transportation costs in order to move the herd to and from the leased pasture, but typically would not incur maintenance costs that are typically incurred under National Forest grazing permits and grazing fee structure. Sufficient information is not available to determine if this is a reasonable option for the permittees. Under any circumstances, it is a substantial increase in costs.

The second possible result from Alternative 2 is that the permittees would be forced to reduce the size of their herds and graze the remaining animals on their currently available private property. The permittees on all eleven allotments would need to reduce their operation by approximately 8008 AUMs. There is insufficient information available to determine the net effect of such an action on the permittees' operations.

Alternative 3: Proposed Action

Due to the stocking reduction, a situation similar to that discussed above occurs for the permittee of the Davis Draw and JB Clarkson Allotments, although on a much smaller scale. The proposed 601 head month (793 AUMs) stocking reduction on Forest Service pasture will be offset by the permittee utilizing some of his private pasture at an opportunity cost of approximately $10,217 as compared to the $811 cost under the current grazing fee associated with the Forest Service term grazing permit.

3.9.2.2 EXISTING RANGE PROGRAM ON THE CUSTER NATIONAL FOREST

Considering the landscape perspective, approximately 204,200 AUMs of livestock were permitted to graze on the Custer National Forest in 2002. Of this total, 8008 AUMs (cow/calf pairs, bulls, yearling cattle, and bison) are permitted to graze on public lands within the analysis area. According to 1997 employment coefficients (table III-33), the Custer National Forest range program (~$1 million annually) provided 245 employment opportunities with a total income of $8.4 million. These results consider four components: actual forage use, Forest Service salaries, Forest Service investments related to the program, and the expenditure of 25% Fund payments by the receiving counties. Grazing on the Custer National Forest is a relatively large program. Estimated total employment and income for the FY2002 Custer National Forest range program, by component, are shown in Table III-33.

Table III-33: Custer National Forest Employment and Income (2002)

Component	Employment-Jobs	Total Income
Forage Use	245	$7,400,208
Forest Service Salaries	21	$922,330
Forest Service Non-Salary Expenditures (30%)	0	$45,500
Total from all Components	**266**	**$8,367,830**

3.9.2.3 ECONOMIC IMPACTS RELATED TO THE CUSTER NATIONAL FOREST GRAZING PROGRAM

The economic impacts of the Custer grazing program are measured in terms of jobs and income in the counties that form the Custer National Forest market area (see project file for additional Social and Economic Analysis information). The Forest Service uses the MicroIMPLAN Input-Output model to estimate job and income impacts. Total job and income impacts include direct, indirect, and induced impacts. The total industry output was derived using annual inventory and market prices found in Montana, Idaho, North Dakota, and South Dakota Agricultural Statistics, 1991-1993. The total industry output was entered into MicroIMPLAN to derive direct, indirect, and induced effects. The job and income impacts associated with the Custer grazing program include allotment grazing outputs (measured in Animal Unit Months or AUMs), Forest Service personnel costs to staff the grazing program, Forest Service investments related to grazing, and grazing revenue contributions to 25% Fund payments to counties in the market area.

Since these impacts are estimated for the entire National Forest grazing program, it is not possible to make precise job and income estimates for individual grazing allotments because MicroIMPLAN is based on county level data and industry averages rather than on specific allotment characteristics. However, the total response coefficients (1997) provide an indication of the order of magnitude of job and income impacts used for this analysis, the most recent data set available.

The employment and total income grazing response coefficients for the Custer National Forest are displayed in Table III-34.

Table III-34: Custer National Forest Employment Coefficients

Component	Direct Employment	Total Employment	Alt. 1		Alt. 2		Alt. 3	
			Direct	Total	Direct	Total	Direct	Total
Forage Use-Cattle & Horses [1]	0.5 jobs / 1000 AUMs	1.1 jobs / 1000 AUMs	4.0 jobs	8.8 jobs	0 jobs	0 jobs	3.6 jobs	7.9 jobs
Forest Service Salaries [2]	15.2 jobs / Million $	33.6 jobs / Million $	0.22 jobs	0.49 jobs	0 jobs	0 jobs	0.20 jobs	0.44 jobs
Forest Service Investments [3]	12.5 jobs / Million $	28.4 jobs / Million $	0.05	0.12	0 jobs	0 jobs	0.05	0.11

Table III-34: Custer National Forest Employment Coefficients

Component	Direct Employment	Total Employment	Alt. 1		Alt. 2		Alt. 3	
			Direct	Total	Direct	Total	Direct	Total
			jobs	jobs			jobs	jobs
25% Fund Payments [4]	16.7 jobs / Million $	37.1 jobs / Million $	0.03 jobs	0.08 jobs	0 jobs	0 jobs	0.03 jobs	0.07 jobs

[1] Alt 1 = 8008 AUMs, Alt 3 = 7213 AUMs

[2] Alt 1 = $14,575 (8008 AUMs X $1.82 salary cost / AUM [$94,000 Ave. annual salary / 51,507 authorized AUMs]). Alt 3 = $13,128 (7213 AUMs X $1.82 salary cost / AUM [$94,000 Ave. annual salary / 51,507 authorized AUMs])

[3] Alt 1 = $4,164 (8008 AUMs X $0.52 investment cost / AUM [$27,000 Ave. annual RBF / 51,507 authorized AUMs]). Alt 3 = $3,751 (7213 AUMs X $0.52 investment cost / AUM [$27,000 Ave. annual RBF/ 51,507 authorized AUMs])

[4] Alt 1 = $2,047, Alt 3 = $1,843

Using the coefficients listed in Table III-34 above, the following Table III-35 discloses the estimated economic impacts of the three alternatives under consideration for the eleven allotments

Table III-35: Custer National Forest Total Income Coefficients

Component	Total Income - $	Alt. 1	Alt. 2	Alt. 3
Forage Use-Cattle & Horses	$36.24 / AUM	$290,209	$0	$261,399
Forest Service Salaries	$1.03 / $ Salary	$15,012	$0	$13,522
Forest Service Investments	$0.91 / $ Investment	$3,789	$0	$3,413
25% Fund Payments	$0.50 / $ Payment	$1,024	$0	$922

3.9.2.4 DIRECT AND INDIRECT EFFECTS

Alternative 1: No Action (Maintain Current Management)

This alternative maintains the status quo. The same number of jobs and income would continue to be generated as has occurred in the past.

Alternative 2: No Grazing

Using Alternative 1 above as representative of the current situation, Alternative 2 represents a total loss of approximately nine jobs and approximately $290,209 of income. Within Harding County, SD, this represents less than three percent of county-wide jobs in the agriculture, forestry, and fisheries segment of the labor force or less than one percent of the total labor force, and less than one percent of the total personal income.

Alternative 3: Proposed Action

This alternative would essentially maintain the same level of impacts as the current situation, with a very slight decrease in jobs (one) and income generated. Non-market outputs are those that are not quantifiable in terms of dollars. For example, the value of improving a mile of hardwood draws with its associated resource values is more of a qualitative value. Non-market outputs such as wildlife

species, plant and animal species diversity, and ecological health are discussed throughout the environmental analysis.

Cumulative Effects Common to All Alternatives

Implementation of any of the alternatives considered in this Environmental Assessment would not be expected to contribute to significant cumulative effects. Ongoing recreational use such as hunting, wood cutting and camping would not have any cumulative effects on economic considerations of the proposed action.

Alternative Summary

In summary, Alternative 1 would not improve non-market outputs and has the potential to further limit or degrade any number of them. Changes in a plant community's ability to move along natural successional pathways will alter or affect other non-market outputs such as extent and function of some upland and hardwood draw areas. This will in turn affect the species and numbers of wildlife use in that area for habitat and foraging needs. Alternatives 2 and 3 have the most potential to improve and sustain non-market outputs, although Alternative 3 would accomplish this at a much-reduced rate than would Alternative 2.

One other non-market output is the sustainability of the permit over time. Under Alternative 3, the desired conditions for the various natural resources are met and the risk of losing livestock grazing on public lands is low since the use can be shown to be compatible with other resources. Alternative 1 does not meet many of the desired conditions and would not sustain the natural functions within the ecosystems. Even though livestock grazing has been a traditional use, the degraded conditions in some areas will promote adverse public opinion concerning this kind of use on public lands so the risk of losing it is higher. Alternative 2 would not be consistent with the Forest Plan in providing appropriate multiple use of the public lands.

A reduction as shown in Alternative 3 for Davis Draw and John Brown Allotments would have minimal or no effect on the social well being of the county but for the individual permittee there is a higher probability that the allotment would be either too cost prohibitive to run on or threaten the viability of the ranching operation. Alternative 2 would have the highest adverse impact on all permittees ranching viability as these permits account for an unknown portion of the total number of livestock each ranch supports. The permit plays a role in maintaining the viability of the operation. However, as mentioned above, the current existence and potential for diversification within an individual operation such as farming, outfitting, or multiple income opportunities is not known.

3.10 REQUIRED DISCLOSURES AND UNIQUE CHARACTERISTICS

This section discloses information and impacts to unique characteristics of the Sioux 2003 Range analysis area. The project record files contain a detailed discussion for each of these sections; the following is a summary of that information.

3.10.1 MUNICIPAL WATERSHEDS

No municipal watersheds occur in the analysis area; therefore there would be no impacts on municipal watersheds.

3.10.2 CONGRESSIONALLY DESIGNATED AREAS

Wilderness: There are no lands designated on the Sioux Ranger District, including the analysis area, as Wilderness; therefore there would be no impacts on Wilderness.

Wilderness Study Areas: There are no lands designated on the Sioux Ranger District, including the analysis area, as Wilderness Study Areas (WSA) or recommended for wilderness classification; therefore, there would be no impacts on any WSA.

National Recreation Areas: There are no lands designated on the Sioux Ranger District, including the analysis area, as National Recreational Areas; therefore, there would be no impacts on any National Recreational Area.

3.10.3 INVENTORIED ROADLESS AREAS

There are no lands designated on the Sioux Ranger District, including the analysis area, classified as roadless. There are no inventoried roadless areas (IRAs) located on the Sioux Ranger District, including the analysis area; therefore, there would be no impacts on IRAs or roadless areas.

3.10.4 RESEARCH NATURAL AREAS

There are no research natural areas on the Sioux Ranger District, including the analysis area; therefore, there would be no impacts on RNAs.

3.10.5 PARKLANDS

The proposed projects would not affect any parklands.

3.10.6 PRIME FARMLANDS, RANGELANDS, AND FORESTLANDS

Prime farmland*:* The analysis area is not located in or adjacent to prime farmlands; therefore, there would be no impacts to Prime Farmland.

Prime Rangeland: the project area would not contain prime rangeland because of soils and climate, and none of the proposed activities would convert rangelands to other uses. Therefore, there would be no impacts on Prime Rangeland.

Prime Forestland: The analysis would not convert forestlands to other uses. All lands designated as forested would be retained as forested; therefore, there would be no impacts on Prime Forestland.

3.10.7 WILD AND SCENIC RIVERS

There are no lands designated or proposed for Wild and Scenic Rivers on the Sioux Ranger District, including the project area; therefore, the project would not impact any Wild and Scenic Rivers.

3.10.8 LANDMARKS

The Sioux Ranger District contains two National Natural Landmarks that were established upon recommendation by the USDA Forest Service and the USDI Park Service in 1977. These Natural Landmarks are situated in Management Area O with the goal to protect unique geological and scenic features. The Castles Natural Landmark, a sandstone formation that resembles a medieval castle encompasses approximately 1,000 acres in the Slim Buttes is located in T18N, R8E, Section 17. With the distance that separates the Castle's from the analysis area, there would be no visual or environmental effects to the National Landmark.

The second Natural Landmark is Capitol Rock, a sandstone formation resembling the Nation's Capitol building. The Landmark encompasses 240 acres and is located in Montana in T3S, R62E, Section 17. With the distance that separates Capitol Rock from the analysis area, there would be no visual or environmental effects to the National Landmark.

3.10.9 WETLANDS (EXECUTIVE ORDER 11990)

The analysis area does not contain wetlands as defined by E.O. 11990. Therefore, the projects would not have any impacts on wetlands.

3.10.10 FLOODPLAINS (EXECUTIVE ORDER 11988)

The Sioux 2003 Range Analysis area and adjacent areas do not contain floodplains as defined by E.O. 11988. Based on ESRI/FEMA Flood Hazard Maps and the secondary analysis, this project would not impact any floodplains.

3.11 LIST OF PREPARERS

This section includes a list of preparers of the environmental document. The following individuals were primarily responsible for developing the environmental analysis.

Custer National Forest, USDA-Forest Service

George Foley
Position: District Ranger
Contribution: Line Officer, Deciding Official

Jeff DiBendetto
Position: Forest Ecologist
Contribution: Soils and Vegetation Analysis

Linda Spencer
Position: Soils Scientist/Ecologist
Contribution: Soils and Vegetation Analysis

Halcyon LaPoint
Position: Forest Archeologist
Contribution: Cultural analysis

Vicky Eubank
Position: Forest GIS Specialist
Contribution: GIS information and support

John Lane
Position: Forest Soil Scientist
Contribution: Soils and Upland Vegetation Review

Charlie Odell
Position: Range Technician
Contribution: Range and noxious weeds

Jane Pedrotti
Position: Resource Assistant
Contribution: Project record, NEPA mailing lists

Kim Reid
Position: Forest Range Program Leader
Contribution: Analysis Review

Don Sasse
Position: District Wildlife Biologist
Contribution: Wildlife analysis

Laurie Walters-Clark
Position: IDT Leader
Contribution: IDT process, NEPA document

3 Environment and Effects

Tom Whitford
Position: Forest Wildlife Biologist
Contribution: Wildlife analysis and review

Enterprise T.E.A.M.S, USDA-Forest Service

Greg D. Lind
Position: Writer-Editor
Contribution: EA document preparation

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3.13 GLOSSARY

active lek: Displaying grouse present during the spring breeding season at least one year within the previous five consecutive years. Leks are assumed to be active in the absence of five consecutive years of data collected according to scientific methods that shows the lek to be inactive. Scientific data collection assumes qualified observers; survey times and conditions appropriate to detect breeding activity, and subsequent written reports. Results of surveys and a list of active leks are part of the Custer Forest Plan Monitoring and Evaluation (Monitoring Item: C2 – sensitive species, C-9 – prairie grouse). Any lek for which five consecutive years of survey data is lacking is assumed to be active.

active nest: An adult pair present at least one year within a period of five consecutive years. Nests are assumed to be active in the absence of five consecutive years of data collected according to scientific methods that shows the nest to be inactive. Scientific data collection assumes qualified observers; survey times and conditions appropriate to detect nesting activity, and subsequent written reports. The reporting process for results of surveys and a list of active nests are part of the Custer Forest Plan Monitoring and Evaluation Report (Monitoring Item: C2 - Sensitive Species, C8 - Special Interest). Evidence that a pair is present within a nesting territory can be based on evidence that eggs were laid or observations of 2 breeding-age birds that appear to be paired. In some species, the presence of a nest that has been recently built, repaired, or decorated may constitute evidence for occupancy because nest building behavior is probably elicited by the presence of a mate.

adaptive management: A type of natural resource management that implies making decisions as part of an on-going process. Monitoring the results of actions will provide a flow of information that may indicate the need to change a course of action. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.

affected environment: The natural environment that exists at the present time in an area being analyzed.

age class: An age grouping of trees according to an interval of years; usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years.

allotment (range allotment): The area designated for use by a prescribed number of livestock for a prescribed period of time. Though an entire Ranger District may be divided into allotments, all land will not be grazed, because other uses, such as recreation or tree plantings, may be more important at a given time.

alternative: A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision-making. An alternative need not substitute for another in all respects.

amenity values: Resource use for which market values (or proxy values) are not, or cannot be established.

analysis area: Area of analysis for this proposal on the Sioux Ranger District of the Custer National Forest.

animal month (AM): The quantity of forage required by one mature cow (or the equivalent, in sheep or horses, for instance) for one month.

animal unit month (AUM): The quantity of forage required by one mature cow and her calf (or the equivalent, in sheep or horses, for instance) for one month.

aquifer: A body of rock that is saturated with water or transmits water. When people drill wells, they tap water contained within an aquifer.

artificial regeneration: See regeneration.

aspect: The direction a slope faces. A hillside facing east has an eastern aspect.

benefit-cost ratio: Measure of economic efficiency, computed by dividing total discounted primary benefits by total discounted economic costs.

best management practices (BMP): A practice or a combination of practices, that is determined by a state (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (40 CFR 130.2g).

big game: Large mammals, such as deer, elk, and antelope that are hunted for sport.

biodiversity: See biological diversity.

biological assessment (BA): A stand alone document which reviews all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on Federally listed threatened, endangered, proposed, and candidate species as identified for the cumulative effects area in coordination with the USFWS . A Biological Assessment is used to satisfy consultation requirements with the USFWS for projects requiring an Environmental Impact Statement. (Reference: Sec. 7, ESA; 50 CFR, 402.12, 1508.7, 1508.25, and 1508.27.) The Biological Assessment displays the Determination of Effects for the DEIS or FEIS preferred alternative. The Determination of Effects (Salwasser, et al. Aug. 17, 1995) is limited to: (1) No Effect; (2) May effect - Not likely to adversely affect (NLAA); (3) *May effect - Likely to adversely affect (LAA); and (4) Beneficial effect. * = Considered a trigger for a significant action.

biological control: The use of natural means to control unwanted pests. Examples include: introduced or naturally occurring predators such as wasps, or hormones that inhibit the reproduction of pests. Biological controls can sometimes be alternatives to mechanical or chemical means.

biological diversity: The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and the ecological processes that connect everything in a common environment. The Custer Forest Plan and accompanying EIS addressed the four requirements to provide for diversity of plant and animal communities while achieving multiple use objectives across the Forest. Forest-wide Management Standards provide for achieving these

goals (FP pp 9-12 and planning record). No. 4 - d, and No. 8 - j, were developed for the management and recovery of threatened and endangered species. Standards No. 4 - c-h, No. 5 - c, d, and e, No. 6 - a, b, and e, No. 7 - a and c, No. 8 - b, No. 10 - a, No. 11 - a, and No. 12 - b, were developed for the management of indicator species. The before mentioned standards are also designed to maintain viable populations of wildlife, fish, and plant species. Management Standards No. 2 - h-i, No. 4 - f-g, and No. 8 - b, were specifically developed for the management of species that warrant special habitats. These are forest, riparian, hardwood draw, evergreen shrub, prairie grassland, or aquatic dependent species and rare plants or plant communities. Desired conditions of all these populations are discussed on pages 9 to 12 of the Forest Plan.

biological evaluation (BE): Documentation on USFS sensitive species (animal and plant) contained within an EIS (see Table of Contents for: USFS sensitive species; List of Preparers). Documentation includes a review of USFS sensitive species present, their habitat, and document that addresses and identifies the Determination of Effects on these species. The USFWS review of the biological evaluation is addressed through public scoping and conducted in conjunction with overall agency review of the DEIS. Reference FSM 2673.4 - Biological Evaluations for Sensitive Species. Opinions in the determination of impacts to sensitive species (Salwasser, et al. Aug. 17,1995) are limited to: (1) NI = No impact; (2) MIIH = May impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species.; (3) *WIFV * = Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population of species (* = Trigger for a significant action as defined in NEPA); and (4.) BI = Beneficial impact.

biomass: The total weight of all living organisms in a biological community.

biotic: Living. Green plants and soil microorganisms are biotic components of ecosystems.

browse: Twigs, leaves, and young shoots of trees and shrubs that animals eat. Browse is often used to refer to the shrubs eaten by big game, such as elk and deer.

buffer: A land area that is designated to block or absorb unwanted impacts to the area beyond the buffer. Buffer strips along a trail could block views that may be undesirable. Buffers may be set-aside next to wildlife habitat to reduce abrupt change to the habitat.

candidate species: A species being considered for listing as a federally endangered or threatened species.

canopy: The part of any stand of trees represented by the tree crowns. It usually refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multi-storied forest.

capability: The potential of an area of land and or water to produce resources, supply goods and services, and allow resource uses under a specified set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as management practices, silviculture or protection from fires, insects, and disease.

cavity- A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

chemical control: The use of pesticides and herbicides to control pests and undesirable plant species.

coarse filter management: Land management that addresses the needs of all associated species, communities, environments, and ecological processes in an area. (See fine filter management.)

commodities: Resources with commercial value; all resource products which are articles of commerce, such as timber, range forage and minerals.

composition: What an ecosystem is composed of. Composition could include water, minerals, trees, snags, wildlife, soil, microorganisms, and certain plant species.

conifer: A tree that produces cones, such as a pine, spruce, or fir tree.

connectivity (of habitats)**:** The linkage of similar but separated vegetation stands by patches, corridors, or "stepping stones" of like vegetation. This term can also refer to the degree to which similar habitats are linked.

consumptive use: Use of resources that reduces the supply, such as logging and mining.

contour: A line drawn on a map representing points of equal elevation.

corridor: Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

cover: Any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut streambanks. Animals use cover to escape from predators, rest, or feed.

cover forage ratio: The ratio of hiding cover to foraging areas for wildlife species.

cover type (forest cover type)**:** Stands of a particular vegetation type that are composed of similar species. The aspen cover type contains plants distinct from the pinyon-juniper cover type.

critical habitat: Areas designated for the survival and recovery of federally listed threatened or endangered species.

cultural resource: The remains of sites, structures, or objects used by people in the past; this can be historical or pre-historic.

cumulative effects: Effects on the environment that result from separate, individual actions that, collectively, become significant over time.

debris, woody: See woody debris

decision criteria: The rules and standards used to evaluate alternatives to a proposed action on National Forest land. Decision criteria are designed to help a decision maker identify a preferred choice from the array of alternatives.

desired condition: Land or resource conditions that are expected to result if goals and objectives are fully achieved.

developed recreation: Recreation that requires facilities that, in turn, result in concentrated use of the area. For example, skiing requires ski lifts, parking lots, buildings, and roads. Campgrounds require roads, picnic tables, and toilet facilities.

direct effects: Effects on the environment which occur at the same time and place as the initial cause or action.

dispersed recreation: Recreation that does not occur in a developed recreation site, such as hunting, backpacking, and scenic driving.

displacement: As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

disturbance: Any event, such as forest fire or insect infestations that alter the structure, composition, or functions of an ecosystem.

ecological approach: An approach to natural resource management that considers the relationships among all organisms, including humans, and their environment.

ecology: The interrelationships of living things to one another and to their environment, or the study of these interrelationships.

ecosystem: An arrangement of living and non-living things and the forces that move among them. Living things include plants and animals. Non-living parts of ecosystems may be rocks and minerals. Weather and wildfire are two of the forces that act within ecosystems.

ecosystem management: An ecological approach to natural resource management to assure productive, healthy ecosystems by blending social, economic, physical, and biological needs and values

edge: The margin where two or more vegetation patches meet, such as a meadow opening next to a mature forest stand, or a ponderosa pine stand next to an aspen stand.

effects: Physical, biological, social and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect, and cumulative and may be either beneficial or detrimental. (See Impacts)

endangered species: A plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973. The policy for the management of Federally listed endangered species is contained in FSM 2670.31, 6/23/95 (http://fsweb.wo.fs.fed.us/directives/fsm/2600/).

endemic plant/organism: A plant or animal that occurs naturally in a certain region and whose distribution is relatively limited geographically.

Environmental Analysis: An analysis of alternative actions and their predictable long and short-term environmental effects. Environmental analyses include physical, biological, social, and economic factors.

Environmental Impact Statement (EIS): A statement of environmental effects of a proposed action and alternatives to it. The EIS is released to other agencies and the public for comment and review.

ephemeral streams: Streams that flow only as the direct result of rainfall or snowmelt. They have no baseflow.

erosion: The wearing away of the land surface by wind or water.

escape cover: Vegetation of sufficient size and density to hide an animal, or an area used by animals to escape from predators.

fauna: The animal life of an area.

felling: Cutting down trees.

fine filter management: Management that focuses on the welfare of a single, or only a few species, rather than the broader habitat or ecosystem. (See coarse filter management.)

fire cycle: The average time between fires in a given area.

fire-damaged trees: All fire-killed and imminently dead trees. Dead trees are defined as any ponderosa pine tree with no green needles. Imminently dead trees are defined as any ponderosa pine tree with less than fifty percent live crown cover as compared to the pre-fire amount of live crown cover.

fisheries habitat: Streams, lakes, and reservoirs that support fish, or have the potential to support fish.

flood plain: A lowland adjoining a watercourse. At a minimum, the area is subject to a 1% or greater chance of flooding in a given year.

flora: The plant life of an area.

forage: All browse and non-woody plants that are eaten by wildlife and livestock.

forb: A broadleaf plant that has little or no woody material in it.

foreground viewing area: The landscape area visible to an observer from the immediate area to 1/2 mile.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA): The parent act that proceeded Forest Planning. This act directed that the National Forest System begin systematic resource planning on the National Forest units.

forest plan: A comprehensive management plan prepared under the National Forest Management Act of 1976 that provides standards and guidelines for management activities on the Custer National Forest. The Custer Forest Plan was approved June 1987.

Forest Supervisor: The official responsible for administering National Forest lands on an administrative unit, usually one or more National Forests. The Forest Supervisor reports to the Regional Forester.

forest transportation system road: A road wholly or partly within or adjacent to and serving the National Forest System and which is necessary for the protection, administration and utilization of the National Forest System and the use and developments of its resources.

fragile soils: Soils that are located on steep topography, are highly susceptible to wind and/or water erosion, have high potential for mass failure, are shallow to bedrock, are saline or alkaline, or soils which are virtually impossible or extremely difficult to reclaim.

fragmentation: Breaking up of contiguous areas into progressively smaller patches of increasing degrees of isolation. Opposite of connectivity.

fuels treatment: The rearrangement or disposal of natural or activity fuels to reduce fire hazard.

function: All the processes within an ecosystem through which the elements interact, such as succession, the food chain, fire, weather, and the hydrologic cycle.

game species: Any species of wildlife or fish that is harvested according to prescribed limits and seasons.

geographic information systems (GIS): GIS is both a database designed to handle geographic data as well as a set of computer operations that can be used to analyze the data. In a sense, GIS can be thought of as a higher order map..

geomorphic processes: Processes that change the form of the earth, such as volcanic activity, running water, and glacial action.

geomorphology: The science that deals with the relief features of the earth's surface.

grazing permit: is a document authorizing livestock to use NFS lands or other lands under Forest Service control for livestock production.

a. Grazing Permit With Term Status is a permit issued for periods up to l0 years. It grants the permittee priority for renewal. Types include the Term Grazing Permit (FSM 2231.11), Term Grazing Association Permit (FSM 2231.12), Term Permit with, On-and-Off Provision (FSM 2231.14), Term Private Land Grazing Permit (FSM 2231.13), and Grazing Agreement (FSM 2232).

b. Temporary Permits are issued for a period not to exceed 1 year to graze specified number, kind, and class of livestock for a specific season and area of use (FSM 2233).

ground water: The supply of fresh water under the earth's surface in an aquifer or in the soil.

habitat: A place where a plant or animal naturally, or normally, lives and grows.

habitat diversity: A number of different types of wildlife habitat within a given area.

habitat indicator species: Species whose population changes are believed to indicate effects of management on other species of a major biological community or on water quality. The forest will provide for the maintenance and improvement of habitats for these indicator species.

habitat type: A way to classify land area. A habitat type can support certain climax vegetation, both tree and undergrowth species. Habitat typing can indicate the biological potential of a site.

hand piling: Fuel treated by hand piling slash.

hardwood draw: See woody draw.

head month: one month's use and occupancy of the range by one animal. For grazing fee purposes, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or 5 sheep or goats.

hibernaculum: a shelter occupied during the winter by a dormant animal.

hiding area/cover: Vegetation capable of hiding 90% of an adult elk or deer from human's view at a distance of 200 feet or less.

horizontal diversity: The distribution and abundance of different plant and animal communities or different stages of plant succession across an area of land; the greater the numbers of communities in a given area, the higher the degree of horizontal diversity.

human dimension: An integral component of Ecosystems Management that recognizes people are part of ecosystems; that people's pursuits of past, present, and future desires, needs and values (including perceptions, beliefs, attitudes and behaviors) have and will continue to influence ecosystems; and that ecosystem management must include consideration of the physical, emotional, mental, spiritual, social, cultural, and economic well being of people and communities.

hydrologic cycle: Also called the water cycle, this is the process of water evaporating, condensing, falling to the ground as precipitation, and returning to the ocean as run-off.

hydrologic unit codes (HUC): Watersheds are delineated by USGS using a nationwide system based on surface hydrologic features. A hierarchical hydrologic unit code (HUC) consisting of 2 digits for each level in the hydrologic unit system used to identify any hydrologic area. The 6 digit accounting units and the 8 digit cataloguing units are generally referred to as basin and sub-basin.

hydrology: The science dealing with the study of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

impacts: Physical, biological, social, and economic results (expected or experienced) resulting from achievement of outputs. Effects can be direct, indirect, and cumulative and may be either beneficial or detrimental. (See effects)

indicator species: A plant or animal species related to a particular kind of environment. Its presence indicates that specific habitat conditions are also present.

indigenous (species): Any species of wildlife native to a given land or water area by natural occurrence.

instream flow: The quantity of water necessary to meet seasonal stream flow requirements to accomplish the purposes of the National Forests. This includes, but is not limited to: fisheries, visual quality, and recreational opportunities.

integrated pest management (IPM): Evaluates alternatives for managing forest pest populations, based on consideration of pest-host relationships.

interdisciplinary team: A team of individuals with skills from different disciplines that focuses on the same task or project.

intermittent stream: A stream that flows only at certain times of the year when it receives water from springs or from some surface sources, such as melting snow.

irretrievable: One of the categories of impacts mentioned in the National Environmental Policy Act to be included in statements of environmental impacts. An irretrievable effect applies to losses of production or commitment of renewable natural resources. For example, while an area is used as a ski area, some or all of the timber production there is irretrievably lost. If the ski area closes, timber production could resume; the loss of timber production during the time that the area was devoted to winter sports is irretrievable. However, the loss of timber production during that time is not irreversible, because it is possible for timber production to resume if the area is no longer used as a ski area.

irreversible: A category of impacts mentioned in statements of environmental impacts that applies to non-renewable resources, such as minerals and archaeological sites. Irreversible effects can also refer to effects of actions that can be renewed only after a very long period of time, such as the loss of soil productivity.

key wildlife area: Any area which is critical to wildlife during at least a portion of the year. This importance may be due to vegetative characteristics such as residual nesting cover, or behavioral aspects of the animals such as lambing areas. Key areas include: winter ranges, lambing/fawning/calving areas, dancing/strutting grounds, nesting areas, breeding grounds, elk wallows, riparian and woody draws, and roosting areas.

key winter range: That portion of big game's range where the animals find food and cover during severe winter weather.

landline location: The legal identification, accurate location, and description of property boundaries.

landscape: A large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse grain analysis.

land use planning: The process of organizing the use of lands and their resources to best meet people's needs over time, according to the land's capabilities.

large woody debris: Woody material derived from tree limbs, boles, and roots that may or may not be in various stages of decay greater than 3 inches in diameter.

lek: See active lek.

linkages: Route that permits movement of individual plant (by dispersal) and animals from a Landscape Unit and/or habitat type to another similar Landscape Unit and/or habitat type.

litter (forest litter)**:** The freshly fallen or only slightly decomposed plant material on the forest floor. This layer includes foliage, bark fragments, twigs, flowers, and fruit.

livestock: foraging animals of any kind kept or raised for use or pleasure.

long-term effects: Those effects which generally occur after the maximum 15-year life of the Forest Plan.

macro climate: The general, large scale climate of a large area, as distinguished from the smaller scale micro climates within it.

management action: Any activity undertaken as part of the administration of the National Forest.

management area: An aggregation of capability areas which have common management direction and may be noncontiguous in the Forest. Consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issue and concerns.

management direction: A statement of multiple-use and other goals and objectives, the associated management practices identified by the Forest Service in the planning process.

management indicator species (MIS): A wildlife species whose population will indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities to that ecosystem. MIS species are selected by land management agencies. (See "indicator species".)

mass movement/wasting: The down-slope movement of large masses of earth material by the force of gravity. Also called a landslide.

mesic: Land conditions that are moist in nature.

micro climate: The climate of a small site. It may differ from the climate at large of the area due to aspect, tree cover (or the absence of tree cover), or exposure to winds.

mineral soil: Soil that consists mainly of inorganic material, such as weathered rock, rather than organic matter.

mitigation: Actions taken to avoid, minimize, or rectify the impact of a land management practice by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action..

monitoring and evaluation: The periodic evaluation of forest management activities to determine how well objectives were met and how management practices should be adjusted. See "adaptive management".

mosaic: Areas with a variety of plant communities over a landscape, such as areas with trees and areas without trees occurring over a landscape.

multiple use management: The management of all the various renewable surface resources of National Forest lands for a variety of purposes such as recreation, range, timber, wildlife and fish habitat, and watershed.

National Environmental Policy Act (NEPA): Congress passed NEPA in 1969 to encourage productive and enjoyable harmony between people and their environment. One of the major tenets of NEPA is its emphasis on public disclosure of possible environmental effects of any major action on public lands. Section 102 of NEPA requires a statement of possible environmental effects to be released to the public and other agencies for review and comment.

National Forest Land and Resource Management Plan (NFLRMP): Also called the Forest Plan or just the Plan, this document guides the management of a particular National Forest and establishes management standards and guidelines for all lands of that National Forest.

National Forest Management Act (NFMA): This law was passed in 1976 and requires the preparation of Regional Guides and Forest Plans.

National Forest System: Includes all National Forest System lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means; the national grasslands; and land utilization projects administered by the Forest Service under Title III of the Bankhead-Jones Farm Tenant Act of 1937.

natural barrier: A natural feature, such as a rock outcrop, sandstone cliff, dense stand of trees or downfall, that will restrict animal travel.

natural disturbance: See disturbance.

natural regeneration: See regeneration.

natural resource: A feature of the natural environment that is of value in serving human needs.

nest, active: See active nest.

no action alternative: An alternative that maintains established trends or management direction.

nongame: Wildlife species that are not hunted for sport.

non-parous: Not giving birth.

nonpoint source pollution: Pollution whose source is not specific in location. The sources of the discharge are dispersed, not well defined, or constant. Rain storms and snowmelt often make this type of pollution worse. Examples include sediments from logging activities and runoff from agricultural chemicals.

non-renewable resource: A resource whose total quantity does not increase measurably over time, so that each use of the resource diminishes the supply.

Northern Region: The portion of the USDA Forest Service also referred to as Region One that includes National Forests in Montana, northern Idaho, and northwestern South Dakota.

noxious weed: According to the Federal Noxious Weed Act (PL 93-629), a weed that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

nutrient cycle: The circulation of chemical elements and compounds, such as carbon and nitrogen, in specific pathways from the non-living parts of ecosystems into the organic substances of the living parts of ecosystems, and then back again to the non-living parts of the ecosystem. For instance, nitrogen in wood is returned to the soil as the dead tree decays; the nitrogen again becomes available to living organisms in the soil, and upon their death, the nitrogen is available to plants growing in that soil.

organic soil: Soil at least partly derived from living matter, such as decayed plant material.

parent material: The mineral or organic matter from which the upper layers of soil are formed.

percolation: Downward flow or infiltration of water through the pores or spaces of rock or soil.

perennial stream: A stream that flows continuously. Perennial streams are generally associated with a water table in the localities through which they flow.

permitted grazing: Grazing on a National Forest range allotment under the terms of a grazing permit.

permittee: any entity that has been issued a grazing permit.

permitted livestock: those livestock presently being grazed under a permit or those that were grazed under a permit during the preceding season, including their offspring retained for herd replacement.

permitted use: the number of animals, period of use, and location of use specified in Part 1 of the grazing permit (see also definition for authorized use).

prescribed fire: Fire set intentionally in wildland fuels under prescribed conditions and circumstances. Prescribed fire can rejuvenate forage for livestock and wildlife or prepare sites for natural regeneration of trees.

prescription: Management practices selected to accomplish specific land and resource management objectives.

present net value (PNV): Also called present net worth. The measure of the economic value of a project when costs and revenues occur in different time periods. Future revenues and costs are "discounted " to the present by an interest rate that reflects the changing value of a dollar over time. The assumption is that dollars today are more valuable than dollars in the future. PNV is used to compare project alternatives that have different cost and revenue flows.

processes: A sequence of events or states, one following from and dependent on another, which lead to some outcome. For instance, ecosystems that have a 10-year fire cycle have a narrower range of

variation than ecosystems with 200-300 year fire cycle. Past management has placed some ecosystems outside their range of variability. Future management should move such ecosystems back toward their natural, sustainable range of variation.

proposed action: In terms of the National Environmental Policy Act, the project, activity, or action that a Federal agency intends to implement or undertake and which is the subject of an environmental analysis.

public involvement: The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

public land: Land for which title and control rests with a government---Federal, state, regional, county, or municipal.

public roads: Any road under the jurisdiction of and maintained by a public authority and "open to public travel".

rangeland: Land on which the principle natural plant cover is composed of native grasses, forbs, and shrubs that are valuable as forage for livestock and big game.

range management: The art and science of planning and directing range use intended to yield the sustained maximum animal production and perpetuation of the natural resources.

range of variability: Also called the historic range of variability or natural range of variation. The components of healthy ecosystems fluctuate over time. The range of sustainable conditions in an ecosystem is determined by time.

Ranger District: The administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

raptor: A bird of prey, such as a eagle or hawk.

recharge: The addition of water to ground water by natural or artificial processes.

reforestation: The restocking of an area with forest trees, by either natural or artificial means, such as planting.

regeneration: The renewal of a tree crop by either natural or artificial means. The term is also used to refer to the young crop itself.

> **artificial:** The restocking of an area with forest trees by the means of planting of seedlings not grown on site but of native origin.
>
> **natural:** The restocking of an area with forest trees by the means of natural seed fall from existing trees on the site.
>
> **delayed-natural:** The restocking of an area with forest trees by the means of natural seed fall from existing trees on the site over long time periods (5 to 100 years or more). Existing seed

source is not available to restock within 5 years. Reforestation will progress over a span of time (5 to 100 or more years) from the existing seed source, as new seedlings will have to grow for 40 to 80 years and cast more seed.

Regional Forester: The official of the USDA Forest Service responsible for administering an entire region of the Forest Service.

resilience: The ability of an ecosystem to maintain diversity, integrity, and ecological processes following a disturbance.

responsible official: The Forest Service employee who has been delegated the authority to carry out a specific planning action.

restoration (of ecosystems): Actions taken to modify an ecosystem to achieve a desired, healthy, and functioning condition.

restriction: A restriction precludes use of the route or area during a specific time period by: Type of vehicle, such as log trucks or type of traffic such as motorized or public. (Source: Access and Travel Management, Northern Region Guide, Missoula, MT. Oct. 1997, 26 pp.)

revegetation: The re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding.

riparian areas: Areas with distinctive resource values and characteristics that are comprised of an aquatic ecosystem and adjacent upland areas that have direct relationships with the aquatic system. This includes floodplains, wetlands, and all areas within a horizontal distance of approximately 100 feet from the normal high waterline of a stream channel, or from the shoreline of a standing body of water.

run-off: The portion of precipitation that flows over the land surface or in open channels.

sapling: A loose term for a young tree more than a few feet tall and an inch or so in diameter that is typically growing vigorously.

savannah: A grassland that has scattered individual trees.

sawtimber: Trees containing at least one 12 foot sawlog or two noncontiguous 8 foot logs, and meeting regional specifications for freedom from defect. Softwood trees must be at least 9 inches in diameter and hardwood trees 11 inches in diameter at breast height.

scale: In ecosystem management, it refers to the degree of resolution at which ecosystems are observed and measured.

scoping: The ongoing process to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

scoria (Porcelainite): A hard, dense, siliceous rock having the texture, dull luster, hardness, fracture, or general appearance of unglazed porcelain, often found in the roof or floor of a burned out coal seam. In North Dakota it is commonly used as a road surfacing material.

security: The protection inherent in any situation that allows elk to remain in a defined area despite an increase in stress or disturbance associated with the hunting season or other human activities. (Lyons and Christensen, 1992)

security area: Any area that will hold elk during periods of stress because of geography, topography, vegetation, or a combination of those features. (Lyons and Christensen, 1992)

sediment: Solid material, both mineral and organic, that is in suspension, being transported, or has been moved from its site of origin by air, water, gravity, or ice.

sensitive species: Those plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations and will be managed similar to threatened or endangered species. The Forest Service policy is to ensure that species would not be affected in such a manner as to have them listed or proposed for listing as threatened or endangered. The policy for the management of Forest Service sensitive species is contained in FSM 2670.32, 6/23/95 (http://fsweb.wo.fs.fed.us/directives/fsm/2600/).

seral: The stage of succession of a plant or animal community that is transitional. If left alone, the seral stage will give way to another plant or animal community that represents a further stage of succession.

silviculture: The art and science that promotes the growth of single trees and the forest as a biological unit.

site preparation: The general term for removing unwanted vegetation, slash, roots, and stones from a site before reforestation. Naturally occurring wildfire, as well as prescribed fire can prepare a site for natural regeneration.

size class: One of the three intervals of tree stem diameters used to classify timber in the Forest Plan data base. The size classes are: seedling/sapling (less than 5 inches in diameter); pole timber (5 to 7 inches in diameter); sawtimber (greater than 7 inches in diameter).

slope classes: The topographic relief of a unit of land. Land classes are separated by slope; slope classes used in the project area are defined by the following slope ranges: 0-20 percent; 20-40 percent; 40-60 percent and greater than 60 percent.

slump: A landslide where the underlying rock masses tilt back as they slide from a cliff or escarpment.

small game: Birds and small animals normally hunted or trapped.

snag: A standing dead tree usually greater than 5 feet in height and 6 inches in diameter at breast height.

soil compaction: The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

soil productivity: The capacity of a soil to produce a specific crop. Productivity depends on adequate moisture and soil nutrients, as well as favorable climate.

soil quality: As generally defined by Forest standards and guidelines "..the inherent ability of soil to support vegetation". This site-specific measure is monitored using surrogate variables from four groups: fire effects, soil erosion, soil organic matter content, and soil physical properties. Required by MUSY Act, NEPA, and NFMA. Also used is the term soil productivity.

stand: A group of trees that occupies a specific area and is similar in species, age, and condition.

standards and guidelines: Requirements found in a Forest Plan which impose limits on natural resource management activities, generally for environmental protection.

stand replacement: When a stand has been totally modified by some disturbance (fire, insects, disease, logging), and needs to be started over.

stocking level: The number of trees in an area as compared to the desirable number of trees for best results, such as maximum wood production.

stream order: A measure of the position of a stream in the hierarchy of tributaries (stream as referenced here refers to perennial streams). First order streams are unbranched streams (they have no tributaries). Second-order streams are formed by the confluence of two or more first-order streams. They are considered second-order or larger stream. Third-order streams are formed by the confluence of two or more second-order streams. They are considered third-order until they join another third-order or larger stream.

structure: How the parts of ecosystems are arranged, both horizontally and vertically. Structure might reveal a pattern, or mosaic, or total randomness of vegetation.

suitable forest land: Forest land (as defined in CRF 219.3) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14); and for which there is management direction that indicates that timber production is an appropriate use of that area.

suitability: The appropriateness of certain resource management to an area of land. Suitability can be determined by environmental and economic analysis of management practices.

succession: The natural replacement, in time, of one plant community with another. Conditions of the prior plant community (or successional stage) create conditions that are favorable for the establishment of the next stage.

successional stage: A stage of development of a plant community as it moves from bare ground to climax. The grass-forb stage of succession precedes the woody shrub stage.

suppression: Any act taken to slow, stop, or extinguish a fire. Examples of suppression activities include fireline construction, backfiring, and application of water or chemical fire retardants.

sustainable: The yield of a natural resource that can be produced continually at a given intensity of management is said to be sustainable.

sustainability: The ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time.

thinning: A cutting made in an immature stand of trees to accelerate growth of the remaining trees or to improve the form of the remaining trees.

threatened species: Those plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future as designated by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973. The policy for the management of Federally listed threatened species is contained in FSM 2670.31, 6/23/95 (http://fsweb.wo.fs.fed.us/directives/fsm/2600/).

total maximum daily loads (TMDL): A requirement (Clean Water Act 303 (d)) which establishes the maximum allowable loading for each pollutant for a waterbody to meet water quality standards and allocates that load among polluting contributors.

transitory range: Land that is suitable for grazing use for a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time before being replace by trees or shrubs not suitable for forage.

transportation planning: The identification of the transportation network through interdisciplinary analysis to effectively and efficiently meet the land and resource management direction on a defined area for a specified planning period. (Source: FSM 7700-2000-1)

travel plan: Access and travel management is a continuous process of analyzing, controlling, and regulating uses to accomplish Forest management objectives. It is the portion of the planning and implementation process that develops clear specific direction on appropriate levels of land, water, and air access opportunities to be made available. It takes into account long-term social, biological, economic, and physical considerations; it combines a variety of design considerations that are commensurate with how access will be provided and travel will be managed; and it also involves sharing this information with the concerned public. Access and Travel Management consideration link resource and people objectives including both road systems and off-road travel for each management areas or areas. (Source: Access and Travel Management, Northern Region Guide, Missoula, MT. Oct. 1997, 26)

understory: The trees and woody shrubs growing beneath the overstory in a stand of trees.

vegetation management: Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

vegetation type: A plant community with distinguishable characteristics.

vertical diversity: The diversity in a stand that results from the different layers or tiers of vegetation.

viable population: The number of individuals of a species sufficient to ensure the long-term existence of the species in natural, self-sustaining populations that are adequately distributed throughout their range.

water quality limited segment: Any stream segment where the stream does not meet applicable water quality standards or will not meet applicable water quality standards even after application of the effluent limitations required by the Clean Water Act, as amended.

watershed: The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land onto which rain falls and is subsequently stored in soil then released down slope to a stream. Watersheds are divided by topographic features.

watershed quality: The specific characterization of a watershed in terms of functionality of it's components including but not limited to vegetation, soil, and water resources.

water table: The upper surface of groundwater. Below it, the soil is saturated with water.

water yield: The runoff from a watershed, including groundwater outflow.

wetlands: Those areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs.

wildfire: Any wildland fire that is not a prescribed fire.

wildlife habitat diversity: The distribution and abundance of different plant and animal communities and species within a specific area.

woody debris: The residue left on the ground after a fire, storm, timber cutting, or other event. Woody debris includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

woody draw: A classification of areas, particularly in grassland settings, where an overstory of woody vegetation in small drainages creates habitat for many wildlife species and shade/wind protection and forage for livestock. The vegetation is a result of higher moisture conditions than in the surrounding areas but surface water if any, running thru the areas is generally short term.

xeric: Land conditions that are dry in nature.